Making nice maps

2019-10-30

```
library(sf)
library(ggplot2)
library(cowplot)
theme_set(theme_half_open())

library(tidycensus)
library(sf)
library(dplyr)
library(tigris)
library(rmapzen)

## You need API keys (Census & mapzen) to use these packages.  Don't
## use mine though.

## Get Census API here
## http://api.census.gov/data/key_signup.html

## Get mapzen API here
## https://developers.nextzen.org/

## census_api_key("3deb7c3e77d1747cf53071c077e276d05aa31407", install = TRUE, overwrite = TRUE)
mz_set_tile_host_nextzen(key = ("hxNDKuWbRgetjkLAf_7MUQ"))

## Function for getting map tiles. This, and a lot of other stuff is from:
## https://www.dshkol.com/2018/better-maps-with-vector-tiles/
get_vector_tiles <- function(bbox){
  mz_box=mz_rect(bbox$xmin,bbox$ymin,bbox$xmax,bbox$ymax)
  mz_vector_tiles(mz_box)
}

################################################################################
                                        #     Get ACS data for geometries     #
################################################################################

## Income (ACS column B19013_001) & geometry for whole state
# txstateincome <- get_acs(state = "TX", geography = "state", geometry = TRUE,
#                          variables = "B19013_001")

txstateincome <- invisible(get_acs(state = "TX", geography = "state", geometry = TRUE,
                          variables = "B19013_001"))
```

```
##
  |
  |                                                                      |   0%
  |
  |=                                                                     |   1%
  |
  |=                                                                     |   2%
  |
```

```
|==                                                    |   2%
|
|==                                                    |   3%
|
|==                                                    |   4%
|
|===                                                   |   4%
|
|===                                                   |   5%
|
|====                                                  |   6%
|
|====                                                  |   7%
|
|=====                                                 |   7%
|
|=====                                                 |   8%
|
|======                                                |   9%
|
|======                                                |  10%
|
|=======                                               |  10%
|
|=======                                               |  11%
|
|========                                              |  12%
|
|========                                              |  13%
|
|=========                                             |  14%
|
|==========                                            |  15%
|
|==========                                            |  16%
|
|===========                                           |  16%
|
|===========                                           |  17%
|
|============                                          |  18%
|
|============                                          |  19%
|
|=============                                         |  19%
|
|=============                                         |  20%
|
|=============                                         |  21%
|
|==============                                        |  21%
|
|==============                                        |  22%
|
```

```
|==============                                                  |  23%
|
|===============                                                 |  24%
|
|================                                                |  24%
|
|================                                                |  25%
|
|=================                                               |  26%
|
|=================                                               |  27%
|
|==================                                              |  27%
|
|=================                                               |  28%
|
|===================                                             |  29%
|
|===================                                             |  30%
|
|====================                                            |  30%
|
|====================                                            |  31%
|
|=====================                                           |  32%
|
|=====================                                           |  33%
|
|======================                                          |  33%
|
|======================                                          |  34%
|
|======================                                          |  35%
|
|=======================                                         |  35%
|
|======================                                          |  36%
|
|========================                                        |  36%
|
|========================                                        |  37%
|
|=========================                                       |  38%
|
|=========================                                       |  39%
|
|==========================                                      |  39%
|
|==========================                                      |  40%
|
|==========================                                      |  41%
|
|===========================                                     |  41%
|
```

```
|=========================                                |  42%
|
|=========================                                |  42%
|
|=========================                                |  43%
|
|=========================                                |  44%
|
|=========================                                |  45%
|
|=========================                                |  46%
|
|=========================                                |  47%
|
|=========================                                |  47%
|
|=========================                                |  48%
|
|=========================                                |  49%
|
|=========================                                |  50%
|
|=========================                                |  50%
