Assignment 2

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```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.0     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.1
## v purrr     1.0.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(GGally)
```

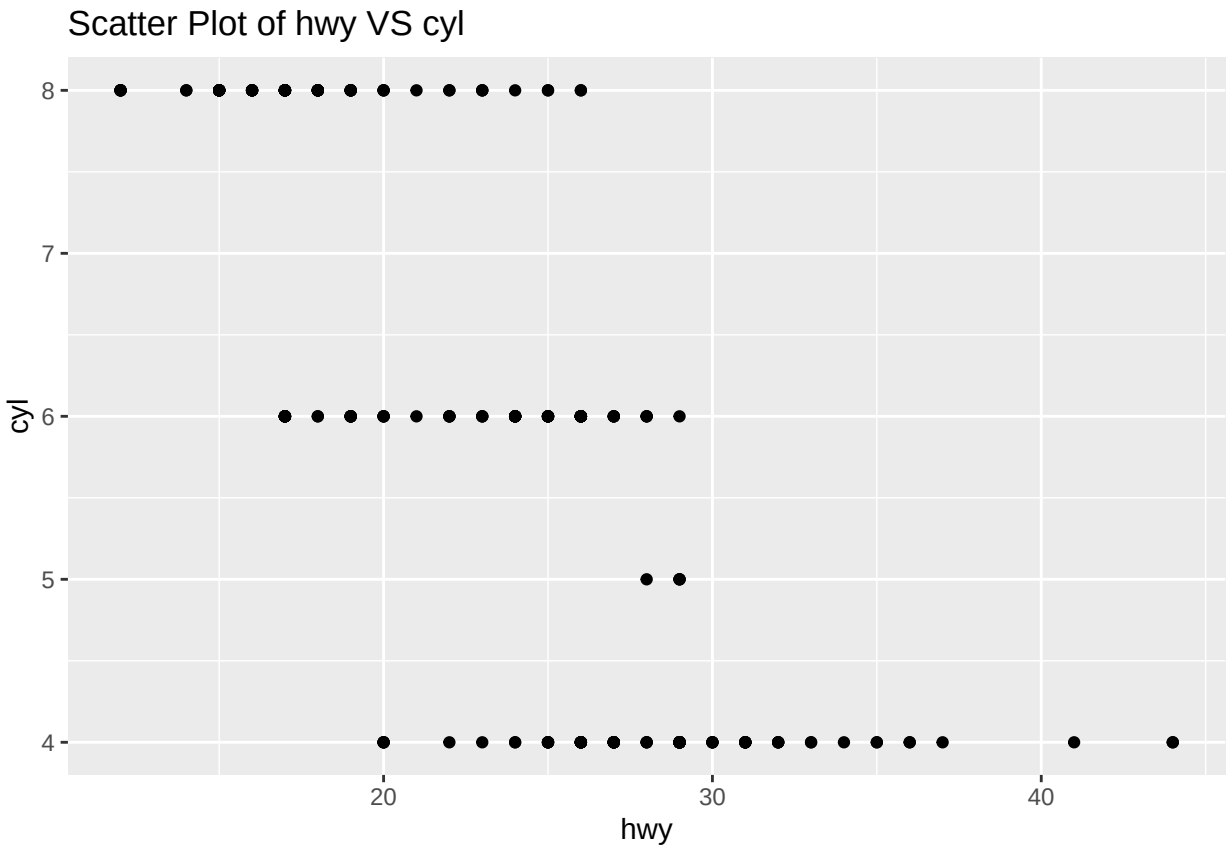
```
## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2
```

```
library(ggridges)
library(naniar)
```

1 Learning ggplot1

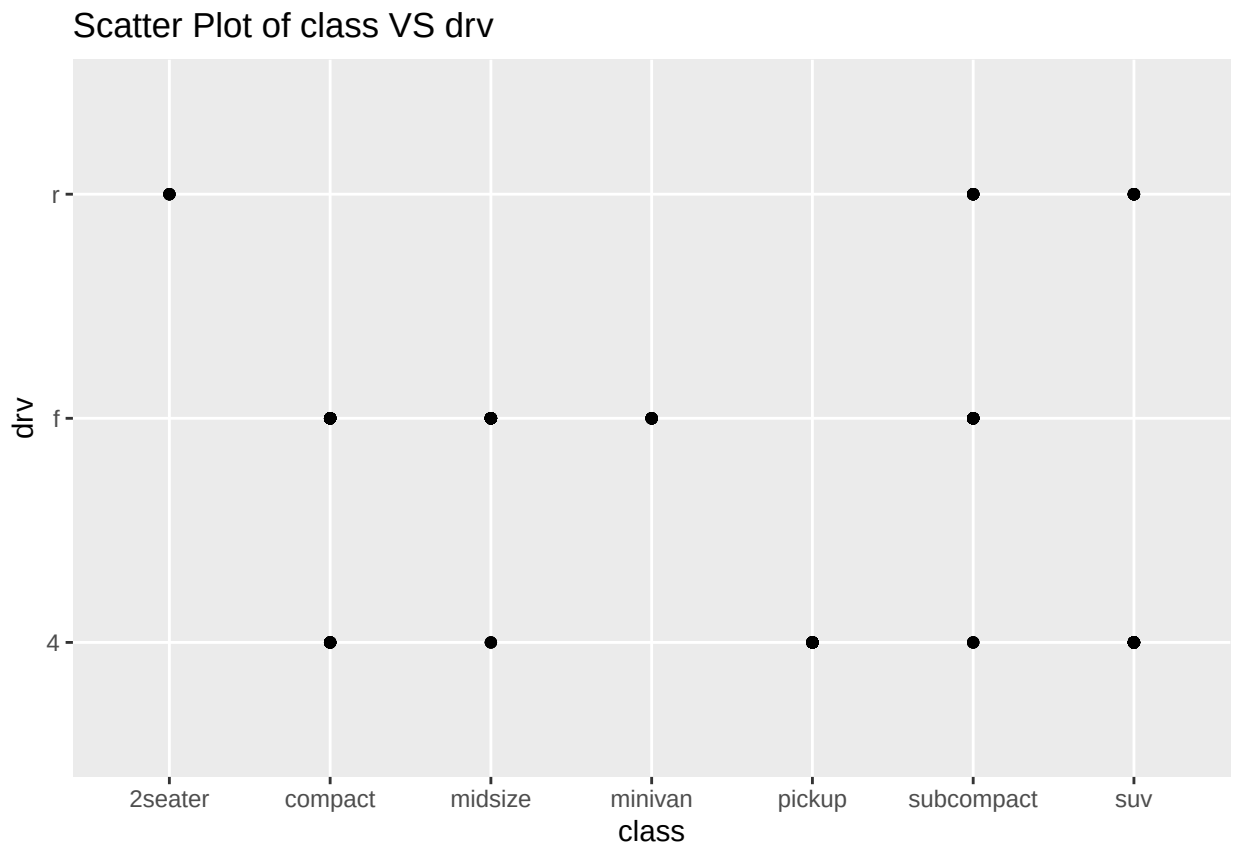
a. §3.2.4 #4 Make a scatterplot of hwy vs cyl.

