How to make a Chloropleth

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1 Introduction

First set up a few libraries and get some relevant information:

```
>  library(RPMG)
>     library(GEOmap)
>     library(maps)
>     library(mapdata)
>     load( "./DATA/BIGNAlakes.RDATA" )
> source("./CODE/submap.R")
> source("./CODE/LEESPLETH.R")
> source("../LEESdev.R")
> Lfiles = list.files(path="./FIGS")
>
>
```

Now you can make a an initial map:

```
> JPNG(file = "./FIGS/PLETH1.png", width=14, height=11 )
> LEESPLETH()
> dev.off()
```

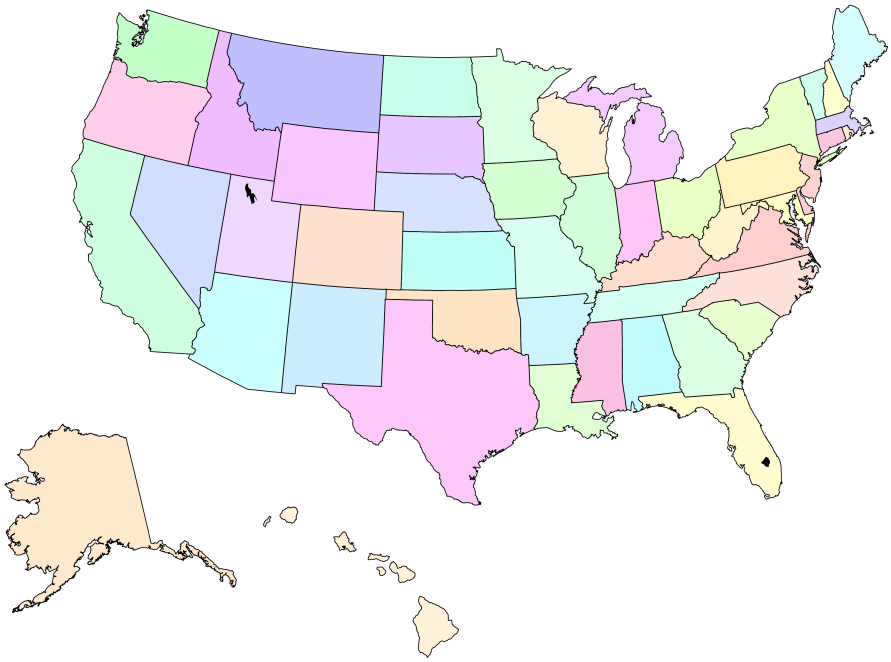

Figure 1: Initial Chloropleth

To get some dagta incorporated into a chloropleth, need to tie the states to specific colormap.

```
> #####  example 2
>
> zednames  = map(database = "state", regions = ".", plot=FALSE, namesonly =TRUE  )
> mystates = sapply( strsplit( zednames, split=":"), "[[", 1)
> Ustates = c(unique(mystates) , "alaska", "hawaii")
>     N = length(Ustates)
>  pal = pastel.colors(N)
> pal = grey(seq(from=.3, to=.95, length=N))
> COL = list(states=Ustates, col=pal)
> JPNG(file = "./FIGS/PLETH2.png", width=14, height=11 )
> LEESPLETH(COL=COL)
> dev.off()
>
```

Next try a voting chloropleth:

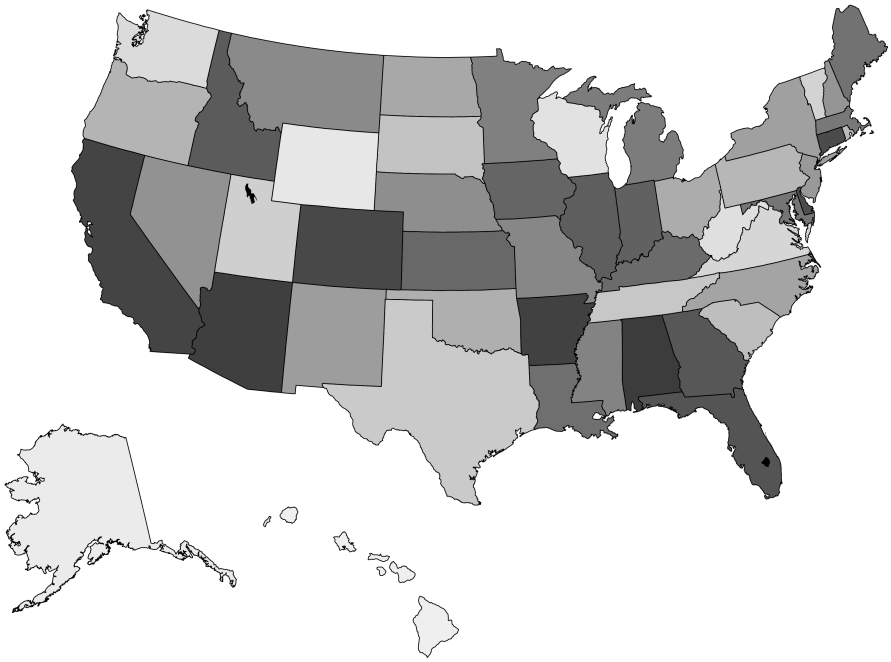

Figure 2: Initial Chloropleth

```
> ##   Say you want to create a pleth
>
> library(cluster)
> data(votes.repub)
> #### make sure the states are in lower case for martching
> gstates = tolower(rownames(votes.repub))
> ###  match my states with the states in the  map database
> mymatch = match(gstates, Ustates)
> pal =  shade.col(N, acol = c(1, 0.8, 0.8), bcol = c(1, 0, 0 ))
> years = colnames( votes.repub)
> i = grep("1972", years)
> v1972 = as.vector(votes.repub[,i])
> ##   cbind(gstates , v1972)
>
>
> mygrey = floor( RESCALE(v1972, 1,   N  , min(v1972, na.rm=TRUE), max(v1972, na.rm =TRUE)
> COL = list(states=Ustates[mymatch], col=pal[mygrey ])
> ##  cbind(gstates ,  Ustates[mymatch], v1972 , mygrey,pal[mygrey ] )
>
```

```
> JPNG(file = "./FIGS/PLETH3.png", width=14, height=11 )
> LEESPLETH(COL=COL)
> title(paste("Republican votes", years[i]))
> HOZscale(v1972, pal, units = "", SIDE = 1, s1 = 0.2, s2 = 0.6)
> dev.off()
>
```

