

San Fransciso Trees

null

2020-12-08

```
library(ggplot2)
library(dplyr)
library(stringr)
library(tidyverse)
library(here)
library(patchwork)
```

Using the sf_trees.csv dataset from Tidy Tuesday, I investigate what the trees are like in San Francisco. The data has 192,987 observations and 12 variables. The variables are the ID given to the tree, the legal status of the tree, the species of the tree, the street address, the order of the trees in the case that there are multiple trees at one location, where the tree is on the lot, the primary caretaker of the tree, the date it was planted, the diameter of the tree, the dimension of the plot, the latitude the plant is at, and the longitude the tree is planted.

```
sf <- read.csv(here("tidytuesday-master", "data", "2020", "2020-01-28", "sf_trees.csv"))
```

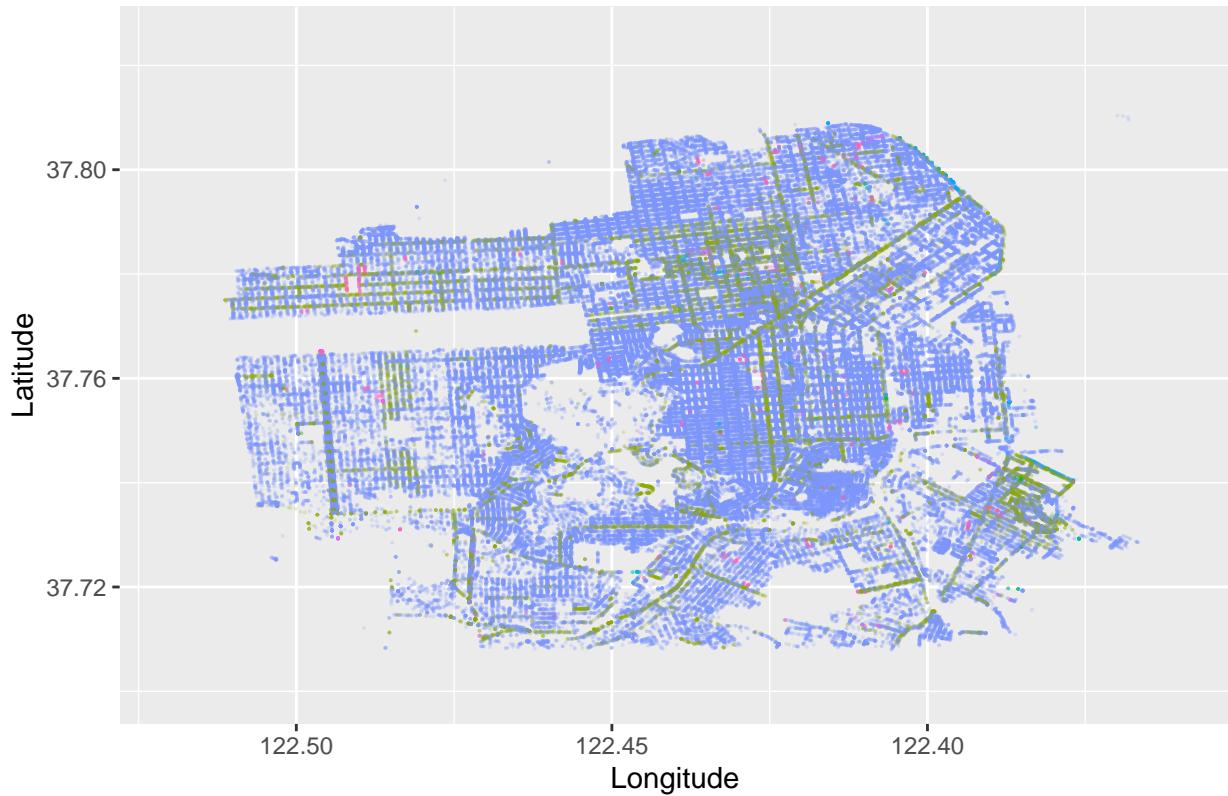
Question 1 : Where are the trees in San Francisco and who owns them?

```
ggplot(sf, aes(x = (longitude*-1), y = latitude, color = caretaker)) +
  geom_point(size = 0.001, alpha = 0.2) +
  ylim(37.7,37.825) +
  theme(legend.position = "none") +
  scale_x_continuous(trans = "reverse") +
  xlim(122.52, 122.36) +
  xlab("Longitude") +
  ylab("Latitude") +
  ggtitle("Map of the Trees in San Francisco")
```

```
## Scale for 'x' is already present. Adding another scale for 'x', which will replace the existing scale
```

```
## Warning: Removed 2963 rows containing missing values (geom_point).
```