```
ggplot(data = mpg, aes(x = hwy,y = cyl)) +
  geom_point() +
  ggtitle("Scatter Plot of hwy VS cyl")
```



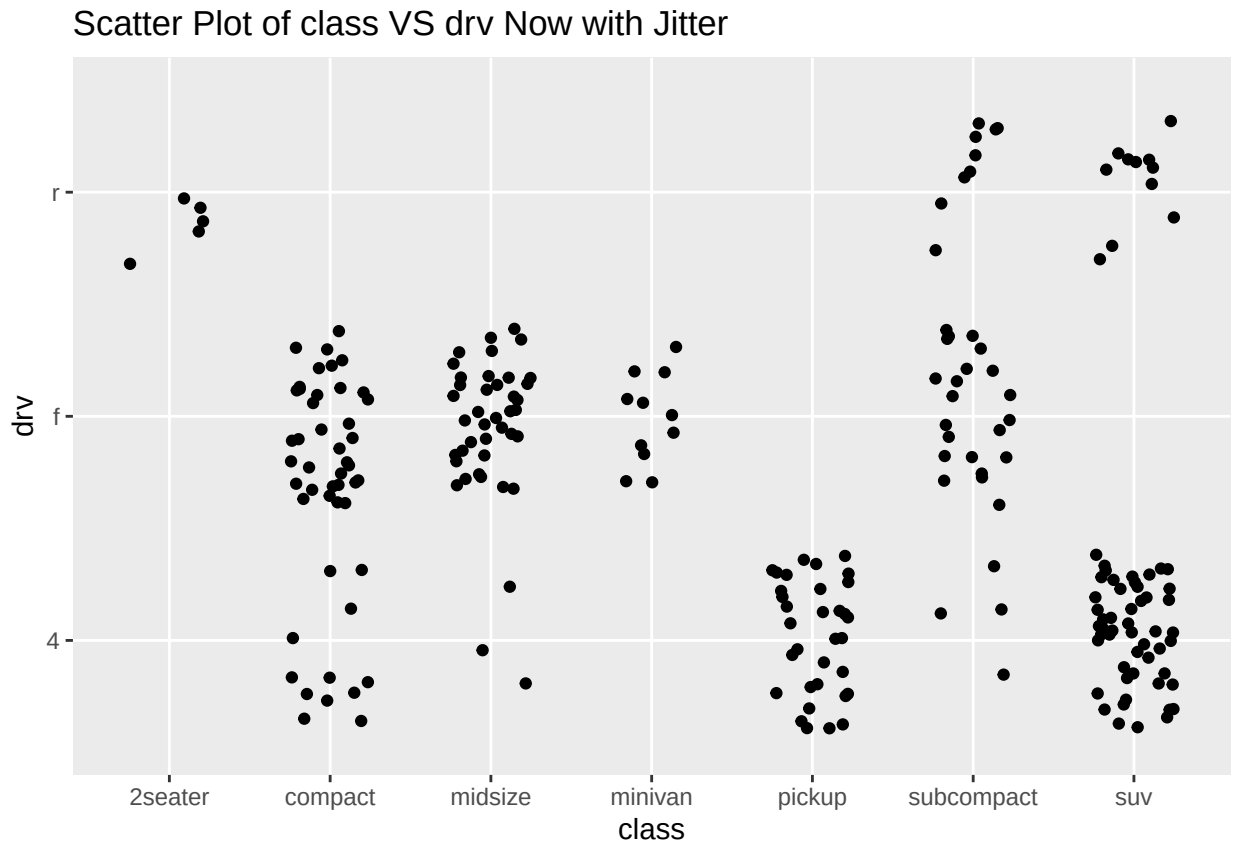
a. §3.2.4 #5 What happens if you make a scatterplot of class vs drv? Why is the plot not useful?

```
ggplot(data = mpg, aes(x = class,y = drv)) +
  geom_point() +
  ggtitle("Scatter Plot of class VS drv")
```



Since both are categorical variables, all data points are printed on top of one another. You can use `jitter` to improve the graphic.

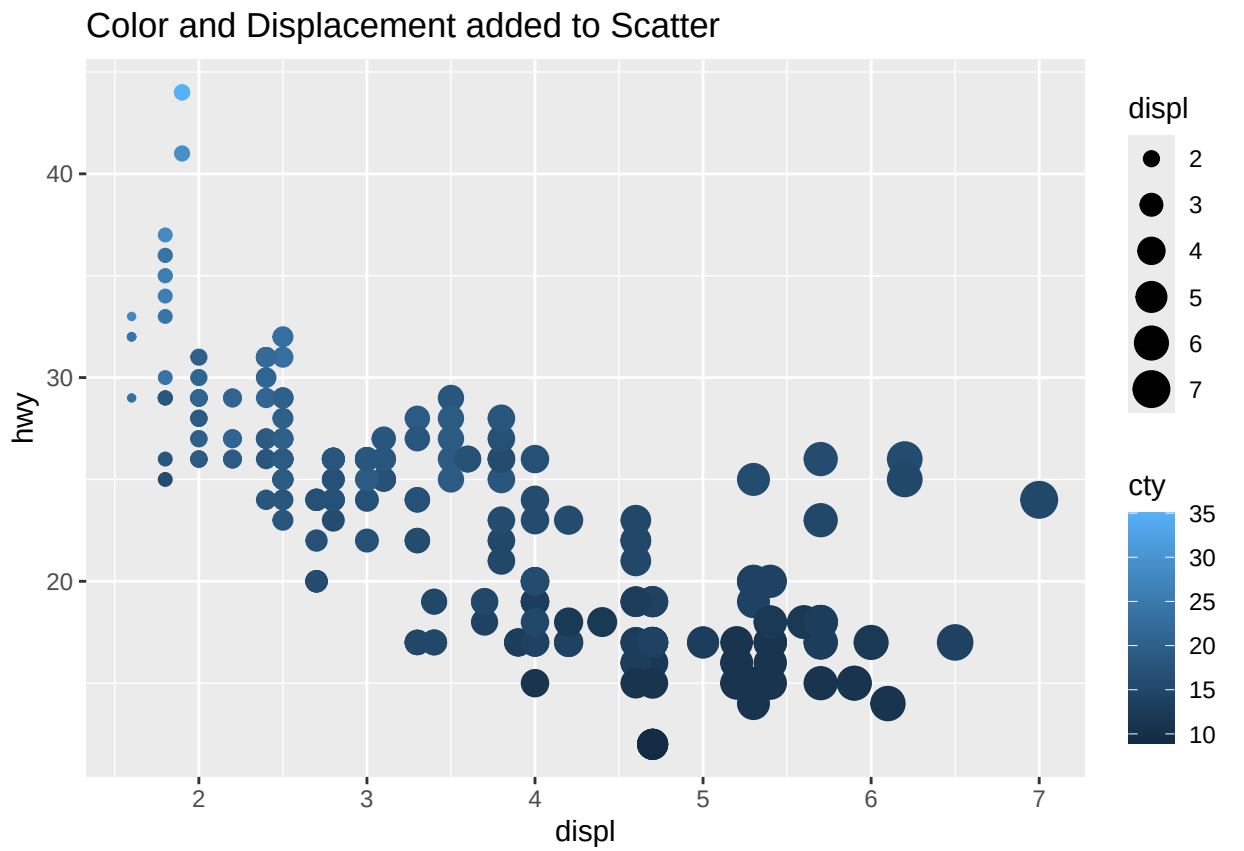
```
ggplot(data = mpg, aes(x = class,y = drv)) +
  geom_jitter(width = 0.25) +
  ggtitle("Scatter Plot of class VS drv Now with Jitter")
```



I did relax the jitter a bit to make certain you could tell where the data belonged.

a. §3.3.1 #3 Map a continuous variable to color, size, and shape. How do these aesthetics behave differently for categorical vs. continuous variables?

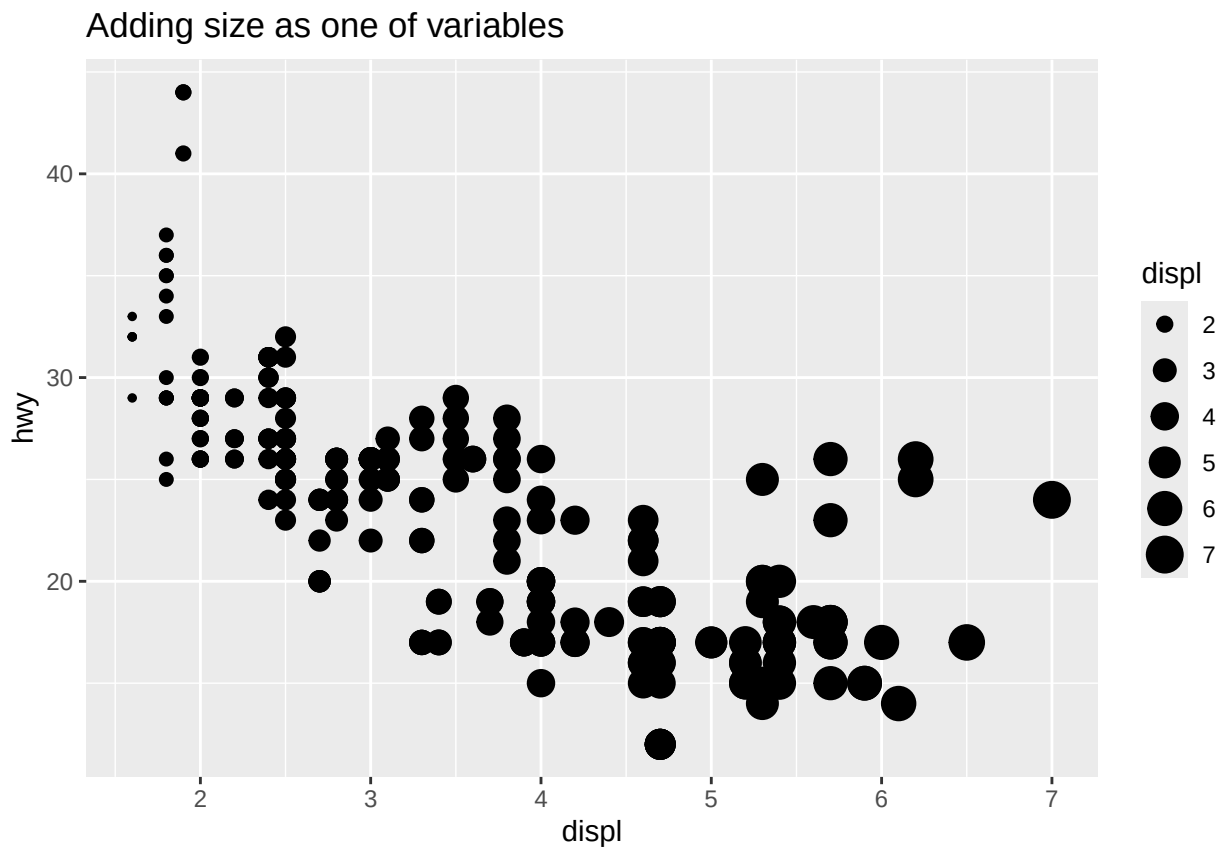
```
ggplot(data = mpg) +
  geom_point(mapping = aes(x = displ, y = hwy, color = cty, size = displ))+
  ggtitle("Color and Displacement added to Scatter")
```



Color gave a gradient and size made some differentiation of the size in the point. `shape` through an error so I removed it so that I could have a picture. The error specifically says that shape cannot be a continuous variable.

a. §3.3.1 #4 What happens if you map the same variable to multiple aesthetics?

