Mini Project 1

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Importing Data

```
library(tidyverse)
library(dplyr)
library(sf)
library(tmap)
library(maps)
library(viridis)
library(htmltools)
library(glue)
library(leaflet)

us_states <- map_data("state")

frogs <- read.csv("~/Desktop/15/SDS264/data/most_common_frog.csv") |>
  na.omit()

forests <- read.csv("~/Desktop/15/SDS264/data/forests.csv") |>
  mutate('forest_cover' = forest_area/land_area * 100)

states <- read_sf("https://rstudio.github.io/leaflet/json/us-states.geojson")
```

Data Source

Forest

For my numerical maps, I looked at the percentage of land covered in forest in the united states. I found this data in the USDA Forest Service FIA Annual Report, this report is a pdf where I extracted the values that I would need for this data set.

Frogs

I wanted to look frogs for my categorical data. I found observations of frogs on the website, inaturalist where you can export observations based on specific criteria. I wanted to look at something more interesting then just the most common frog in each state so i looked at the most commonly observed frog that is deemed threatened.

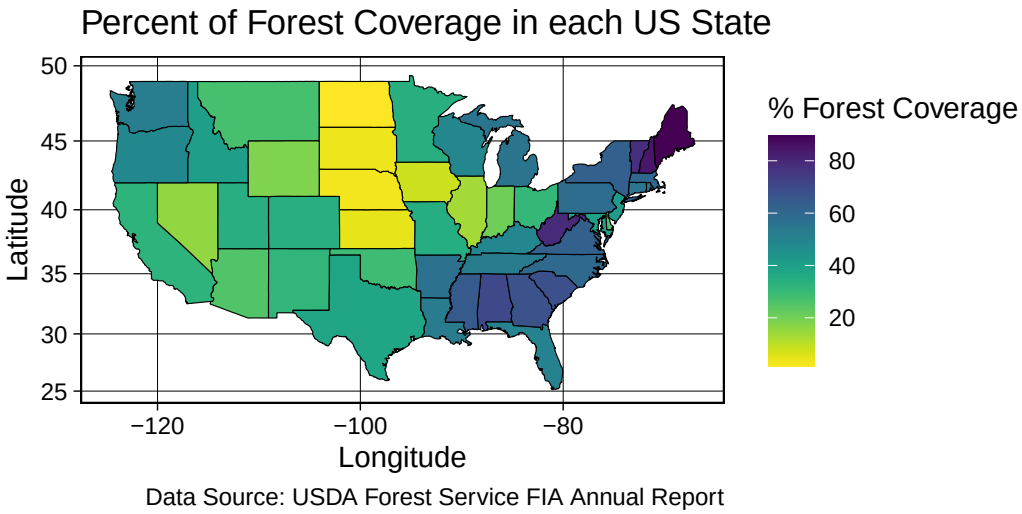
Joining with Polygons

```
forests_static <- forests |>
  mutate(state = str_to_lower(state)) |>
  right_join(us_states, by = c("state" = "region"))
```

```
frogs_static <- frogs |>
  mutate(state = str_to_lower(state)) |>
  right_join(us_states, by = c("state" = "region"))
```

Static Maps

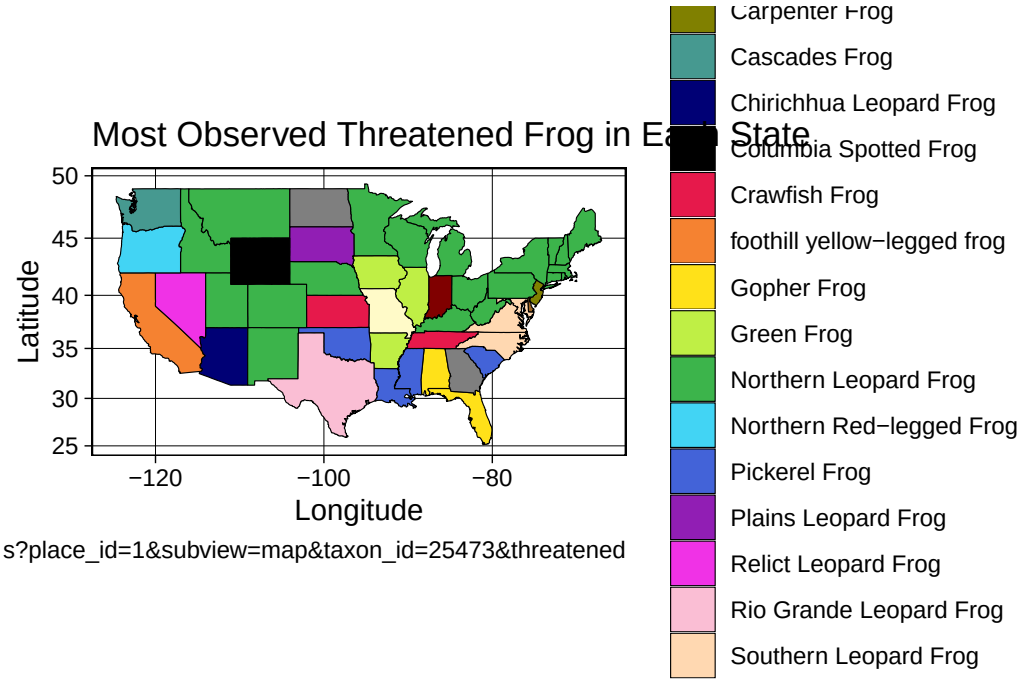
```
forests_static |>
  ggplot(mapping = aes(x = long, y = lat, group = group)) +
  geom_polygon(aes(fill = forest_cover), color = "black", linewidth = 0.2) +
  labs(fill = "% Forest Coverage", title = "Percent of Forest Coverage in each US State", x =
  coord_map() +
  scale_fill_viridis(option = "viridis", direction = -1) +
  theme_linedraw()
```



