Totle of Paper

Kemar Gordon

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```
library(tidyverse)
library(readr)
WaterPipesBurned <- read_csv("Burned Pipes/WaterPipesBurned.csv")%>%
  rename_all(tolower) %>%
  mutate(burned=1)
WaterPipesUnburned <- read_csv("Burned Pipes/WaterPipesUnburned.csv")%>%
  rename_all(tolower) %>%
  mutate(burned=0)
rb1<-rbind(WaterPipesUnburned,WaterPipesBurned )
#%%%%%%%%%%%%%%1853%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
library(readr)
Pipes1853Burned <- read_csv("Burned Pipes/Pipes1853Burned.csv")%>%
  rename_all(tolower) %>%
  mutate(burned=1)
Pipes1853UnBurned <- read_csv("Burned Pipes/Pipes1853UnBurned.csv")%>%
  rename_all(tolower) %>%
  mutate(burned=0)
rb2<-rbind(Pipes1853UnBurned,Pipes1853Burned )%>%
  mutate(objectid = (oid_save+1)) %>%
  select(distpipew, mainpipew, objectid, length, burned)
Wp_data <- right_join(rb2, rb1, by = c("objectid", "burned"))%>%
  select(-shape_leng)%>%
  mutate(waterdate=as.character(waterdate))%>%
  mutate(w_pipe_in=as.character(w_pipe_in))%>%
  mutate(w_pipeleng=as.character(w_pipeleng))%>%
  mutate(w_comments = paste(waterdate,"/", w_pipe_in,"/", w_pipeleng, ";"))%>%
  mutate(waterdate=as.numeric(waterdate))%>%
  mutate(w_pipe_in=as.numeric(w_pipe_in))%>%
  mutate(w_pipeleng=as.numeric(w_pipeleng))%>%
  mutate(waterdate=1852)%>%
  mutate(w_pipe_in = distpipew)%>%
  mutate(w_pipe_in= ifelse(w_pipe_in==0," .",w_pipe_in))

#%%%%%%%%%%%%%%1853%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%


library(readr)

DistToFire_Burned <- read_csv("Burned Pipes/DistToFire_Burned.csv")%>%
  rename_all(tolower) %>%
  select(-objectid)%>%
  rename(objectid=oid_save)%>%
```

```
  mutate(objectid=objectid+1)%>%
  select(objectid, near_dist, shape_length)%>%
  rename(dist_sl=shape_length)%>%
  mutate(burned=1)

Wp3_data <- right_join(DistToFire_Burned,Wp_data, by = c("objectid", "burned"))

library(readr)
DistToFire_Unburned <- read_csv("Burned Pipes/DistToFire_Unburned.csv")%>%
  rename_all(tolower) %>%
  select(-objectid)%>%
  rename(objectid=oid_save)%>%
  rename(near_distu=near_dist)%>%
  mutate(objectid=objectid+1)%>%
  select(objectid, near_distu, shape_length)%>%
  rename(dist_sl=shape_length)%>%
  mutate(burned=0)
Wp4_data <- full_join(DistToFire_Unburned,Wp3_data, by = c("objectid", "burned"))
```

```
library(tidyverse)
```

```
library(readr)
```

Cleaning Code

```
AllParcels2012 <- read_csv("2012dataclean/AllParcels2012.txt")
AllParcels2012 <- AllParcels2012 %>% select(WARD, PARCEL, PID_LONG, SHAPE_area, point_x, point_y, fire_
  df <- data.frame(AllParcels2012)%>% #Creates a data frame#
  distinct()%>%# Removes duplicated values#
  rename_all(tolower) %>%
  mutate(pid_long=as.numeric(pid_long))%>%
  group_by(ward, parcel, pid_long) %>%
  summarize(fire_dist = mean(fire_dist), shape_area = mean(shape_area), point_x = mean(point_x), point_
```

```
SampleParcels <- read_csv("SampleParcels.csv")
df_2 <- data.frame(SampleParcels)%>%
  rename_all(tolower)%>%
  group_by(ward, parcel, pid_long)%>%
  summarize(samplearea = mean(samplearea))%>%
  mutate(pid_long=as.numeric(pid_long))
```