```
ggplot(data = mpg) +
  geom_point(mapping = aes(x = displ, y = hwy, size = displ))+
  ggtitle("Adding size as one of variables")
```

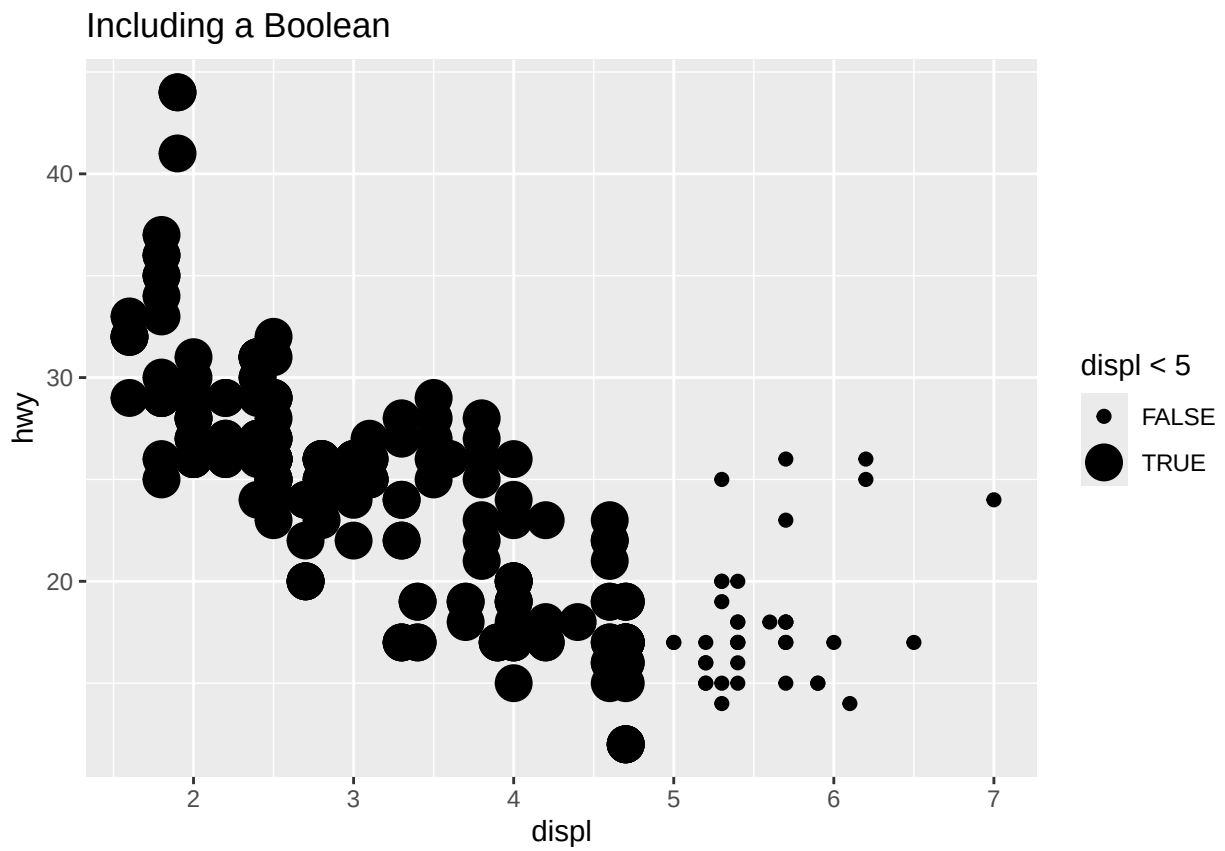


Nothing, it makes the graphic that you asked for...

a. §3.3.1 #6 What happens if you map an aesthetic to something other than a variable name, like aes(colour = displ < 5)? Note, you'll also need to specify x and y.