Map of the Trees in San Francisco



This reveals that there is a lot about where the trees are in San Francisco. A person can easily see the street layout of San Francisco. Also, a person can see how well the streets are lined with trees. It also shows where the data set didn't collect data, which is parks. The long strip in the left side of the map is actually Golden Gate Park which has several trees, but these trees were not included in the scope of the research. The central blank area as well as the North West and South West are areas reserved for more nature, usually golf courses. the only area with no trees that actually has no trees is the area in the South East. This is a primarily commercial area with few street decorations or Trees. The blue indicates private trees, which suggests that while the trees may be mandatory to be on a street, it is still the land owner's responsibility to take care of the tree.

Question 2: What is the most common type of tree?

```
species_list <- sf %>%
  mutate(species = word(species, 1, sep = " ")) %>%
  separate_rows(species, sep = ' ') %>%
  group_by(species) %>%
  summarize(Count = n()) %>%
  filter(Count >= 5000)

x <- 0

for (i in 1:12) {
  x <- x + species_list[i,2]
}

z <- 19287 - x
```

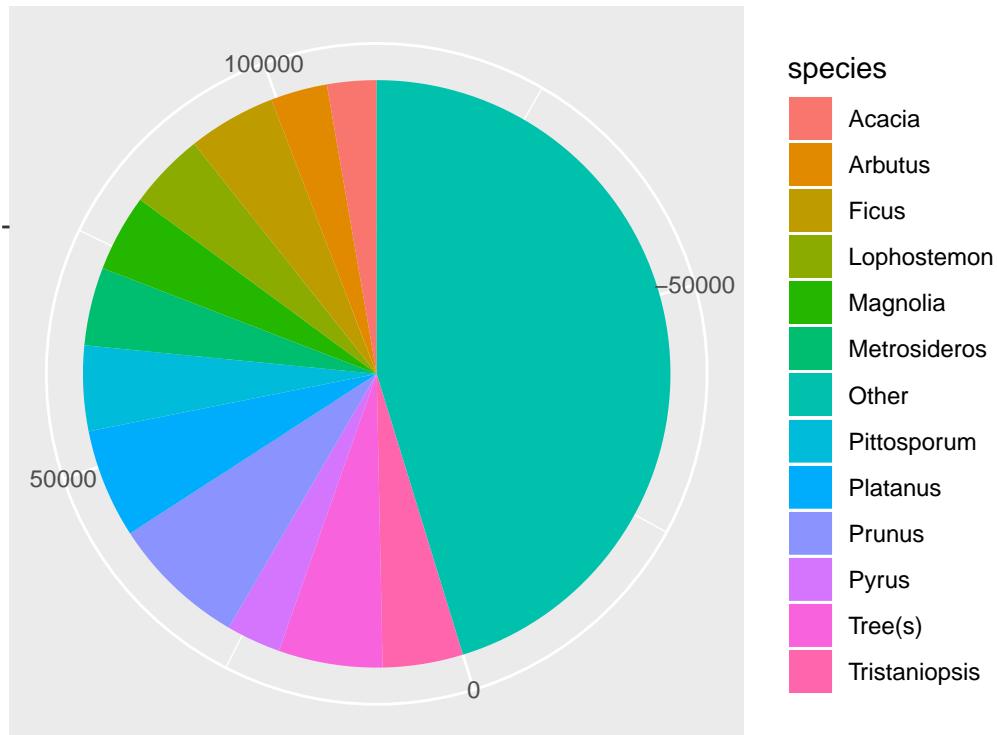
```

species_list[nrow(species_list) + 1,] = c("Other", z)

ggplot(species_list, aes(x= "", y=Count, fill = species)) +
  geom_bar(width = 10, stat = "identity") +
  coord_polar("y", start = 0) +
  xlab("") +
  ylab("") +
  ggtitle("Number of Trees of a Certain Species")

```

Number of Trees of a Certain Species



Surprisingly, there is a lot of variety in tree. About 50% of trees have less than 5000 of the same type of tree. Considering there are around 200,000 trees, it means that only 11 tree types are over 2.5% of the trees in the San Francisco area. This indicates that the people care about their yards and their plants and want their yards to be more unique and have personality, so they choose a more unique tree. The area also must be habitable for any different tree types because there is so much of a variety. If there was a large portion of any one type of tree, it would be assumed that there is a smaller tree pool to choose from for consumers. However, it looks like people have found that many trees can grow well in the San Francisco area.