|
|=========================                                |  51%
|
|=========================                                |  52%
|
|=========================                                |  53%
|
|=========================                                |  53%
|
|=========================                                |  54%
|
|=========================                                |  55%
|
|=========================                                |  56%
|
|=========================                                |  56%
|
|=========================                                |  57%
|
|=========================                                |  58%
|
|=========================                                |  59%
|
|=========================                                |  60%
|
|=========================                                |  61%
|
|=========================                                |  62%
|
|=========================                                |  62%
|
```

```
|=======================================                |  63%
|
|=======================================                |  64%
|
|========================================               |  64%
|
|========================================               |  65%
|
|=========================================              |  66%
|
|=========================================              |  67%
|
|==========================================             |  67%
|
|==========================================             |  68%
|
|===========================================            |  69%
|
|===========================================            |  70%
|
|============================================           |  70%
|
|============================================           |  71%
|
|============================================           |  72%
|
|=============================================          |  72%
|
|=============================================          |  73%
|
|==============================================         |  73%
|
|==============================================         |  74%
|
|==============================================         |  75%
|
|===============================================        |  76%
|
|================================================       |  76%
|
|================================================       |  77%
|
|=================================================      |  78%
|
|=================================================      |  79%
|
|==================================================     |  79%
|
|==================================================     |  80%
|
|===================================================    |  81%
|
|====================================================   |  81%
|
```

```
  |=================================================             |  82%
  |
  |==================================================            |  83%
  |
  |==================================================            |  84%
  |
  |==================================================            |  85%
  |
  |==================================================            |  86%
  |
  |==================================================            |  87%
  |
  |==================================================            |  87%
  |
  |==================================================            |  88%
  |
  |==================================================            |  89%
  |
  |==================================================            |  90%
  |
  |==================================================            |  90%
  |
  |==================================================            |  91%
  |
  |==================================================            |  92%
  |
  |==================================================            |  93%
  |
  |==================================================            |  93%
  |
  |==================================================            |  94%
  |
  |==================================================            |  95%
  |
  |==================================================            |  96%
  |
  |==================================================            |  96%
  |
  |==================================================            |  97%
  |
  |==================================================            |  98%
  |
  |==================================================            |  98%
  |
  |==================================================            |  99%
  |
  |==================================================            | 100%
```

```r
## Income for state by county
txcountyincome <- invisible(get_acs(state = "TX", geography = "county", geometry = TRUE,
                          variables = "B19013_001") %>%
  arrange(desc(estimate)))
```

```
##
  |
```

```
|                                                                      |   0%
|                                                                      |   1%
|=                                                                     |   1%
|=                                                                     |   2%
|==                                                                    |   2%
|==                                                                    |   3%
|==                                                                    |   4%
|===                                                                   |   4%
|===                                                                   |   5%
|====                                                                  |   5%
|====                                                                  |   6%
|====                                                                  |   7%
|=====                                                                 |   7%
|=====                                                                 |   8%
|======                                                                |   8%
|======                                                                |   9%
|======                                                                |  10%
