

# deforestation\_amazon\_states\_prodes

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Used packages and libraries

```
sessionInfo()
```

```
## R version 3.5.2 (2018-12-20)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: Ubuntu 19.04
##
## Matrix products: default
## BLAS: /usr/lib/x86_64-linux-gnu/blas/libblas.so.3.8.0
## LAPACK: /usr/lib/x86_64-linux-gnu/lapack/liblapack.so.3.8.0
##
## locale:
##  [1] LC_CTYPE=pt_BR.UTF-8      LC_NUMERIC=C
##  [3] LC_TIME=pt_BR.UTF-8      LC_COLLATE=en_US.UTF-8
##  [5] LC_MONETARY=pt_BR.UTF-8  LC_MESSAGES=en_US.UTF-8
##  [7] LC_PAPER=pt_BR.UTF-8     LC_NAME=C
##  [9] LC_ADDRESS=C             LC_TELEPHONE=C
## [11] LC_MEASUREMENT=pt_BR.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods    base
##
## loaded via a namespace (and not attached):
##  [1] compiler_3.5.2  magrittr_1.5    tools_3.5.2    htmltools_0.4.0
##  [5] yaml_2.2.0      Rcpp_1.0.2      stringi_1.4.3  rmarkdown_1.16
##  [9] knitr_1.25      stringr_1.4.0   xfun_0.10      digest_0.6.21
## [13] rlang_0.4.0     evaluate_0.14
```

Reading CSV Dataset available on Brazilian Open Data Portal = <http://dados.gov.br/dataset/sistema-nacional-de-informacoes-florestais-snif/resource/7da885b0-141e-4463-a374-a07603fdf70a>

```
dtset_path = "http://homolog-dados.mma.gov.br/pt_BR/dataset/ffd9ab35-5719-4ec1-8d13-ae8f738bebc2/resource/7da885b0-141e-4463-a374-a07603fdf70a"
```

```
deforestation_amazon_states_prodes <- read.csv(dtset_path,
                                              header = TRUE,
                                              sep = ";", dec = ",",
                                              strip.white = TRUE, stringsAsFactors = FALSE)
```

```
names(deforestation_amazon_states_prodes) <- c("Year", "Biome", "Category", "State", "Number of Records")
head(deforestation_amazon_states_prodes)
```

##	Year	Biome	Category	State	Number of Records
## 1	Até 2012	Amazônia	Desflorestamento	Acre	1
## 2	Até 2012	Amazônia	Desflorestamento	Amapá	1
## 3	Até 2012	Amazônia	Desflorestamento	Amazonas	1
## 4	Até 2012	Amazônia	Desflorestamento	Maranhão	1
## 5	Até 2012	Amazônia	Desflorestamento	Mato Grosso	1

```
## 6 Até 2012 Amazônia Desflorestamento      Pará      1
##      Period Deforested_Area
## 1 31/12/2012      2069692.8
## 2 31/12/2012      296396.9
## 3 31/12/2012      3504915.6
## 4 31/12/2012      8005247.8
## 5 31/12/2012      18127035.1
## 6 31/12/2012      25387873.8
```

```
library(plotly)
```

```
## Loading required package: ggplot2
```

```
##
```

```
## Attaching package: 'plotly'
```

```
## The following object is masked from 'package:ggplot2':
```

```
##
```

```
##      last_plot
```

```
## The following object is masked from 'package:stats':
```

```
##
```

```
##      filter
```