Question 3: Does site of the tree affect the diameter of the tree?

```

g1 <- ggplot(sf, aes(x= site_info)) +
  geom_bar() +
  theme(axis.text.x = element_text(angle = 90)) +
  xlab("Tree Location") +
  ylab("Number of Trees") +
  ggtitle("Popular Locations of Trees in SF")

```

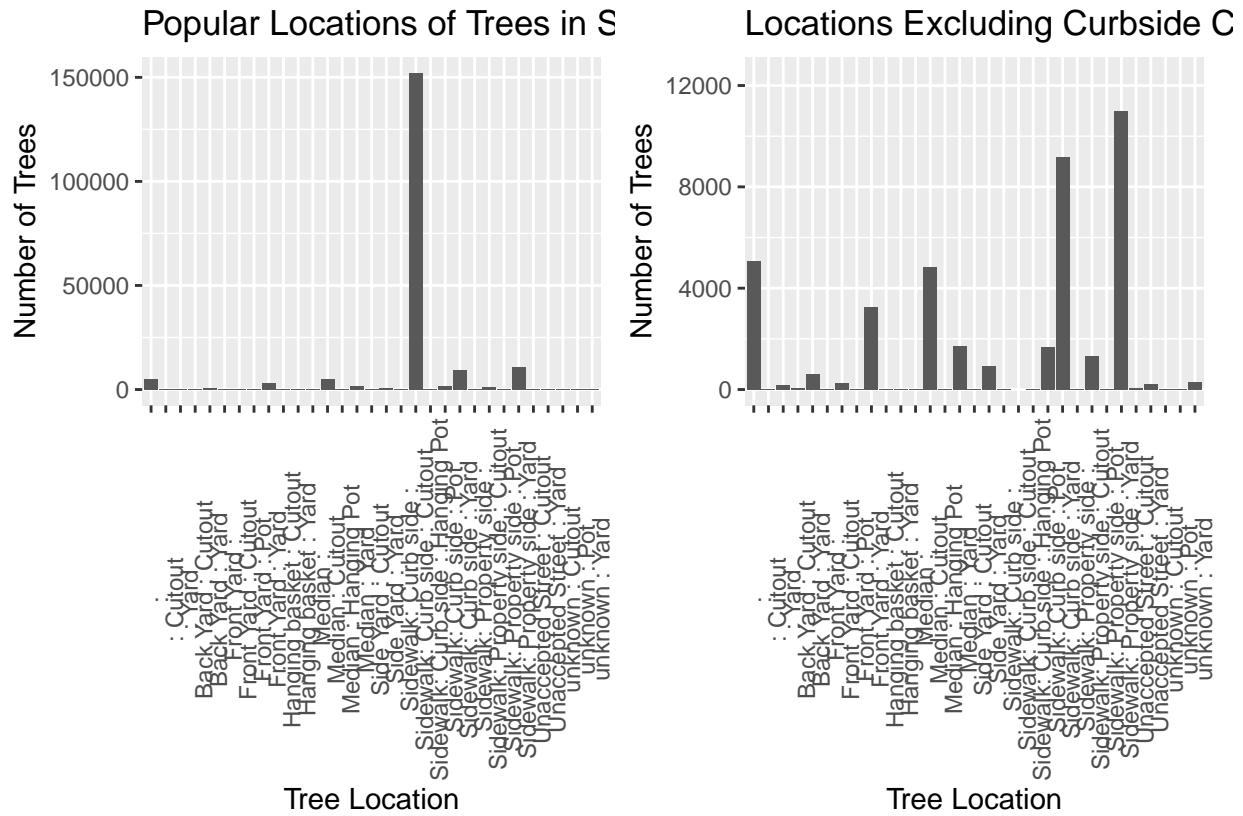
```

g2 <- ggplot(sf, aes(x= site_info)) +
  geom_bar() +
  theme(axis.text.x = element_text(angle = 90)) +
  ylim(0,12500) +
  xlab("Tree Location") +
  ylab("Number of Trees") +
  ggtitle("Locations Excluding Curbside Cutouts")

```

```
g1 + g2
```

```
## Warning: Removed 1 rows containing missing values (geom_bar).
```