```
ggplot(data = mpg) +
  geom_point(mapping = aes(x = displ, y = hwy, size = displ<5))+
  ggtitle("Including a Boolean")
```

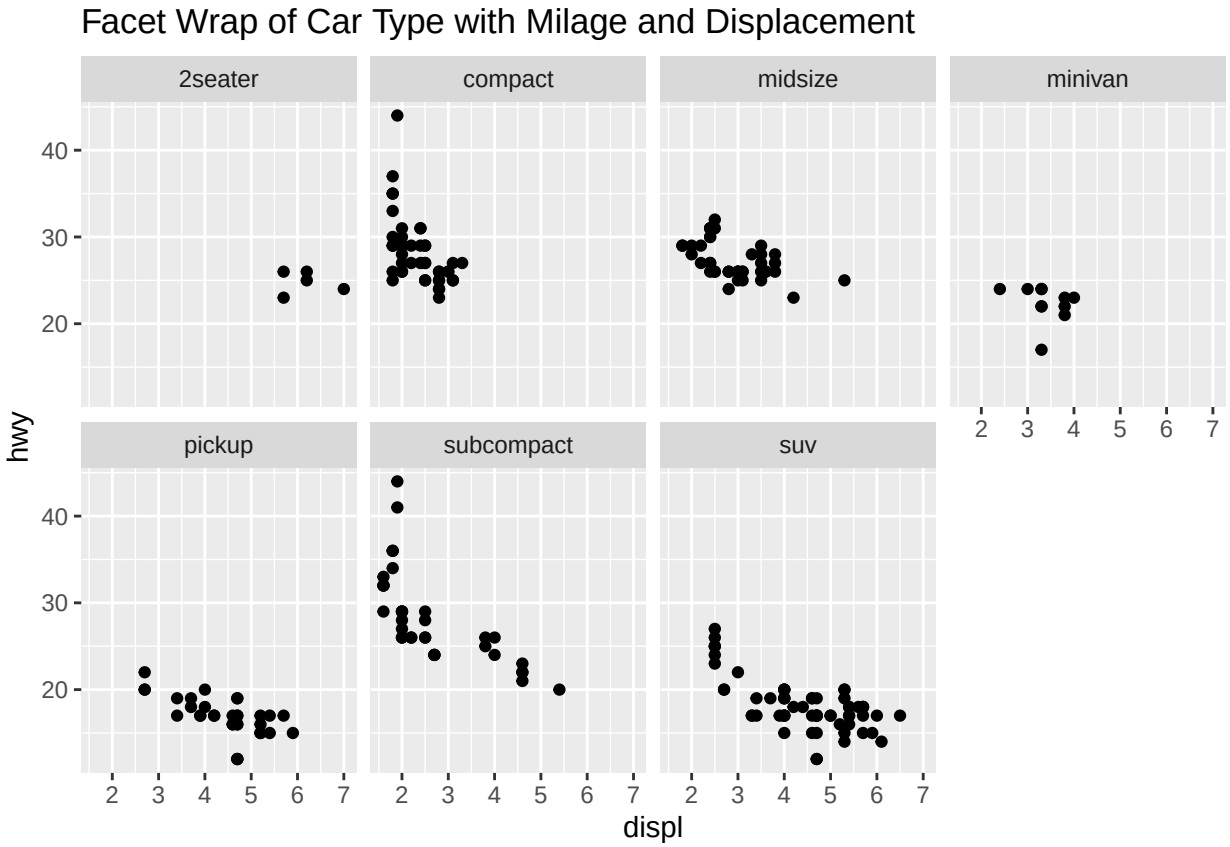
```
## Warning: Using size for a discrete variable is not advised.
```



It converted that variable from the dataset into a boolean and then graphed it.

a. §3.5.1 #4 Take the first faceted plot in this section:

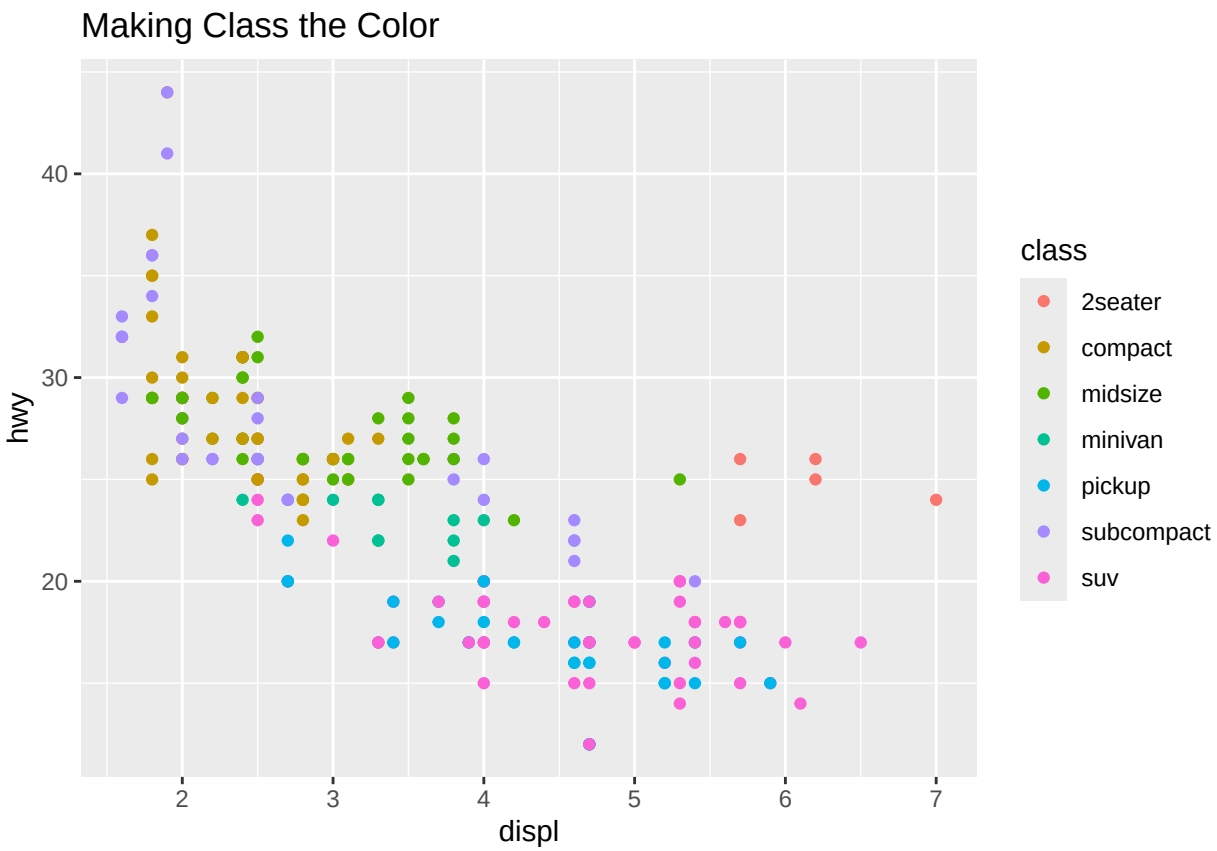
```
ggplot(data = mpg) +
  geom_point(mapping = aes(x = displ, y = hwy)) +
  facet_wrap(~ class, nrow = 2)+
  ggtitle("Facet Wrap of Car Type with Milage and Displacement")
```



What are the advantages to using faceting instead of the colour aesthetic? What are the disadvantages? How might the balance change if you had a larger dataset?

Facet is going to give each `class` by itself. You can quickly see each class and recognize where it congregates in the data. If we had done this with the color aesthetic as below,

