GIS Lab

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Getting Started

```
library( maptools )
```

```
## Warning: package 'maptools' was built under R version 3.2.3
```

```
## Loading required package: sp
## Checking rgeos availability: FALSE
##      Note: when rgeos is not available, polygon geometry     computations in maptools
depend on gpclib,
##      which has a restricted licence. It is disabled by default;
##      to enable gpclib, type gpclibPermit()
```

```
library( sp )
library( dplyr )
```

```
## Warning: package 'dplyr' was built under R version 3.2.3
```

```
##
## Attaching package: 'dplyr'
##
## The following objects are masked from 'package:stats':
##
##     filter, lag
##
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library( RColorBrewer )

syr <- readShapePoly( fn="01-05-2015", proj4string=CRS("+proj=longlat +datum=WGS84") )
dat <- as.data.frame( syr )
```

1. What is the average price of a single family home in each neighborhood?

```
sing.fam <- dat[dat$LandUse == "Single Family", ]
tapply(sing.fam$AssessedVa, sing.fam$Nhood, mean, na.rm=T)
```

```
##              Brighton          Court-Woodlawn                Downtown
##              40094.17                66871.46               110000.00
##              Eastwood                 Elmwood           Far Westside
##              69104.49                49731.14                53933.33
##       Franklin Square             Hawley-Green              Lakefront
##                    NA                47813.46                37808.33
##          Lincoln Hill              Meadowbrook          Near Eastside
##              61543.79               118554.66                47798.92
##         Near Westside             North Valley              Northside
##              35441.17                55983.21                47844.53
##        Outer Comstock                Park Ave.          Prospect Hill
##              73063.41                43215.57                54648.28
##          Salt Springs                 Sedgwick             Skunk City
##              63101.46               127879.40                45020.43
##          South Campus             South Valley              Southside
##             109180.00                72826.85                39907.01
##             Southwest               Strathmore              Tipp Hill
##              39231.46                90516.28                63720.00
##      University Hill University Neighborhood      Washington Square
##              85041.18               114846.58                50096.53
##              Westcott                Winkworth
##              86743.18               109447.02
```

2. What is the average value of one acre of land in each neighborhood?

```
dat$acreprice <- dat$AssessedVa/dat$Acres
tapply(dat$acreprice, dat$Nhood, mean, na.rm=T)
```

```
##             Brighton          Court-Woodlawn              Downtown
##             303053.6                550582.0             3252663.7
##             Eastwood                 Elmwood         Far Westside
##             558296.7                345209.3              552823.7
##      Franklin Square            Hawley-Green             Lakefront
##             817599.0                653100.2              562909.0
##         Lincoln Hill             Meadowbrook         Near Eastside
##             508069.6                477755.9              427704.6
##        Near Westside            North Valley             Northside
##             279609.0                356223.0              571657.2
##       Outer Comstock               Park Ave.         Prospect Hill
##             404540.1                455879.1              897674.4
##         Salt Springs                Sedgwick            Skunk City
##             431394.5                664994.5              380891.4
##         South Campus            South Valley             Southside
##             647834.9                347411.5              299747.6
##            Southwest              Strathmore             Tipp Hill
##             253118.3                545052.0              651839.8
##      University Hill University Neighborhood     Washington Square
##            1979056.2                749673.8              553236.6
##             Westcott               Winkworth
##             675517.6                367041.8
```

```
#or with dplyr package
dat2 <- mutate( dat, price.acre = AssessedVa / Acres  )
by.hood <- group_by( dat2, Nhood )
prices <- summarise( by.hood, count = n(),
                     ave.price = mean(price.acre, na.rm= TRUE) )
as.data.frame( prices )
```

```
##                      Nhood count ave.price
## 1                 Brighton  2302  303053.6
## 2            Court-Woodlawn  2402  550582.0
## 3                 Downtown   389 3252663.7
## 4                 Eastwood  4889  558296.7
## 5                  Elmwood  1444  345209.3
## 6             Far Westside  1027  552823.7
## 7          Franklin Square    89  817599.0
## 8             Hawley-Green   367  653100.2
## 9                Lakefront   312  562909.0
## 10            Lincoln Hill  1123  508069.6
## 11              Meadowbrook  1878  477755.9
## 12            Near Eastside   441  427704.6
## 13            Near Westside  1772  279609.0
## 14             North Valley  1531  356223.0
## 15               Northside  3261  571657.2
## 16           Outer Comstock   990  404540.1
## 17                Park Ave.   942  455879.1
## 18            Prospect Hill   365  897674.4
## 19             Salt Springs  1414  431394.5
## 20                 Sedgwick  1138  664994.5
## 21               Skunk City   713  380891.4
## 22             South Campus    36  647834.9
## 23             South Valley  1925  347411.5
## 24                Southside  1370  299747.6
## 25                Southwest  1150  253118.3
## 26               Strathmore  1822  545052.0
## 27                Tipp Hill  1468  651839.8
## 28          University Hill   505 1979056.2
## 29 University Neighborhood  1259  749673.8
## 30        Washington Square  1180  553236.6
## 31                 Westcott  1540  675517.6
## 32                Winkworth   452  367041.8
## 33                     <NA>     6  145493.0
```