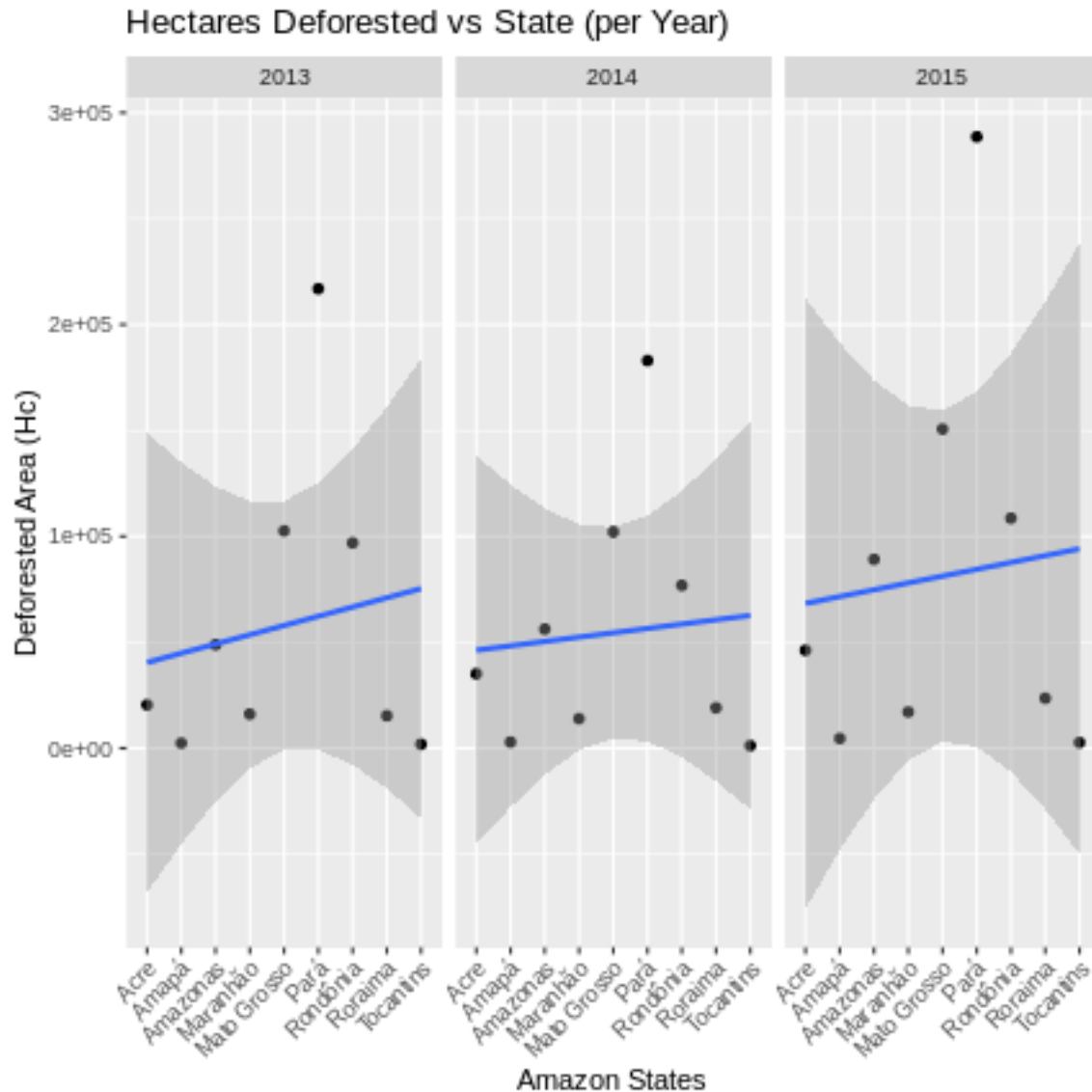
```
## The following object is masked from 'package:graphics':
```

```
##
```

```
##      layout
```

```
plotDefState <- deforestation_amazon_states_prodes %>%
  group_by(Year, State) %>%
  summarise(Deforested_Area_Hc = sum(Deforested_Area)) %>%
  filter(Year != "Até 2012") %>% # Filtering outlier value
  ggplot(aes(x = State , y = Deforested_Area_Hc, group= Year)) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  geom_point() + geom_smooth(method="lm") + facet_wrap(~Year)

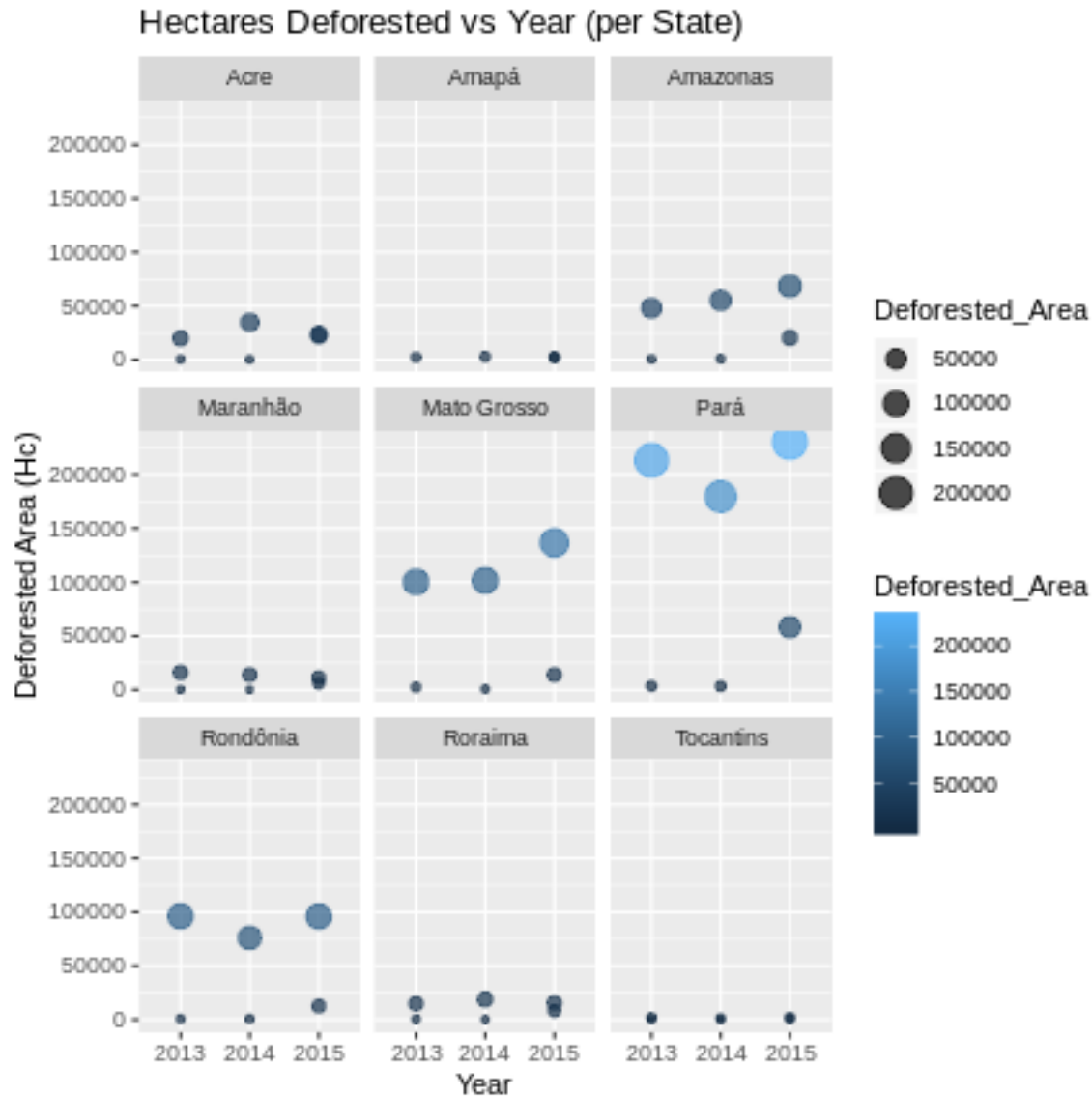
print(plotDefState + labs(title= "Hectares Deforested vs State (per Year)",
  y="Deforested Area (Hc)", x = "Amazon States"))
```



```
ggsave("deforestedstate.png", width = 6, height = 6, dpi = "screen")
```

```
plotDefYear <- deforestation_amazon_states_prodes %>%
  group_by(Year, State) %>%
  select(Year, State, Deforested_Area) %>%
  filter(Year != "Até 2012") %>%
  ggplot(aes(x = Year,
             y = Deforested_Area)) +
  geom_point(aes( size = Deforested_Area, color= Deforested_Area), alpha = 0.7) +
  facet_wrap(~ State)

print(plotDefYear + labs(title= "Hectares Deforested vs Year (per State)",
                        y="Deforested Area (Hc)", x = "Year"))
```



```
ggsave("deforestedyear.png", width = 6, height = 6, dpi = "screen")
```