```
ggplot(data = mpg) +
  geom_point(mapping = aes(x = displ, y = hwy, color = class))+
  ggtitle("Making Class the Color")
```

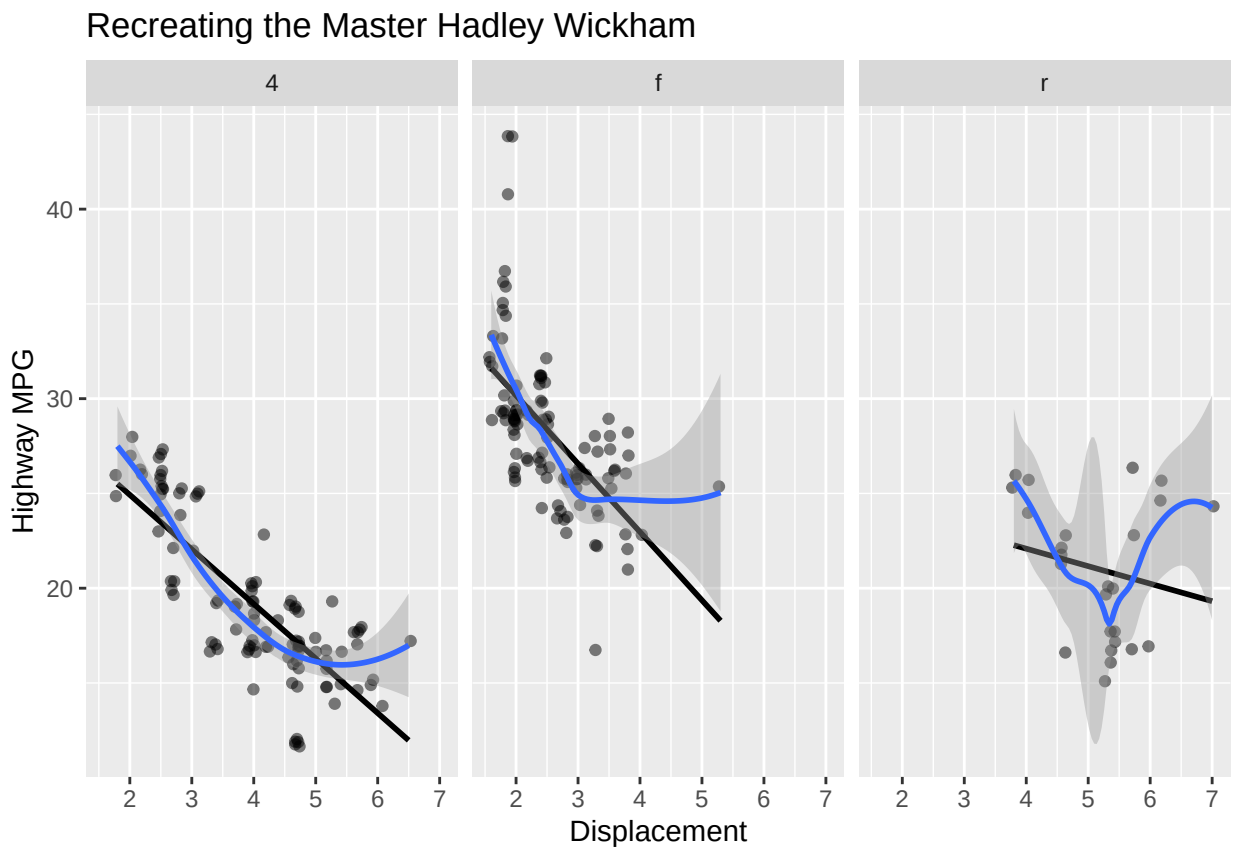


We could observe something similar in the clustering. I am color blind so if there are too many colors, I cannot distinguish them all. The defaults are normally fine for me but the fancier folks try to get the harder it is for me to distinguish the colors. In a large dataset, faceting would be necessary as the color would blob over each other with some entries right on top of each other.

b.

```
ggplot(data = mpg, aes(x = displ, y = hwy ))+
  geom_jitter(alpha = 0.5) + #jitter but not too much
  facet_wrap(~drv) + #facit into three graphs
  geom_smooth(method = "lm", se = FALSE, color = 'black' ) + #straight line of best fit
  geom_smooth(method = "loess") +  #curvy one
  ylab("Highway MPG") + #labels
  xlab("Displacement") + #labels
  ggtitle("Recreating the Master Hadley Wickham") #credit where credit is due
```

```
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
```



2. House Price Data: EDA and Viz

```
house <- read.csv('housingData-1.csv')
head(house)
```

```
##   Id MSSubClass MSZoning LotFrontage LotArea Alley LotShape LandContour
## 1  1         20       RL          NA   11000  <NA>      IR1         Lvl
## 2  2         20       RL          NA   36500  <NA>      IR1         Low
## 3  3         20       RL          57    9764  <NA>      IR1         Lvl
## 4  4         70       RL          NA    7500  <NA>      IR1         Bnk
## 5  5         20       RL          80    9200  <NA>      Reg         Lvl
## 6  6         60       RL          72   11317  <NA>      Reg         Lvl
##   LotConfig LandSlope Neighborhood Condition1 BldgType HouseStyle OverallQual
## 1   CulDSac       Gtl        NAmes       Norm     1Fam     1Story           5
## 2    Inside       Mod      ClearCr       Norm     1Fam     1Story           5
## 3     other       Gtl       Sawyer      Feedr     1Fam     1Story           5
## 4    Inside       Gtl      Crawfor       Norm     1Fam     2Story           6
## 5    Inside       Gtl        NAmes       Norm     1Fam     1Story           6
## 6    Inside       Gtl      CollgCr       Norm     1Fam     2Story           7
##   OverallCond YearBuilt YearRemodAdd RoofStyle Exterior1st Exterior2nd
## 1           6      1966         1966     Gable     Plywood     Plywood
## 2           5      1964         1964     Gable     Wd Sdng     Wd Sdng
## 3           7      1967         2003     Gable     VinylSd     VinylSd
## 4           7      1942         1950     Gable     Wd Sdng     Wd Sdng
## 5           6      1965         1965     Gable     HdBoard     HdBoard
## 6           5      2003         2003     Gable     VinylSd     VinylSd
##   MasVnrType MasVnrArea ExterQual ExterCond Foundation BsmtQual BsmtCond
```

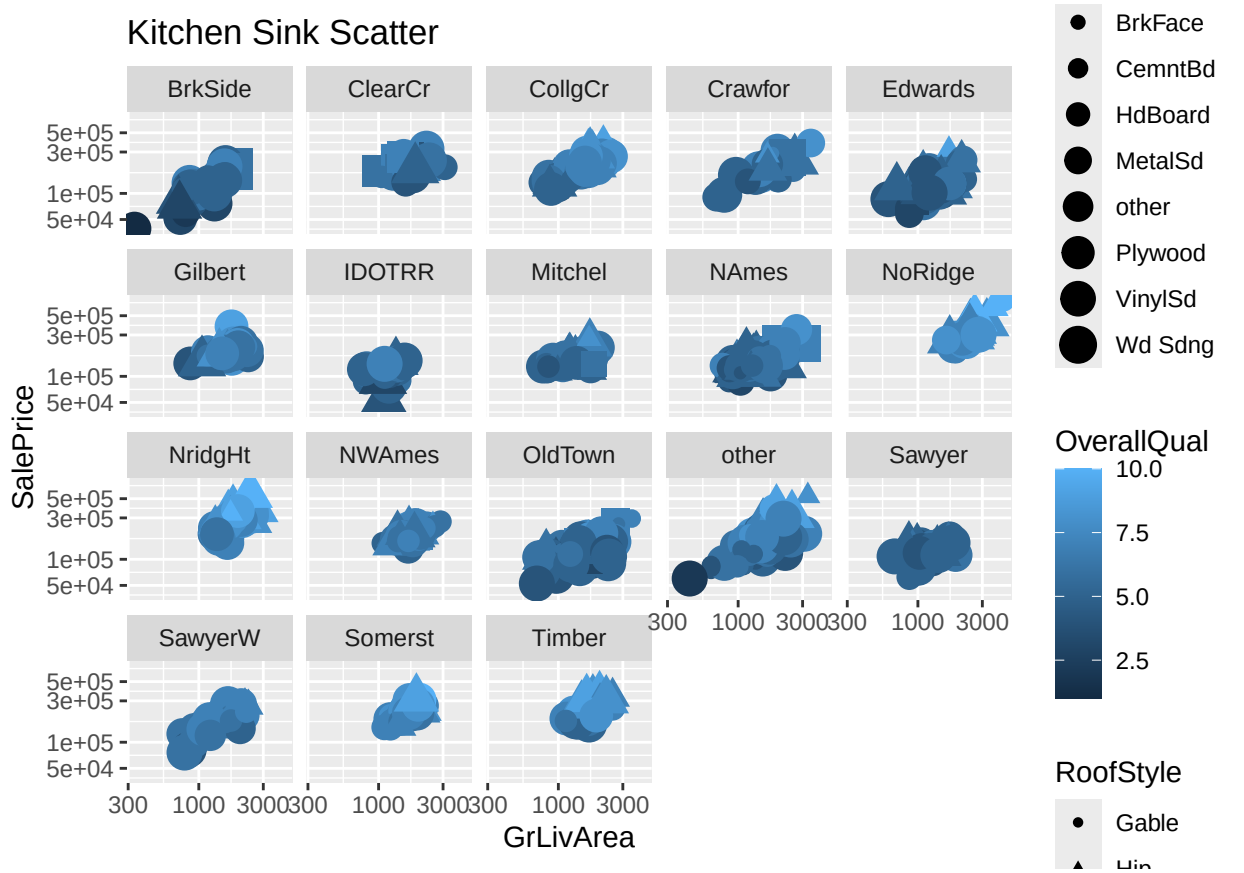
```
## 1    BrkFace        200       Avg       Avg     CBlock      Avg      Avg
## 2     BrkCmn        621       Avg  AboveAvg     CBlock      Avg      Avg
## 3       None          0       Avg       Avg     CBlock      Avg      Avg
## 4       None          0       Avg       Avg     CBlock      Avg      Avg
## 5       None          0       Avg       Avg     CBlock      Avg      Avg
## 6    BrkFace        101  AboveAvg       Avg      PConc AboveAvg      Avg
##   BsmtExposure BsmtFinType1 BsmtFinSF1 BsmtFinType2 BsmtFinSF2 BsmtUnfSF
## 1           Mn          BLQ        740          Rec        230       184
## 2           Av          Rec        812          Unf          0       812
## 3           No          BLQ        702          Unf          0       192
## 4           No          BLQ        547          Unf          0       224
## 5           No          Rec        892          Unf          0       244
## 6           No          Unf          0          Unf          0       840
##   TotalBsmtSF Heating HeatingQC CentralAir Electrical X1stFlrSF X2ndFlrSF
## 1        1154    GasA  AboveAvg          Y      SBrkr      1154         0
## 2        1624    GasA  BelowAvg          Y      SBrkr      1582         0
## 3         894    GasA  AboveAvg          Y      SBrkr       894         0
## 4         771    GasA  BelowAvg          Y      SBrkr       753       741
## 5        1136    GasA       Avg          Y      SBrkr      1136         0
## 6         840    GasA  AboveAvg          Y      SBrkr       840       828
##   LowQualFinSF GrLivArea BsmtFullBath BsmtHalfBath FullBath HalfBath
## 1            0      1154            0            0        1        1
## 2            0      1582            0            1        2        0
## 3            0       894            1            0        1        0
## 4            0      1494            0            0        1        0
## 5            0      1136            1            0        1        0
## 6            0      1668            0            0        2        1
##   BedroomAbvGr KitchenAbvGr KitchenQual TotRmsAbvGrd Functional Fireplaces
## 1            3            1         Avg            6        Typ          1
## 2            4            1         Avg            7        Typ          0
## 3            3            1    AboveAvg            5        Typ          0
## 4            3            1    AboveAvg            7        Typ          2
## 5            3            1         Avg            5        Typ          1
## 6            3            1    AboveAvg            8        Typ          0
##   FireplaceQu GarageType GarageYrBlt GarageFinish GarageCars GarageArea
## 1    BelowAvg     Attchd        1966          RFn          2        480
## 2        <NA>     Attchd        1964          Unf          2        390
## 3        <NA>     Attchd        1967          RFn          2        450
## 4    AboveAvg     Attchd        1942          Unf          1        213
## 5    AboveAvg     Attchd        1965          RFn          1        384
## 6        <NA>     Attchd        2003          RFn          2        500
##   GarageQual GarageCond PavedDrive WoodDeckSF OpenPorchSF EncPorchSF PoolArea
## 1        Avg        Avg          Y          0          58          0        0
## 2        Avg        Avg          N        168         198          0        0
## 3        Avg        Avg          Y          0           0          0        0
## 4        Avg        Avg          P          0           0        224        0
## 5        Avg        Avg          Y        426           0          0        0
## 6        Avg        Avg          Y        144          68          0        0
##   PoolQC Fence MiscFeature MiscVal MoSold YrSold SaleType SalePrice
## 1   <NA> MnPrv        <NA>       0     11   2009       WD    154000
## 2   <NA>  <NA>        <NA>       0      6   2006       WD    190000
## 3   <NA>  <NA>        <NA>       0      5   2008       WD    130000
## 4   <NA>  <NA>        <NA>       0     11   2009       WD    177500
## 5   <NA>  <NA>        <NA>       0      7   2008       WD    140000
```