```
df_3 <- right_join(df_2, df,by = c("ward", "parcel", "pid_long")) %>%
  mutate (sample_frac= samplearea/shape_area) %>%
  mutate(sample_frac = ifelse(samplearea/shape_area > 1 & !is.na(samplearea/shape_area) , 1 ,sample_frac
  mutate(sample_frac = ifelse(is.na(samplearea/shape_area) , 0 ,sample_frac))
```

```
BurnedParcels <- read_csv("2012dataclean/BurnedParcels.txt")
df_4 <- data.frame(BurnedParcels)%>%
  rename_all(tolower)%>%
  group_by(ward, parcel, pid_long)%>%
  summarize(burnedarea = mean(burnedarea)) %>%
  mutate(pid_long=as.numeric(pid_long))
```

```
df_5 <- right_join(df_4, df_3,by = c("ward", "parcel", "pid_long"))%>%
  mutate (burned_frac= burnedarea/shape_area) %>%
  mutate(burned_frac = ifelse(is.na(burned_frac) , 0 ,burned_frac))
```

```
ConstructionParcels <- read_csv("2012dataclean/ConstructionParcels.txt")
df_6 <- data.frame(ConstructionParcels)%>%
  rename_all(tolower)%>%
  group_by(ward, parcel, pid_long)%>%
  summarize(constarea = mean(constarea)) %>%
  mutate(pid_long=as.numeric(pid_long))
```

```
df_7 <- right_join(df_6, df_5,by = c("ward", "parcel", "pid_long"))%>%
  mutate (const_frac= constarea/shape_area)%>%
  mutate(const_frac = ifelse(is.na(const_frac) , 0 ,const_frac))
```

```
SampleParcelCentroids <- read_csv("2012dataclean/SampleParcelCentroids.txt")%>%
  rename_all(tolower)%>%
  select(bad_points, block_id, wharf, dist_burne, burned, s_point_y, s_point_x, ward, parcel, pid_long)
```

```
df_8 <- data.frame(SampleParcelCentroids)%>%
  mutate(burnedarea = 0)%>%
  group_by(ward, parcel, pid_long)%>%
  summarize(s_point_x = mean(s_point_x),s_point_y = mean(s_point_y),burned = mean(burned),dist_burne = m
  mutate(pid_long = as.numeric(pid_long))
```

```
df_9 <- right_join(df_8, df_7,by = c("ward", "parcel", "pid_long"))%>%
  filter(!(pid_long == " ." ))
```

```
DATA2012_FULL <- read_csv("2012dataclean/DATA2012-FULL.txt")
DATA2012_FULL <- DATA2012_FULL %>% select(-(R_BLDG_STYL:U_FPLACE))
DATA2012_FULL <- DATA2012_FULL %>% select(-(MAIL_ADDRESS:MAIL_ZIPCODE))
df_10 <- data.frame(DATA2012_FULL) %>%
  rename_all(tolower)%>%
  mutate(st_num = str_remove_all(st_num," "))%>%
  mutate(st_name = str_remove_all(st_name," "))%>%
  mutate(st_name_SUF = str_remove_all(st_name_suf," "))%>%
  mutate(st_num = str_replace_all(st_num,"_ ", " - "))%>%
  mutate(st_num = str_replace_all(st_num," _"," - "))%>%
  group_by(pid, cm_id, st_num, st_name, st_name_suf, zipcode) %>%
  summarize(owner = first(owner),av_land = first(av_land),av_bldg = first(av_bldg), av_total = first(av_
  mutate(cm_id =as.numeric(cm_id))

df_10$originalorder <- 1:nrow(df_10)
```

```
df_11 <-df_10 %>%
  mutate(pid_long = as.numeric(pid))%>%
  mutate(strpid = as.character(pid_long))%>%
  mutate(address =paste(st_num, st_name, st_name_suf, as.character(zipcode)))%>%
  mutate(condo_id= 0) %>%
  mutate(cm_id = ifelse(!(is.na(cm_id)), pid_long,cm_id))%>%
  group_by(address, condo_id)%>%
  mutate(condo_temp=ifelse(originalorder == 1, 1,condo_id)) %>%
  group_by(address)%>%
  mutate(condo_count=sum(condo_temp))
```