alt text: This is a choropleth map of the United States that is looking a the percentage of land area that is covered by forest in each state. The x-axis is the longitude values of the United States which contain values -120 - -80. The y-axis the latitude values of the United States which contain values 25-50. This map is colored by the percentage forest covereage with the most coverage being a dark purple while the least coverage is a bright yellow. From this map we can see that states in the East have a higher percentage of forest coverage while states in the middle have a much lower percent forest coverage, then the west coast has a medium amount of forest coverage.

```
frogs_static |>
  ggplot(mapping = aes(x = long, y = lat, group = group)) +
  geom_polygon(aes(fill = frog), color = "black", linewidth = 0.2) +
  labs(fill = "Frog Common Name", title = "Most Observed Threatened Frog in Each State", x =
  scale_fill_manual(values = c("#800000",
                               "#9A6324",
                               "#808000",
                               "#469990",
                               "#000075",
                               "#000000",
                               "#e6194B",
                               "#f58231",
                               "#ffe119",
                               "#bfef45",
```

```
                                "#3cb44b",
                                "#42d4f4",
                                "#4363d8",
                                "#911eb4",
                                "#f032e6",
                                "#fabed4",
                                "#ffd8b1",
                                "#fffac8",
                                "#aaffc3")) +
  coord_map() +
  theme_linedraw()
```



s?place_id=1&subview=map&taxon_id=25473&threatened

Joining for Interactive Polygons

```
states <- states |>
  filter(!(name %in% c("Alaska", "Hawaii", "Puerto Rico"))) |>
  select("name", "geometry")

frogs_interactive <- frogs |>
  right_join(states, by = c("state" = "name"))
```

```r
forest_interactive <- forests |>
  right_join(states, by = c("state" = "name"))
```