As seen in the graph, a majority of the trees are on sidewalk curbs. This is most likely why we see such a distinct street layout in the spatial map. These trees most likely consists of the more common tree types because they are on streets. Since they are on streets, it suggests that there is some degree of uniformity set in place by some form of city official or home owners association. Of the relatively smaller tree locations, they are mostly in yards. This I believe is where the variation in tree types comes from. In yards, it is more likely that people can take more creative freedom on what kind of tree they want. While some trees look nice on a curb, other more exciting and unique trees are in private yards to add more character to one's home.

```

today <- 2020

tree_age <- sf %>%
  filter(!is.na(dbh)) %>%

```

```

  mutate(age = substr(date, 1, 4)) %>%
  mutate(age = as.numeric(age)) %>%
  mutate(age = today - age)

```

tree_age

		species
##	tree_id	legal_status
## 1	30314	DPW Maintained
## 2	30321	DPW Maintained
## 3	30334	DPW Maintained
## 4	30335	DPW Maintained
## 5	30333	DPW Maintained
## 6	30339	DPW Maintained
## 7	30337	DPW Maintained
## 8	30341	DPW Maintained
## 9	30348	DPW Maintained
## 10	30350	DPW Maintained
## 11	53216	DPW Maintained
## 12	30353	DPW Maintained
## 13	30346	DPW Maintained
## 14	30352	DPW Maintained
## 15	30351	DPW Maintained
## 16	30379	DPW Maintained
## 17	30372	DPW Maintained
## 18	30362	DPW Maintained
## 19	30367	DPW Maintained
## 20	30368	DPW Maintained
## 21	30418	DPW Maintained
## 22	30417	DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 23	30416	DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 24	30414	DPW Maintained
## 25	30415	DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 26	30411	DPW Maintained
## 27	30410	DPW Maintained
## 28	30450	DPW Maintained
## 29	30437	DPW Maintained
## 30	30431	DPW Maintained
## 31	30429	DPW Maintained
## 32	30460	DPW Maintained
## 33	30445	DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 34	30459	DPW Maintained
## 35	30457	DPW Maintained
## 36	30454	DPW Maintained
## 37	30463	DPW Maintained
## 38	30446	DPW Maintained
## 39	30442	DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 40	30433	DPW Maintained
## 41	30465	DPW Maintained
## 42	30428	DPW Maintained
## 43	30451	DPW Maintained
## 44	30443	DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 45	30441	DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 46	30440	DPW Maintained

```

## 47 30425 DPW Maintained
## 48 30452 DPW Maintained
## 49 30434 DPW Maintained
## 50 30438 DPW Maintained
## 51 30466 DPW Maintained
## 52 30464 DPW Maintained
## 53 30444 DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 54 30458 DPW Maintained
## 55 30439 DPW Maintained
## 56 30468 DPW Maintained
## 57 30462 DPW Maintained
## 58 30470 DPW Maintained
## 59 30473 DPW Maintained
## 60 30475 DPW Maintained
## 61 30477 DPW Maintained
## 62 30474 DPW Maintained
## 63 30478 DPW Maintained
## 64 30479 DPW Maintained
## 65 30285 DPW Maintained
## 66 30286 DPW Maintained
## 67 30288 DPW Maintained
## 68 30298 DPW Maintained
## 69 30295 DPW Maintained
## 70 30297 DPW Maintained
## 71 30292 DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 72 30302 DPW Maintained
## 73 30299 DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 74 30489 DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 75 30488 DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
## 76 30490 DPW Maintained Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'

##   dbh plot_size latitude longitude age
## 1   16      <NA>  37.75977 -122.3981  65
## 2    2      <NA>  37.79572 -122.4419  64
## 3    4      <NA>  37.74322 -122.4336  64
## 4    2      <NA>  37.74323 -122.4336  64
## 5    1      <NA>  37.74322 -122.4337  64
## 6   11      <NA>  37.79319 -122.4414  64
## 7   12      <NA>  37.79324 -122.4414  64
## 8   10      <NA>  37.80591 -122.4375  64
## 9   13      <NA>  37.76083 -122.3984  64
## 10  20      <NA>  37.76065 -122.3984  64
## 11   1      <NA>  37.75568 -122.3979  64
## 12  20      <NA>  37.75901 -122.3980  64
## 13  30      <NA>  37.76090 -122.3984  64
## 14  21      <NA>  37.75947 -122.3981  64
## 15  13      <NA>  37.76043 -122.3984  64
## 16   9      <NA>  37.75572 -122.3979  64
## 17  10      3x3  37.76005 -122.3983  64
## 18  11      <NA>  37.75852 -122.3982  64
## 19  23      <NA>  37.75779 -122.3981  64
## 20  43      <NA>  37.76105 -122.3985  64
## 21  12      <NA>  37.79730 -122.4409  64
## 22  13      <NA>  37.79741 -122.4412  64
## 23  14      <NA>  37.79742 -122.4411  64

Arbutus 'Marina' :: Hybrid Strawberry Tree
Pittosporum undulatum :: Victorian Box
Arbutus 'Marina' :: Hybrid Strawberry Tree
Pittosporum undulatum :: Victorian Box
Melaleuca quinquenervia :: Cajeput
Pittosporum undulatum :: Victorian Box
Melaleuca quinquenervia :: Cajeput
Pittosporum undulatum :: Victorian Box
Callistemon citrinus :: Lemon Bottlebrush
Metrosideros excelsa :: New Zealand Xmas Tree
Pittosporum undulatum :: Victorian Box
Olea europaea :: Olive Tree
Metrosideros excelsa :: New Zealand Xmas Tree
Ulmus parvifolia :: Chinese Elm
Ulmus parvifolia :: Chinese Elm
Ulmus parvifolia :: Chinese Elm
Pittosporum undulatum :: Victorian Box
Maytenus boaria :: Mayten
Acacia melanoxylon :: Blackwood Acacia
Acacia melanoxylon :: Blackwood Acacia
Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'
Ficus microcarpa nitida 'Green Gem' :: Indian Laurel Fig Tree 'Green Gem'