|=======                                                               |  10%
|=======                                                               |  11%
|========                                                              |  12%
|========                                                              |  13%
|=========                                                             |  13%
|=========                                                             |  14%
|==========                                                            |  15%
|==========                                                            |  16%
|===========                                                           |  16%
|===========                                                           |  17%
|
```

```
|==========                                                    |  18%
|
|==========                                                    |  18%
|
|==========                                                    |  19%
|
|==========                                                    |  19%
|
|==========                                                    |  20%
|
|==========                                                    |  21%
|
|==========                                                    |  21%
|
|==========                                                    |  22%
|
|==========                                                    |  22%
|
|==========                                                    |  23%
|
|==========                                                    |  24%
|
|==========                                                    |  24%
|
|==========                                                    |  25%
|
|==========                                                    |  25%
|
|==========                                                    |  26%
|
|==========                                                    |  27%
|
|==========                                                    |  27%
|
|==========                                                    |  28%
|
|==========                                                    |  29%
|
|==========                                                    |  30%
|
|==========                                                    |  30%
|
|==========                                                    |  31%
|
|==========                                                    |  32%
|
|==========                                                    |  33%
|
|==========                                                    |  33%
|
|==========                                                    |  34%
|
|==========                                                    |  35%
|
```

```
|======================                                |  35%
|
|======================                                |  36%
|
|=======================                               |  36%
|
|=======================                               |  37%
|
|=======================                               |  38%
|
|========================                              |  38%
|
|========================                              |  39%
|
|========================                              |  39%
|
|=========================                             |  40%
|
|=========================                             |  41%
|
|=========================                             |  41%
|
|==========================                            |  42%
|
|==========================                            |  42%
|
|===========================                           |  43%
|
|===========================                           |  44%
|
|===========================                           |  44%
|
|============================                          |  45%
|
|============================                          |  45%
|
|============================                          |  46%
|
|=============================                         |  47%
|
|=============================                         |  47%
|
|=============================                         |  48%
|
|==============================                        |  48%
|
|==============================                        |  49%
|
|==============================                        |  50%
|
|===============================                       |  50%
|
|===============================                       |  51%
|
```

```
|================================                      |  52%
|
|================================                      |  52%
|
|================================                      |  53%
|
|================================                      |  53%
|
|================================                      |  54%
|
|================================                      |  55%
|
|================================                      |  56%
|
|================================                      |  56%
|
|================================                      |  57%
|
|================================                      |  58%
|
|================================                      |  58%
|
|================================                      |  59%
|
|================================                      |  59%
|
|================================                      |  60%
|
|================================                      |  61%
|
|================================                      |  61%
|
|================================                      |  62%
|
|================================                      |  62%
|
|================================                      |  63%
|
|================================                      |  64%
|
|================================                      |  64%
|
|================================                      |  65%
|
|================================                      |  65%
|
|================================                      |  66%
|
|================================                      |  67%
|
|================================                      |  67%
|
|================================                      |  68%
|
```

```
|=========================================                |  69%