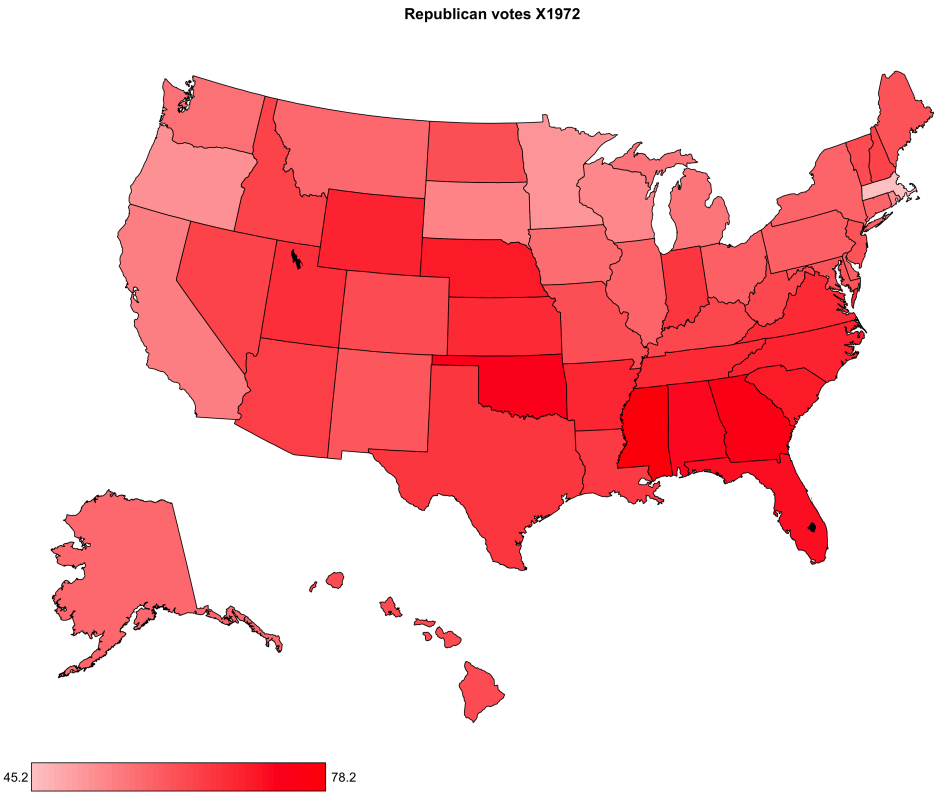

Figure 3: One Year Chloropleth

```
> #######  watch voting change over the years:
>
> vnames = colnames(votes.repub)
> pal =  shade.col(N, acol = c(1, 0.8, 0.8), bcol = c(1, 0, 0 ))
> KN = 4
> Nvotes = length(vnames)
> isamp = sample(1:Nvotes, KN )
> isamp = sort(isamp)
> JPNG(file = "./FIGS/PLETHvotes1.png", width=14, height=14 )
> par(mfrow=c(2,2))
> for(j in 1:KN )
   {
```

```
  i = isamp[j]
v = as.vector(votes.repub[ , i])

mygrey = floor( RESCALE(v, 1, N , min(v, na.rm =TRUE ), max(v, na.rm =TRUE  )) )


COL = list(states=Ustates[mymatch], col=pal[mygrey ])

LEESPLETH(COL=COL)
title(paste("Percent Republican Votes", vnames[i]))

HOZscale(v, pal, units = "", SIDE = 1, s1 = 0.2, s2 = 0.6)

## locator(1)
  }
> dev.off()
>
>
>
>
>
```

2 U.S. Counties

```
> source("./CODE/BaddLLXY.R")
> source("./CODE/quickUScol.R")
> data(countyMapEnv)
>  zednames  = map(database = "state", regions = ".", plot=FALSE, namesonly =TRUE  )
> mystates = sapply( strsplit( zednames, split=":"), "[[", 1)
> Ustates = c(unique(mystates) , "alaska", "hawaii")
> Ustates48 = unique(mystates)
> Ustates48  = Ustates48[-grep("district", Ustates48)]
> JPNG(file = "./FIGS/PLETHcounties1.png", width=14, height=14 )
> par(mai=c(0.1, 0.1, 0.1,0.1))
> usproj = quickUScol(LL=FALSE, states=FALSE, WINFIT=TRUE)
> for(i in 1:length(Ustates48))
  {
    istate = Ustates48[i]
pcount = map('county', istate, fill = TRUE, plot=FALSE)
```