```

```

## 24   9      <NA> 37.79725 -122.4412  64
## 25  13      <NA> 37.79739 -122.4411  64
## 26  12      <NA> 37.79729 -122.4409  64
## 27  12      <NA> 37.79728 -122.4410  64
## 28   9      <NA> 37.79209 -122.4452  64
## 29  12      <NA> 37.80044 -122.4087  64
## 30   9      <NA> 37.80438 -122.4076  64
## 31  19      <NA> 37.80085 -122.4064  64
## 32  19      4x4 37.80074 -122.4073  64
## 33  15      <NA> 37.80102 -122.4051  64
## 34   7      <NA> 37.80091 -122.4049  64
## 35   7      <NA> 37.80090 -122.4049  64
## 36   8      3x3 37.80081 -122.4057  64
## 37  16      <NA> 37.80066 -122.4069  64
## 38  12      <NA> 37.80084 -122.4054  64
## 39  14      <NA> 37.80101 -122.4051  64
## 40   8      <NA> 37.80089 -122.4051  64
## 41   7      <NA> 37.80438 -122.4077  64
## 42  13      7x3 37.80082 -122.4066  64
## 43  11      <NA> 37.80446 -122.4081  64
## 44  15      <NA> 37.80102 -122.4051  64
## 45  12      <NA> 37.80100 -122.4052  64
## 46  11      <NA> 37.80097 -122.4055  64
## 47   5      <NA> 37.80083 -122.4055  64
## 48  11      <NA> 37.80436 -122.4078  64
## 49  20      <NA> 37.80105 -122.4048  64
## 50  15      <NA> 37.80104 -122.4049  64
## 51  11      <NA> 37.80437 -122.4077  64
## 52  11      <NA> 37.80077 -122.4071  64
## 53  10      <NA> 37.80102 -122.4050  64
## 54   8      <NA> 37.80092 -122.4048  64
## 55  15      <NA> 37.80080 -122.4058  64
## 56   8      3x3 37.80061 -122.4073  64
## 57  12      <NA> 37.80081 -122.4067  64
## 58   8      3x3 37.80062 -122.4073  64
## 59  15      <NA> 37.80448 -122.4080  64
## 60   8      <NA> 37.80083 -122.4065  64
## 61  12      <NA> 37.79573 -122.4391  64
## 62   9      <NA> 37.80075 -122.4062  64
## 63   4      <NA> 37.79576 -122.4391  64
## 64  10      <NA> 37.79575 -122.4390  64
## 65   8      <NA> 37.79501 -122.4132  64
## 66  10      <NA> 37.79495 -122.4132  64
## 67  14      <NA> 37.79509 -122.4132  64
## 68  10      <NA> 37.79533 -122.4318  64
## 69  11      <NA> 37.79541 -122.4317  64
## 70   9      <NA> 37.79521 -122.4316  64
## 71  12      <NA> 37.79526 -122.4318  64
## 72  11      <NA> 37.79528 -122.4317  64
## 73  15      <NA> 37.79535 -122.4317  64
## 74  16      <NA> 37.78958 -122.4127  64
## 75  14      <NA> 37.78957 -122.4128  64
## 76  16      3x3 37.78959 -122.4127  64
## [ reached 'max' / getOption("max.print") -- omitted 151092 rows ]