Plotting Maps with brmap lib Polygons of Brazilian territorial units in R - By states

```
library(tibble)
library(brmap)
```

```
## Loading required package: sf
```

```
## Linking to GEOS 3.7.1, GDAL 2.4.0, PROJ 5.2.0
```

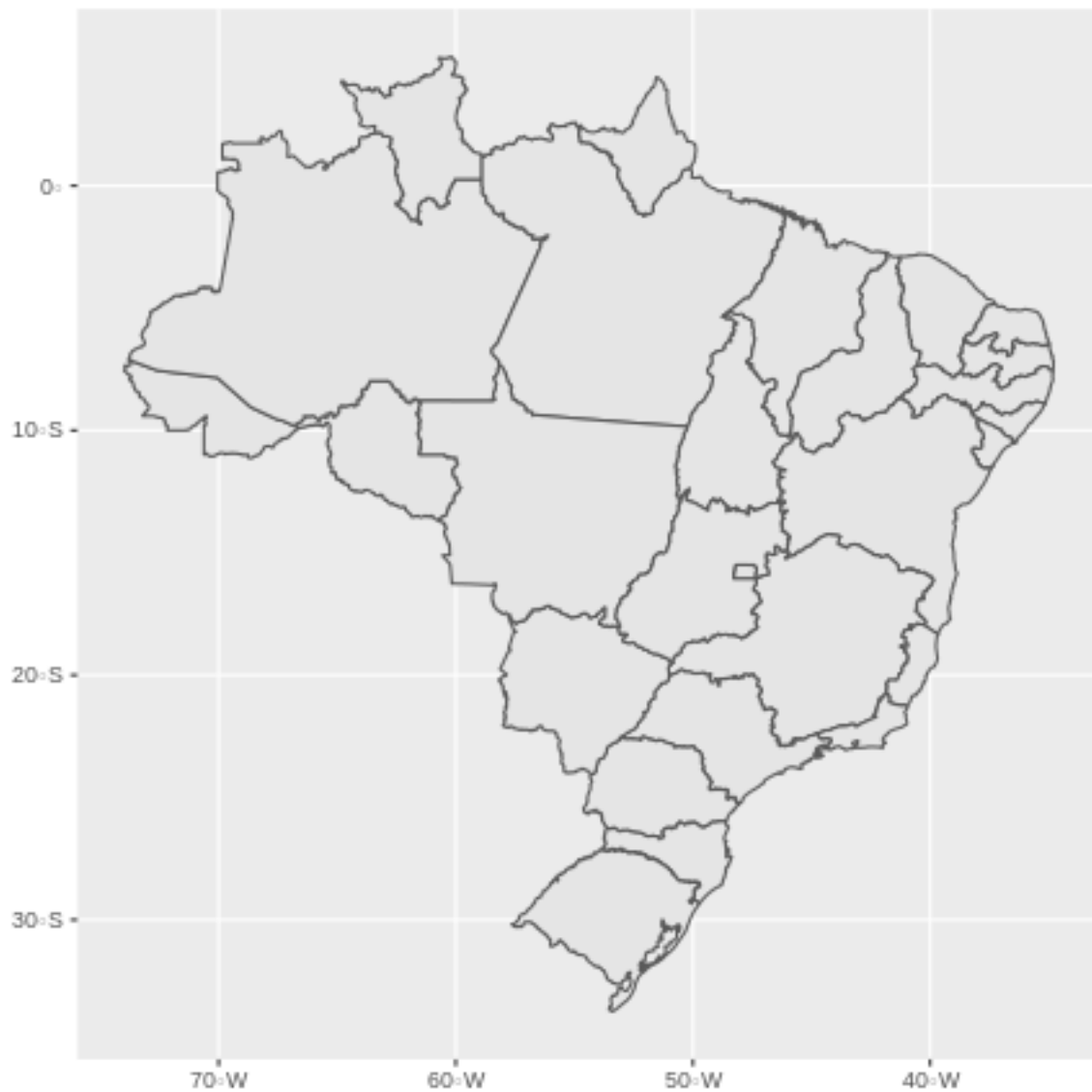
```
summary(brmap_estado)
```

```
##      estado_cod      regioao_cod      estado_nome      estado_sigla
## Min.   :11.00    Min.   :1.000    Length:27      Length:27
## 1st Qu.:19.00    1st Qu.:1.500    Class :character Class :character
## Median :27.00    Median :2.000    Mode  :character Mode  :character
## Mean   :29.11    Mean   :2.556
## 3rd Qu.:38.00    3rd Qu.:3.500
```

```
## Max.      :53.00  Max.      :5.000
##          geometry
## POLYGON    :27
## epsg:4674   : 0
## +proj=long...: 0
##
##
##
```