3. Drill down to the downtown area for the following:

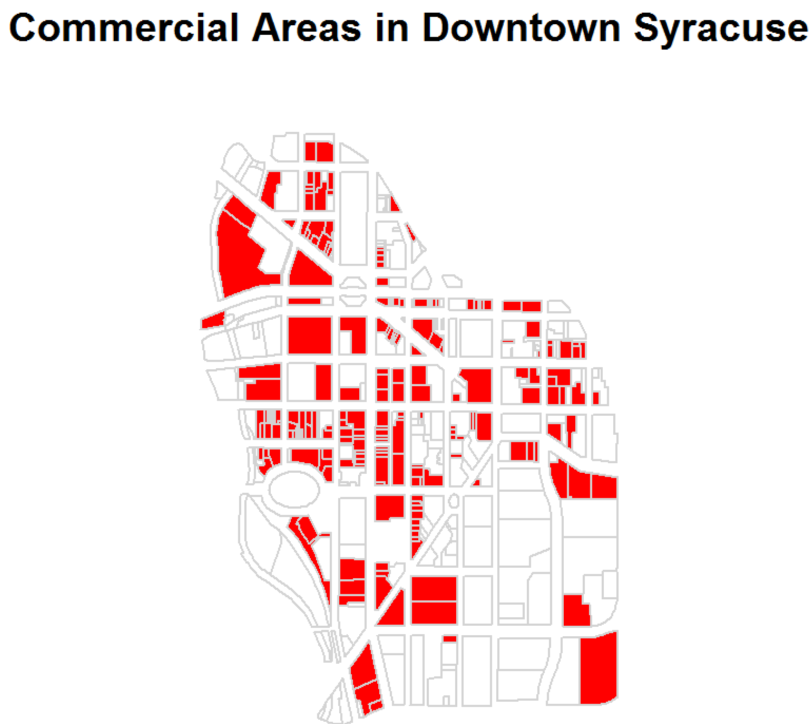
a. Create a map that highlights parking lots.

```
these.downtown <- syr$Nhood == "Downtown"
these.downtown[ is.na(these.downtown) ] <- F
downtown <- syr[ these.downtown , ]

dat.dt <- as.data.frame( downtown )
col.vec <- ifelse( dat.dt$LandUse == "Parking", "red", NA)

plot( downtown, col=col.vec, border="lightgray", main="Parking Lots in Downtown Syracus
e")
```