```

```

b1 <- ggplot(tree_age, aes(x= site_info, y = dbh)) +
  geom_boxplot() +
  theme(axis.text.x = element_text(angle = 90)) +
  ylim(0,125) +
  xlab("Tree Location") +
  ylab("Diameter") +
  ggtitle("Diameter of Tree per Location")

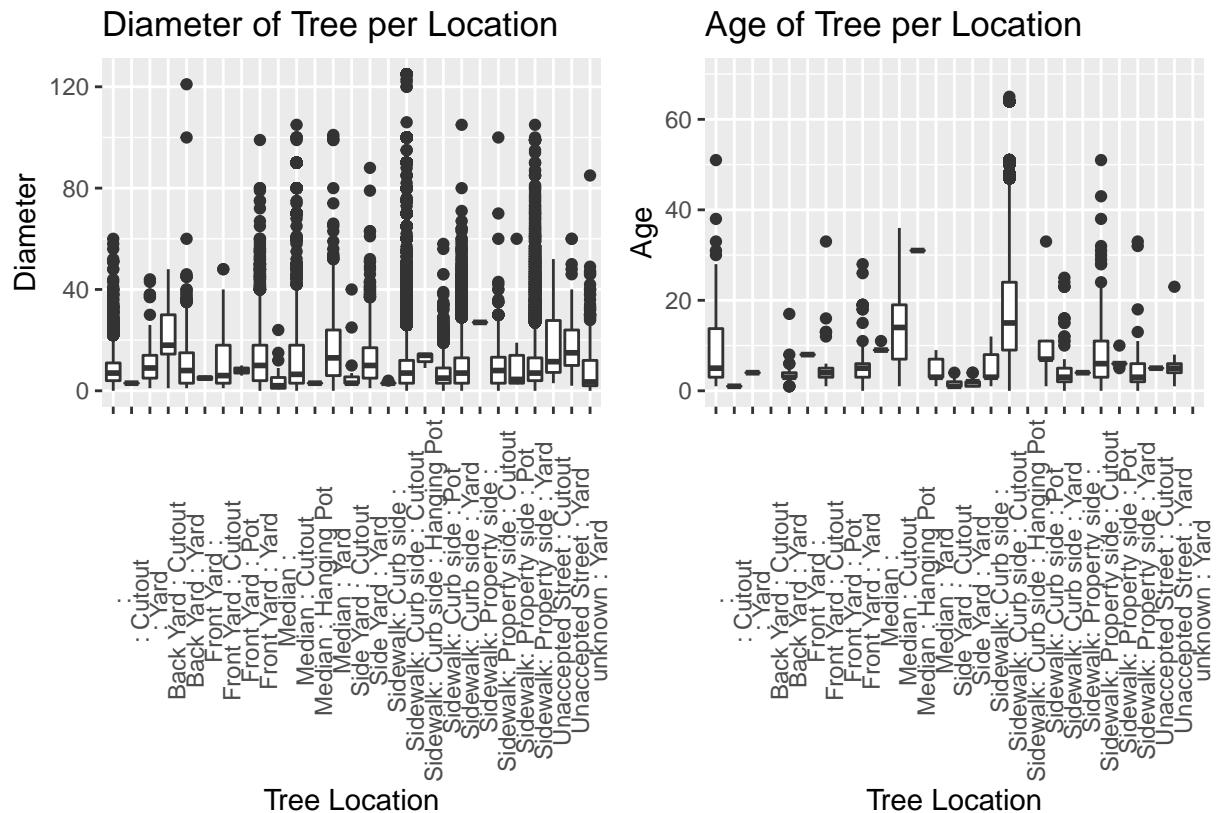
b2 <- ggplot(tree_age, aes(x= site_info, y = age)) +
  geom_boxplot() +
  theme(axis.text.x = element_text(angle = 90)) +
  ylim(0,70) +
  xlab("Tree Location") +
  ylab("Age") +
  ggtitle("Age of Tree per Location")

b1 + b2

```

Warning: Removed 13 rows containing non-finite values (stat_boxplot).

Warning: Removed 113239 rows containing non-finite values (stat_boxplot).



These graphs show that trees that grow in yards grow bigger for their age than other trees. While other spots may use trees as decoration, trees should be in the place where they grow the best.