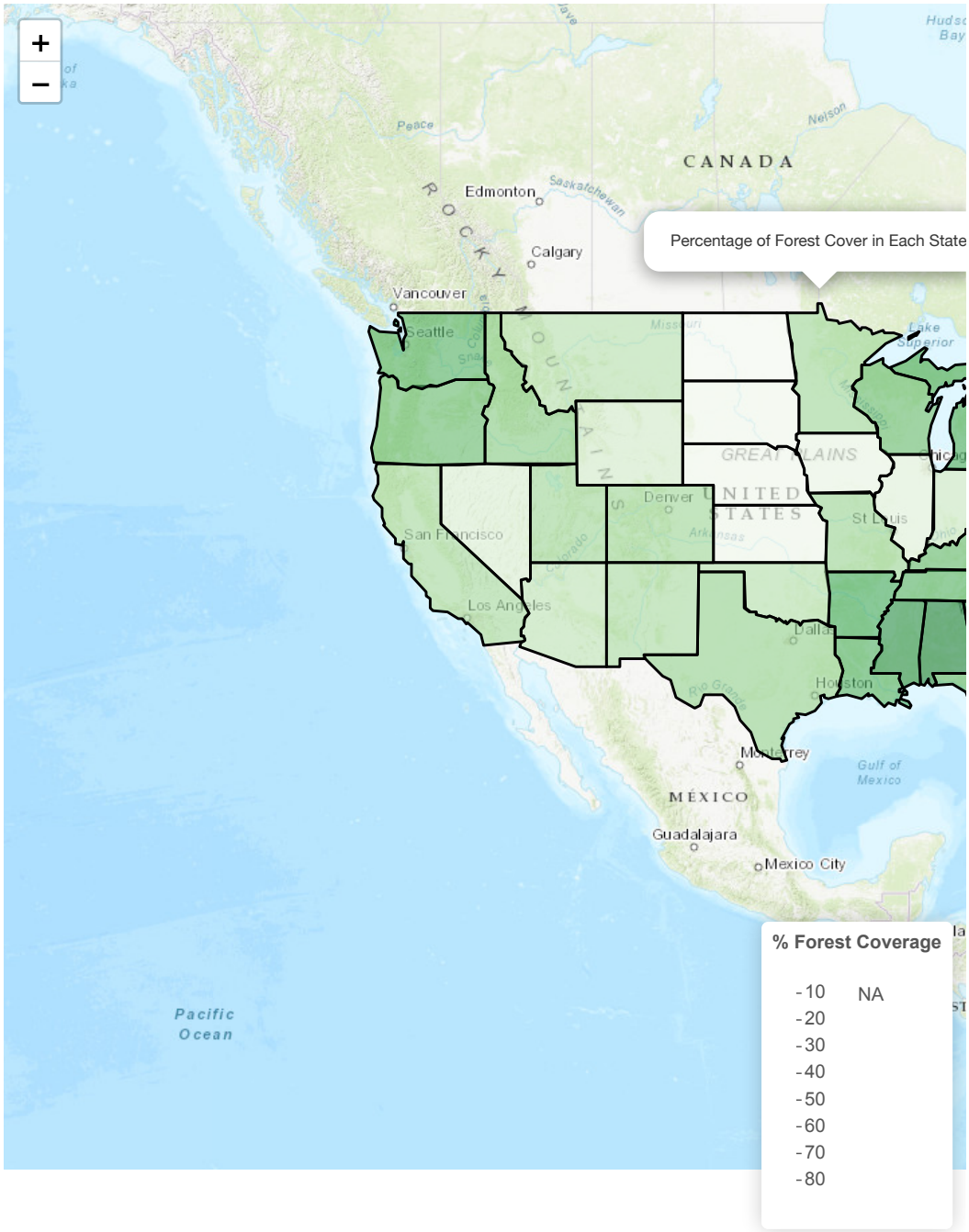
Interactive Maps

```r
forest_sf <- st_as_sf(forest_interactive) |>
  mutate(forest_cover = trunc(forest_cover))

pal <- colorNumeric("Greens", domain = forest_sf$forest_cover)

forest_sf <- forest_sf |>
  mutate(labels = str_c(state, ": ", forest_cover, "% forest cover"))

labels <- lapply(forest_sf$labels, HTML)
leaflet(forest_sf) |>
  setView(-96, 37.8, 4) |>
  addProviderTiles("Esri.WorldTopoMap") |>
  addPolygons(
    fillColor = ~pal(forest_cover),
    weight = 2,
    opacity = 1,
    color = "black",
    fillOpacity = 0.6,
    highlightOptions = highlightOptions(
      weight = 5,
      color = "pink",
      fillOpacity = 0.7,
      bringToFront = TRUE),
    label = labels,
    labelOptions = labelOptions(
      style = list("font-weight" = "normal", padding = "3px 8px"),
      textsize = "12px",
      direction = "auto")) |>
  addLegend(pal = pal, title = "% Forest Coverage", values = ~forest_cover, opacity = 0.7, po
  addScaleBar(position = "bottomleft") |>
  addPopups(-95, 50, "Percentage of Forest Cover in Each State",
              options = popupOptions(closeOnClick = FALSE))
```


Percentage of Forest Cover in Each State
CANADA
Edmonton
Calgary
Vancouver
Seattle
San Francisco
Los Angeles
Denver
UNITED STATES
GREAT PLAINS
St Louis
Dallas
Houston
Monterrey
MÉXICO
Guadalajara
Mexico City
Gulf of Mexico
Pacific Ocean
% Forest Coverage
-10
-20
-30
-40
-50
-60
-70
-80
NA
Leaflet | Tiles © Esri — Esri, DeLorme, NAVTEQ, TomTom, Intermap, iPC, USGS, FAO, NPS, NRCAN, GeoBase, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