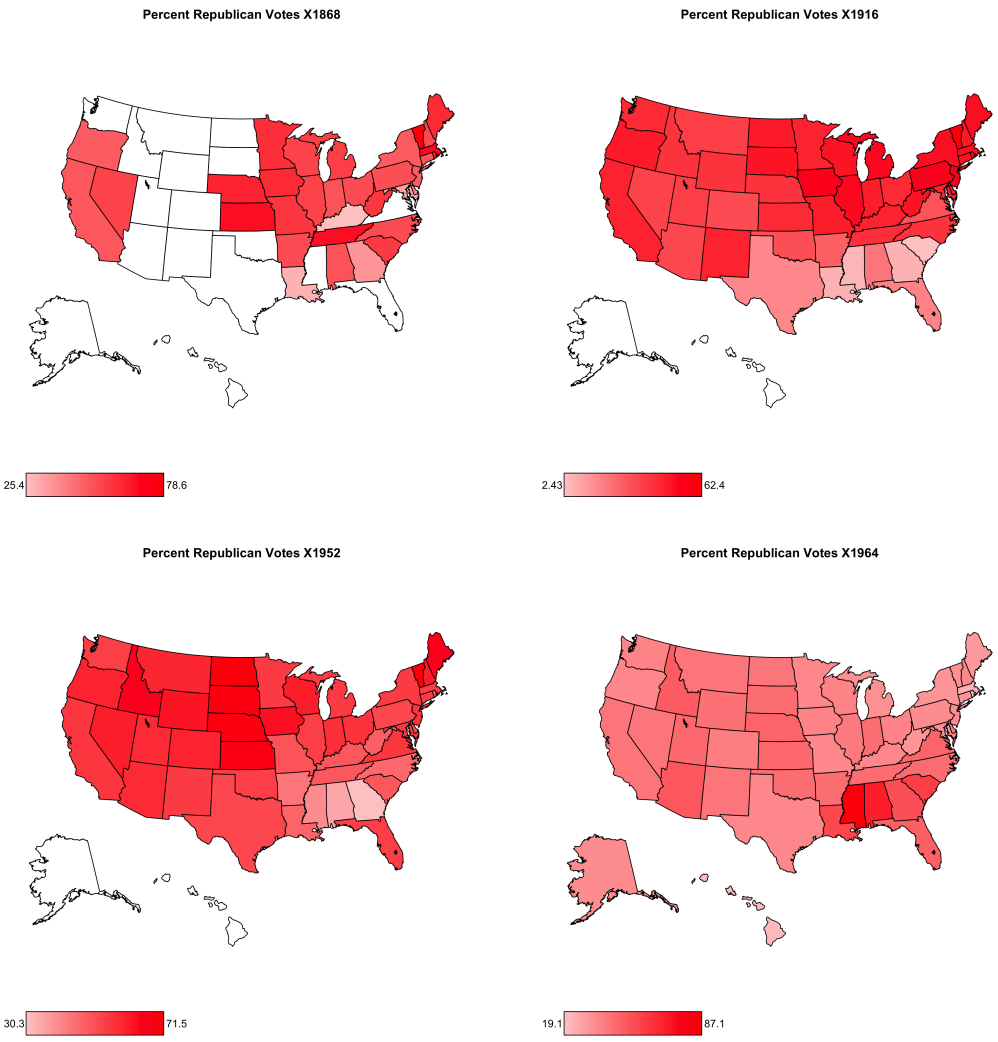

Figure 4: Votes Chloropleth

```
 countG    = maps2GEOmap(pcount)

   Nkount = length(countG$STROKES$col)

   countG$STROKES$col = pastel.colors(Nkount)
 ##  countG$STROKES$col = rainbow(Nkount)

  plotGEOmapXY(countG, PROJ=usproj, MAPstyle=3, add=TRUE, lwd=0.5   )

   }
> dev.off()
>
>
```

```
>
```

