

Reproducible R code for the manuscript entitled ‘Forest loss and fire in the Dominican Republic during the 21st Century’: Data download, preparation and exploratory data analysis (EDA)

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1 Description and URLs

This is a reproducible notebook of the manuscript entitled 'Forest loss and fire in the Dominican Republic during the 21st Century' (Martínez Batlle, 2021). Useful URLs are listed below:

- This document: <https://github.com/geofis/forest-loss-fire-reproducible/data-download-preparation-eda.pdf>
- Source repo: <https://github.com/geofis/forest-loss-fire-reproducible>
- Associated preprint DOI: <https://www.biorxiv.org/content/10.1101/2021.06.15.448604v1>
- Associated preprint full text: <https://www.biorxiv.org/content/10.1101/2021.06.15.448604v1.full>
- Cite the preprint using the following format: Martínez Batlle, J. R. (2021). Forest loss and fire in the Dominican Republic during the 21st Century. *bioRxiv*. <https://doi.org/10.1101/2021.06.15.448604>

2 Instructions for downloading the source data

Visit ZENODO, download `forest-loss-fire-reproducible-data-repo.zip` (preserve its name, otherwise, won't work) and place the ZIP file in this repo (e.g. in the same directory containing this document).

3 Unzip source data

```
if(any(dir.exists('out'), dir.exists('data'))){  
  "Directories 'out' and/or 'data' already available in the repo dir. Skipping unzip."  
} else {  
  unzip('forest-loss-fire-reproducible-data-repo.zip')  
}  
## [1] "Directories 'out' and/or 'data' already available in the repo dir. Skipping unzip."
```

4 Packages and functions

4.1 Packages

```
source('R/load-packages.R')  
my_tmap_options <- tmap_options()  
my_tmap_options$legend.format$big.num.abbr <- c("MM" = 6, "BB" = 9)  
tmap_options(my_tmap_options)
```

4.2 Custom functions

```
source('R/load-functions.R')
```

5 Abbreviations

Abbreviations used in column names and maps:

```
abbr <- data.frame(  
  Abbreviation = c('MM', 'PUA', 'SQM', 'SQKM', 'PCT', 'PYR'),  
  Meaning = c('millions', 'per unit-area', 'square meters', 'square kilometers', 'percent', 'per year'))  
knitr::kable(abbr %>% arrange(.[[1]]), format = "latex") %>%  
  kable_styling(bootstrap_options = "striped", full_width = F, position = "left")
```

Abbreviation	Meaning
MM	millions
PCT	percent
PUA	per unit-area
PYR	per year
SQKM	square kilometers
SQM	square meters

6 Common use objects

6.1 Cores for parallel computing

```
UseCores <- detectCores() -1
```

6.2 Reference layers

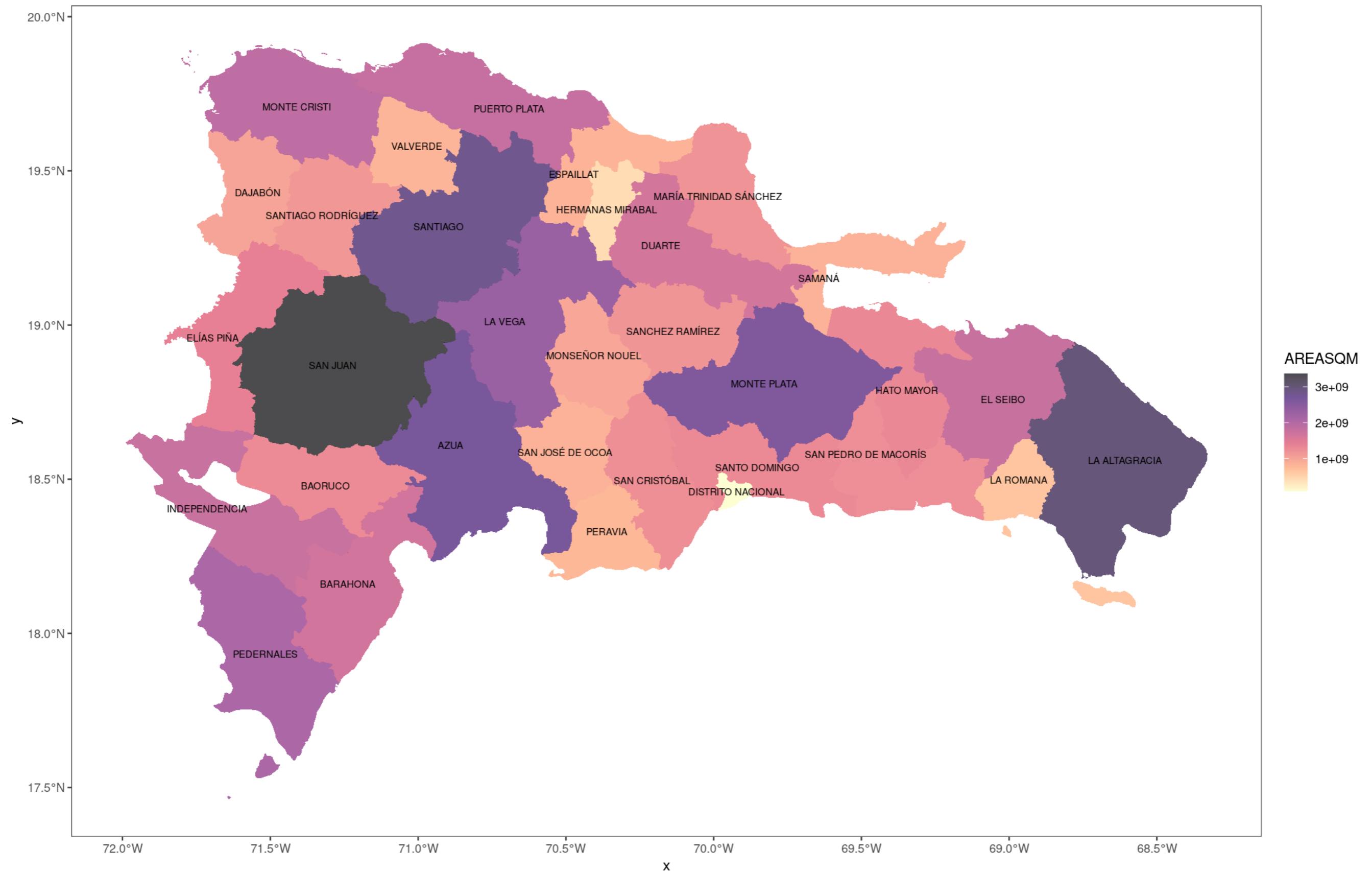
These layers are used as references in thematic maps and provide zones for exploratory data analysis useful for policy desing and decision makers.

6.2.1 Administrative

Source: Oficina Nacional de Estadística -ONE- (2015)

```
admpath <- 'data/administrative/administrative.gpkg'
st_layers(admpath)
## Driver: GPKG
## Available layers:
##   layer_name geometry_type features fields
## 1 PROVCenso2010      Polygon      32      4
## 2 MUNCenso2010      Polygon     155      5
## 3 REGCenso2010      Polygon      10      2
prov <- st_read(admpath, 'PROVCenso2010', quiet = T)
prov
## Simple feature collection with 32 features and 4 fields
## Geometry type: MULTIPOLYGON
## Dimension: XY
## Bounding box: xmin: 182215.8 ymin: 1933532 xmax: 571365.3 ymax: 2205216
## Projected CRS: WGS 84 / UTM zone 19N
## First 10 features:
##   PROV REG      TOPONIMIA ENLACE          geom
## 1 01 10 DISTRITO NACIONAL 1001 MULTIPOLYGON (((406845.9 20...
## 2 02 05         AZUA 0502 MULTIPOLYGON (((322129.5 20...
## 3 03 06        BAORUCO 0603 MULTIPOLYGON (((271940 2060...
## 4 04 06       BARAHONA 0604 MULTIPOLYGON (((291856.5 20...
## 5 05 04      DAJABÓN 0405 MULTIPOLYGON (((245433.3 21...
## 6 06 03        DUARTE 0306 MULTIPOLYGON (((374434.8 21...
## 7 07 07      ELÍAS PIÑA 0707 MULTIPOLYGON (((235630.8 21...
## 8 08 08        EL SEIBO 0808 MULTIPOLYGON (((523436.4 20...
## 9 09 01      ESPAILLAT 0109 MULTIPOLYGON (((385993.5 21...
## 10 10 06 INDEPENDENCIA 0610 MULTIPOLYGON (((205698.2 20...
prov <- prov %>% mutate(AREASQM = st_area(geom) %>% units::drop_units())
# plot(prov['AREASQM'])
prov %>% ggplot + aes(fill=AREASQM, label = TOPONIMIA) +
  geom_sf(color='transparent') +
  scale_fill_viridis_c(option = 'magma', direction = -1, alpha = 0.7) +
  geom_sf_text(size = 2.5) +
```

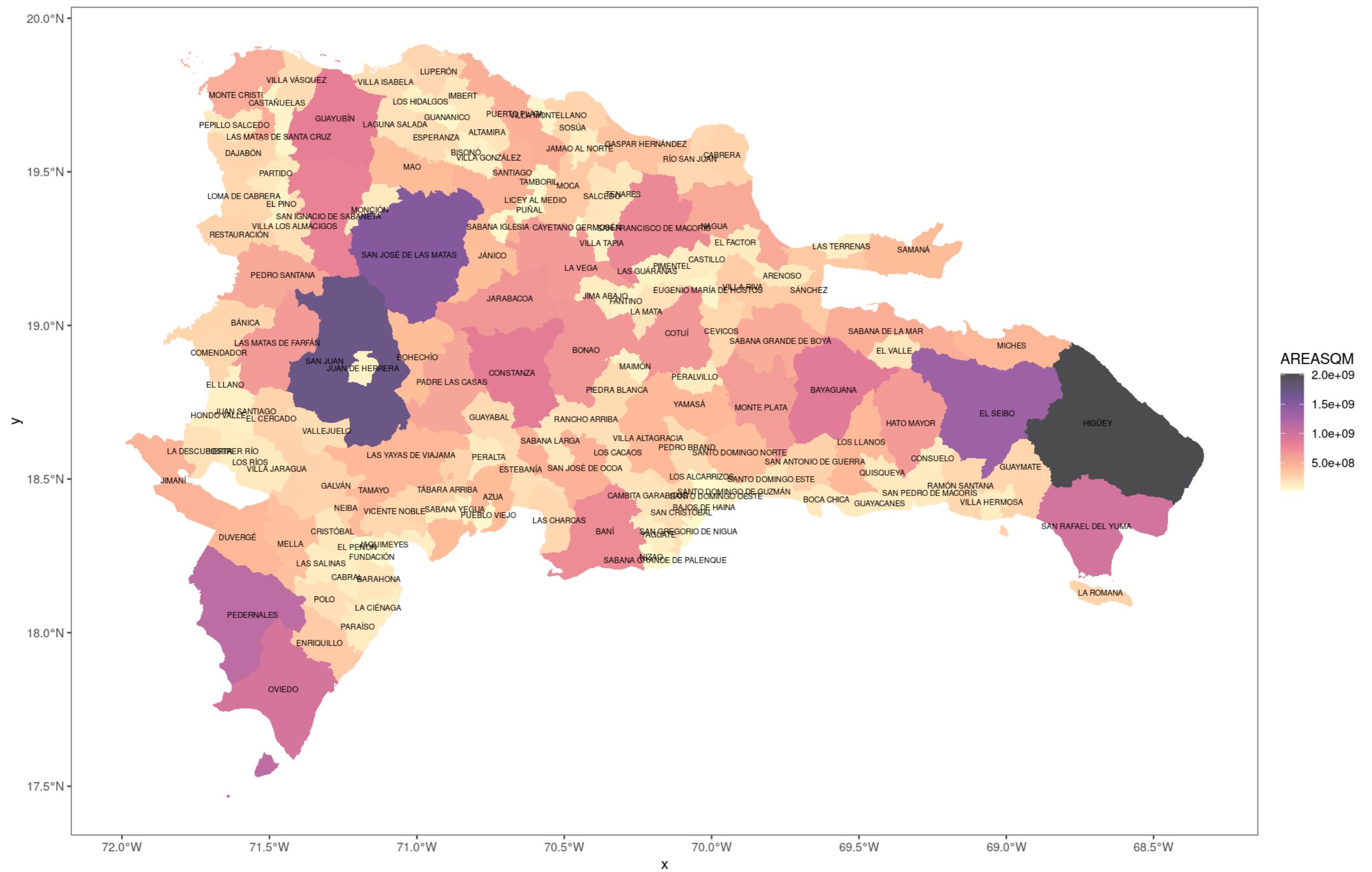
```
theme_bw() +  
theme(panel.grid=element_blank())
```



```

mun <- st_read(admpath, 'MUNCenso2010', quiet = T)
mun
## Simple feature collection with 155 features and 5 fields
## Geometry type: MULTIPOLYGON
## Dimension: XY
## Bounding box: xmin: 182215.8 ymin: 1933532 xmax: 571365.3 ymax: 2205216
## Projected CRS: WGS 84 / UTM zone 19N
## First 10 features:
##   PROV MUN REG          TOPONIMIA ENLACE           geom
## 1   01 10 SANTO DOMINGO DE GUZMÁN 100101 MULTIPOLYGON (((405218.1 20...
## 2   02 01 05               AZUA 050201 MULTIPOLYGON (((319065.3 20...
## 3   02 02 05             LAS CHARCAS 050202 MULTIPOLYGON (((341415.3 20...
## 4   02 03 05      LAS YAYAS DE VIAJAMA 050203 MULTIPOLYGON (((304058.1 20...
## 5   02 04 05        PADRE LAS CASAS 050204 MULTIPOLYGON (((312890.8 20...
## 6   02 05 05            PERALTA 050205 MULTIPOLYGON (((317370.6 20...
## 7   02 06 05           SABANA YEGUA 050206 MULTIPOLYGON (((306745.8 20...
## 8   02 07 05         PUEBLO VIEJO 050207 MULTIPOLYGON (((310447.9 20...
## 9   02 08 05       TÁBARA ARRIBA 050208 MULTIPOLYGON (((306556.7 20...
## 10  02 09 05        GUAYABAL 050209 MULTIPOLYGON (((322129.5 20...
mun <- mun %>% mutate(AREASQM = st_area(geom) %>% units::drop_units())
mun %>% ggplot + aes(fill=AREASQM, label = TOPONIMIA) +
  geom_sf(color='transparent') +
  scale_fill_viridis_c(option = 'magma', direction = -1, alpha = 0.7) +
  geom_sf_text(size = 2) +
  theme_bw() +
  theme(panel.grid=element_blank())