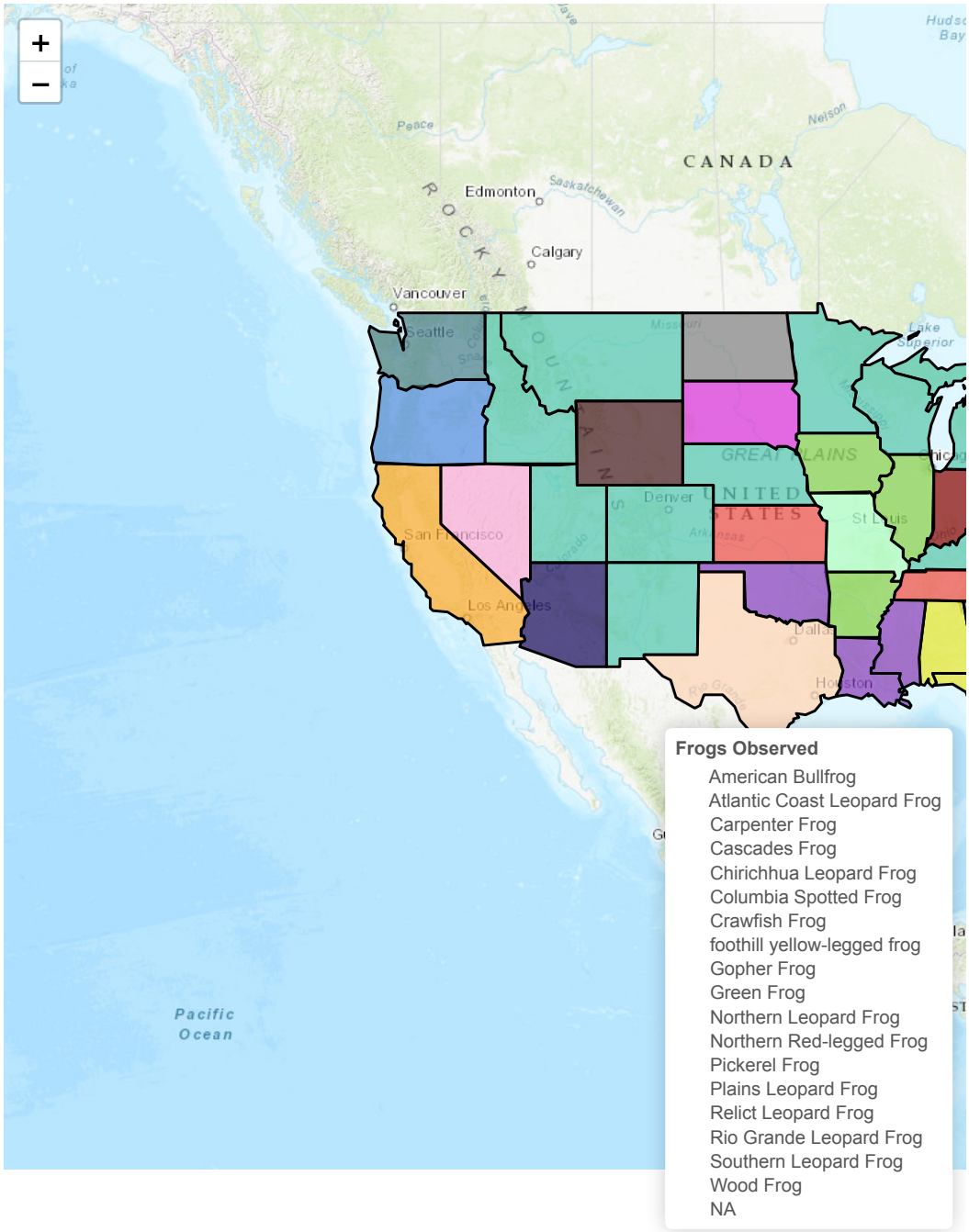
```r
frog_sf <- st_as_sf(frogs_interactive)
pal <- colorFactor(c("#800000",
                                "#9A6324",
                                "#808000",
                                "#469990",
                                "#000075",
                                "#000000",
                                "#e6194B",
                                "#f58231",
                                "#ffe119",
                                "#bfef45",
                                "#3cb44b",
                                "#42d4f4",
                                "#4363d8",
                                "#911eb4",
                                "#f032e6",
                                "#fabed4",
                                "#ffd8b1",
                                "#fffac8",
                                "#aaffc3"), domain = frog_sf$frog)

frog_sf <- frog_sf |>
  mutate(labels = str_c("The ", frog, " is the most observed threatened frog in ", state))

labels <- lapply(frog_sf$labels, HTML)

leaflet(frog_sf) |>
  setView(-96, 37.8, 4) |>
  addProviderTiles("Esri.WorldTopoMap") |>
  addPolygons(
    fillColor = ~pal(frog),
    weight = 2,
    opacity = 1,
    color = "black",
    fillOpacity = 0.7,
    highlightOptions = highlightOptions(
      weight = 5,
      color = "pink",
      fillOpacity = 0.7,
      bringToFront = TRUE),
    label = labels,
    labelOptions = labelOptions(
```

```
    style = list("font-weight" = "normal", padding = "3px 8px"),
    textsize = "12px",
    direction = "auto")) |>
addLegend(pal = pal, title = "Frogs Observed", values = ~frog, opacity = 0.7, position = "
addScaleBar(position = "bottomleft")
```



Leaflet | Tiles © Esri — Esri, DeLorme, NAVTEQ, TomTom, Intermap, iPC, USGS, FAO, NPS, NRCAN, GeoBase, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community