

# Bridges

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First load the packages and data.

```
library(tidyverse)
library(plyr)
library(choroplethr)
library(dplyr)
library(readr)
library(data.table)
library(ggplot2)

dest = "https://www.fhwa.dot.gov/bridge/nbi/2016/delimited/AK16.txt"
tmp = fread(dest)
tmp = as.tbl(tmp)
tmp1 = read_csv(dest)
tmp2 = read_csv(dest, col_types = "c") # could make them all characters...
classes = sapply(tmp, class)

states= read_csv("http://pages.stat.wisc.edu/~karlrohe/classes/data/stateAbv.txt")
states=states[-(1:12),]
states[51,] = c("WashDC", "DC")
states[52,] = c("Puerto Rico", "PR")
dat=list()

dest= rep("", 52)
for(i in 1:52) dest[i]=paste("https://www.fhwa.dot.gov/bridge/nbi/2016/delimited/", states[i,2],"16.txt")
x16 = ldply(dest, fread, colClasses = classes)

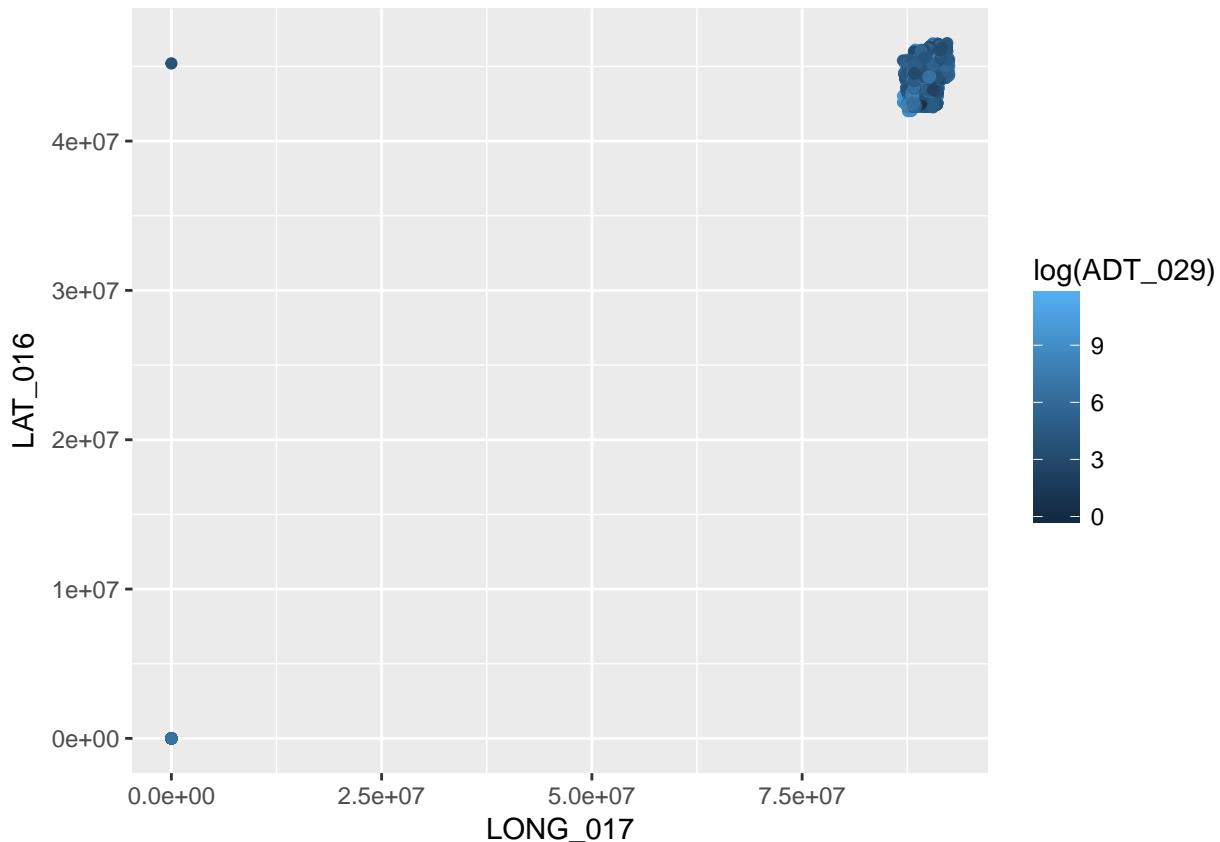