```



6.2.2 Protected areas

Source: UNEP-WCMC and IUCN (October 2021)

```

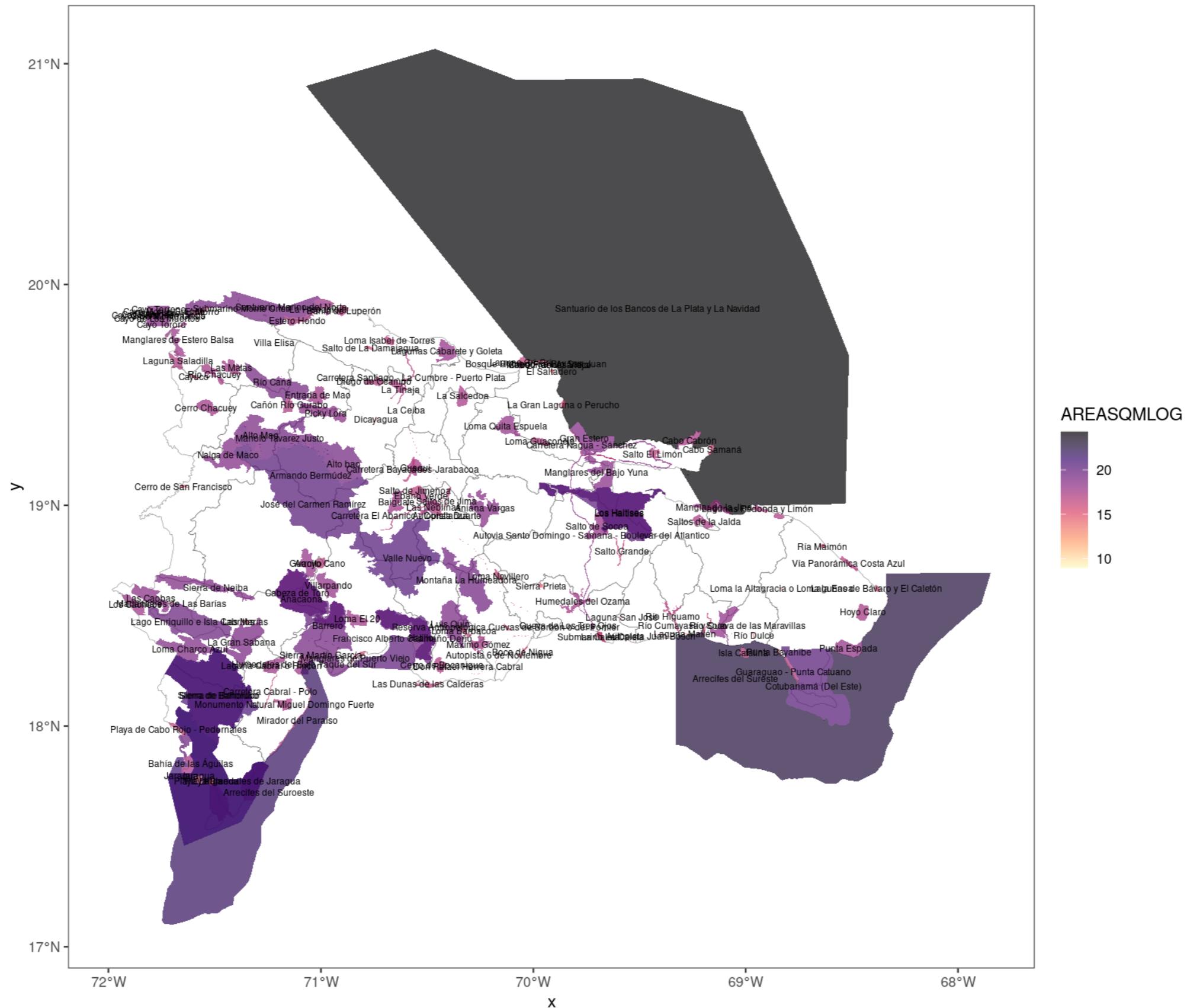
papath <- 'data/protected_areas/protected-areas.gpkg'
st_layers(papath)
## Driver: GPKG
## Available layers:
##   layer_name geometry_type features fields
## 1 Protected Areas Multi Polygon      143     30
pa <- st_read(papath, 'Protected Areas', quiet = T) %>% st_transform(32619)
pa
## Simple feature collection with 143 features and 30 fields
## Geometry type: MULTIPOLYGON
## Dimension: XY
## Bounding box: xmin: 185574.6 ymin: 1893434 xmax: 622910.8 ymax: 2333086
## Projected CRS: WGS 84 / UTM zone 19N
## First 10 features:
##   WDPAID WDPA_PID PA_DEF          NAME          ORIG_NAME
## 1    180     180      1 Cotubanamá (Del Este) Cotubanamá (Del Este)
## 2    181     181      1           Los Haitises       Los Haitises
## 3   6673    6673      1           Jaragua        Jaragua
## 4   6674    6674      1 Submarino Monte Cristi Submarino Monte Cristi
## 5   6675    6675      1 Sierra de Bahoruco Sierra de Bahoruco
## 6  478066  478066      1        Alto bao        Alto bao
## 7  478067  478067      1        Alto Mao        Alto Mao
## 8  478068  478068      1 Armando Bermúdez Armando Bermúdez
## 9  478069  478069      1       Arroyo Cano       Arroyo Cano
## 10 478070  478070      1 Bahia de Luperón Bahia de Luperón
##   DESIG          DESIG_ENG DESIG_TYPE IUCN_CAT
## 1 Parque Nacional      National Park    National      II
## 2 Parque Nacional      National Park    National      II
## 3 Parque Nacional      National Park    National      II
## 4 Parque Nacional Submarino Marine National Park National      II
## 5 Parque Nacional      National Park    National      II
## 6 Reserva Forestal      Forest Reserve National      V
## 7 Reserva Forestal      Forest Reserve National      V
## 8 Parque Nacional      National Park    National      II
## 9 Reserva Forestal      Forest Reserve National      V
## 10 Refugio de Vida Silvestre Wildlife Refuge National     IV
##   INT_CRIT MARINE REP_M_AREA  GIS_M_AREA REP_AREA  GIS_AREA
## 1 Not Applicable      1    381.78 378.5932313 796.405 801.33295
## 2 Not Applicable      0     0.00  0.5377948 631.681 635.48169
## 3 Not Applicable      1    829.18 817.7824560 1535.470 1541.74197
## 4 Not Applicable      2    246.45 238.2627059 246.450 246.28055
## 5 Not Applicable      0     0.00  0.0000000 1091.770 1097.13371
## 6 Not Applicable      0     0.00  0.0000000 307.270 263.91396
## 7 Not Applicable      0     0.00  0.0000000 457.050 211.08661
## 8 Not Applicable      0     0.00  0.0000000 802.550 806.46533
## 9 Not Applicable      0     0.00  0.0000000 23.900 24.01876
## 10 Not Applicable     1     5.49  5.0876446 18.700 18.77749
##   NO_TAKE NO_TK_AREA      STATUS STATUS_YR
## 1 Not Reported      0 Designated    2014
## 2 Not Applicable     0 Designated    2004
## 3 Not Reported      0 Designated    2004
## 4 Not Reported      0 Designated    2004
## 5 Not Applicable     0 Designated    2004
## 6 Not Applicable     0 Designated    2004
## 7 Not Applicable     0 Designated    2004
## 8 Not Applicable     0 Designated    2004
## 9 Not Applicable     0 Designated    2004

```

```

## 10 Not Reported 0 Designated 2004
## GOV_TYPE OWN_TYPE MANG_AUTH MANG_PLAN
## 1 Federal or national ministry or agency Not Reported Not Reported Yes, 2013
## 2 Federal or national ministry or agency Not Reported Not Reported Yes, 2013
## 3 Federal or national ministry or agency Not Reported Not Reported Yes, 2015
## 4 Federal or national ministry or agency Not Reported Not Reported No
## 5 Federal or national ministry or agency Not Reported Not Reported Yes, 2007
## 6 Federal or national ministry or agency Not Reported Not Reported No
## 7 Federal or national ministry or agency Not Reported Not Reported No
## 8 Federal or national ministry or agency Not Reported Not Reported Yes, 2005
## 9 Federal or national ministry or agency Not Reported Not Reported No
## 10 Federal or national ministry or agency Not Reported Not Reported No
## VERIF_METADATAID SUB_LOC PARENT_ISO ISO3 SUPP_INFO
## 1 State Verified 830 Not Reported DOM DOM Not Applicable
## 2 State Verified 830 Not Reported DOM DOM Not Applicable
## 3 State Verified 830 Not Reported DOM DOM Not Applicable
## 4 State Verified 830 Not Reported DOM DOM Not Applicable
## 5 State Verified 830 D0-16 DOM DOM Not Applicable
## 6 State Verified 830 D0-25 DOM DOM Not Applicable
## 7 State Verified 830 Not Reported DOM DOM Not Applicable
## 8 State Verified 830 D0-25 DOM DOM Not Applicable
## 9 State Verified 830 D0-02 DOM DOM Not Applicable
## 10 State Verified 830 Not Reported DOM DOM Not Applicable
## CONS_OBJ geom
## 1 Not Applicable MULTIPOLYGON (((522048.1 20...
## 2 Not Applicable MULTIPOLYGON (((397402.4 21...
## 3 Not Applicable MULTIPOLYGON (((217347 2001...
## 4 Not Applicable MULTIPOLYGON (((243475.9 22...
## 5 Not Applicable MULTIPOLYGON (((232865.5 20...
## 6 Not Applicable MULTIPOLYGON (((287355.2 21...
## 7 Not Applicable MULTIPOLYGON (((253093.5 21...
## 8 Not Applicable MULTIPOLYGON (((251693.4 21...
## 9 Not Applicable MULTIPOLYGON (((289126.3 20...
## 10 Not Applicable MULTIPOLYGON (((300900.2 22...
pa <- pa %>% mutate(
  AREASQM = st_area(geom) %>% units::drop_units(),
  AREASQMLOG = log(st_area(geom)) %>% units::drop_units()
)
pa %>% ggplot + aes(fill=AREASQMLOG) +
  geom_sf(data = prov, fill = 'transparent', lwd = 0.1) +
  geom_sf(color='transparent') +
  scale_fill_viridis_c(option = 'magma', direction = -1, alpha = 0.7) +
  geom_sf_text(aes(label = NAME), size = 2) +
  theme_bw() +
  theme(panel.grid=element_blank())

```



6.3 Cutline for cropping raster sources

A cutline was generated using a shapefile from Oficina Nacional de Estadística -ONE- (2015) as well as the datamask provided in Hansen et al. (2013). In detail, the cutline was generated using the following workflow: the international boundary between Haiti and the DR was extracted as a polyline from Oficina Nacional de Estadística -ONE- (2015); the remainder of the DR land area (water bodies excluded) was extracted from a vectorized version of the datamask file from Hansen et al. (2013); both layers were then joined together into a single cutline. Afterwards, cropped and warped versions (e.g., onto EPSG:32619) of the datamask, lossyear, treecover and gain files were masked using the generated cutline.

```
source('R/load-cutline.R')
## Reading layer `cutline' from data source
##   `/home/jose/Documentos/git/forest-loss-fire-reproducible/out/cutline.geojson'
##   using driver `GeoJSON'
## Simple feature collection with 222 features and 2 fields
## Geometry type: MULTIPOLYGON
## Dimension: XY
## Bounding box: xmin: 182239.3 ymin: 1933574 xmax: 571425.3 ymax: 2205219
## Projected CRS: WGS 84 / UTM zone 19N
```

7 Download and prepare forest cover and forest loss data

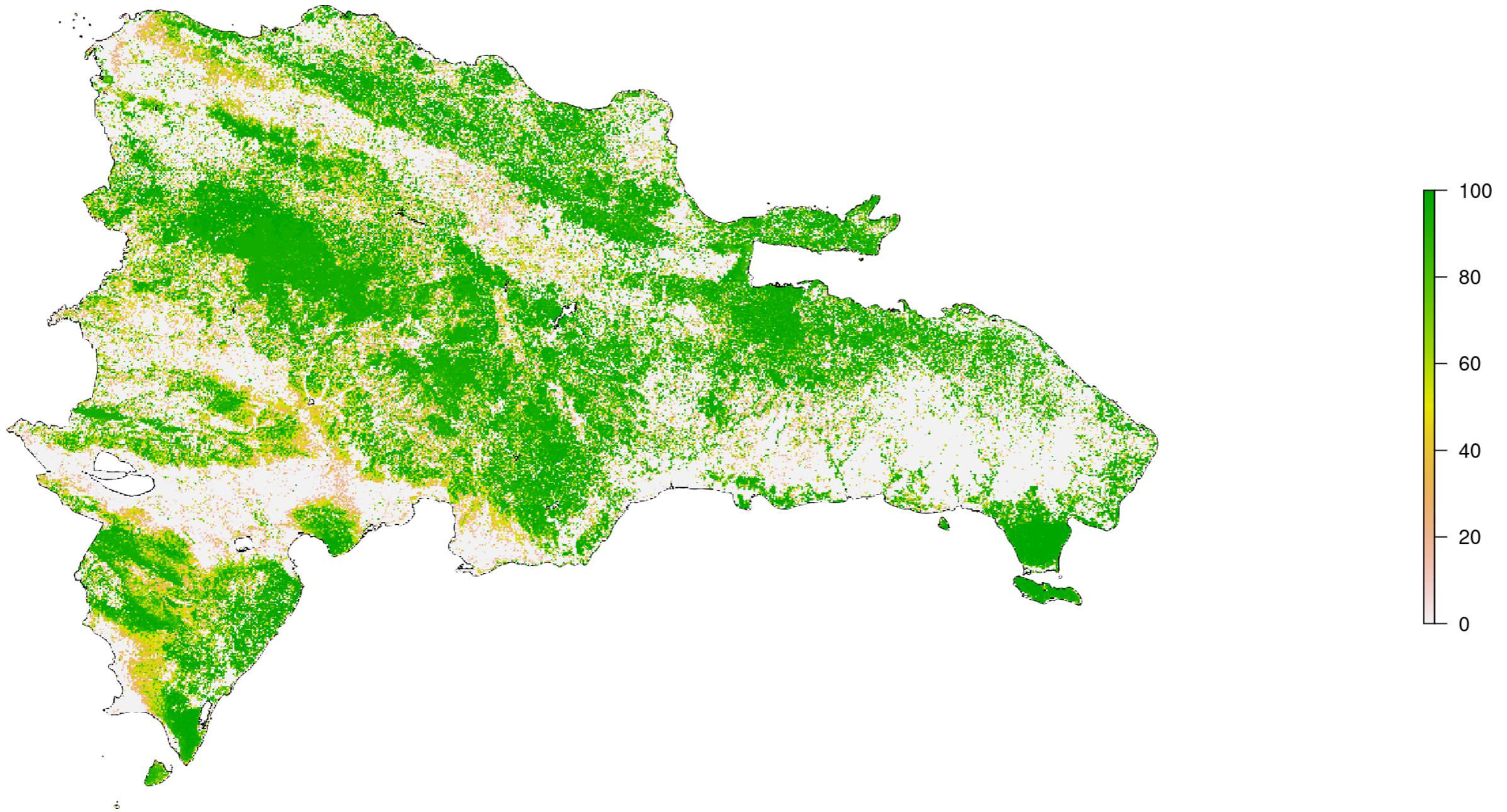
Using the R/original-script-used-to-download-and-prepare-forest-cover-and-forest-loss-data.R script many operations were accomplished to prepare the forest cover and forest loss layers generated by Hansen et al., which included downloading, mosaicking, cropping and clipping with the above mentioned cutline. The resulting files were saved in the directory named `out`, appending the suffix `_crop` to each filename (e.g. `out/treecover2000_crop.tif`)

8 Tree cover, forest loss and fire layers: importing and plotting

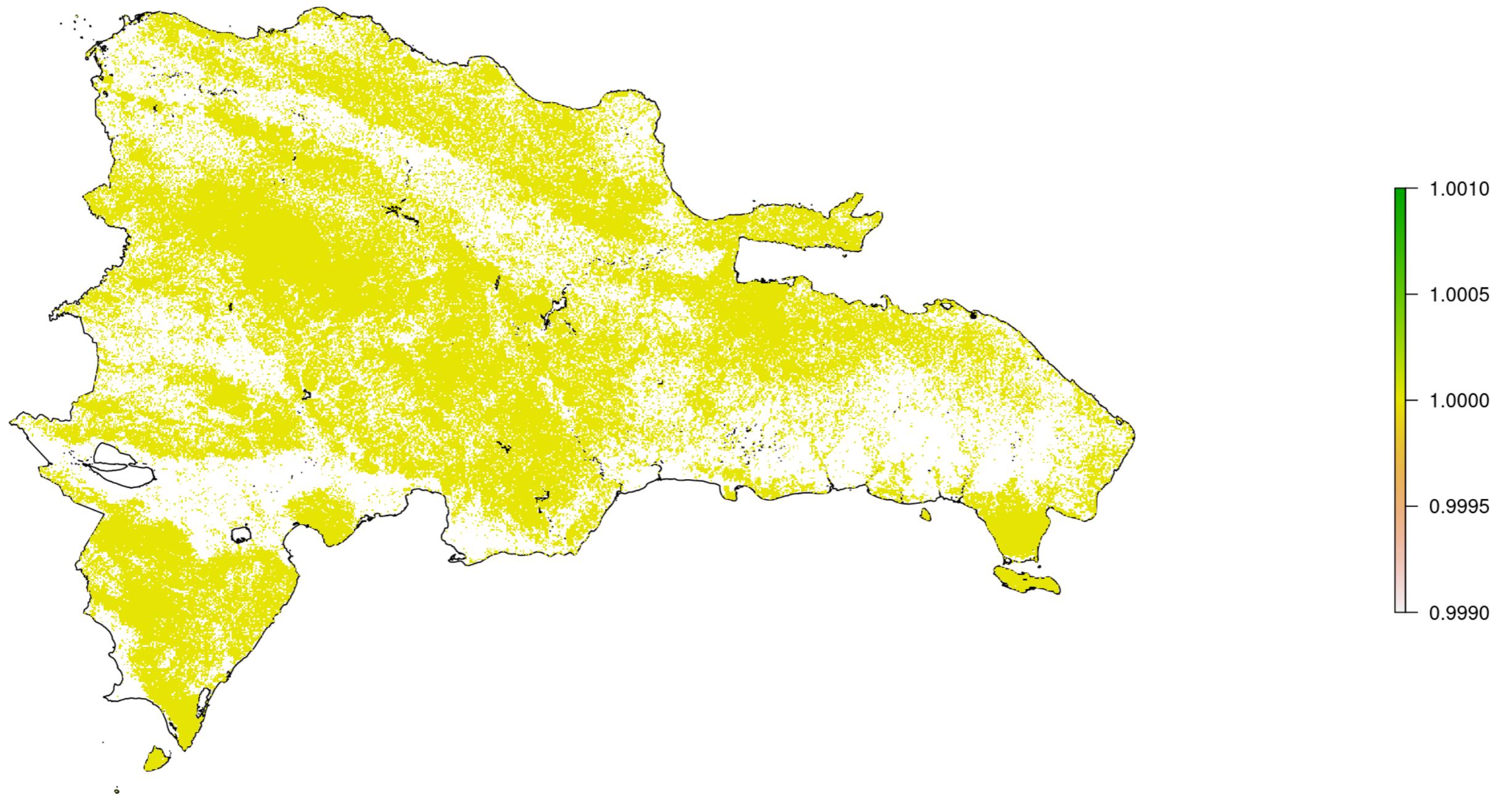
8.1 Tree canopy cover of year 2000

Set a percentage threshold above which tree-cover would be considered as forest.

```
tc <- raster('out/treecover2000_crop.tif')
names(tc) <- 'TREECOVER2000'
plot(as_Spatial(cline))
plot(tc, add = T)
```