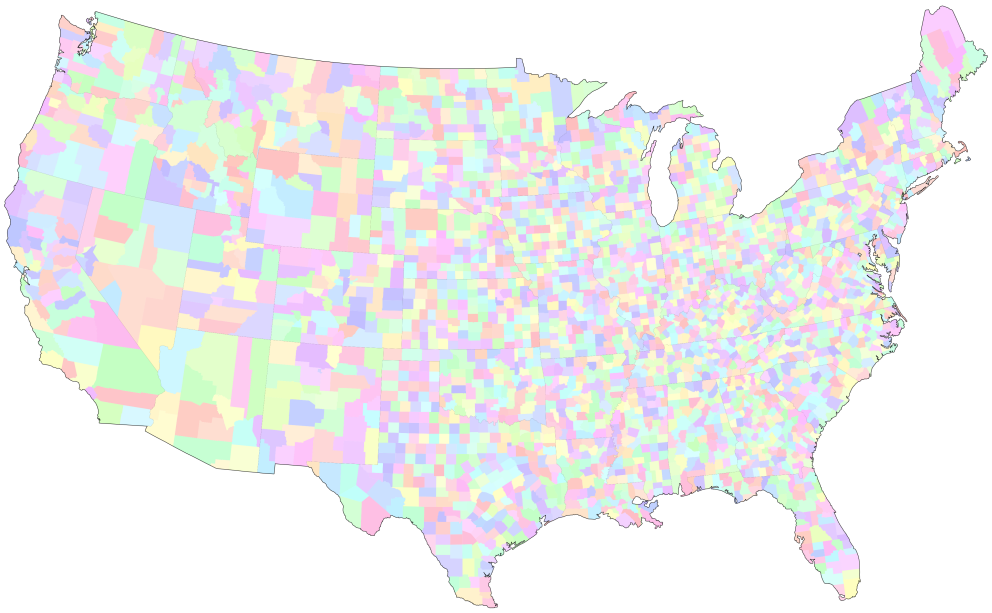

Figure 5: U.S. Counties Chloropleth

2.1 Average State Elevations

Collect data and produce maps of mean and median state elevations:

```
> source("./CODE/KountyByElevation.R")
> source("./CODE/BaddLLXY.R")
> source("./CODE/quickUScol.R")
> library(RPMG)
```

```
> library(GEOmap)
> library(geomapdata)
> library(ETOPO)
> library(RSEIS)
> library(maps)
> source("./CODE/submap.R")
> source("./CODE/LEESPLETH.R")
> data(countyMapEnv)
>  zednames  = map(database = "state", regions = ".", plot=FALSE, namesonly =TRUE  )
> mystates = sapply( strsplit( zednames, split=":"), "[[", 1)
> Ustates = c(unique(mystates) , "alaska", "hawaii")
> Ustates48 = unique(mystates)
> Ustates48  = Ustates48[-grep("district", Ustates48)]
> data(ETOPO2)
> ELAT = attr( ETOPO2, "lat" )
> ELON = attr( ETOPO2, "lon" )
> ELON = fmod(ELON, 360)
> mzup = t( ETOPO2[, rev(1:length(ELAT)) ])
> LEN = length(Ustates48)
> Hstates = vector(length=LEN)
> Mstates = vector(length=LEN)
> for(i in 1:LEN)
   {
     istate = Ustates48[i]
    print(paste(i, istate))
     Zstate  = map(database = "state", regions = istate, plot=FALSE, fill=TRUE  )
  Zmap  = maps2GEOmap(Zstate)
     Rlat = Zstate$range[3:4]
     Rlon = fmod(Zstate$range[1:2], 360)
     JLAT = which(ELAT>=Rlat[1] & ELAT<=Rlat[2] )
     JLON = which(ELON>=Rlon[1] & ELON<=Rlon[2] )
   stateTOPO1 = mzup[  JLAT, JLON ]
 ## plot(Rlon, Rlat, type='n' )
 ##  polygon(fmod(Zstate$x, 360), Zstate$y)
  MJJ =    meshgrid(ELON[JLON] , ELAT[JLAT] )
 MX = as.vector(MJJ$x)
 MY =     as.vector(MJJ$y)
 k = which.max(Zmap$STROKES$num)

 ##  for(k in 1:length(Zmap$STROKES$num))
   {

  mystroke = GEOmap.Extract(Zmap, k , INOUT="in" )

 IP = inpoly(MX , MY ,
```

```
       list(x=fmod(mystroke$POINTS$lon, 360), y =mystroke$POINTS$lat) )

 ##  points(MX[IP==1], MY[IP==1], col='red', cex=0.5)

 ZEE = as.vector( stateTOPO1)

  Z2 = ZEE[IP==1]

 ##  x = MX[IP==1]
 ##  y=MY[IP==1]
 ## I1 = interp(x=x, y= y , z= Z2, xo=seq(from=range(x)[1], range(x)[2], length=100),
 ##        yo=seq(from=range(y)[1], range(y)[2], length=100) )
 Hstates[i] = mean(Z2)
 Mstates[i] = median(Z2)

 }
 ## locator(1)
   }
> stateELEV = list(name=Ustates48, h=Hstates, M=Mstates)
```

Now plot the Chloropleths:

```
> library(RSEIS)
>  N = length(Ustates)
> pal = tomo.colors(N)
> mygrey = floor( RESCALE(stateELEV$h, 1, N, min(stateELEV$h), max(stateELEV$h)) )
> mymatch = match(stateELEV$name, Ustates)
> JPNG(file = "./FIGS/PLETHmeanStateELEV.png", width=14, height=12 )
> COL = list(states=Ustates[mymatch], col=pal[ mygrey ])
> LEESPLETH(COL=COL)
> title(paste("Mean Elevation, m"))
> HOZscale(stateELEV$h, pal, units = "m", SIDE = 1, s1 = 0.2, s2 = 0.6)
> nomoredev()
> mygrey = floor( RESCALE(stateELEV$M, 1, N, min(stateELEV$M), max(stateELEV$M)) )
> mymatch = match(stateELEV$name, Ustates)
> COL = list(states=Ustates[mymatch], col=pal[ mygrey ])
> JPNG(file = "./FIGS/PLETHmedianStateELEV.png", width=14, height=12 )
> LEESPLETH(COL=COL)
> title(paste("Median Elevation, m"))
> HOZscale(stateELEV$M, pal, units = "m", SIDE = 1, s1 = 0.2, s2 = 0.6)
> nomoredev()
>
```