```
df_11 <-df_10 %>%
  mutate(pid_long = as.numeric(pid))%>%
  mutate(strpid = as.character(pid_long))%>%
  mutate(address =paste(st_num, st_name, st_name_suf, as.character(zipcode)))%>%
  mutate(condo_id= 0) %>%
  mutate(cm_id = ifelse(!(is.na(cm_id)), pid_long,cm_id))%>%
  group_by(address, condo_id)%>%
  mutate(condo_temp=ifelse(originalorder == 1, 1,condo_id)) %>%
  group_by(address)%>%
  mutate(condo_count=sum(condo_temp))%>%
  mutate(pid_long = ifelse(pid_long == 0302953018, 302953010,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 305358202, 305358000 ,pid_long ))%>%
  mutate( pid_long = ifelse( pid_long == 305424300 | pid_long == 305424030,305424020, pid_long ))%>%
  mutate( pid_long = ifelse( pid_long == 303041300 | pid_long == 303041010,303041000, pid_long ))%>%
  mutate( pid_long = ifelse( pid_long == 304304402 | pid_long == 304304401,304304400, pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 30511201 |pid_long == 305112012,305112010, pid_long ))%>%
  mutate( pid_long = ifelse( pid_long == 304826012 | pid_long == 304826014, 304826010, pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 500043011, 500043010,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 304133001, 304133000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long ==  301674001, 301674000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 500001001, 500001000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long== 305651001, 305651000,pid_long ))%>%
  mutate( pid_long= ifelse(pid_long== 500045001, 500045000,pid_long))%>%
  mutate( pid_long = ifelse(pid_long == 304500200, 304500000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 304890100, 304890000,pid_long))%>%
  mutate( pid_long = ifelse(pid_long == 304692051, 304692050,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 305380001, 305380000,pid_long))%>%
  mutate( pid_long = ifelse(pid_long == 304893001, 304893000,pid_long))%>%
  mutate( pid_long = ifelse(pid_long ==  302862001, 302862000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 304788001, 304788000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 304102001, 304102000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 304605001, 304605000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long== 304692050, 304692000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 304821001, 304821000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 304841001, 304841000 ,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 304860001, 304860000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 305106001, 305106000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 305107001, 305107000 ,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 305777001, 305777000,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 302952014, 302952010,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long== 303028500, 303028300,pid_long ))%>%
  mutate( pid_long = ifelse(pid_long == 305107001, 305107000 ,pid_long ))%>%
  mutate(pid_long = ifelse(pid_long == 303740000, 303747000,pid_long ))%>%
  mutate(pid_long = ifelse( pid_long == 304870400 | pid_long == 304870020, 304870010, pid_long ))%>%
  mutate(cm_id = ifelse(cm_id == 303740000, 303747000,cm_id ))%>%
  mutate(pid_long = ifelse( pid_long == 304832420 | pid_long == 304832400| pid_long == 304832020, 30483
  mutate(pid_long = ifelse( substr(strpid, 1, 6) == "305378" | substr(strpid, 1, 6) ==  "305379", 30537
  mutate(pid_long = ifelse( substr(strpid, -1, 1) == "1" & st_name == "HARRISON", pid_long-1, pid_long
  select(-strpid)
```

##Cleaning Road Data

```
X1867_Burned <- read_csv("Road width clean/1867_Burned.csv")%>%
  rename_all(tolower)%>%
```

```
  mutate(burned=1)

X1867_Unburned <- read_csv("Road width clean/1867_Unburned.csv")%>%
  rename_all(tolower)%>%
  mutate(burned=0)

rb01<-rbind(X1867_Unburned, X1867_Burned)%>%
  mutate(year=1867)%>%
  mutate(width=ifelse(roadw_1867!=0,roadw_1867,0 ))%>%
  mutate(width=ifelse(roadw_67!=0,(width+roadw_67)/2,width ))%>%
  select(objectid, full_name, length,burned, width, year )

#%%%%%%%%%%%%%%%1867%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%


#%%%%%%%%%%%%%%%1873%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
library(readr)
X1873_Burned <- read_csv("Road width clean/1873_Burned.csv")%>%
  rename_all(tolower)%>%
  mutate(burned=1)