Plotting Brazil Maps

```
ggplot(brmap_estado) +
  geom_sf()
```



```
ggsave("brmap.png", width = 6, height = 6, dpi = "screen")
```

Joining Data Tables Plotting Deforested area in Amazonia, by state - Prodes (2012-2015)

```

library(dplyr)

##
## 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(ggplot2)

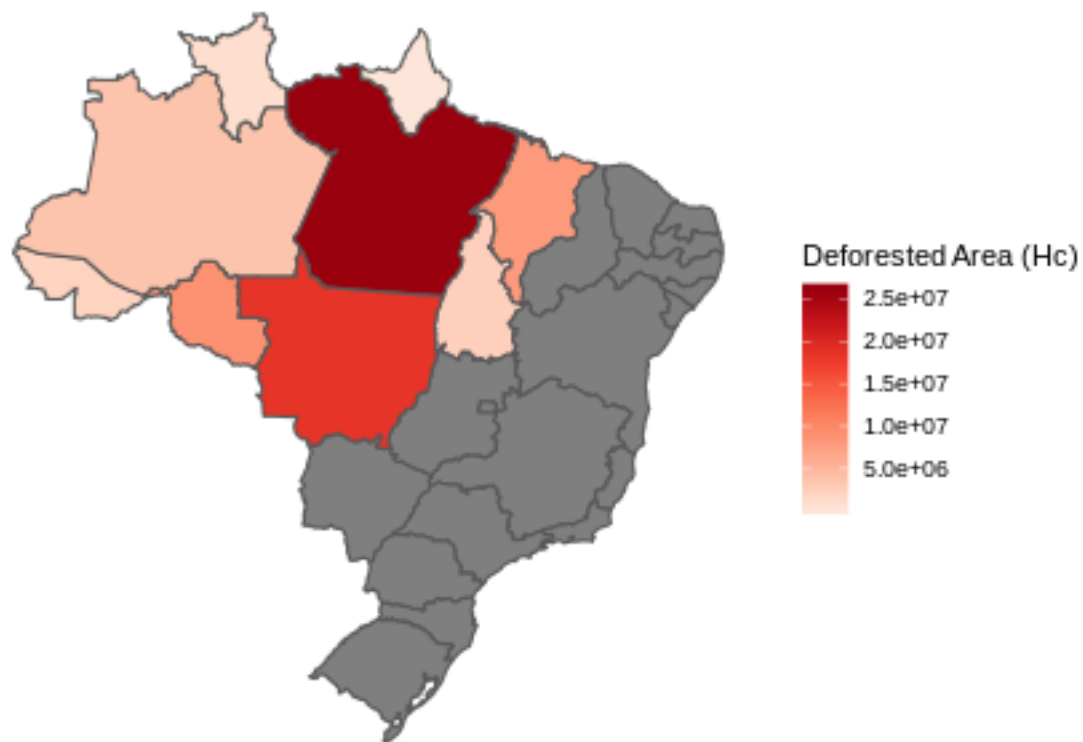
stateVsDeforested <- left_join(brmap_estado,
                              deforestation_amazon_states_prodes %>%
                                group_by(State) %>%
                                summarise(Deforested_Area_Hc = sum(Deforested_Area)),
                              by = c("estado_nome" = "State"))

ggplot(stateVsDeforested) +
  geom_sf(aes(fill = Deforested_Area_Hc)) +
  scale_fill_distiller(
    'Deforested Area (Hc)',
    type = "seq",
    palette = "Reds",
    direction = 1) +
  theme(
    panel.background = element_blank(),
    panel.grid.major = element_line(color = "transparent"),
    axis.text = element_blank(),
    axis.ticks = element_blank()
  ) +
  labs(title = "Amazon Deforestation by State - Prodes (2012-2015) ",
       subtitle = "Source: Brazilian Forest Service (SNIF)")

```

## Amazon Deforestation by State - Prodes (2012-2015)

Source: Brazilian Forest Service (SNIF)



```
ggsave("map.png", width = 6, height = 6, dpi = "screen")
```