```
## 6    <NA>  <NA>         <NA>        0       9    2007        WD     180000
```

First visualization I want to create is the kitchen sink. I've seen this data set before so I am just going to try and get everything I can into one visualization. I am thinking I can get 6 parts of the data...

```
ggplot(data = house, aes(y = SalePrice, x = GrLivArea, color = OverallQual, size = Exterior1st, shape =
  facet_wrap(~Neighborhood) +
  geom_point()+
  scale_x_log10() +
  scale_y_log10() +
  ggtitle("Kitchen Sink Scatter")
```

```
## Warning: Using size for a discrete variable is not advised.
```



Not as good as I hoped for the kitchen sink method. Did a bit of playing around to try to make it usable but not sure you can glean much from it. I did get 6 peices of info represented in one graph so there is something to say for that. I do like the different roof styles as those shapes too.

Let's try another! I did not know what was meant by sploms, but I had seen these before and even had used the `GGally` package before. I picked the CentralAir for color because I am sweating in my office right now...

```
names(house)[c(5,14,16,17,38,74,73,66)]
```

```
## [1] "LotArea"     "HouseStyle"  "OverallCond" "YearBuilt"   "CentralAir"
## [6] "SalePrice"   "SaleType"    "PoolArea"
```

```
ggpairs(house[,names(house)[c(5,14,16,17,38,74,73,66)]], aes(colour = CentralAir, alpha = 0.4))+
  ggtitle("Splom Graph of a Few Variables")
```

```
## Warning in cor(x, y): the standard deviation is zero
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
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```

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```

```
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```

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```
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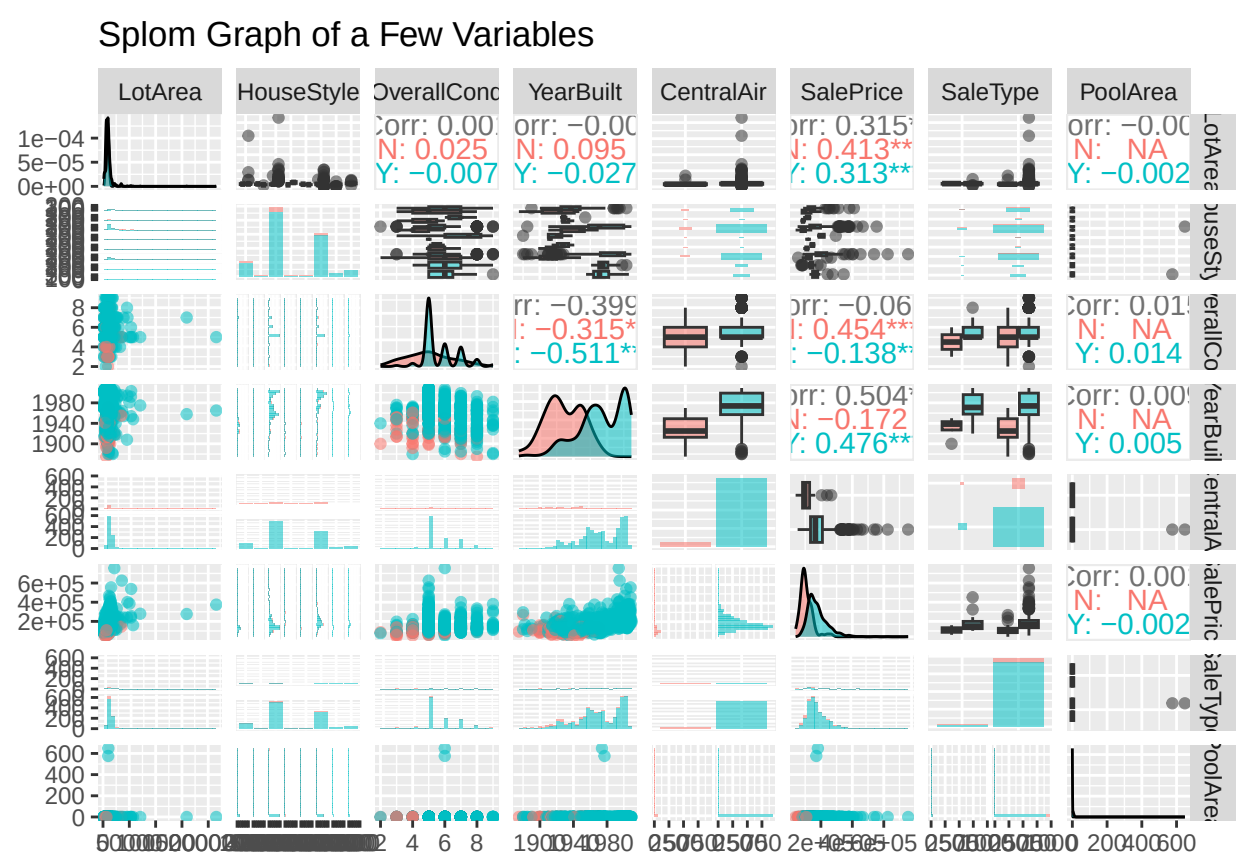
```