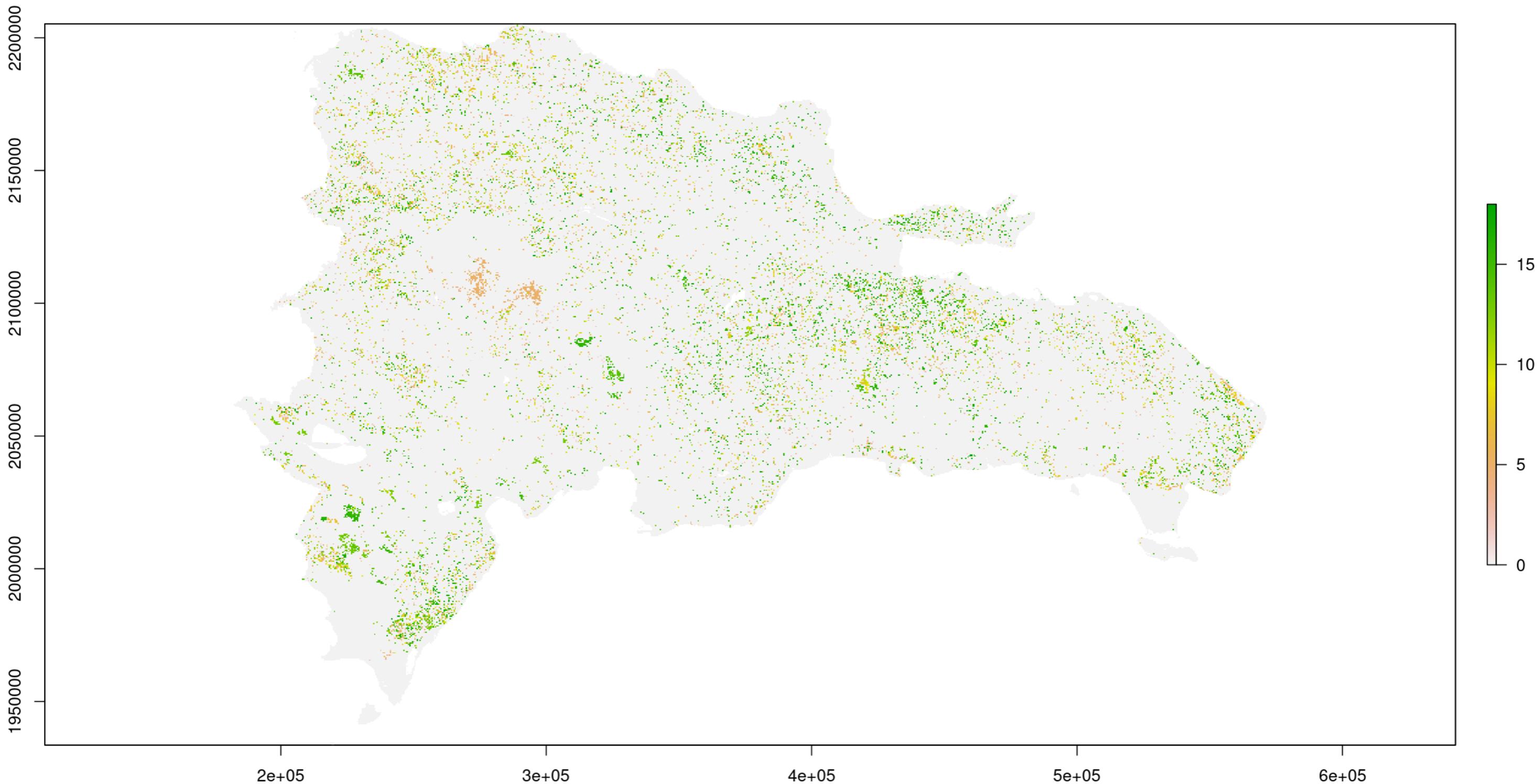


```
pctc <- 25 #25% or higher tree cover in year 2000 as a baseline is considered as "forest cover"  
tcforzonal <- tc  
tcforzonal[tcforzonal < pctc] <- NA  
tcforzonal[tcforzonal >= pctc] <- 1  
plot(as_Spatial(cline))  
plot(tcforzonal, add = T)
```

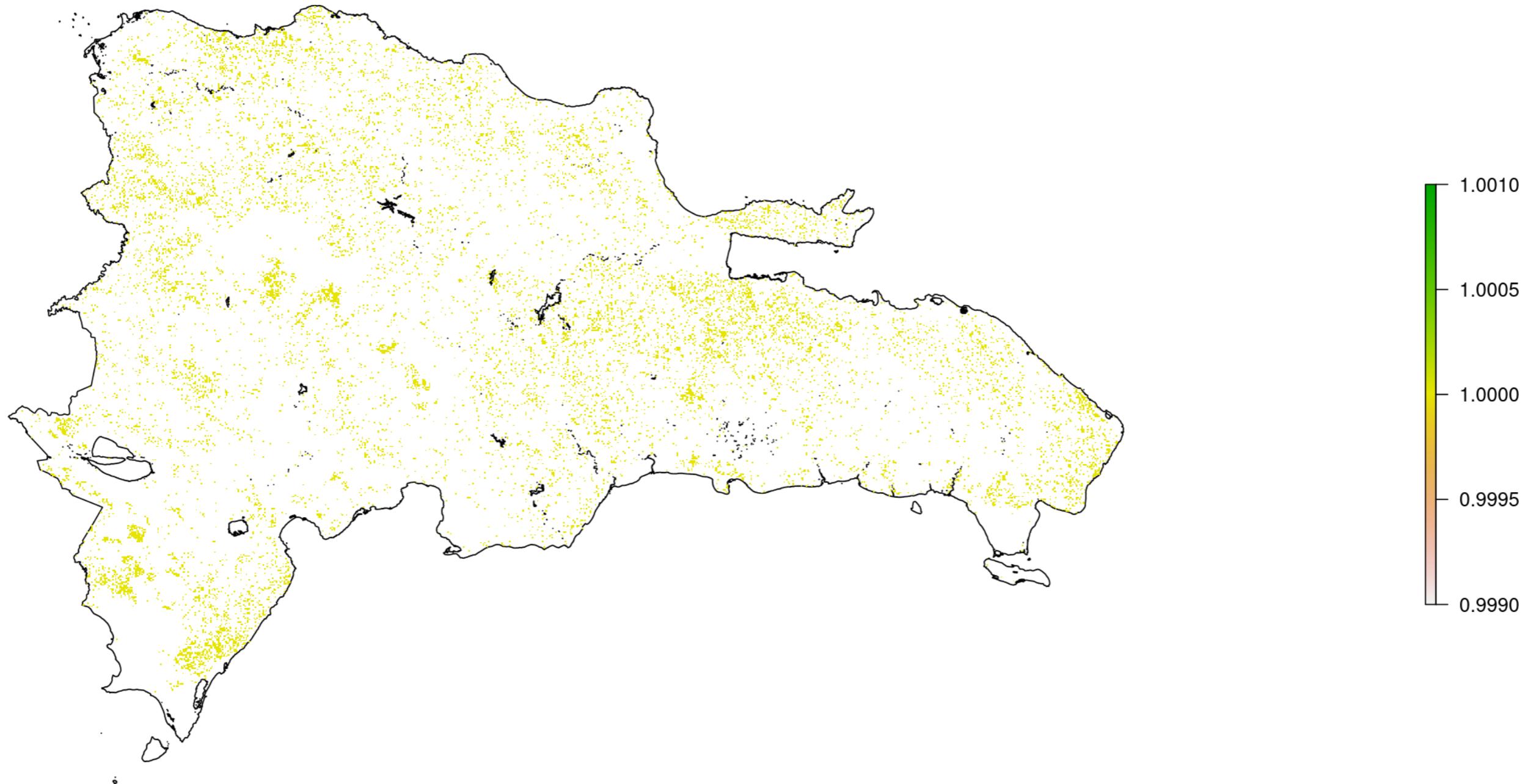


8.2 Year of gross forest cover loss (2001-2018)

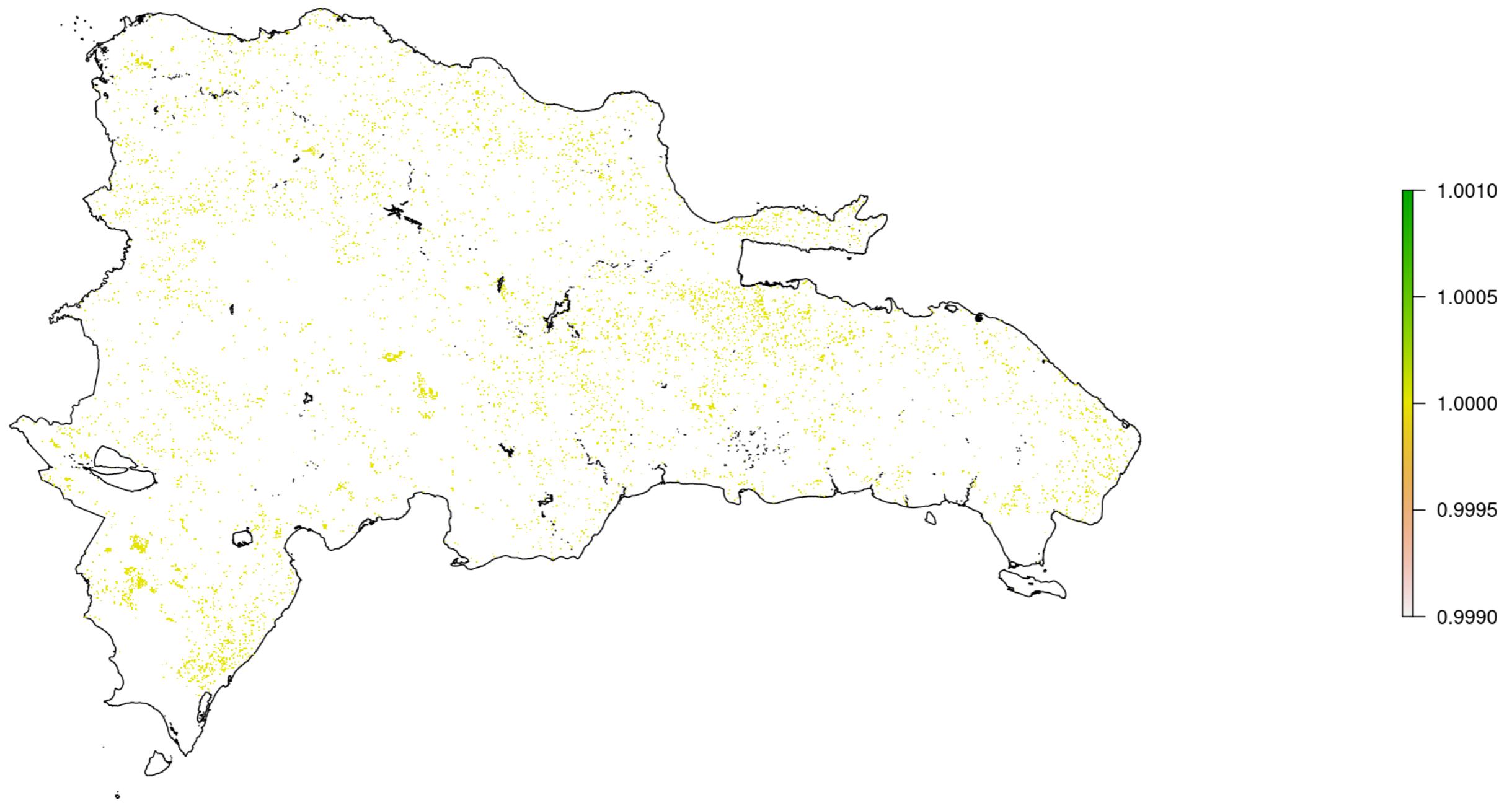
```
ly <- raster('out/lossyear_crop.tif')
names(ly) <- 'LOSSYEAR'
plot(ly)
```



```
lt <- ly
lt[lt > 0] <- 1
lt[lt == 0] <- NA
plot(as_Spatial(cline))
plot(lt, add = T)
```



```
lt1218 <- ly  
lt1218[ly <= 11] <- NA  
lt1218[ly > 11] <- 1  
plot(as_Spatial(cline))  
plot(lt1218, add = T)
```