FALSE CRITICAL_FACILITY_006B      BASE_HWY_NETWORK_012      LRS_INV_ROUTE_013A
FALSE          12                      16                      17
FALSE      SUBROUTE_NO_013B      OPERATING_RATING_064      INVENTORY_RATING_066
FALSE          18                      72                      74
FALSE      WORK_PROPOSED_075A      WORK_DONE_BY_075B      IMP_LEN_MT_076
FALSE          81                      82                      83
FALSE  INSPECT_FREQ_MONTHS_091  FRACTURE_LAST_DATE_093A UNDWATER_LAST_DATE_093B
FALSE          85                      89                      90
FALSE      SPEC_LAST_DATE_093C      BRIDGE_IMP_COST_094      ROADWAY_IMP_COST_095
FALSE          91                      92                      93
FALSE      TOTAL_IMP_COST_096      YEAR_OF_IMP_097      OTHER_STATE_CODE_098A
FALSE          94                      95                      96
FALSE  OTHER_STATE_PCNT_098B  OTHR_STATE_STRUC_NO_099      TEMP_STRUCTURE_103
FALSE          97                      98                      102
FALSE  YEAR_RECONSTRUCTED_106  PERCENT_ADT_TRUCK_109      PIER_PROTECTION_111
FALSE          105                     110                     112
FALSE      MIN_NAV_CLR_MT_116      REMARKS                  PROJ_SUFFIX
FALSE          117                     122                     125
FALSE      NBI_TYPE_OF_IMP      DTL_TYPE_OF_IMP      SPECIAL_CODE
FALSE          126                     127                     128
FALSE      STEP_CODE
```

```

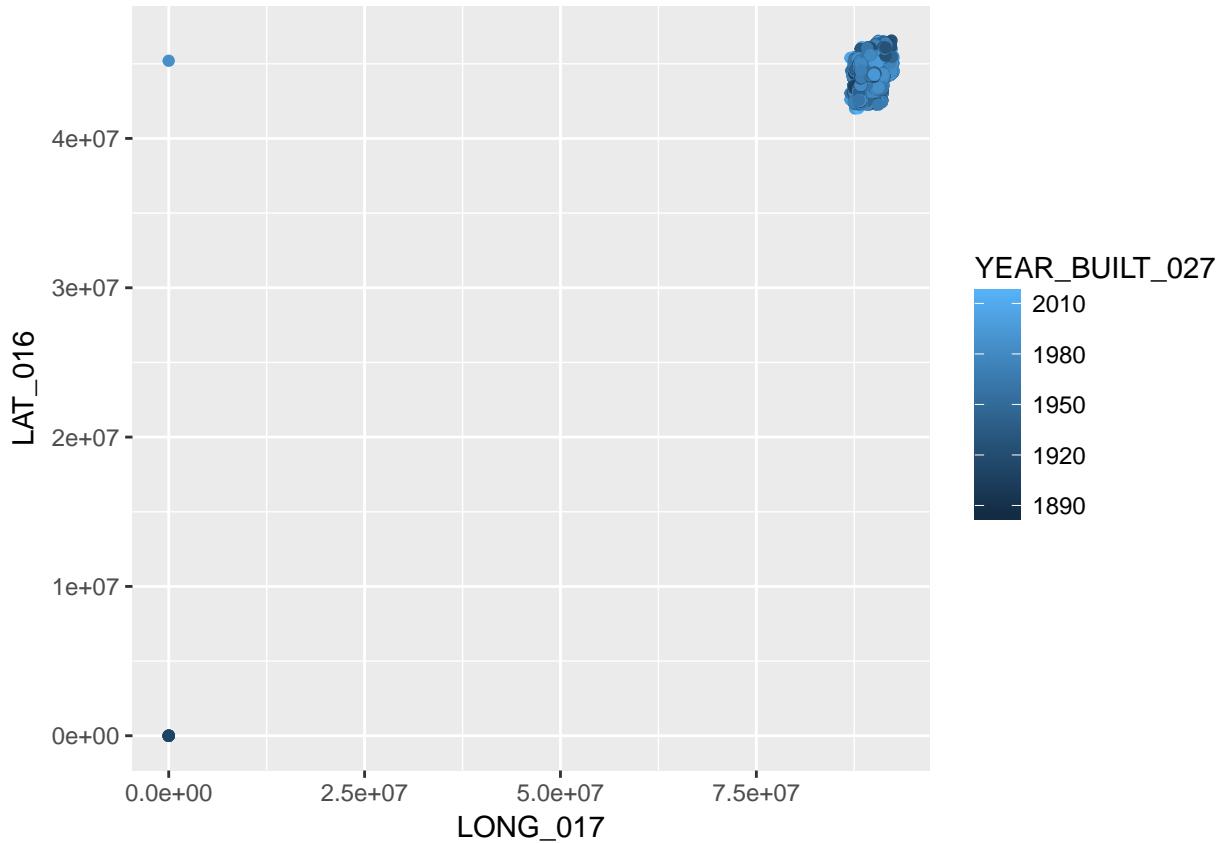
FALSE                               129
wi = filter(x, STATE_CODE_001 == 55)
wi

## # A tibble: 14,230 × 18
##   STATE_CODE_001 STRUCTURE_NUMBER_008 COUNTY_CODE_003 LAT_016 LONG_017
##       <int>           <chr>          <int>     <dbl>     <dbl>
## 1      55 00000000000F303        51 45585400 89560600
## 2      55 00000000000F310       115 44543000 88544200
## 3      55 00000000000F311       115 44563600 88554200
## 4      55 00000000000F315         3 46360600 90390000
## 5      55 00000000000F317         3 46371020 90421190
## 6      55 00000000000F318         3 46365090 90414920
## 7      55 00000000000F321       115 44551800 88562400
## 8      55 00000000000F323         3 46262400 90350000
## 9      55 00000000000F324         3 46290000 90373000
## 10     55 00000000000F325         3 46282400 90364800
## # ... with 14,220 more rows, and 13 more variables: TOLL_020 <int>,
## #   ADT_029 <int>, YEAR_ADT_030 <int>, YEAR_BUILT_027 <int>,
## #   DECK_COND_058 <chr>, SUPERSTRUCTURE_COND_059 <chr>,
## #   SUBSTRUCTURE_COND_060 <chr>, CHANNEL_COND_061 <chr>,
## #   CULVERT_COND_062 <chr>, DATE_OF_INSPECT_090 <int>,
## #   FRACTURE_092A <chr>, UNDWATER_LOOK_SEE_092B <chr>,
## #   SPEC_INSPECT_092C <chr>
ggplot(data = wi) +geom_point(mapping = aes(y = LAT_016, x = LONG_017, col = log(ADT_029)))

```

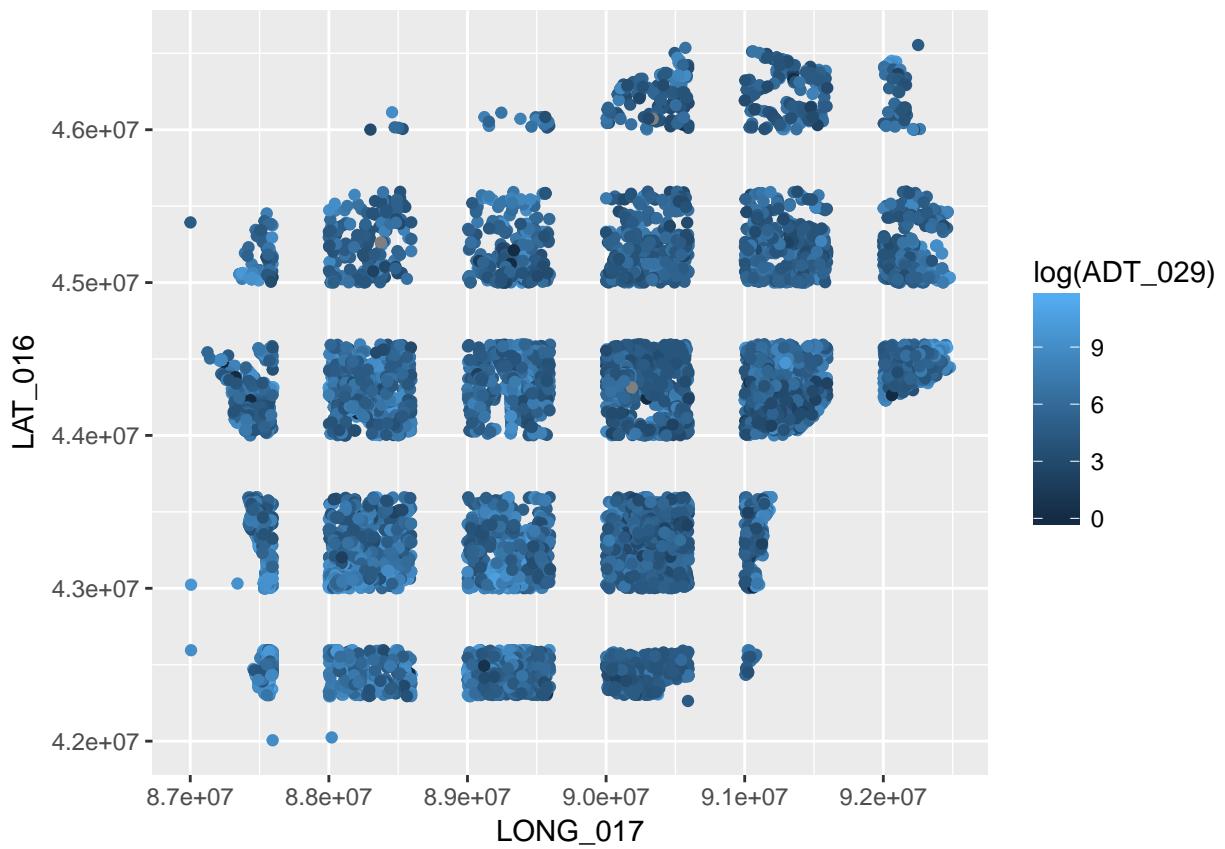


```
ggplot(data = wi) +geom_point(mapping = aes(y = LAT_016, x = LONG_017, col = YEAR_BUILT_027))
```

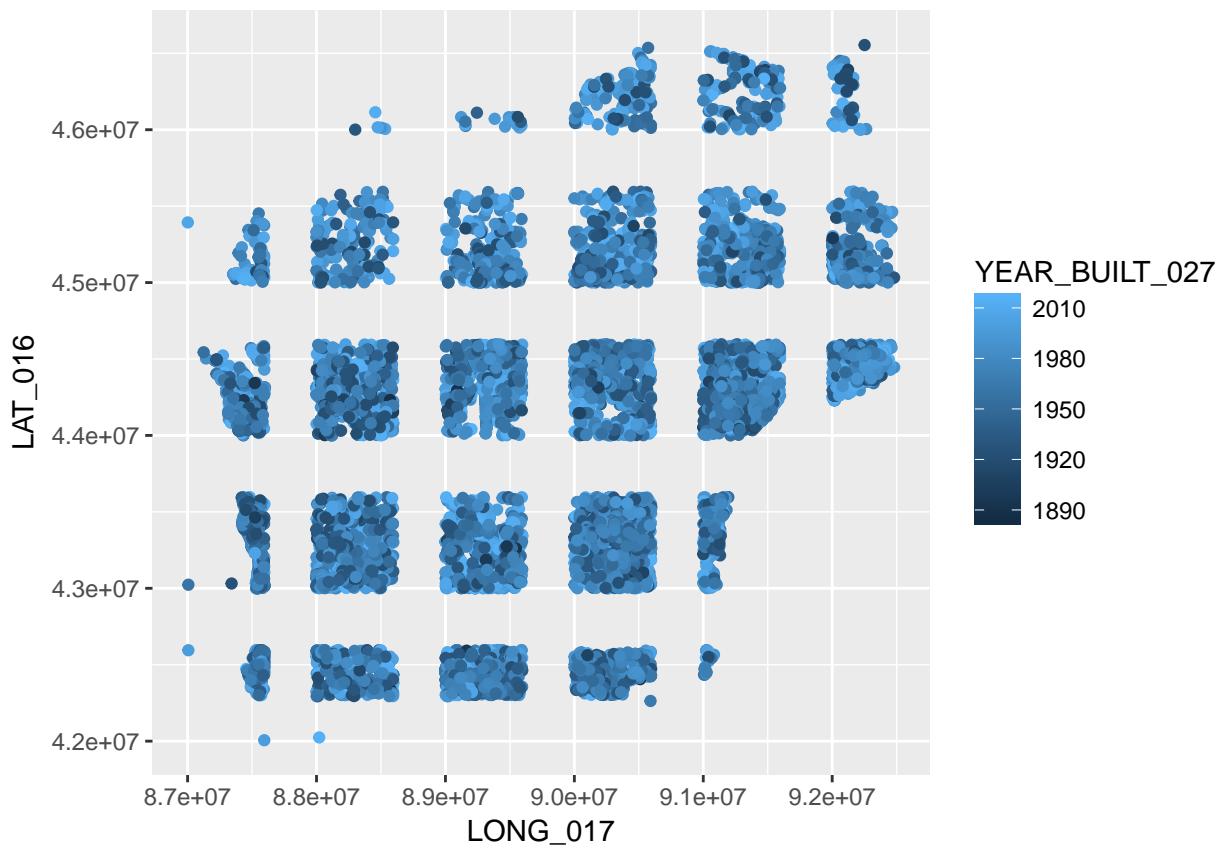


```
wi2 = filter(wi, LAT_016>0&LONG_017>0)
```

```
ggplot(data = wi2) +geom_point(mapping = aes( y = LAT_016, x = LONG_017, col = log(ADT_029)))
```

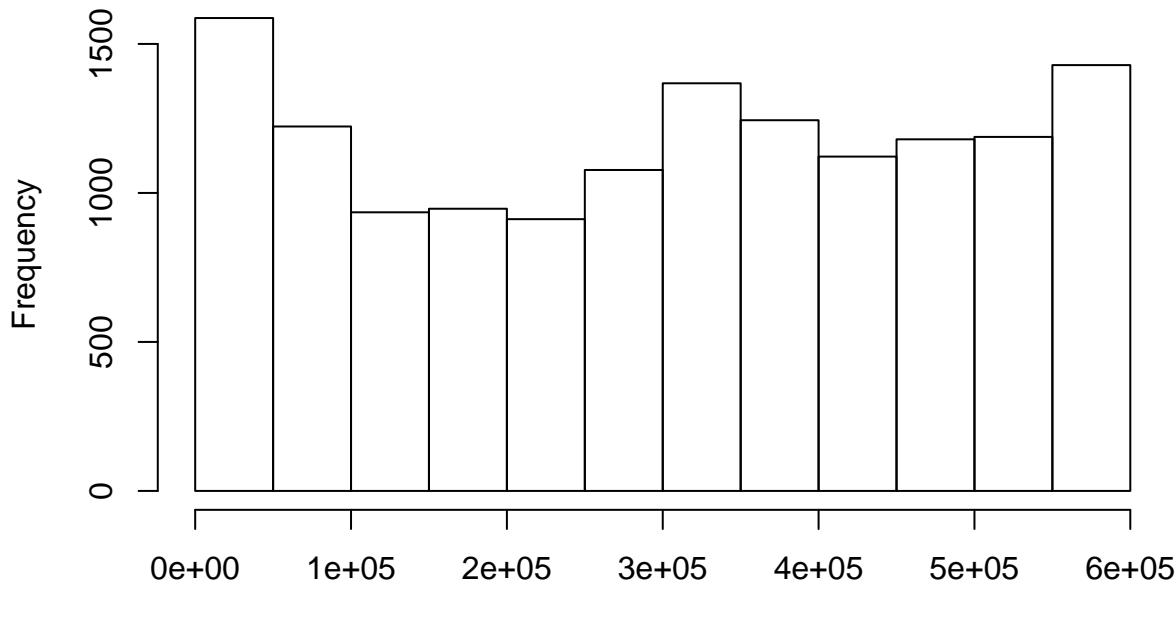


```
ggplot(data = wi2) +geom_point(mapping = aes(y = LAT_016, x = LONG_017, col = YEAR_BUILT_027))
```

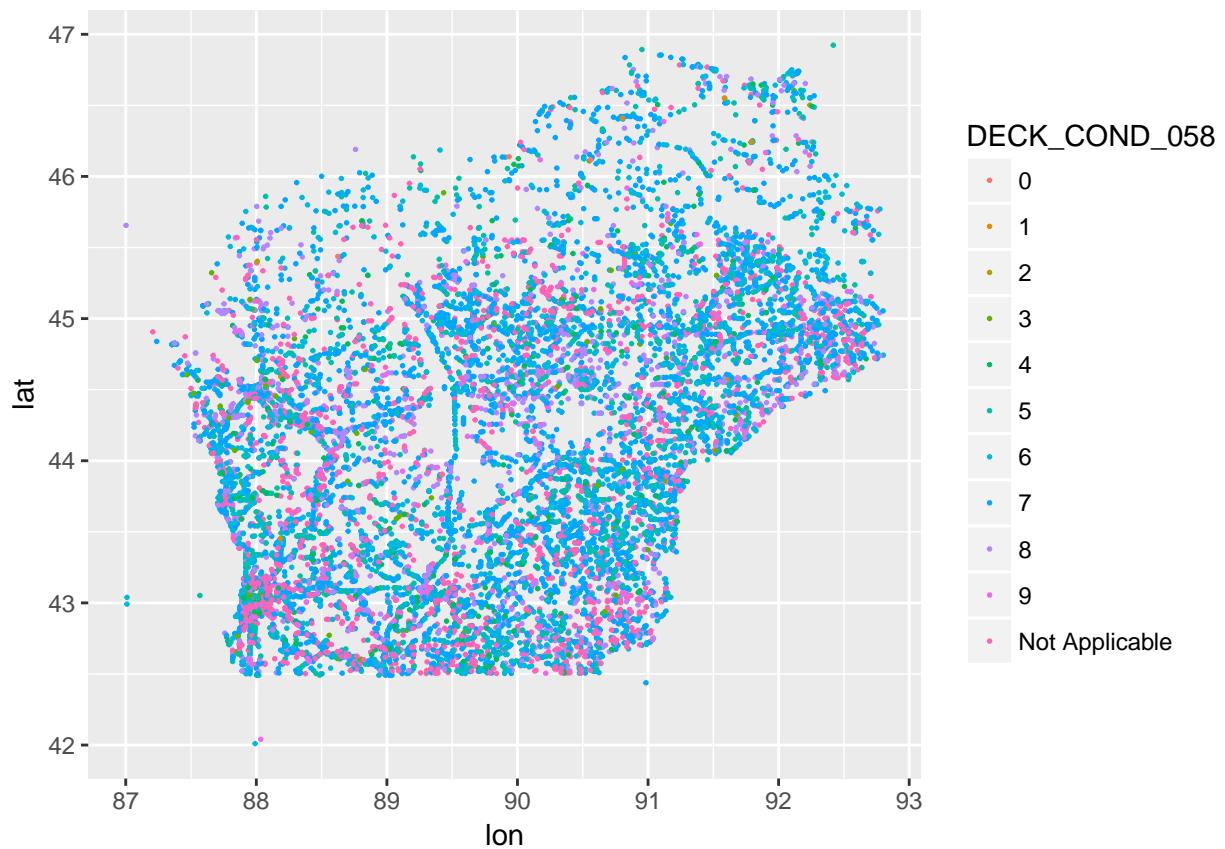


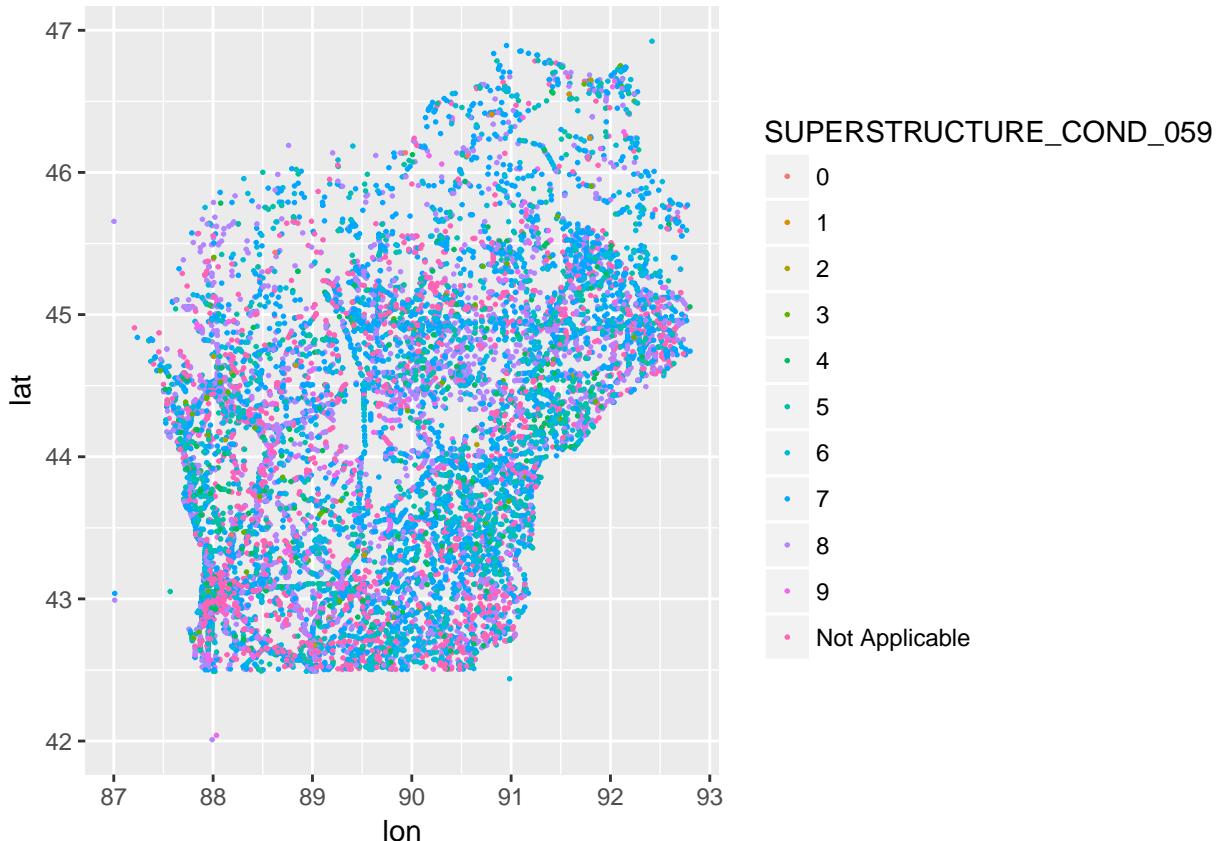
```
min2dec = function(x){  
  substr(x,3,8) %>% return  
}  
hist(wi$LAT_016 %>% min2dec %>% as.numeric)