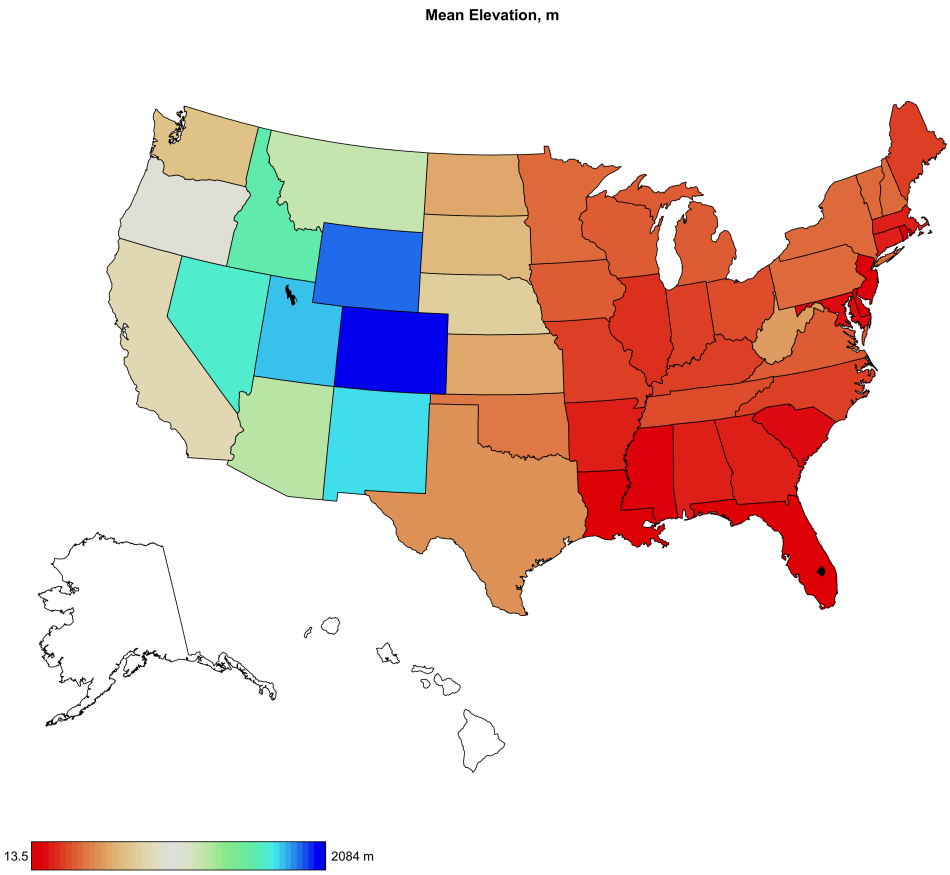

Figure 6: U.S. Mean State Elevation Chloropleth

2.2 Average County Elevations

```
> if(length( grep("PLETHcountiesELEV", Lfiles) )   < 1)
   {
 source("./CODE/KountyByElevation.R")

 source("./CODE/BaddLLXY.R")
 source("./CODE/quickUScol.R")

 library(geomapdata)
 library(ETOPO)
 library(RSEIS)


 data(ETOPO2)
```