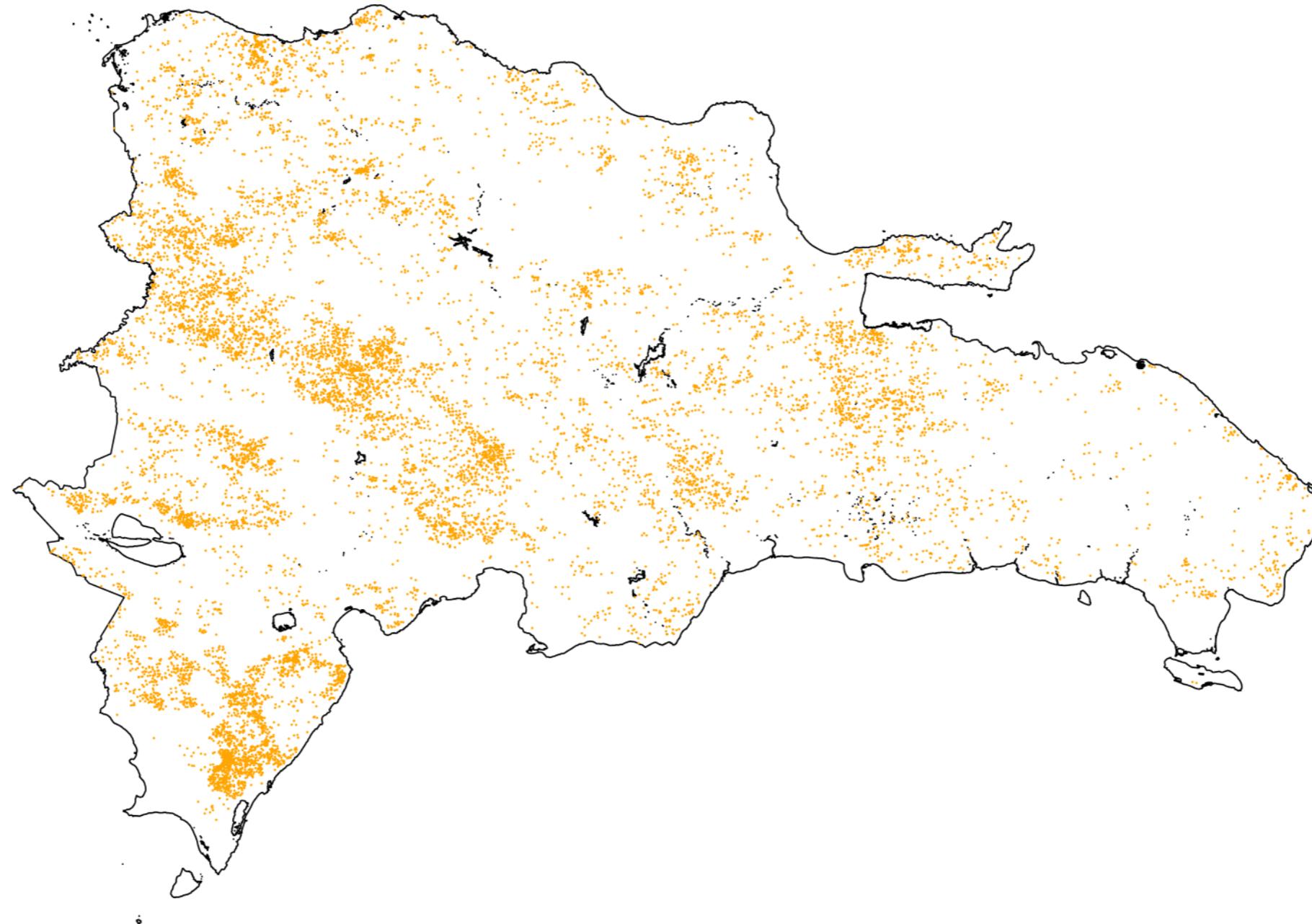


8.3 Hotspot/fire layers (M6 and V1) for the long-term analytical approach

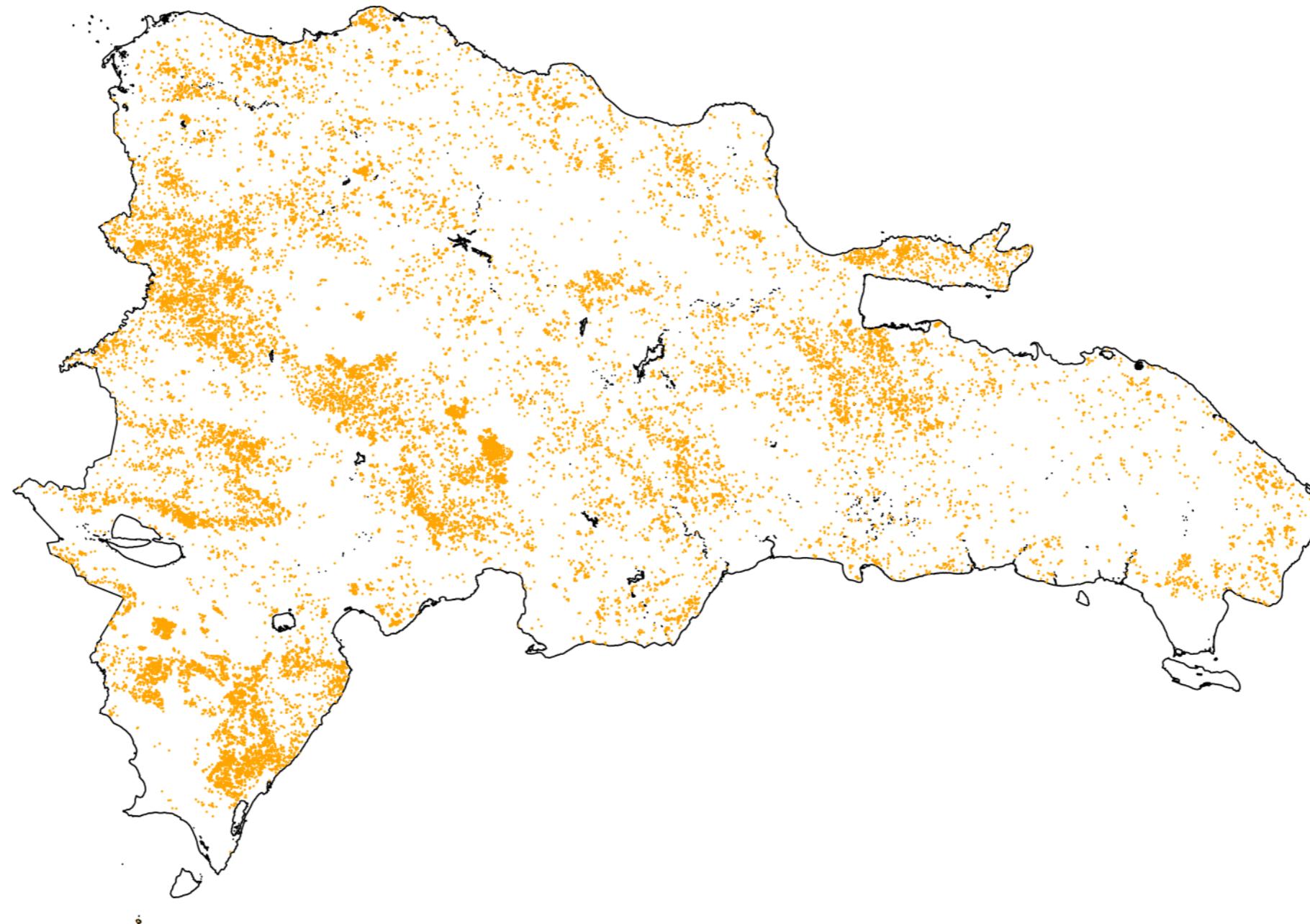
The hotspot/fire/thermal anomalies layers (M6 and V1) were created using the script `R/original-script-used-to-create-the-hotspot-fire-layers-M6-and-V1-for-long-term-approach.R`. This script was initially fed from a layer where thermal anomalies and spontaneous fires from chimneys and landfills were manually removed. Then, the script filtered out points falling outside the mask (e.g. outside forest cover), as well as points recorded before 1-1-2001 and after 31-12-2018. Lastly, all points with a confidence value of less than 30% in the MODIS collection, as well as those with a “low confidence” tag in the VIIRS collection, were excluded from the dataset. For practical reasons, the fire layers are simply loaded using the `readRDS` function as follows.

```
firesm6sel2 <- st_read('out/fire_archive_M6_93308_DR_firesm6sel2.geojson')
## Reading layer `fire_archive_M6_93308_DR_firesm6sel2` from data source
##   `/home/jose/Documentos/git/forest-loss-fire-reproducible/out/fire_archive_M6_93308_DR_firesm6sel2.geojson'
##   using driver `GeoJSON'
## Simple feature collection with 11861 features and 15 fields
## Geometry type: POINT
## Dimension: XY
## Bounding box: xmin: 184698.8 ymin: 1964160 xmax: 568878.1 ymax: 2203503
## Projected CRS: WGS 84 / UTM zone 19N
```

```
cline %>% as_Spatial %>% plot  
plot(as_Spatial(firesm6sel2), main = "Thermal anomalies within forest M6",  
     pch = 1, cex = 0.1, add = T, col = 'orange')
```



```
firesv1sel2 <- st_read('out/fire_archive_V1_93309_DR_firesv1sel2.geojson')  
## Reading layer `fire_archive_V1_93309_DR_firesv1sel2' from data source  
##   '/home/jose/Documentos/git/forest-loss-fire-reproducible/out/fire_archive_V1_93309_DR_firesv1sel2.geojson'  
##   using driver `GeoJSON'  
## Simple feature collection with 25838 features and 14 fields  
## Geometry type: POINT  
## Dimension:     XY  
## Bounding box:  xmin: 184135.9 ymin: 1934167 xmax: 569069 ymax: 2204713  
## Projected CRS: WGS 84 / UTM zone 19N  
cline %>% as_Spatial %>% plot  
plot(as_Spatial(firesv1sel2), main = "Thermal anomalies within forest V1",  
     pch = 1, cex = 0.1, add = T, col = 'orange')
```



8.4 Hotspot/fire layers (M6 and V1) for the annual analytical approach

The hotspot/fire/thermal anomalies layers (M6 and V1) were created using the script `R/original-script-used-to-create-the-hotspot-fire-layers-M6-and-V1-for-annual-approach.R`. This script was initially fed from a layer where thermal anomalies and spontaneous fires from chimneys and landfills were manually removed. Then ...

9 Grid layers for modelling

The models generated in this study are referred to zonal statistics computed using different regular grids for long-term and annual approaches

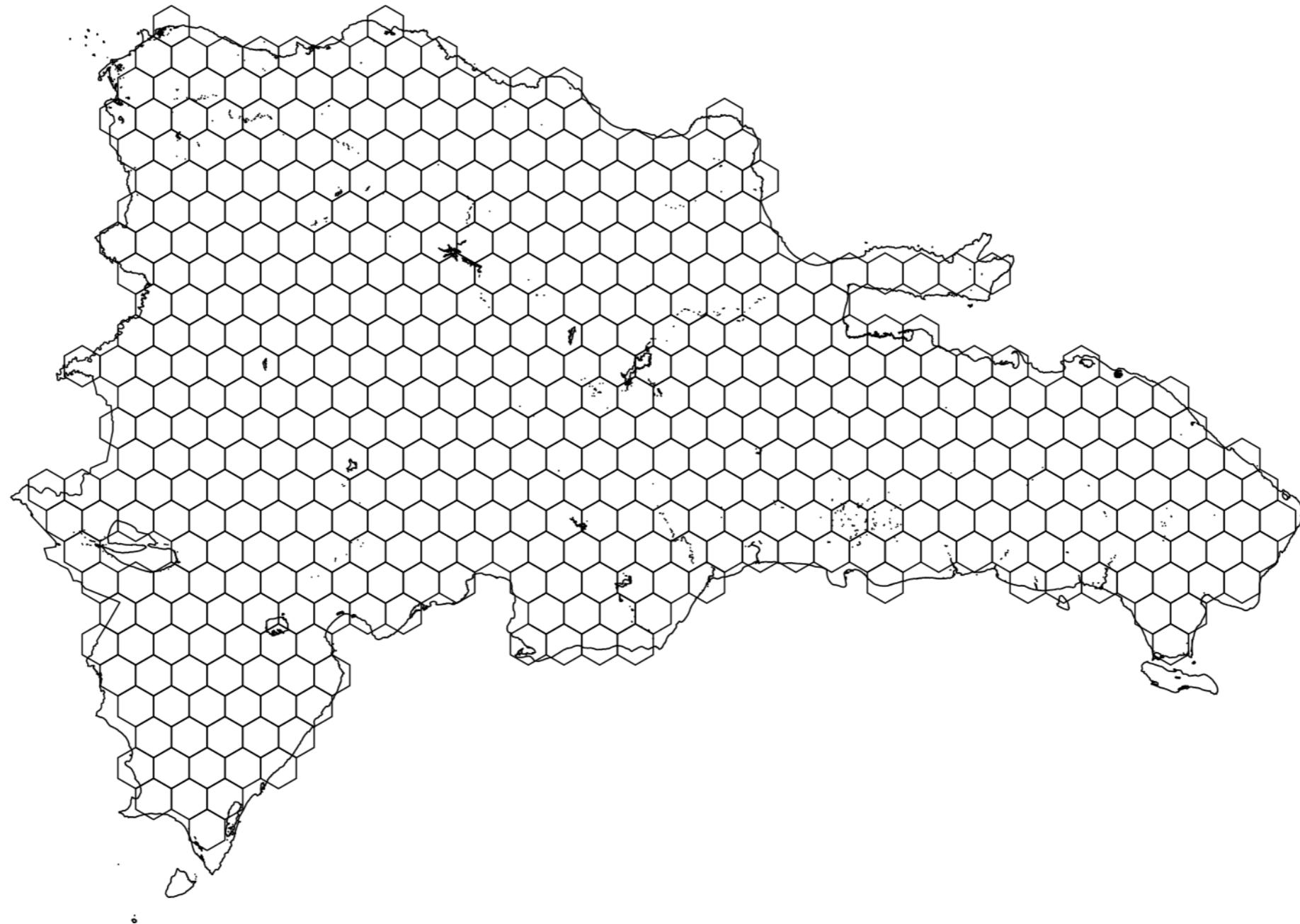
9.1 Long-term approach analysis grid

The regular grid for the long-term approach, loaded in the following code chunk, was generated using the script `R/original-script-used-to-create-the-grid-long-term-approach.R`. For practical reasons, the grid is simply loaded using the `readRDS` function.

```

grd <- readRDS('out/grd_plain_only_area_known_in_R_as_grd.RDS')
grd
## Simple feature collection with 482 features and 3 fields
## Geometry type: POLYGON
## Dimension: XY
## Bounding box: xmin: 187612.2 ymin: 1955288 xmax: 569084.5 ymax: 2209654
## Projected CRS: WGS 84 / UTM zone 19N
## First 10 features:
##   ENLACE AREASQM AREASQM_PCT           geometry
## 1 1 47325583 47.32558 POLYGON ((192985 2057655, 1...
## 2 2 99988965 99.98896 POLYGON ((198357.9 2048349, ...
## 3 3 99522753 99.52275 POLYGON ((203730.7 2039043, ...
## 4 4 65772385 65.77239 POLYGON ((203730.7 2057655, ...
## 5 5 49396881 49.39688 POLYGON ((203730.7 2094879, ...
## 6 6 62199862 62.19986 POLYGON ((209103.6 2011125, ...
## 7 7 84439177 84.43918 POLYGON ((209103.6 2029737, ...
## 8 8 92450749 92.45075 POLYGON ((209103.6 2048349, ...
## 9 9 98900253 98.90025 POLYGON ((214476.4 2001819, ...
## 10 10 68962809 68.96281 POLYGON ((214476.4 2020431, ...
cline %>% as_Spatial %>% plot
grd %>% as_Spatial %>% plot(add=T)

```



9.2 Annual approach analysis grid

10 Zonal statistic computations

Many zonal statistics were performed using different zone layers. These computations may assist policy information and decision-making processes. These tasks were performed in semi-automatic mode using R scripts. Since such scripts produced intermediate results, they are not essential to reproduce this RMarkdown. However, if one or more scripts should be run, it would be sufficient to open and run them in one go.

10.1 Zonal statistics by provinces

The script used to compute zonal statistics is stored in `R/original-script-used-to-compute-zonal-statistics-provinces.R`. For practical reasons and for future use (e.g. in the EDA section), the results of the script were saved as an RDS file located at `out/prov_zonal_statistics.RDS`.

10.2 Zonal statistics by municipalities

The script used to compute zonal statistics is stored in R/original-script-used-to-compute-zonal-statistics-municipalities.R. For practical reasons and for future use (e.g. in the EDA section), the results of the script were saved as an RDS file located at out/mun_zonal_statistics.RDS.

10.3 Zonal statistics by protected areas

The script used to compute zonal statistics is stored in R/original-script-used-to-compute-zonal-statistics-protected-areas.R. It is worth mentioning that protected areas with less than 3 sq. km and less than 30% within cutline, were excluded in the script. For practical reasons and for future use (e.g. in the EDA section), the results of the script were saved as an RDS file located at out/pa_zonal_statistics.RDS.

10.4 Zonal statistics by grid used in the long-term analytical approach

The script used to compute zonal statistics is stored in R/original-script-used-to-compute-zonal-statistics-grid-long-term-approach.R. For practical reasons and for future use (e.g. in the EDA section), the results of the script were saved as an RDS file located at out/grd_zonal_statistics.RDS.