Parking Lots in Downtown Syracuse

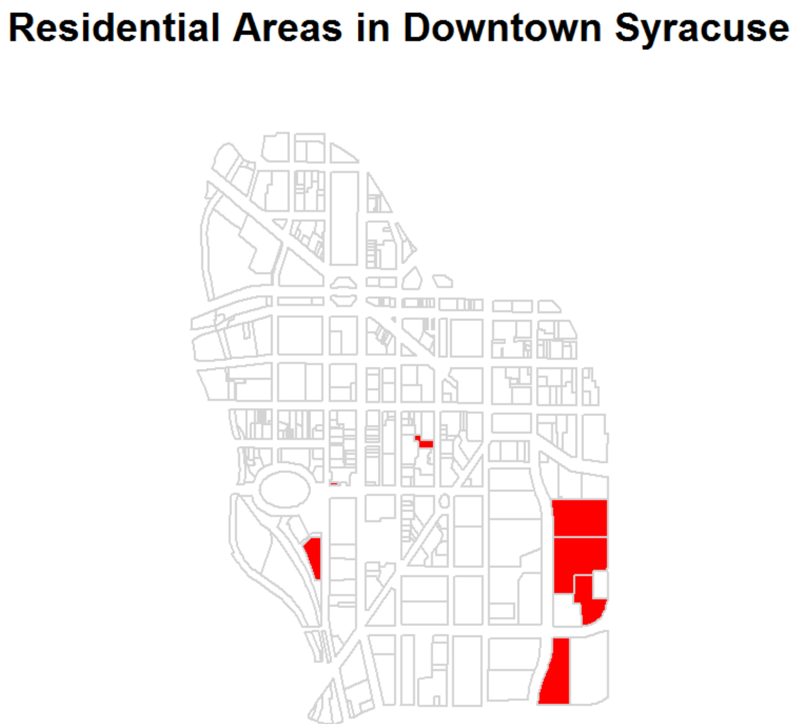
b. Create a map that highlights commercial areas.

```
col.vec <- ifelse( dat.dt$LandUse == "Commercial", "red", NA)

plot( downtown, col=col.vec, border="lightgray", main="Commercial Areas in Downtown Syrac
use")
```



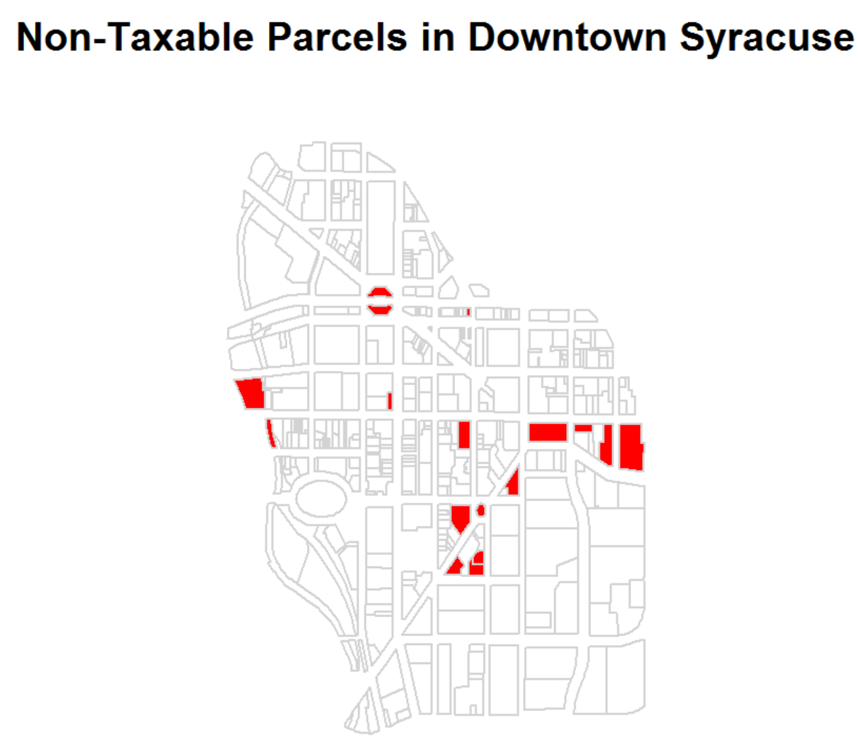
c. Create a map that highlights residential areas.

```
col.vec <- rep( NA, nrow(dat.dt) )
col.vec[ dat.dt$LandUse == "Apartment" ] <- "red"
col.vec[ dat.dt$LandUse == "Multiple Residence" ] <- "red"
col.vec[ dat.dt$LandUse == "Single Family" ] <- "red"
col.vec[ dat.dt$LandUse == "Three Family" ] <- "red"
col.vec[ dat.dt$LandUse == "Two Family" ] <- "red"

plot( downtown, col=col.vec, border="lightgray", main="Residential Areas in Downtown Syra
cuse")
```



d. Create a map that highlights non-taxable parcels.

```
col.vec <- rep( NA, nrow(dat.dt) )
col.vec[ dat.dt$LandUse == "Parks" ] <- "red"
col.vec[ dat.dt$LandUse == "Schools" ] <- "red"
col.vec[ dat.dt$LandUse == "Religious" ] <- "red"


plot( downtown, col=col.vec, border="lightgray", main="Non-Taxable Parcels in Downtown Sy
racuse")
```



e. What proportion of the downtown is residential? What proportion is commercial?

```
acreage.dt <- tapply(dat.dt$Acres, dat.dt$LandUse, sum, na.rm=T)
acre.df <- data.frame( Acres=as.numeric(acreage.dt), name=names(acreage.dt), stringsAsFac
tors=F )

#find residential rows
which(acre.df$name ==  "Apartment" )
```