```

## Histogram of wi\$LAT\_016 %>% min2dec %>% as.numeric



```
min2dec = function(x){  
  as.numeric(substr(x,1,2)) + as.numeric(substr(x,3,8))/6e+05 %>% return  
}  
wi2 = mutate(wi2,lat = min2dec(LAT_016), lon = min2dec(LONG_017))  
wi2 = filter(wi2,lon<100)  
  
wi2$DECK_COND_058[wi2$DECK_COND_058=="N"] = "Not Applicable"  
wi2$SUPERSTRUCTURE_COND_059[wi2$SUPERSTRUCTURE_COND_059=="N"] = "Not Applicable"  
wi2$SUBSTRUCTURE_COND_060[wi2$SUBSTRUCTURE_COND_060=="N"] = "Not Applicable"  
wi2$CHANNEL_COND_061[wi2$CHANNEL_COND_061=="N"] = "Not Applicable"  
wi2$CULVERT_COND_062[wi2$CULVERT_COND_062=="N"] = "Not Applicable"  
  
ggplot(data = wi2) +geom_point(mapping = aes(y = lat, x = lon,col = DECK_COND_058),size = 0.3)
```





```

wi3 = mutate(wi2, cond=pmin(DECK_COND_058,SUPERSTRUCTURE_COND_059,SUBSTRUCTURE_COND_060,CHANNEL_COND_061))