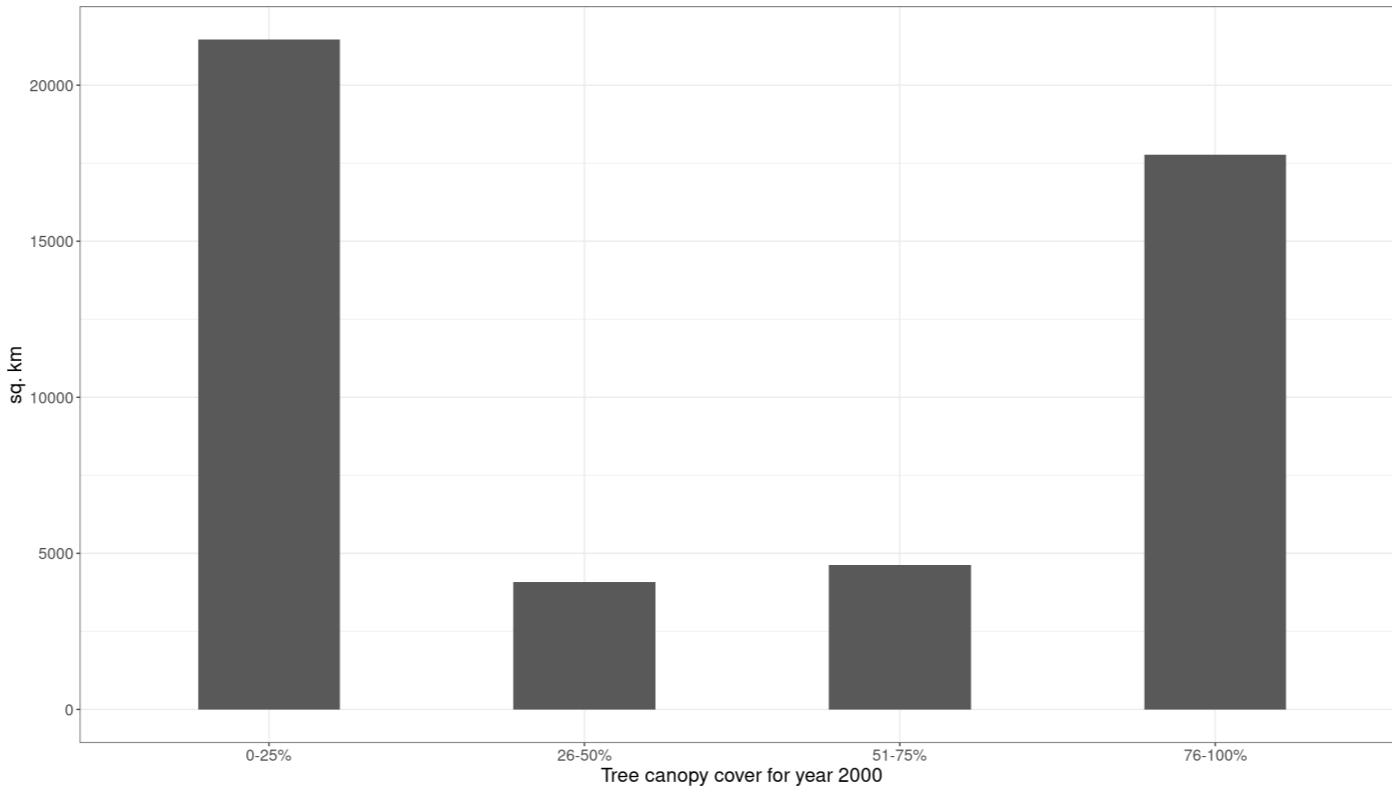
10.5 Zonal statistics by grid used in the annual analytical approach

11 Exploratory data analysys (EDA)

11.1 At National level, no zonal analysis

11.1.1 Tree canopy cover of year 2000 classes: area in km² and percentages

```
tct <- table(tc[])
tcsum <- tct %>% as.data.frame %>%
  mutate(
    treecover = as.numeric(as.character(Var1)),
    `sq. km` = Freq*prod(res(tc))/1000000,
    pct = Freq/sum(Freq)*100) %>%
  dplyr::select(-Var1, -Freq) %>%
  mutate(`Tree canopy cover for year 2000` = case_when(
    treecover <= 25 ~ '0-25%',
    treecover >= 26 & treecover <= 50 ~ '26-50%',
    treecover >= 51 & treecover <= 75 ~ '51-75%',
    treecover >= 76 ~ '76-100%')
  )) %>%
  group_by(`Tree canopy cover for year 2000`) %>%
  summarise_each(funsum(.), (`sq. km`:pct))
tcsum
## # A tibble: 4 x 3
##   `Tree canopy cover for year 2000` `sq. km`   pct
##   <chr>                      <dbl> <dbl>
## 1 0-25%                      21455.  44.8 
## 2 26-50%                      4076.   8.50 
## 3 51-75%                      4631.   9.66 
## 4 76-100%                     17762.  37.1
```



11.1.2 Year of gross forest cover loss (2001-2018): area in km² and percentages

- By year

```

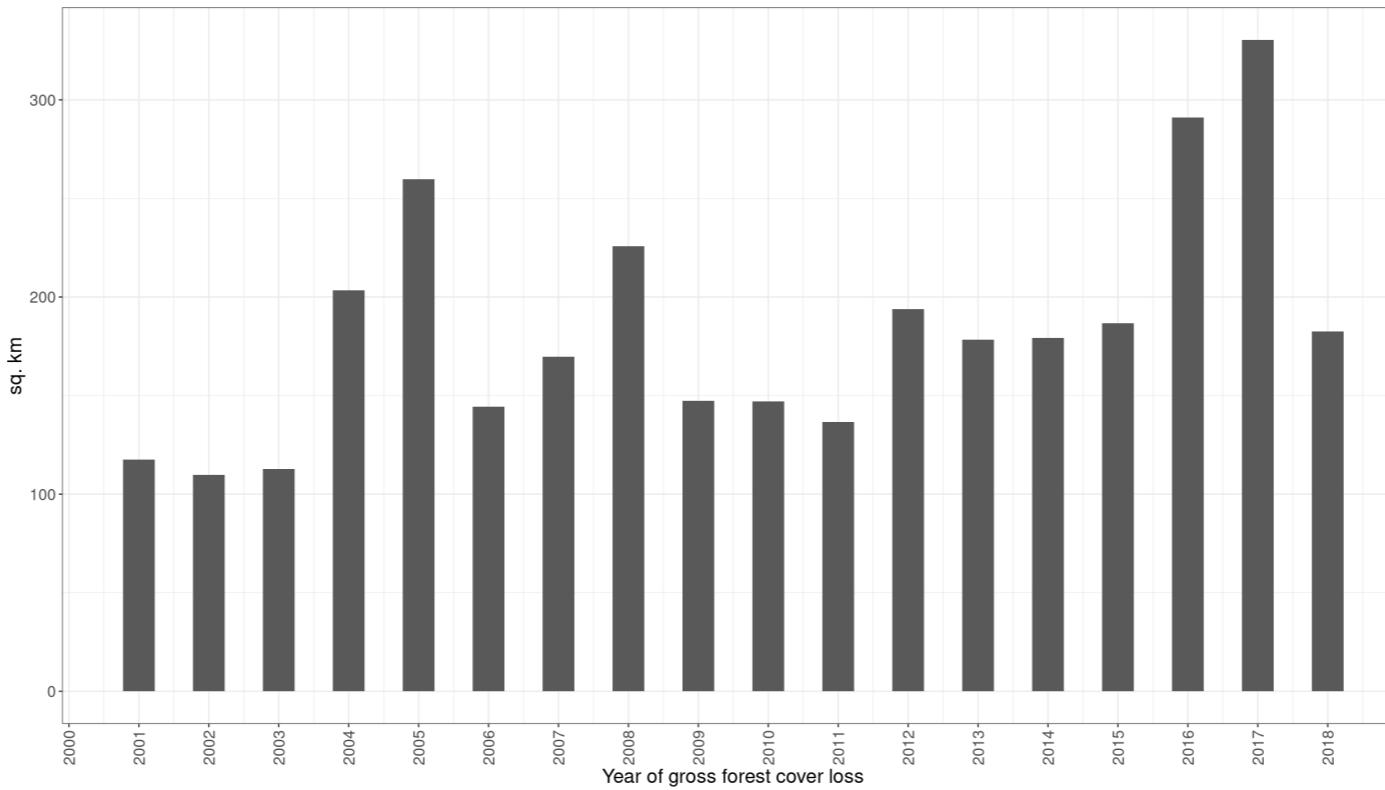
lyt <- table(lty[])
lysum <- lyt %>% as.data.frame %>%
  mutate(
    `Year of gross forest cover loss` = as.numeric(as.character(Var1)) + 2000,
    `sq. km` = Freq*prod(res(lty))/1000000,
    pct = Freq/sum(Freq)*100) %>%
  dplyr::select(-Var1, -Freq)
lysum
##   Year of gross forest cover loss   sq. km      pct
## 1                         2000 44608.0329 93.0816470
## 2                         2001 117.4182  0.2450114
## 3                         2002 109.6281  0.2287562
## 4                         2003 112.7959  0.2353664
## 5                         2004 203.3267  0.4242729
## 6                         2005 259.6146  0.5417266
## 7                         2006 144.4874  0.3014955
## 8                         2007 169.8247  0.3543659
## 9                         2008 225.6897  0.4709369
## 10                        2009 147.2277  0.3072137
## 11                        2010 146.8974  0.3065245
## 12                        2011 136.6796  0.2852035
## 13                        2012 193.7474  0.4042844
## 14                        2013 178.2085  0.3718599
## 15                        2014 179.2863  0.3741089
## 16                        2015 186.6761  0.3895290
## 17                        2016 291.0449  0.6073108
## 18                        2017 330.4609  0.6895584

```

```

## 19          2018   182.5063  0.3808280
lysum %>% dplyr::filter(`Year of gross forest cover loss` > 2000) %>%
  ggplot() + aes(x = `Year of gross forest cover loss`, y = `sq. km`) +
  theme_bw() + geom_col(width = 0.45) +
  scale_x_continuous(breaks = lysum$`Year of gross forest cover loss`) +
  theme(axis.text.x = element_text(angle = 90, vjust = 0.5), text = element_text(size = 16))

```

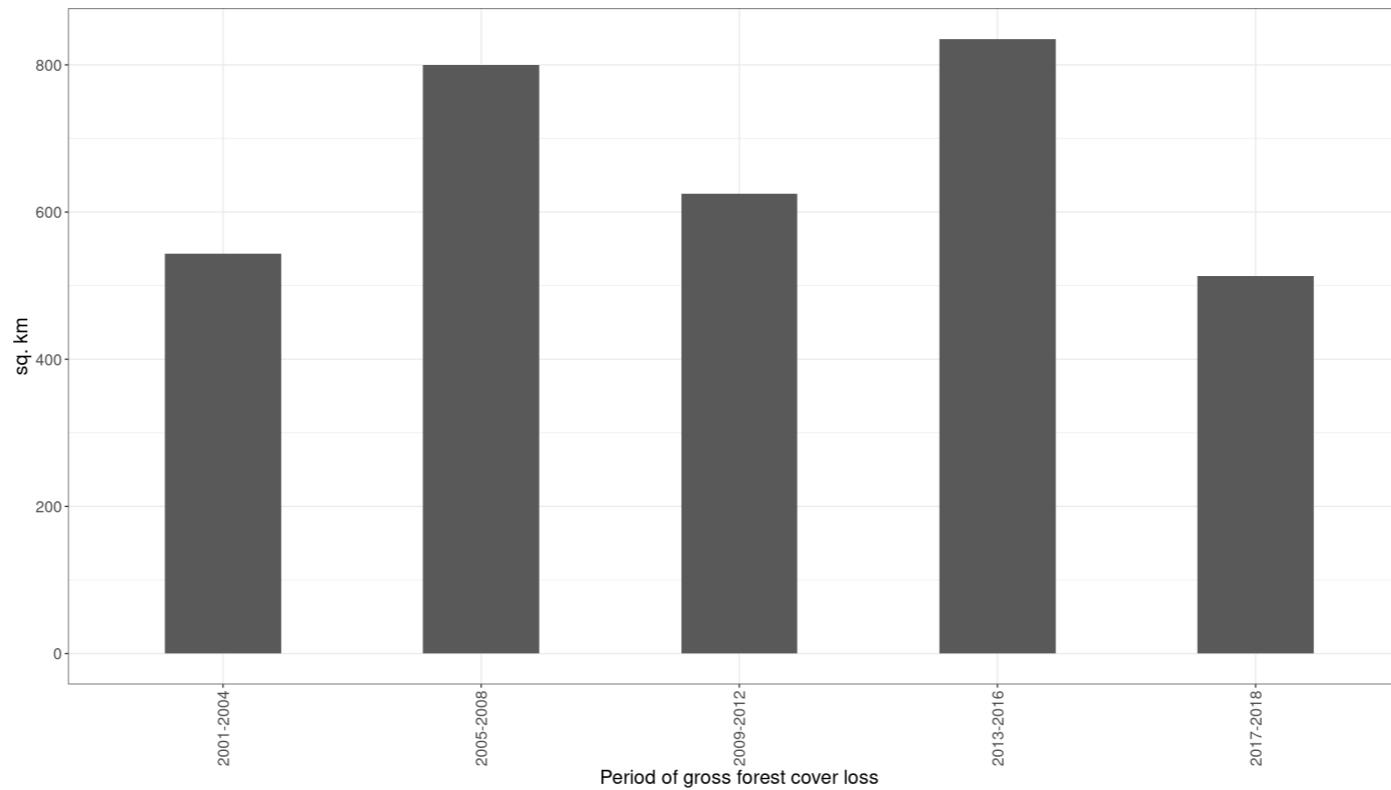


- By 4-year periods

```

lysum %>% dplyr::filter(`Year of gross forest cover loss` > 2000) %>%
  mutate(`Period of gross forest cover loss` = case_when(
    `Year of gross forest cover loss` <= 2004 ~ '2001-2004',
    `Year of gross forest cover loss` >= 2005 &
      `Year of gross forest cover loss` <= 2008 ~ '2005-2008',
    `Year of gross forest cover loss` >= 2009 &
      `Year of gross forest cover loss` <= 2012 ~ '2009-2012',
    `Year of gross forest cover loss` >= 2013 &
      `Year of gross forest cover loss` <= 2016 ~ '2013-2016',
    `Year of gross forest cover loss` >= 2017 ~ '2017-2018')) %>%
  group_by(`Period of gross forest cover loss`) %>%
  summarise_each(funs(sum(.)), (`sq. km`:pct)) %>%
  ggplot() + aes(x = `Period of gross forest cover loss`, y = `sq. km`) +
  theme_bw() + geom_col(width = 0.45) +
  theme(axis.text.x = element_text(angle = 90, vjust = 0.5), text = element_text(size = 16))

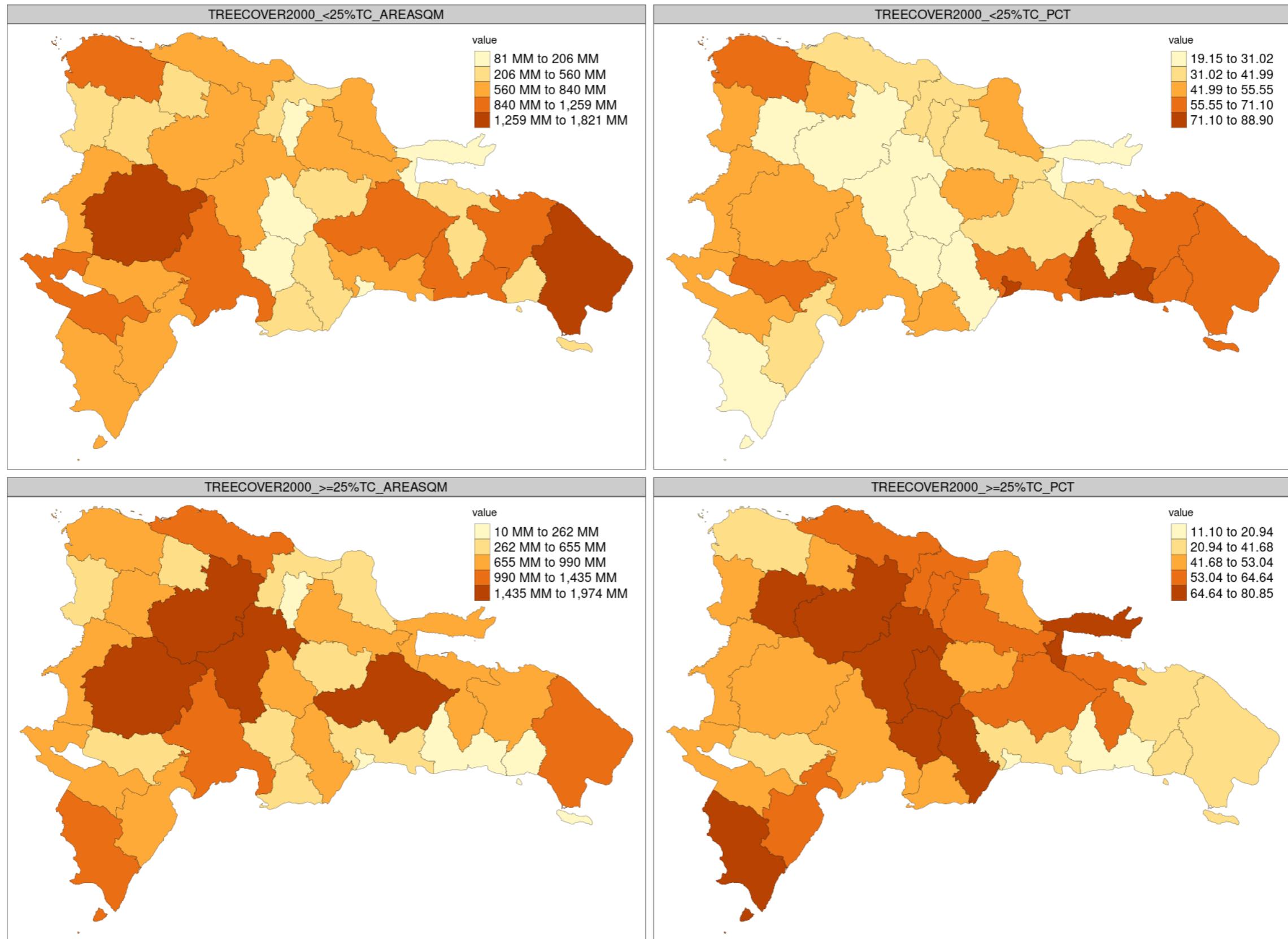
```