X1873_Unburned <- read_csv("Road width clean/1873_Unburned.csv")%>%
  rename_all(tolower)%>%
  mutate(burned=0)
rb02<-rbind(X1873_Unburned, X1873_Burned)%>%
  rename(length=shape_le_1)%>%
  mutate(year=1873)%>%
  mutate(width=ifelse(roadw_1873 !=0,roadw_1873 ,0 ))%>%
  mutate(width=ifelse(roadw_73 !=0,(width+roadw_73)/2,width ))%>%
  select(objectid, full_name, length,burned, width, year )

rb03<-rbind(rb02, rb01)

#%%%%%%%%%%%%%%%1873%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%


#%%%%%%%%%%%%%%%1882%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
X1882_Burned <- read_csv("Road width clean/1882_Burned.csv")%>%
  rename_all(tolower)%>%
  mutate(burned=1)

X1882_Unburned <- read_csv("Road width clean/1882_Unburned.csv")%>%
  rename_all(tolower)%>%
  mutate(burned=0)

rb04<-rbind(X1882_Unburned, X1882_Burned)%>%
  rename(length=shape_le_1)%>%
  mutate(year=1882)%>%
  mutate(width=ifelse(roadw_1882!=0,roadw_1882,0 ))%>%
  mutate(width=ifelse(roadw_82!=0,(width+roadw_82)/2,width ))%>%
  select(objectid, full_name, length,burned, width, year )

rb05<-rbind(rb04, rb03)
```

```r
#%%%%%%%%%%%%%1882%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

#%%%%%%%%%%%%%1895%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
X1890_Burned <- read_csv("Road width clean/1890_Burned.csv")%>%
  rename_all(tolower)%>%
  mutate(burned=1)
X1890_Unburned <- read_csv("Road width clean/1890_Unburned.csv")%>%
  rename_all(tolower)%>%
  mutate(burned=0)

rb06<-rbind(X1890_Unburned, X1890_Burned)%>%
  rename(length=shape_le_1)%>%
  mutate(year=1895)%>%
  mutate(width=ifelse(roadw_1880!=0,roadw_1880,0 ))%>%
  mutate(width=ifelse(roadw_80!=0,(width+roadw_80)/2,width ))%>%
  select(objectid, full_name, length,burned, width, year )

rb07<-rbind(rb06, rb05)
#%%%%%%%%%%%%%1890%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%



#%%%%%%%%%%%%%2014%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
library(plyr)
Modern_Burned <- read_csv("Road width clean/Modern_Burned.csv")%>%
  rename_all(tolower)%>%
  mutate(burned=1)
Modern_Unburned <- read_csv("Road width clean/Modern_Unburned.csv")%>%
  rename_all(tolower)%>%
  mutate(burned=0)
rb08<-rbind(Modern_Unburned, Modern_Burned)%>%
  mutate(width = rightsidew+ rightshoul+ medianwidt+ leftsidewa+ leftshould+ surfacewid)%>%
  mutate(width2 = rightofway)%>%
  mutate(year=2014)%>%
  select( length, burned, width,width2, year)


rb09<-rbind.fill(rb08, rb07)


#%%%%%%%%%%%%%2014%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%


#%%%%%%%%%%%%%1882%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
DistToFire_Burned <- read_csv("Road width clean/DistToFire_Burned.csv")%>%
  rename_all(tolower)%>%
  select(-objectid)%>%
  mutate(objectid=oid_save)%>%
  mutate(objectid=objectid+1)%>%
  select(objectid, near_dist, shape_length)%>%
  mutate(dist_sl=shape_length)%>%
  mutate(burned=1)
rw1 <- right_join(DistToFire_Burned, rb09, by = c("objectid", "burned"))
```

```r
DistToFire_Unburned <- read_csv("Road width clean/DistToFire_Unburned.csv")%>%
  rename_all(tolower)%>%
  select(-objectid)%>%
  mutate(near_distu=near_dist)%>%
  mutate(objectid=oid_save)%>%
  mutate(objectid=objectid+1)%>%
  select(objectid, near_distu, shape_length)%>%
  mutate(dist_sl=shape_length)%>%
  mutate(burned=0)
rw2 <- right_join(DistToFire_Unburned, rw1, by = c("objectid", "burned"))
#%%%%%%%%%%%%%%1882%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```