rateIt = function(cond){
  # gives a good to fail rating for cond.
  rate = rep("good", length(cond))
  rate[cond<7] = "bad"
  rate[cond<5]= "fail"
  return(rate)
}

wi3$rate = rateIt(wi3$cond)
table(wi3$cond)

## 
##      0     1     2     3     4     5     6     7     8     9 
##      6     7    27   233   953  2547  3995  4645  1570   227 

table(wi3$rate)

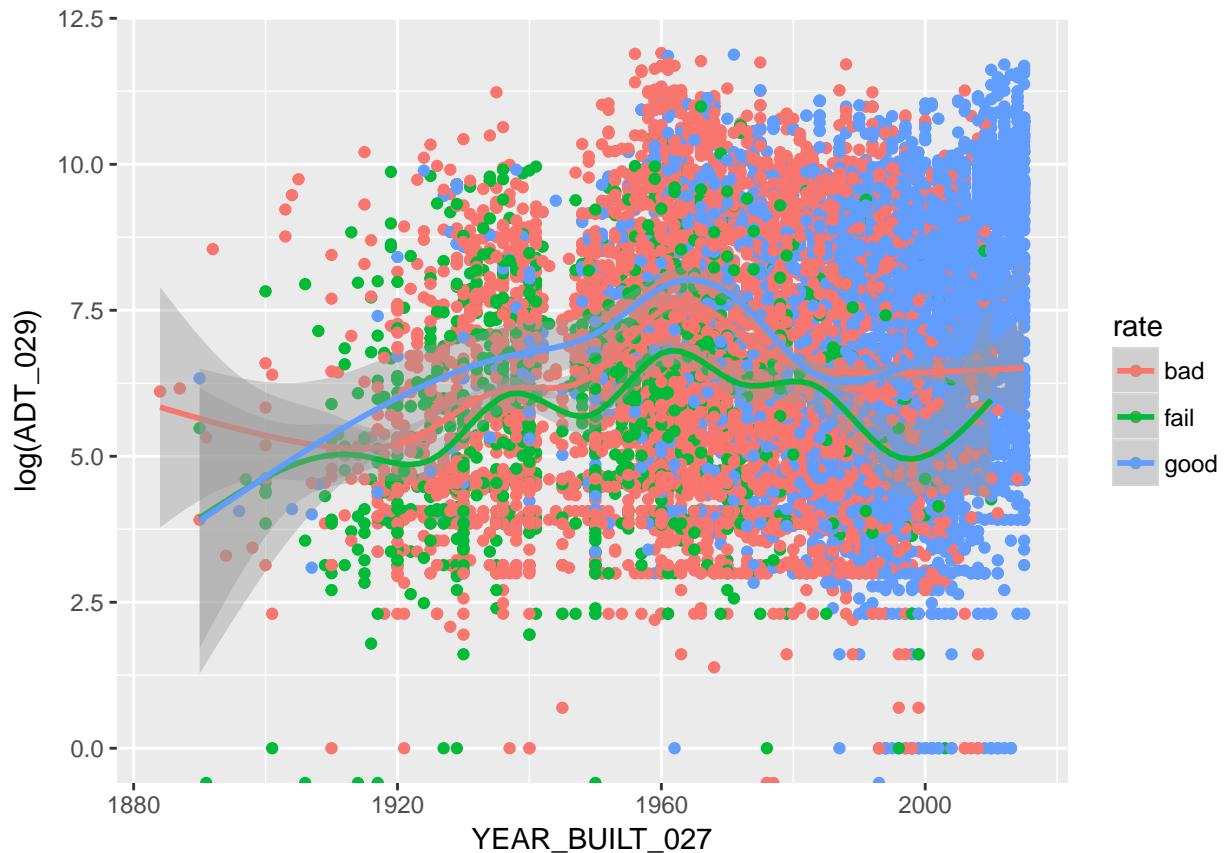
## 
##   bad fail good 
## 6542 1226 6442

ggplot(data = wi3, mapping = aes(y = log(ADT_029), x = YEAR_BUILT_027, col = rate)) +geom_point() + geom_smooth()