11.2 Zonal, by provinces

```
#Zonal statistics object
provzonal <- readRDS('out/prov_zonal_statistics.RDS')

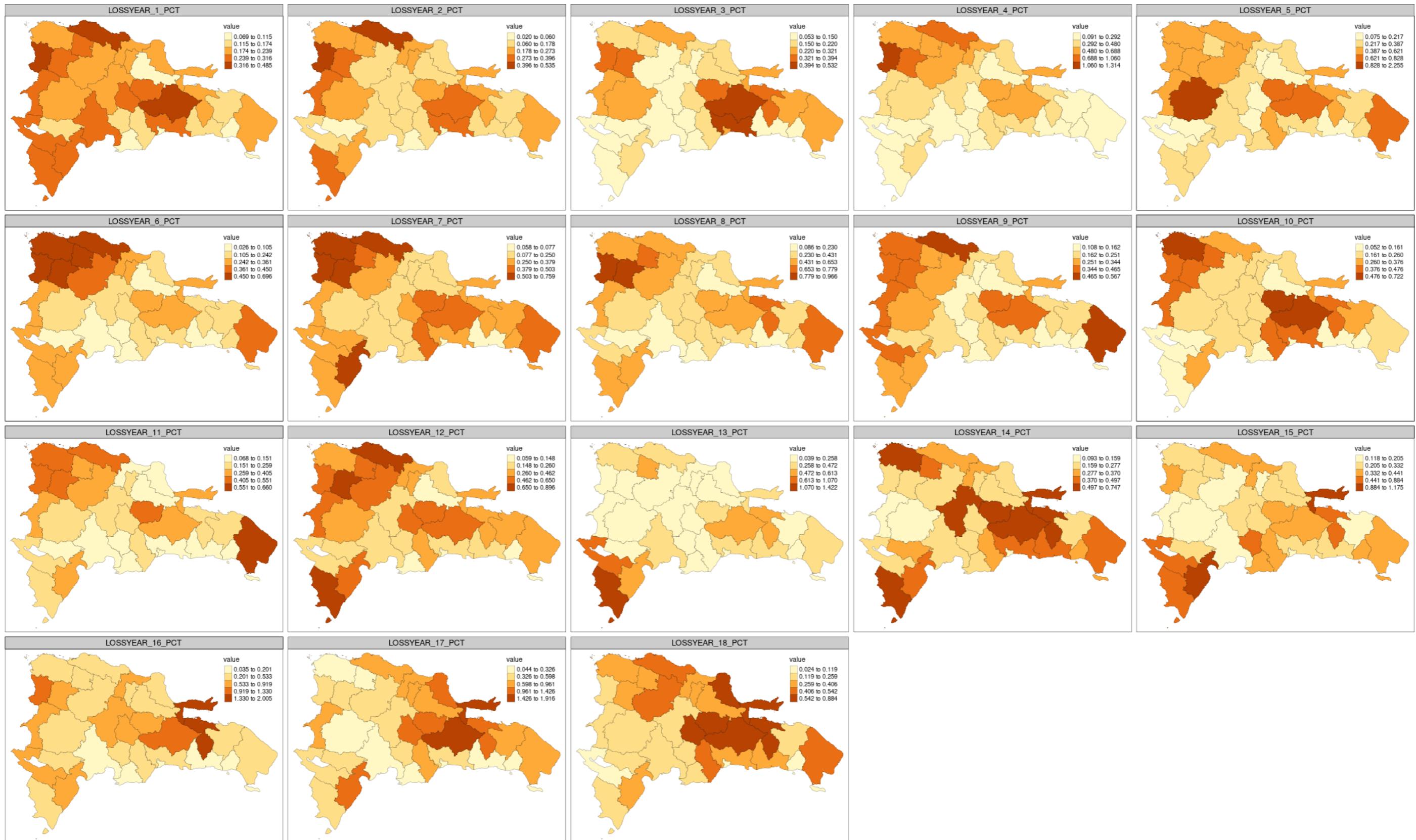
# Tree cover for pctc threshold
provzonal %>% select(matches('^TREECOVER2000')) %>%
  gather(variable, value, -geom) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 2, nrow = 2, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1)
```



```
# Top twenty sorted descending by column 2
stripped_table(provzonal %>% select(TOPONIMIA, matches('`^TREECOVER2000`')))
```

TOPONIMIA	TREECOVER2000_>=25%TC_PCT	TREECOVER2000_<25%TC_PCT	TREECOVER2000_>=25%TC_AREASQM	TREECOVER2000_<25%TC_AREASQM
1 SAMANÁ	80.85482	19.14518	697688722	165201971
2 MONSEÑOR NOUEL	79.24722	20.75278	786118604	205863963
3 SAN JOSÉ DE OCOA	76.76925	23.23075	655338410	198308635
4 SAN CRISTÓBAL	73.34135	26.65865	909995521	330771898
5 SANTIAGO RODRÍGUEZ	71.24034	28.75966	817955801	330208089
6 SANTIAGO	70.33967	29.66033	1974345122	832527766
7 LA VEGA	69.57361	30.42639	1595092664	697576339
8 PEDERNALES	68.98473	31.01527	1434924143	645136293
9 HATO MAYOR	64.64493	35.35507	851745302	465829547
10 MONTE PLATA	62.66562	37.33438	1630805609	971587235
11 PUERTO PLATA	62.25984	37.74016	1124498325	681639068
12 BARAHONA	59.64874	40.35126	990426487	670005055
13 HERMANAS MIRABAL	58.42910	41.57090	249509302	177519888
14 ESPAILLAT	58.12143	41.87857	489330733	352580341
15 DUARTE	58.01404	41.98596	956931584	692551115
16 AZUA	53.04008	46.95992	1422559629	1259486713
17 SAN JUAN	52.85447	47.14553	1778257738	1586183858
18 DAJABÓN	52.80924	47.19076	539049686	481699091
19 SANCHEZ RAMÍREZ	52.80050	47.19950	626044975	559635063
20 ELÍAS PIÑA	52.62086	47.37914	734376775	661223287

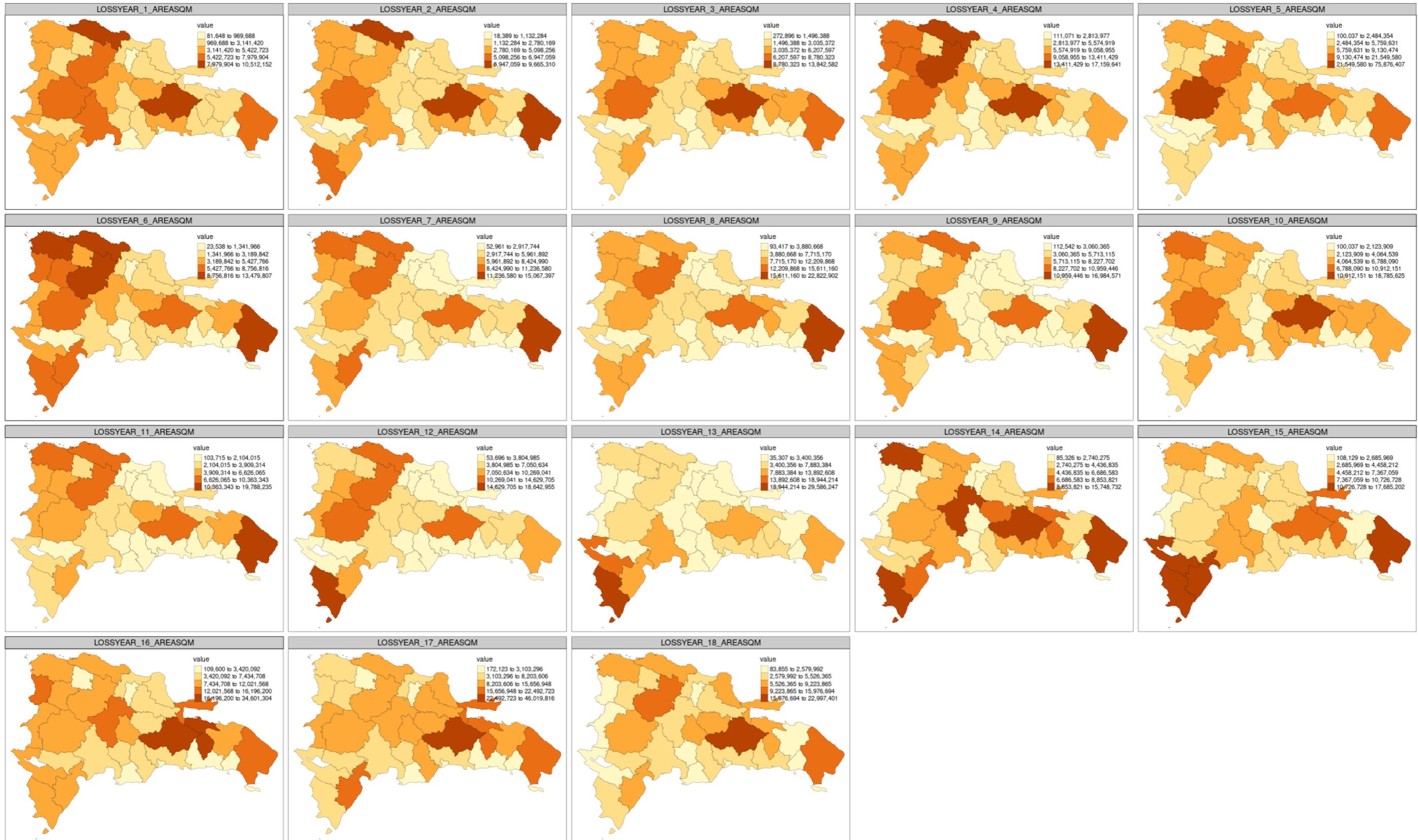
```
# Loss year
# * PCT
provzonal %>% select(matches('`LOSSYEAR_[1-9].*_PCT$')) %>%
gather(variable, value, -geom) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 5, nrow = 4, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 0.75)
```



```
# Top twenty sorted descending by column 2
stripped_table(provzonal %>% select(TOPONIMIA, matches('`LOSSYEAR_[1-9].*_PCT$')))
```

TOPONIMIA	LOSSYEAR_1_PCT	LOSSYEAR_2_PCT	LOSSYEAR_3_PCT	LOSSYEAR_4_PCT	LOSSYEAR_5_PCT	LOSSYEAR_6_PCT	LOSSYEAR_7_PCT	LOSSYEAR_8_PCT	LOSSYEAR_9_PCT	LOSSYEAR_10_PCT	LOSSYEAR_11_PCT	LOSSYEAR_12_PCT	LOSSYEAR_13_PCT	LOSSYEAR_14_PCT	LOSSYEAR_15_PCT	LOSSYEAR_16_PCT	LOSSYEAR_17_PCT	LOSSYEAR_18_PCT
1 PUERTO PLATA	0.4854033	0.5351371	0.3030461	0.9500740	0.5055249	0.6957841	0.5974570	0.6533006	0.5522852	0.2971400	0.4568094	0.7188384	0.3663436	0.3215384	0.4078903	0.4661778	0.7320356	0.4957085
2 MONTE PLATA	0.4039418	0.3434452	0.5319174	0.5990856	0.8280679	0.3364909	0.4261050	0.5998771	0.4211296	0.7218597	0.3840966	0.5049202	0.5338398	0.6051635	0.4013127	1.3295957	1.7683654	0.8837021
3 DAJABÓN	0.3859482	0.4994623	0.3857320	1.3138814	0.5642555	0.6333730	0.7586350	0.9663479	0.4653721	0.4743090	0.5288679	0.5945260	0.1581270	0.2243617	0.4136240	1.3073949	0.5980575	0.2201814
4 SÁNCHEZ RAMÍREZ	0.3155063	0.2208855	0.3544095	0.5330888	0.6887159	0.3173057	0.5028247	0.5889452	0.3766842	0.5659880	0.4704985	0.5568671	0.3777390	0.7467294	0.3760017	0.6270417	1.0814081	0.7779388
5 BARAHONA	0.2998575	0.2703060	0.2199753	0.3992784	0.3350358	0.3610873	0.5961263	0.5263456	0.3440741	0.3436310	0.3990568	0.6184561	0.5691888	0.4556789	1.0650967	0.6482735	1.3546311	0.3753093
6 MONSEÑOR NOUEL	0.2824113	0.1507726	0.1862965	0.2836721	0.2126243	0.1842200	0.3424089	0.4217629	0.2037989	0.2141075	0.2493348	0.5413130	0.1340119	0.2562319	0.2707678	0.9194683	1.2140422	0.7173010
7 SANTIAGO RODRIGUEZ	0.2736038	0.3961808	0.3497259	1.0600704	0.4575014	0.5693137	0.5800144	0.8622043	0.3819560	0.4693554	0.5423378	0.7058593	0.1944061	0.2220847	0.3113444	0.7409728	0.5158745	0.3121133
8 INDEPENDENCIA	0.2711904	0.1089000	0.1474574	0.2677834	0.1403110	0.3065486	0.2943748	0.3793840	0.3731932	0.1135119	0.2082021	0.2052521	0.10699287	0.1967346	0.8844539	0.6789524	0.3517540	0.1188717
9 AZUA	0.2701846	0.1700380	0.1122706	0.1476552	0.2497767	0.0937280	0.2104697	0.1600261	0.2511208	0.2280522	0.0995157	0.1711078	0.4719864	0.2066843	0.2048191	0.1874834	0.2329348	0.1510016
10 SANTO DOMINGO	0.2655681	0.3163866	0.4769824	0.4041745	0.3869900	0.1863160	0.2981847	0.2011263	0.4078488	0.1434113	0.2302381	0.3510948	0.4365084	0.2905534	0.3616655	0.5426678	0.3521688	
11 VALVERDE	0.2611979	0.2553856	0.1753540	0.5959891	0.2612874	0.5922335	0.4354789	0.7788545	0.2929423	0.4686540	0.3940771	0.6503569	0.6132473	0.4969110	0.2831954	0.4157169	0.2378591	0.3705595
12 PEDERNALES	0.2607003	0.3339835	0.1316057	0.2915415	0.2447845	0.2928501	0.3791489	0.5344514	0.3382631	0.1614212	0.1706524	0.8962699	1.4223744	0.6685683	0.6581700	0.4487539	0.3943927	0.1971433
13 ELÍAS PINA	0.2534464	0.3174933	0.3209197	0.4796927	0.5114789	0.3298810	0.2870776	0.5510140	0.3946658	0.4270846	0.4050504	0.5805863	0.0637306	0.1014734	0.1503388	0.7099978	0.7971332	0.1848662
14 SANTIAGO	0.2385887	0.1776507	0.1409831	0.5236214	0.6205194	0.3952453	0.3488538	0.5477083	0.2863432	0.2289697	0.3224604	0.5212101	0.1757898	0.2382218	0.1588320	0.3998058	0.4230540	0.5417849
15 SAN JUAN	0.2371836	0.2004045	0.2609741	0.3329798	2.2552452	0.1875471	0.2504127	0.3398458	0.3150932	0.2595091	0.1693107	0.3840813	0.1896463	0.1592740	0.1317662	0.3455967	0.3258296	0.2154485
16 HERMANAS MIRABAL	0.2270777	0.2651537	0.1335245	0.4107385	0.2105379	0.3142563	0.2108825	0.3275226	0.1616077	0.1917584	0.2198416	0.3094322	0.1193967	0.2770417	0.1807318	0.5185918	0.7267176	0.3337250
17 LA VEGA	0.2215651	0.1126597	0.0835562	0.3951270	0.3431451	0.1919161	0.1580316	0.2788415	0.1133335	0.1772841	0.1705137	0.2238754	0.0601001	0.5803689	0.3087151	0.6971679	0.4252573	0.1800116
18 MONTE CRISTI	0.2206413	0.2545229	0.2071980	0.6881459	0.4269014	0.6814243	0.5968959	0.6485977	0.4370619	0.5796620	0.5505089	0.3745352	0.3531979	0.7201909	0.3214656	0.5196754	0.2361948	0.4062284
19 LA ALTAGRACIA	0.2199468	0.2731973	0.2878811	0.2529765	0.7061977	0.4499186	0.5029080	0.7617653	0.5668980	0.2265677	0.6604766	0.3419018	0.4177518	0.4235467	0.4413736	0.5330860	0.7415321	0.5332578
20 MARÍA TRINIDAD SÁNCHEZ	0.2186695	0.1393362	0.1892168	0.4124596	0.3075154	0.2367192	0.2088519	0.4097156	0.2200720	0.2120838	0.1359824	0.2602569	0.1933023	0.2573299	0.2494027	0.4291678	0.2977478	0.6553986

```
# * AREASQM
provzonal %>% select(matches('`^LOSSYEAR_[1-9].*_AREASQM$`)) %>%
  gather(variable, value, -geom) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 5, nrow = 4, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 0.75)
```