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

```
which(acre.df$name ==  "Multiple Residence" )
```

```
## [1] 6
```

```
which(acre.df$name ==  "Single Family" )
```

```
## [1] 12
```

```r
which(acre.df$name ==  "Two Family" )
```

```
## [1] 14
```

```r
which(acre.df$name ==  "Three Family" )
```

```
## [1] 13
```

```r
#create proportions
res.prop.dt <- sum(acre.df[c(1, 6, 12, 13, 14),1], na.rm=T) / sum(acre.df$Acres, na.rm=T)
com.prop.dt <- acre.df[acre.df$name == "Commercial",1] / sum(acre.df$Acres, na.rm=T)

#Proportion Residential
res.prop.dt
```

```
## [1] 0.06875218
```

```r
#Proportion Commercial
com.prop.dt
```

```
## [1] 0.3726347
```

4. Which neighborhood has the highest number of vacant lots (var=LandUse)?

```r
vacant.lot <- dat[dat$LandUse == "Vacant Land",]
vac.nhood <- as.data.frame(table(vacant.lot$Nhood))
most.vac <- which.max(vac.nhood$Freq)
vac.nhood[most.vac, ]
```

```
##             Var1 Freq
## 13 Near Westside  425
```

Vacant buildings (var=VacantBuil)?

```r
vac.build <- dat[dat$VacantBuil == "Y",]
vac.nhood <- as.data.frame(table(vac.build$Nhood))
most.vac <- which.max(vac.nhood$Freq)
vac.nhood[most.vac, ]
```

```
##         Var1 Freq
## 15 Northside  264
```

Highest proportion of both combined?

```
vac.all <- dat[dat$VacantBuil == "Y" | dat$LandUse == "Vacant Land",]
vac.nhood <- as.data.frame(table(vac.all$Nhood))
prop.all <- as.data.frame(table(dat$Nhood))
dat3 <- merge(prop.all, vac.nhood, by.x="Var1", by.y="Var1")
dat3$prop.vac <- dat3$Freq.y/dat3$Freq.x
most.prop.vac <- which.max(dat3$prop.vac)
dat3[most.prop.vac, ]
```

```
##              Var1 Freq.x Freq.y  prop.vac
## 7 Franklin Square     89     37 0.4157303
```

5. Create a map of the city that highlights the age of buildings using the following categories:

< 1900, 1900-1919, 1920-1939, 1940-1959, 1960-1979, 1980-1999, 2000-2014

For your maps, be sure to use an informative title and legend.

```
dat$Build <- 2015 - as.numeric(dat$YearBuilt)
col.vals <- brewer.pal( 7, "BuGn" )
dat$col.vec2 <- rep( NA, nrow(dat) )
dat$col.vec2[ dat$Build < 1900 ] <- "#EDF8FB"
dat$col.vec2[ dat$Build > 1899 & dat$Build < 1920 ] <- "#CCECE6"
dat$col.vec2[ dat$Build > 1919 & dat$Build < 1940 ] <- "#99D8C9"
dat$col.vec2[ dat$Build > 1939 & dat$Build < 1960 ] <- "#66C2A4"
dat$col.vec2[ dat$Build > 1959 & dat$Build < 1980 ] <- "#41AE76"
dat$col.vec2[ dat$Build > 1979 & dat$Build < 2000 ] <- "#238B45"
dat$col.vec2[ dat$Build > 1999 ] <- "#005824"


plot(syr, col=dat$col.vec2, border=NA, main="Syracuse Buildings by Age")
legend("bottomleft",  legend = c("< 1900", "1900-1919", "1920-1939", "1940-1959", "1960-1
979", "1980-1999", "2000-2014"),
  title = "Year Built",
  fill = col.vals,
  cex = 0.56,
  bty = "n")
```

Syracuse Buildings by Age