|
|=========================================                |  70%
|
|=========================================                |  70%
|
|=========================================                |  71%
|
|=========================================                |  72%
|
|=========================================                |  73%
|
|=========================================                |  73%
|
|=========================================                |  74%
|
|=========================================                |  75%
|
|=========================================                |  75%
|
|=========================================                |  76%
|
|=========================================                |  76%
|
|=========================================                |  77%
|
|=========================================                |  78%
|
|=========================================                |  78%
|
|=========================================                |  79%
|
|=========================================                |  79%
|
|=========================================                |  80%
|
|=========================================                |  81%
|
|=========================================                |  81%
|
|=========================================                |  82%
|
|=========================================                |  82%
|
|=========================================                |  83%
|
|=========================================                |  84%
|
|=========================================                |  84%
|
|=========================================                |  85%
|
|=========================================                |  85%
|
```

```
  |=======================================================          |  86%
  |
  |=======================================================          |  87%
  |
  |========================================================         |  87%
  |
  |========================================================         |  88%
  |
  |=========================================================        |  88%
  |
  |=========================================================        |  89%
  |
  |=========================================================        |  90%
  |
  |==========================================================       |  90%
  |
  |==========================================================       |  91%
  |
  |==========================================================       |  92%
  |
  |===========================================================      |  92%
  |
  |===========================================================      |  93%
  |
  |============================================================     |  93%
  |
  |============================================================     |  94%
  |
  |============================================================     |  95%
  |
  |=============================================================    |  95%
  |
  |=============================================================    |  96%
  |
  |=============================================================    |  96%
  |
  |=============================================================    |  97%
  |
  |=============================================================    |  98%
  |
  |============================================================== |  98%
  |
  |============================================================== |  99%
  |
  |===============================================================|  99%
  |
  |===============================================================| 100%
```

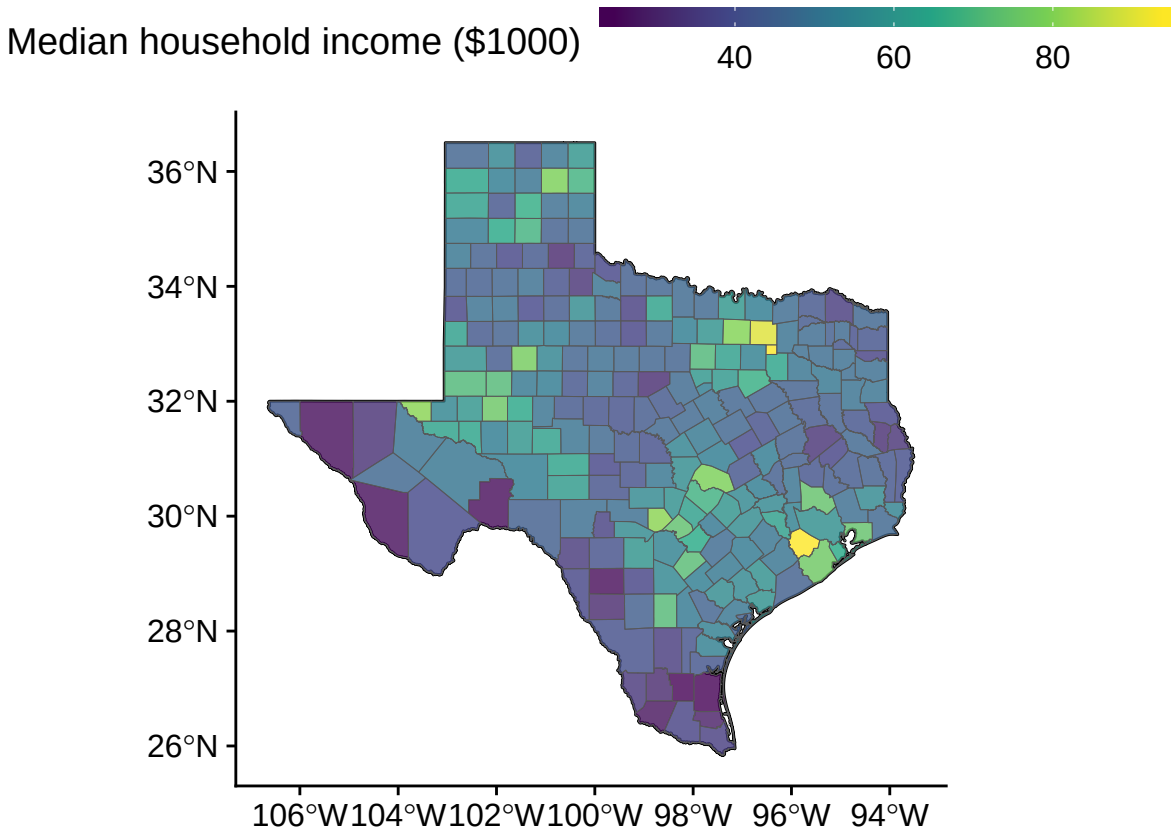
```
## You can see that we have the shape file (column "geometry") and
## income (column "estimate") for each county
txcountyincome %>% glimpse()
```

```
## Observations: 254
## Variables: 6
## $ GEOID    <chr> "48157", "48397", "48085", "48259", "48301", "48121",...
```

```
## $ NAME     <chr> "Fort Bend County, Texas", "Rockwall County, Texas", ...
## $ variable <chr> "B19013_001", "B19013_001", "B19013_001", "B19013_001...
## $ estimate <dbl> 93645, 93269, 90124, 81023, 80938, 80290, 79167, 7912...
## $ moe      <dbl> 1349, 3672, 995, 5739, 32455, 1119, 8098, 1440, 14586...
## $ geometry <MULTIPOLYGON [°]> MULTIPOLYGON (((-96.08891 2..., MULTIPOL...
```

```
## Plot the counties
incomeMap <- ggplot(txcountyincome) +
  geom_sf(data = txstateincome, fill = "white", col  = "black") +
  geom_sf(aes(fill = estimate / 1000), size = 0.1, alpha = 0.8) +
  scale_fill_viridis_c("Median household income ($1000)") +
  theme(legend.position = "top") +
  guides(fill = guide_colorbar(barwidth = 15, barheight = 0.5))

incomeMap
```




```
##############################################################################
                                  #  Get geographic info (road & water) #
##############################################################################

## (this stuff not technically needed, but nice to have as an annotation)

txbbox <- st_bbox(txstateincome)

tx_vector_tiles <- get_vector_tiles(txbbox)
names(tx_vector_tiles)
```

```
## [1] "water"      "buildings"  "places"     "transit"    "pois"
## [6] "boundaries" "roads"      "earth"      "landuse"
```

```r
tx_water <- as_sf(tx_vector_tiles$water)
tx_roads <- as_sf(tx_vector_tiles$roads)

tx_roads_alt <- st_transform(tx_roads, 4269)

txunion <- st_union(txcountyincome$geometry)

tx_roads_crop <- st_intersection(tx_roads_alt, txstateincome)

################################################################################
                                        # Income plot with roads in background #
################################################################################

incomeMapRoads <- ggplot() +
  geom_sf(data = txstateincome, fill = "white", col  = "black") +
  geom_sf(data = tx_roads_crop,
          col = "black") +
  geom_sf(data = txcountyincome, aes(fill = estimate / 1000), size = 0.1, alpha = 0.85) +
  theme(legend.position = "top") +
  scale_fill_viridis_c("Median household income ($1000)") +
  guides(fill = guide_colorbar(barwidth = 15, barheight = 0.5))

incomeMapRoads
```