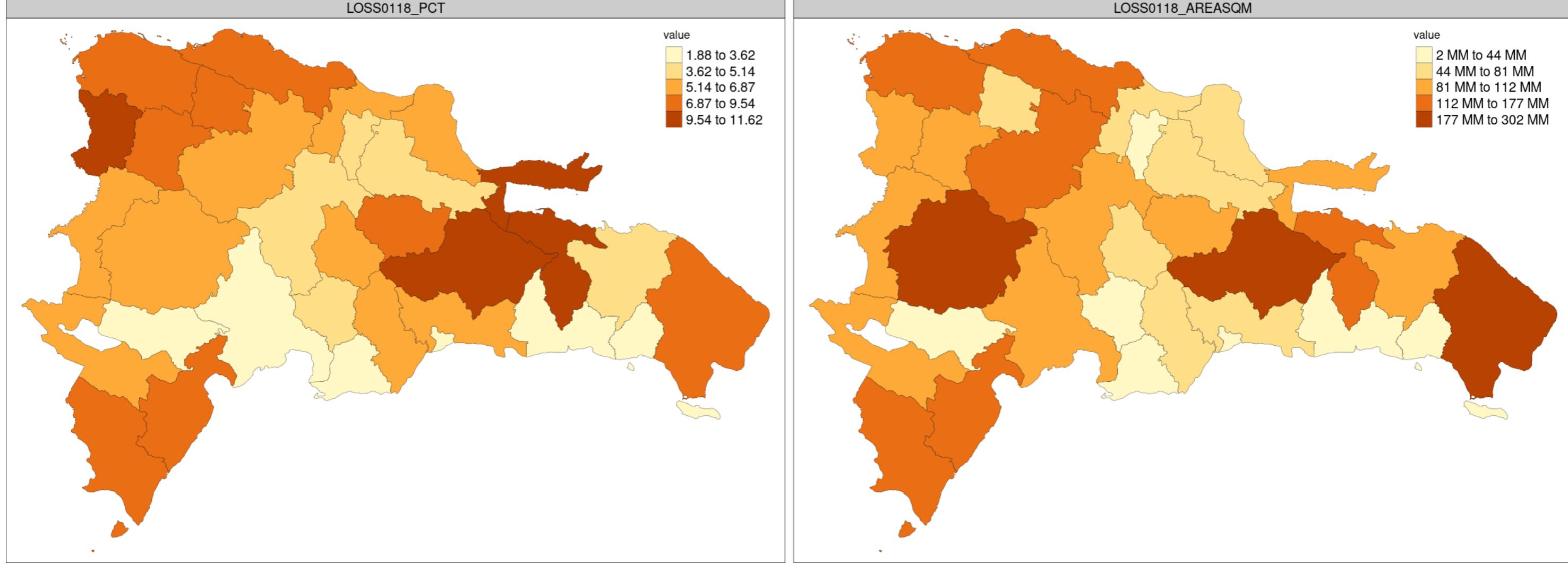


```
# Top twenty sorted descending by column 2
stripped_table(provzonal %>% select(TOPONIMIA, matches('`LOSSYEAR_[1-9].*_AREASQM$`')))
```

TOPONIMIA	LOSSYEAR_1_AREASQM	LOSSYEAR_2_AREASQM	LOSSYEAR_3_AREASQM	LOSSYEAR_4_AREASQM	LOSSYEAR_5_AREASQM	LOSSYEAR_6_AREASQM	LOSSYEAR_7_AREASQM	LOSSYEAR_8_AREASQM	LOSSYEAR_9_AREASQM	LOSSYEAR_10_AREASQM	LOSSYEAR_11_AREASQM	LOSSYEAR_12_AREASQM	LOSSYEAR_13_AREASQM	LOSSYEAR_14_AREASQM	LOSSYEAR_15_AREASQM	LOSSYEAR_16_AREASQM	LOSSYEAR_17_AREASQM	LOSSYEAR_18_AREASQM
1 MONTE PLATA	10512152	8932794	13842582	15590561	21549580	8756816	11088926	15611160	10959446	18785625	9995703	13140006	13892608.0	15748732	10443733	34601304	46019816	22997401
2 PUERTO PLATA	8767050	9665310	5473429	17159641	9130474	12566816	10790895	11795030	5366756	8250606	12983209	6616669.4	5807426	7367059	8419811	13221568	8953176	
3 SAN JUAN	7979904	6742493	8780323	11202912	75876407	6309914	8424990	11433915	10601127	8731032	5696358	12922192	6380539.4	5358682	4433199	11627398	10962345	7248640
4 AZUA	7246475	4560498	3011150	3960180	6699127	2513828	5644894	4291973	6735176	6116467	2669057	4589189	12658893.6	5543370	5493343	5028392	6247418	4049934
5 SANTIAGO	6696882	4986430	3957215	14697387	17417191	11094034	9791882	15373476	8037289	6426888	9051054	14629705	4934196.5	6686583	4458212	11222042	11874389	15207213
6 LA ALTAGRACIA	6574744	8185140	8625075	6980102	21158066	13479807	15067397	22822902	16984571	6788090	19788235	10243564	12516069.9	12689690	13223791	15971544	22216705	15976694
7 PEDERNALES	5422723	6947059	2737478	6064239	5091665	6091459	7886527	11116913	7036077	3357659	3549673	18642955	29586246.8	13906625	13690334	9334352	8203606	4100700
8 LA VEGA	5079754	2582913	1915667	9058955	7867181	4400001	3623141	6392912	2598362	4064539	3009314	5132721	1377897.0	13305938	7077815	15983752	9749743	4127070
9 BARAHONA	4978929	4488245	3685239	6629744	59563041	5995607	9888269	5713115	5205758	6626065	10269041	9450588.6	7566236	17688202	10764138	22492723	6231753	
10 INDEPENDENCIA	4801712	1928189	2610889	4741387	2484354	5427766	5212215	6717394	6607779	2009848	3686438	3642025	18944213.5	3483393	15660187	12021568	628174	2104749
11 MONGA	7070750	8800000	1564228	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	
12 DIAJABON	3939561	5089256	3937354	13411429	5759361	6465147	7743758	9863985	4414154	5389413	1614079.8	6058916	2292569	4222042	13345218	6304665	2347459	
13 SANCHEZ RAMIREZ	3740896	2618995	4202163	6344442	8165896	30762290	5864882	6983005	4466269	6710887	5578606	6602663	4476657	8853821	4450177	7437008	12822940	9286365
14 ELIAS PINA	3537998	4430936	4478755	6694591	7138200	4004555	7689952	5507956	5960393	5452883	8102662	889424.2	1416163	2098730	11124592	2579992	11124592	
15 SANTO DOMINGO	3456185	4117554	6207997	5260052	5036498	2424774	4706091	3880668	2675759	5303870	1866399	2946390	4569256.2	5680856	3781352	4706827	7062447	4583234
16 SANTIAGO RODRIGUEZ	3114120	4548805	4015426	13171346	5252866	6536454	6536454	6536454	6536454	6536454	6536454	6536454	6536454	6536454	6536454	6536454	6536454	
17 MONSERRAT NOUEL	2801471	1489638	1884899	2833097	2109996	1827430	2896626	4183814	2021690	2122899	2073357	5369731	1329374.4	2541776	2688969	9120865	12043987	7115500
18 EL SEIBO	2645538	2780169	5113774	4597320	5246934	3735093	5257969	7715170	4418548	5937010	4638519	3203925.5	4108823	2656780	7928520	1188734	2555784	
19 MARIA TRINIDAD SANCHEZ	2638183	1681051	2282845	4976205	3710083	2859947	2519737	4943099	2655104	2558729	1640588	3139924	2332136.3	3104610	3008971	5177284	15656948	7907193
20 HATO MAYOR	2563792	3420105	5190115	5891939	7558955	3189842	3473809	9824067	3060365	6267864	2582919	6084683	7883383.6	8226203	10726728	26411836	18794028	8975846

Total loss 2001-2018

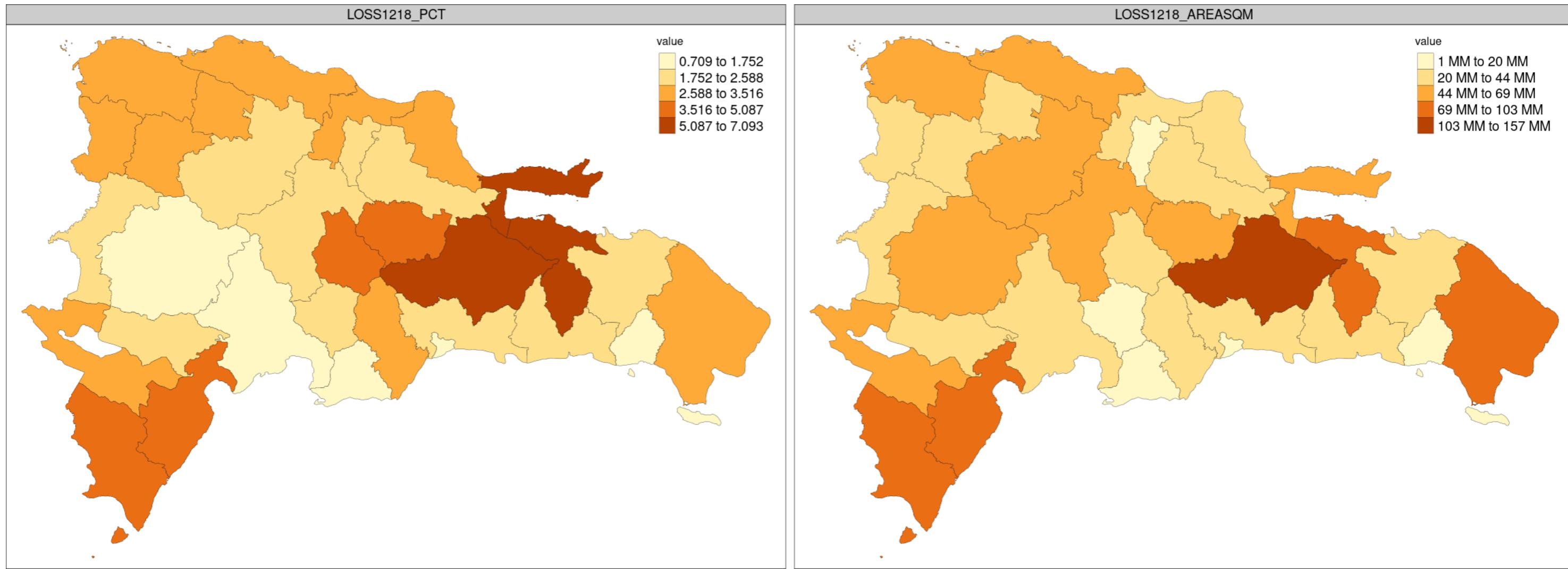
```
provzonal %>% select(matches('`LOSS0118`')) %>% select(-matches('<NA>')) %>%
gather(variable, value, -geom) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1)
```



```
# Top twenty sorted descending by column 2
stripped_table(provzonal %>% select(TOPONIMIA, matches('^LOSS0118')) %>% select(-matches('<NA>')))
```

	TOPONIMIA	LOSS0118_PCT	LOSS0118_AREASQM
1	MONTE PLATA	11.622916	302473946
2	SAMANÁ	11.232321	96922649
3	HATO MAYOR	10.635182	140126481
4	DAJABÓN	10.492457	107101625
5	PUERTO PLATA	9.540494	172314432
6	SANCHEZ RAMÍREZ	9.480578	112409320
7	BARAHONA	9.181408	152451002
8	SANTIAGO RODRÍGUEZ	8.949919	102759738
9	LA ALTAGRACIA	8.320683	249292186
10	MONTE CRISTI	8.223049	154799087
11	PEDERNALES	7.825075	162766292
12	VALVERDE	7.579301	62354694
13	ELÍAS PIÑA	6.865931	95820932
14	MONSEÑOR NOUEL	6.784546	67301511
15	SAN JUAN	6.560149	220712371
16	SAN CRISTÓBAL	6.542953	81182825
17	SANTIAGO	6.289643	176542269
18	INDEPENDENCIA	6.116804	108304461
19	ESPAILLAT	6.052755	50958817
20	MARÍA TRINIDAD SÁNCHEZ	6.033228	72789136

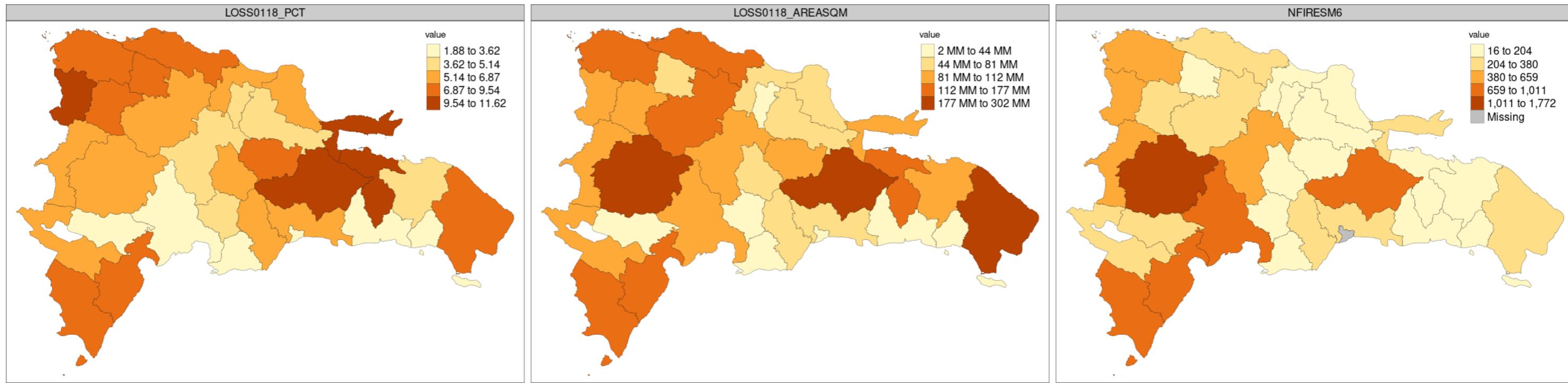
```
# Total loss 2012-2018
provzonal %>% select(matches('^LOSS1218')) %>% select(-matches('<NA>')) %>%
  gather(variable, value, -geom) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1)
```



```
# Top twenty sorted descending by column 2
stripped_table(provzonal %>% select(TOPONIMIA, matches('`LOSS1218`')) %>% select(-matches('<NA>')))
```

	TOPONIMIA	LOSS1218_PCT	LOSS1218_AREASQM
1	SAMANÁ	7.092585	61201256
2	HATO MAYOR	6.610836	87102708
3	MONTE PLATA	6.026899	156843601
4	BARAHONA	5.086634	84460081
5	PEDERNALES	4.685672	97464819
6	SANCHEZ RAMÍREZ	4.543726	53874049
7	MONSEÑOR NOUEL	4.053136	40206403
8	DAJABÓN	3.516272	35892309
9	PUERTO PLATA	3.508532	63368918
10	INDEPENDENCIA	3.505947	62076489
11	LA ALTAGRACIA	3.432450	102838057
12	MARÍA TRINIDAD SÁNCHEZ	3.342606	40327565
13	ESPAILLAT	3.308128	27851494
14	SAN CRISTÓBAL	3.174297	39385647
15	VALVERDE	3.067846	25239085
16	SANTIAGO RODRÍGUEZ	3.007655	34532810
17	MONTE CRISTI	2.931488	55185337
18	ELÍAS PIÑA	2.588126	36119894
19	SANTO DOMINGO	2.564897	33380362
20	LA VEGA	2.475496	56754936

```
# Fires M6
provzonal %>% select(matches('`^LOSS0118|NFIRESM6`')) %>% select(-matches('<NA>')) %>%
gather(variable, value, -geom) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 3, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1)
```



```
# Top twenty sorted descending by column 2
stripped_table(provzonal %>% select(TOPONIMIA, matches('`^LOSS0118|NFIRESM6`')) %>% select(-matches('<NA>')))
```