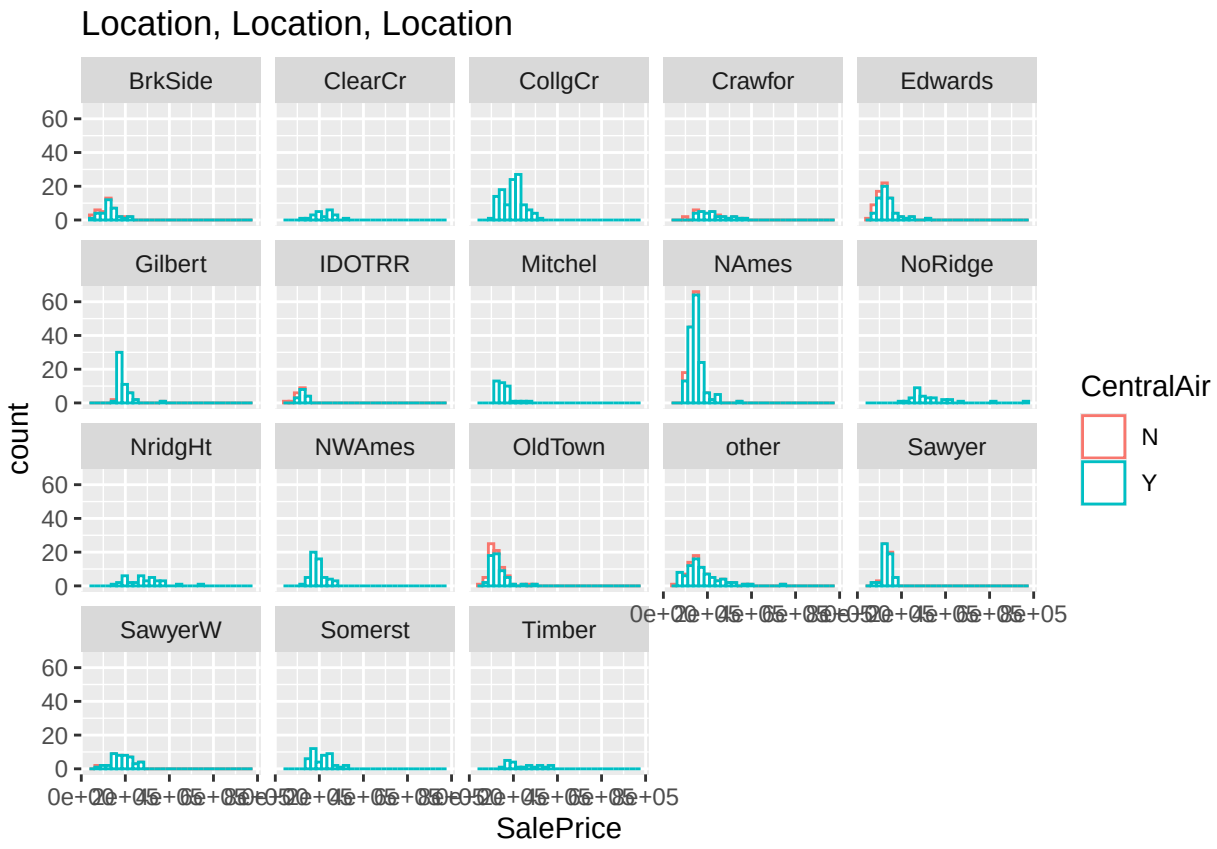


After a bunch of tries to get this code to compile, I limited the data available to it in the hopes of improving runtime. I think the graphic is niffty and perhaps reveals some correlations. Honestly, I have a hard time gleaning much from the multitude of graphics. You have them all but my eyes glaze over and I cannot really look at any one of them for info. Not the biggest fan of this method.

I'm going to keep moving through the suggested plots and try parallel histograms. I am most interested in location, location, location. So I think that effects house price the most.

```
ggplot(data = house, aes(x = SalePrice, color = CentralAir))+
  geom_histogram(fill = "white") +
  facet_wrap(~Neighborhood ) +
  ggtitle("Location, Location, Location")
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

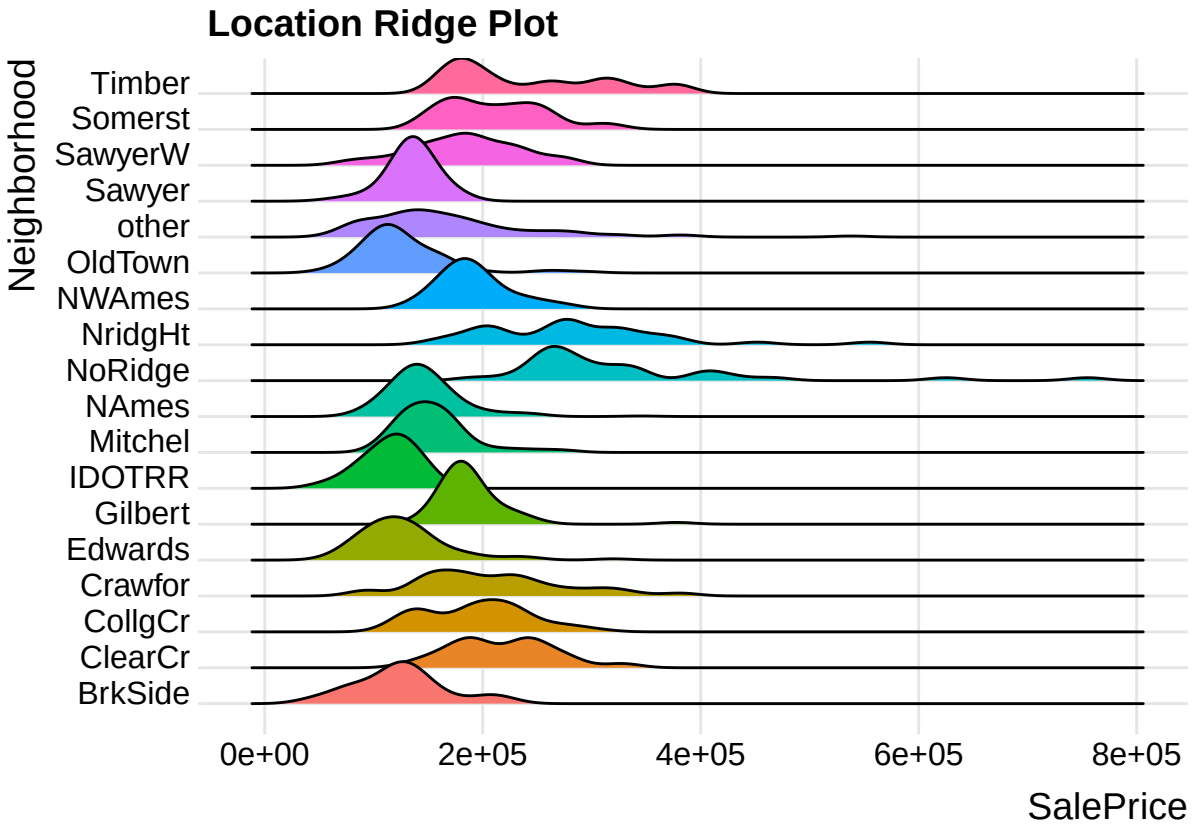


Still a bit fixated on the central air question. Cannot really see many houses without it but where you can they mostly fall in the cheaper range. We do see a variation in the histograms based on location.

I'll try the ridge plot next because I think those are cool