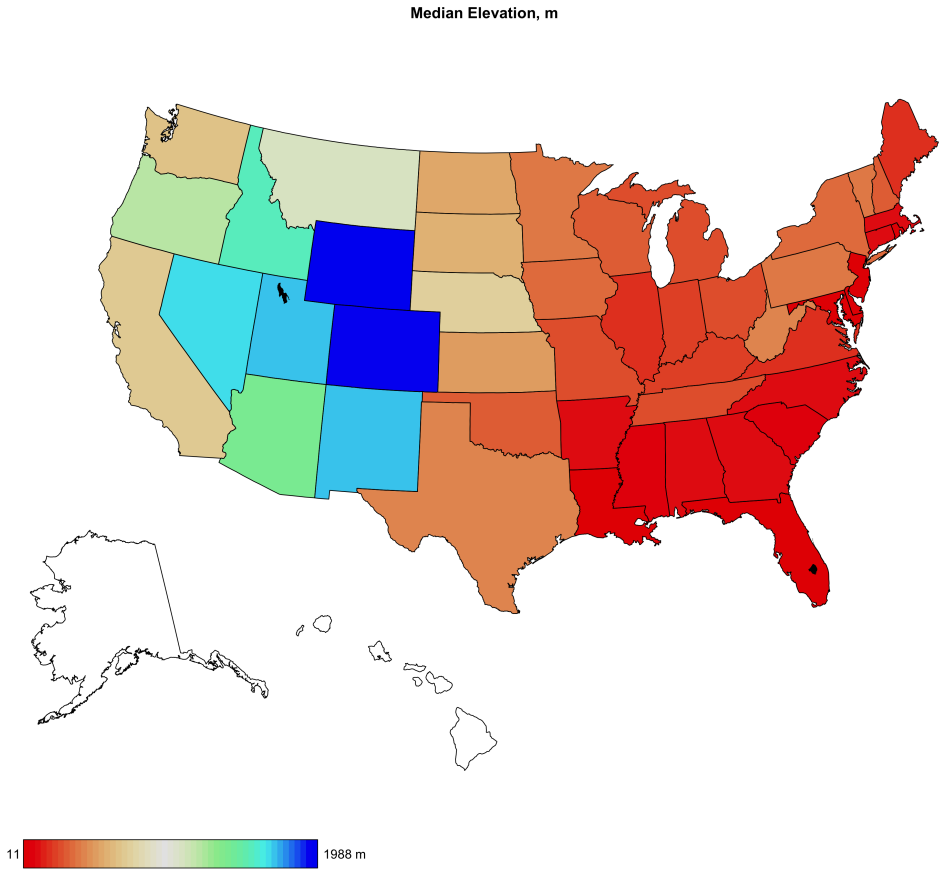

Figure 7: U.S. Median State Elevation Chloropleth

```
 ELAT = attr( ETOPO2, "lat" )
 ELON = attr( ETOPO2, "lon" )



 ELON = fmod(ELON, 360)

 mzup = t( ETOPO2[, rev(1:length(ELAT)) ])

 JPNG(file = "./FIGS/PLETHcountiesELEV.png", width=14, height=12 )

 KountyByElevation(mzup, ELAT, ELON)

 nomoredev()
 }
>
>
```

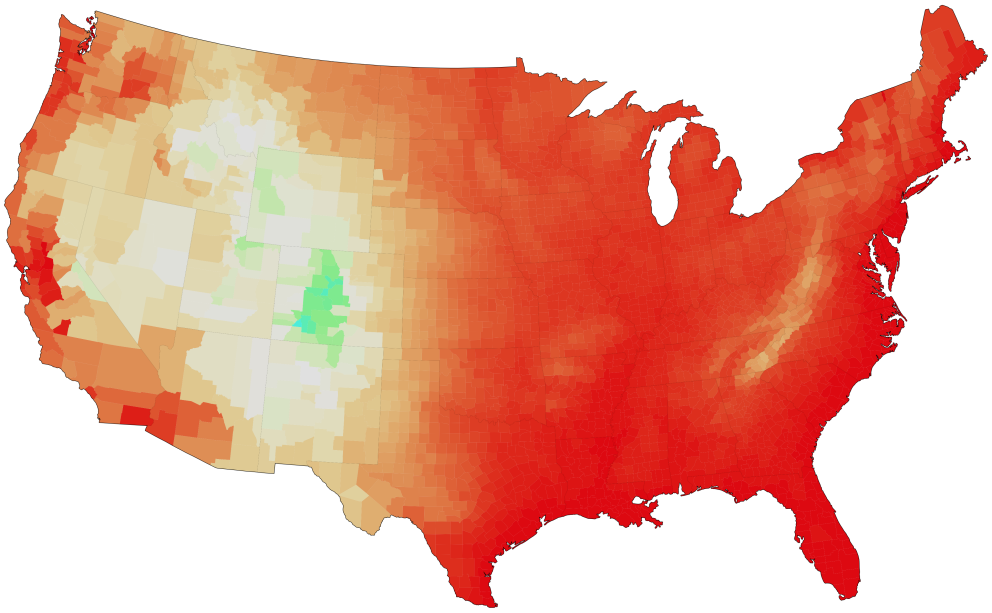

Figure 8: U.S. Counties Elevation Chloropleth