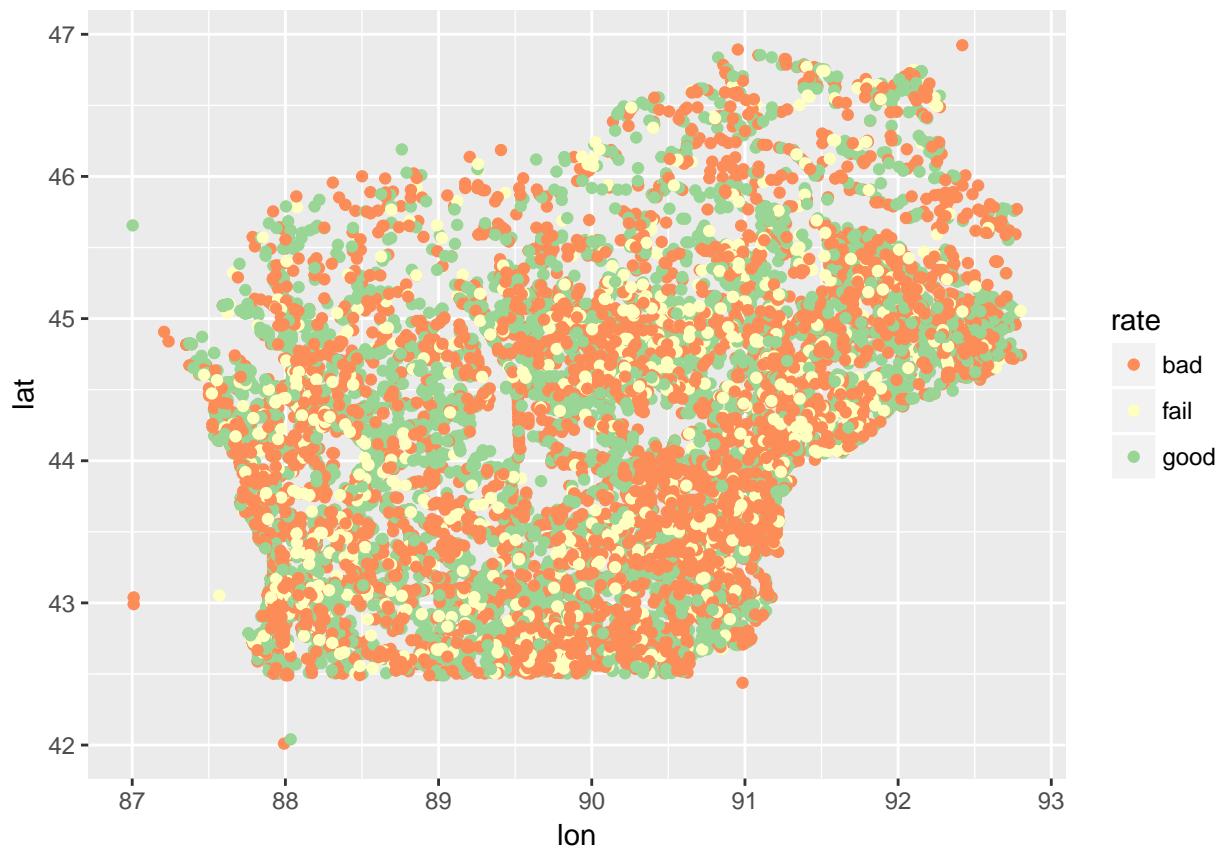
## `geom_smooth()` using method = 'gam'

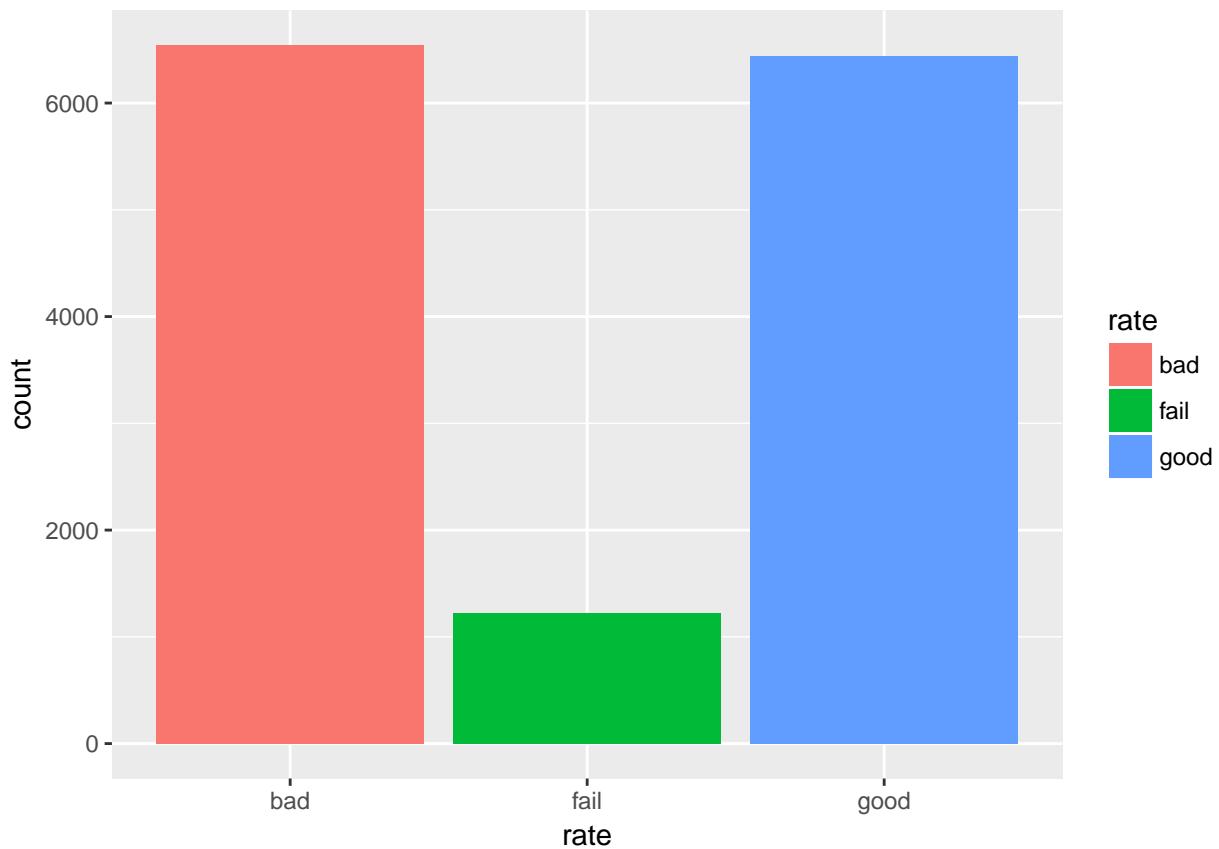
## Warning: Removed 9 rows containing non-finite values (stat_smooth).

```



```
map = ggplot(data = wi3, mapping = aes(y = lat, x = lon))
map + geom_point(aes(col=rate))+ scale_colour_brewer(palette = "Spectral")
```





```
ggplot(data = w13) +  
  geom_bar(mapping = aes(x = YEAR_BUILT_027, fill = rate))
```