```
ggplot(data = house, aes(x = SalePrice, y = Neighborhood, fill = Neighborhood))+
  geom_density_ridges()+
  theme_ridges()+
  theme(legend.position = "none")+
  ggtitle("Location Ridge Plot")
```

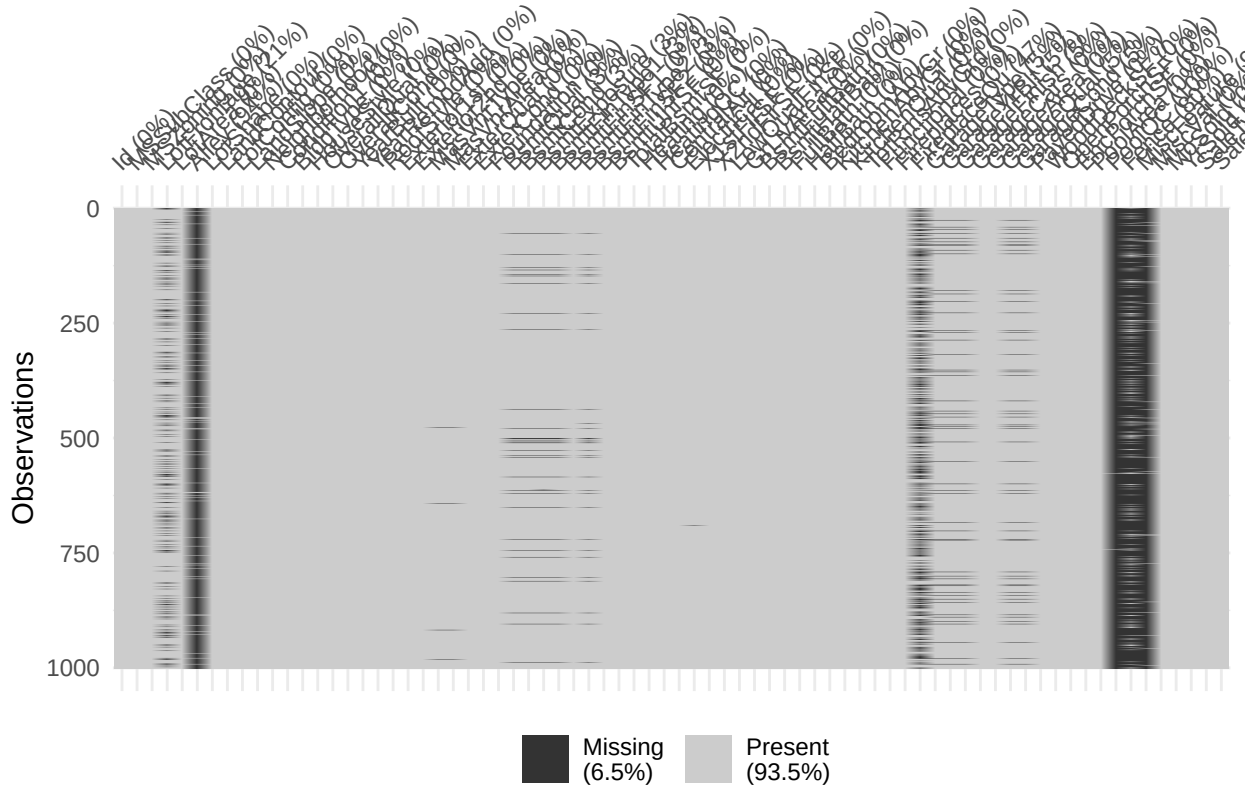
```
## Picking joint bandwidth of 17000
```



My ridge plots reinforce my previous statement that location matters. I think this does a much better job than the histograms too.

I had never seen a missing value visualization so I'll try a few here for my last exercise. Of course you need another library for it.

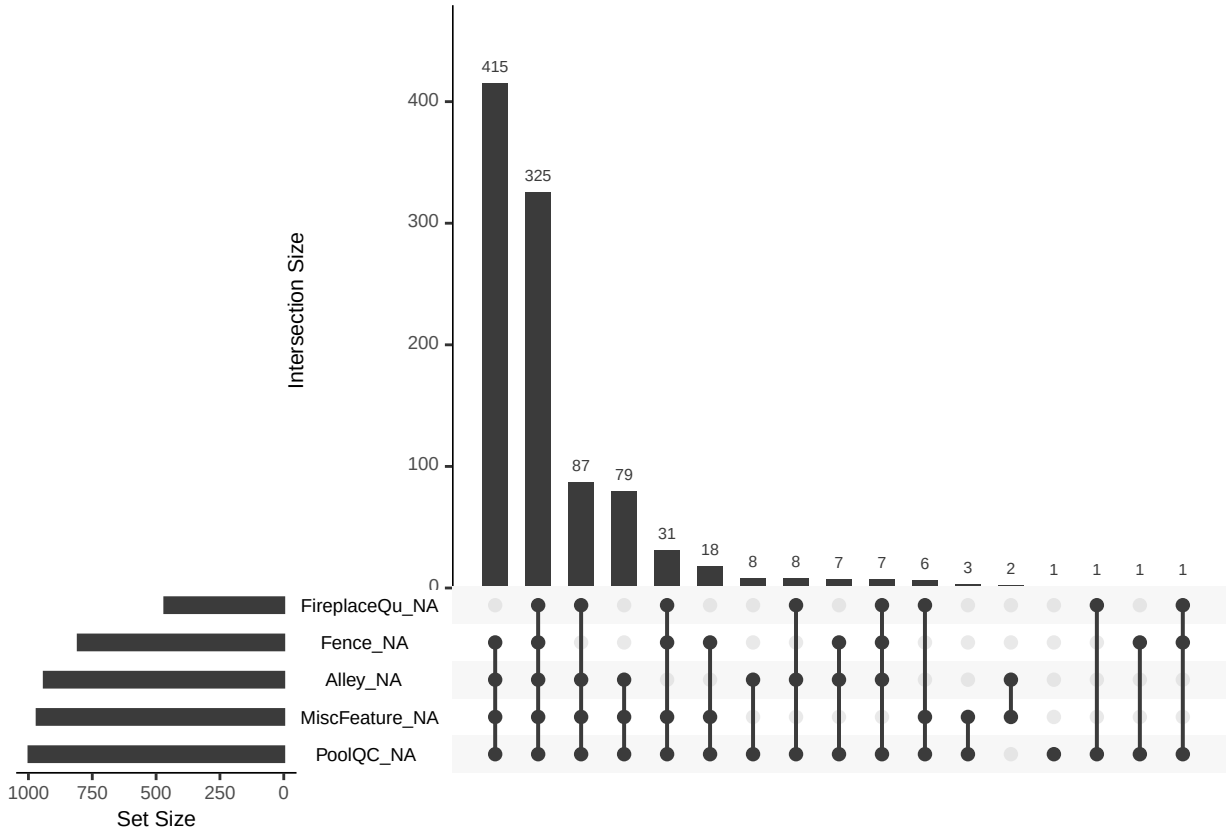
```
vis_miss(house)
```



This graphic feels overwhelming. We do see that there is a lot of missing data in a couple of columns but I am not clear which ones they are based on the names overwriting each other. I would not have included this graphic except that I wanted to find the command again later.

Let's look for patterns in this data.

```
gg_miss_upset(house)
```



This one is very informative, it shows some of the counts and the connections with missed data. Very cool!

So I have 6 total but I find the penultimate to be cheeky and not a very good representation of the data so I did not want to include it as one of the good ones...