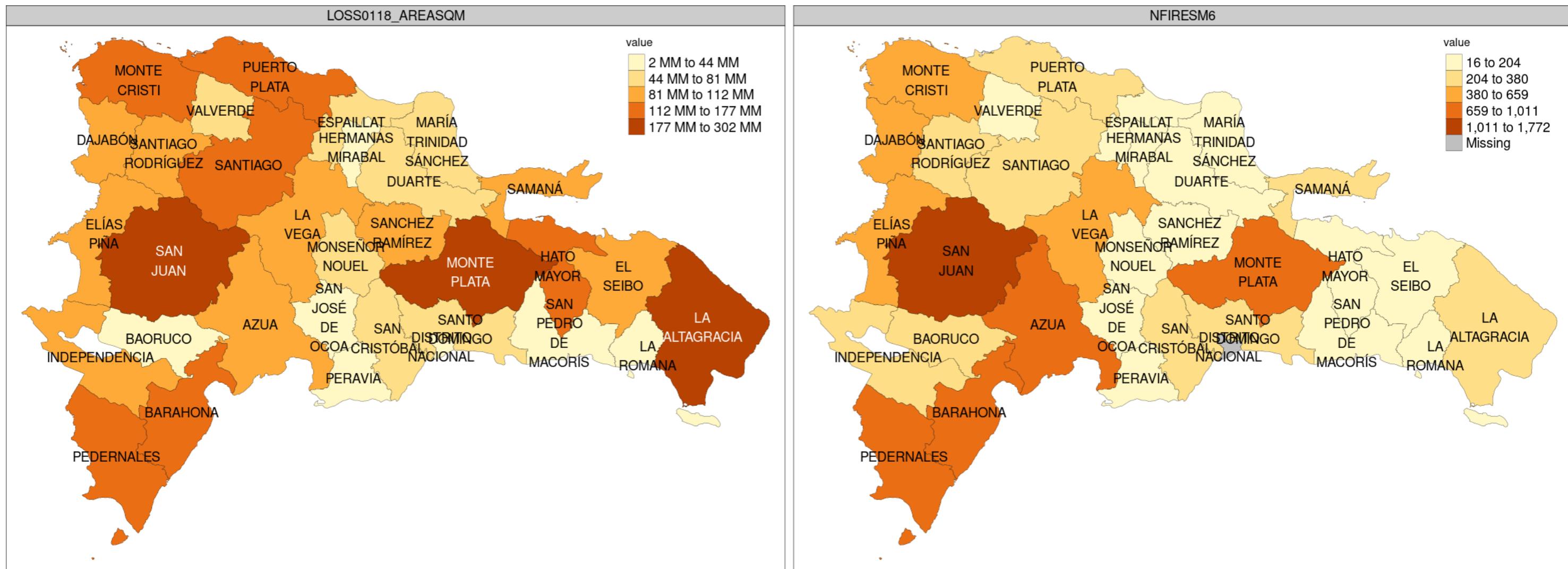
	TOPONIMIA	LOSS0118_PCT	LOSS0118_AREASQM	NFIRESM6
1	MONTE PLATA	11.622916	302473946	791
2	SAMANÁ	11.232321	96922649	248
3	HATO MAYOR	10.635182	140126481	193
4	DAJABÓN	10.492457	107101625	444
5	PUERTO PLATA	9.540494	172314432	289
6	SANCHEZ RAMÍREZ	9.480578	112409320	204
7	BARAHONA	9.181408	152451002	1006
8	SANTIAGO RODRÍGUEZ	8.949919	102759738	349
9	LA ALTAGRACIA	8.320683	249292186	230
10	MONTE CRISTI	8.223049	154799087	554
11	PEDERNALES	7.825075	162766292	1011
12	VALVERDE	7.579301	62354694	183
13	ELÍAS PIÑA	6.865931	95820932	659
14	MONSEÑOR NOUEL	6.784546	67301511	168
15	SAN JUAN	6.560149	220712371	1772
16	SAN CRISTÓBAL	6.542953	81182825	226
17	SANTIAGO	6.289643	176542269	380
18	INDEPENDENCIA	6.116804	108304461	363
19	ESPAILLAT	6.052755	50958817	58
20	MARÍA TRINIDAD SÁNCHEZ	6.033228	72789136	136

```
# Fires M6. Only AREASQM and FIRESM6
provzonal %>% select(matches('`^LOSS0118_AREASQM|NFIRESM6|TOPONIMIA`')) %>% select(-matches('<NA>')) %>%
gather(variable, value, -geom, -TOPONIMIA) %>%
mutate(TOPONIMIA=gsub(' ', '\n', TOPONIMIA)) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
```

```

tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1) +
tm_text(text = 'TOPONIMIA')

```



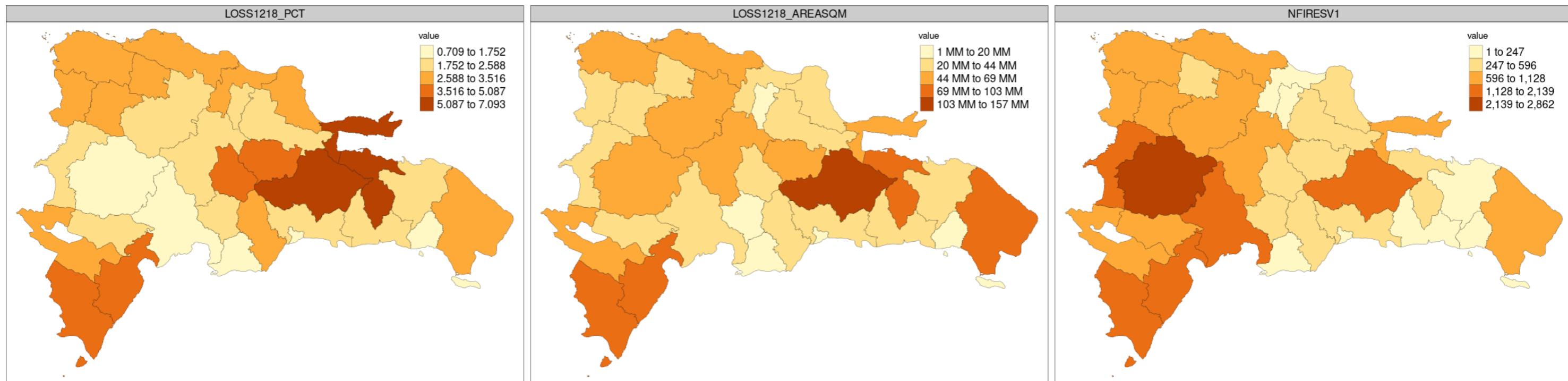
```

# Top twenty sorted descending by column 2
stripped_table(provzonal %>% select(matches('`^LOSS0118_AREASQM|NFIRESM6|TOPONIMIA`')) %>% select(-matches('<NA>')))

```

	TOPONIMIA	LOSS0118_AREASQM	NFIRESM6
1	MONTE PLATA	302473946	791
2	LA ALTAGRACIA	249292186	230
3	SAN JUAN	220712371	1772
4	SANTIAGO	176542269	380
5	PUERTO PLATA	172314432	289
6	PEDERNALES	162766292	1011
7	MONTE CRISTI	154799087	554
8	BARAHONA	152451002	1006
9	HATO MAYOR	140126481	193
10	SANCHEZ RAMÍREZ	112409320	204
11	INDEPENDENCIA	108304461	363
12	LA VEGA	108247674	475
13	DAJABÓN	107101625	444
14	SANTIAGO RODRÍGUEZ	102759738	349
15	AZUA	97059365	908
16	SAMANÁ	96922649	248
17	ELÍAS PIÑA	95820932	659
18	EL SEIBO	89985798	75
19	SAN CRISTÓBAL	81182825	226
20	SANTO DOMINGO	78261478	258

```
# Fires V1
provzonal %>% select(matches('`^LOSS1218|NFIRESV1`')) %>% select(-matches('<NA>')) %>%
  gather(variable, value, -geom) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 3, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1)
```



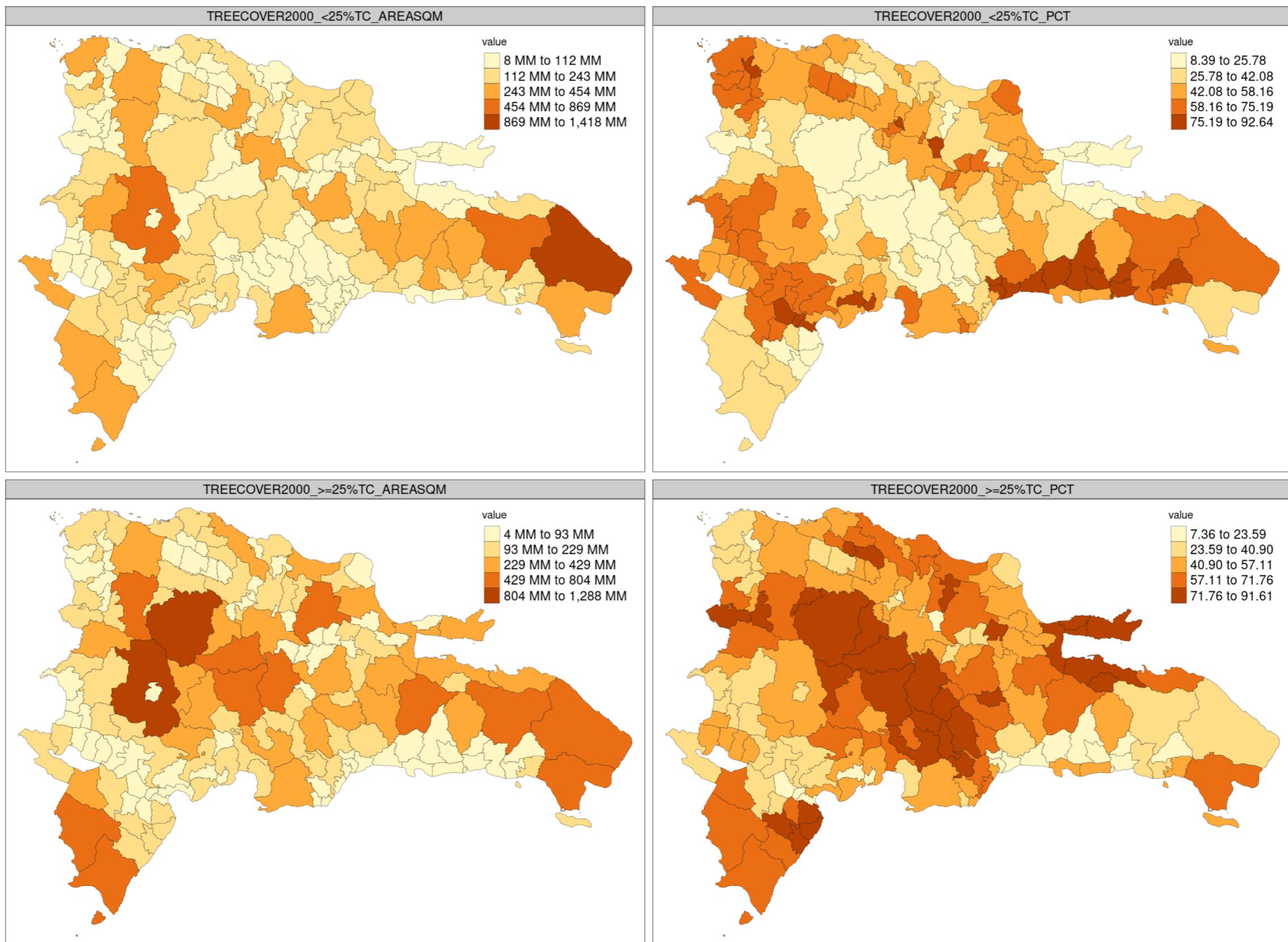
```
# Top twenty sorted descending by column 2
stripped_table(provzonal %>% select(TOPONIMIA, matches('`^LOSS1218|NFIRESV1`')) %>% select(-matches('`<NA>`')))
```

	TOPONIMIA	LOSS1218_PCT	LOSS1218_AREASQM	NFIRESV1
1	SAMANÁ	7.092585	61201256	835
2	HATO MAYOR	6.610836	87102708	555
3	MONTE PLATA	6.026899	156843601	1589
4	BARAHONA	5.086634	84460081	2139
5	PEDERNALES	4.685672	97464819	1894
6	SANCHEZ RAMÍREZ	4.543726	53874049	376
7	MONSEÑOR NOUEL	4.053136	40206403	387
8	DAJABÓN	3.516272	35892309	931
9	PUERTO PLATA	3.508532	63368918	883
10	INDEPENDENCIA	3.505947	62076489	897
11	LA ALTAGRACIA	3.432450	102838057	794
12	MARÍA TRINIDAD SÁNCHEZ	3.342606	40327565	348
13	ESPAILLAT	3.308128	27851494	187
14	SAN CRISTÓBAL	3.174297	39385647	596
15	VALVERDE	3.067846	25239085	390
16	SANTIAGO RODRÍGUEZ	3.007655	34532810	807
17	MONTE CRISTI	2.931488	55185337	1123
18	ELÍAS PIÑA	2.588126	36119894	1624
19	SANTO DOMINGO	2.564897	33380362	502
20	LA VEGA	2.475496	56754936	1128

11.3 Zonal, by municipalities

```
#Zonal statistics object
munzonal <- readRDS('out/mun_zonal_statistics.RDS')

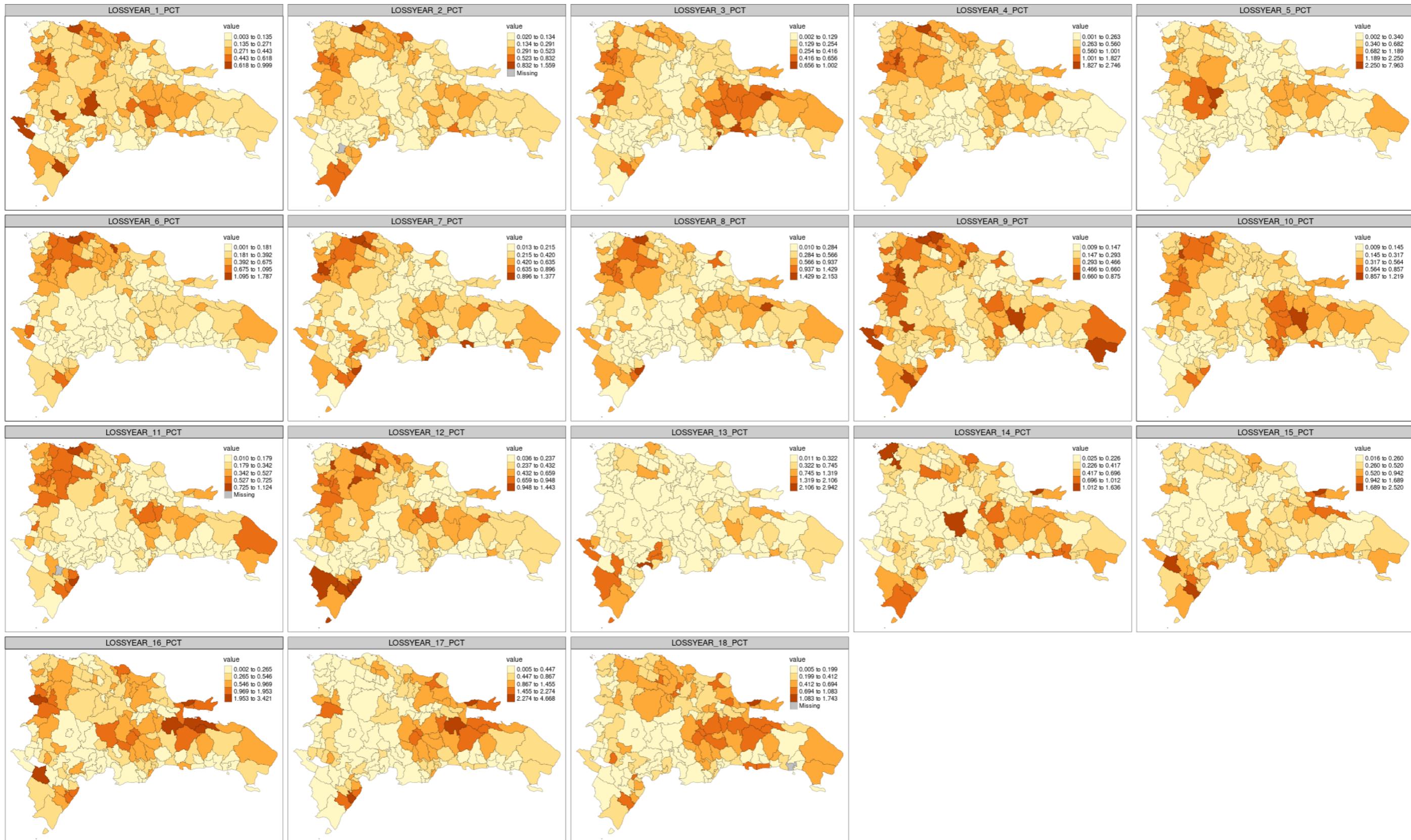
# Tree cover for pctc threshold
munzonal %>% select(matches('`^TREECOVER2000`')) %>%
gather(variable, value, -geom) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 2, nrow = 2, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1)
```



```
# Top twenty sorted descending by column 2
stripped_table(munzonal %>% select(TOPONIMIA, matches('`TREECOVER2000`')))
```

TOPONIMIA	TREECOVER2000_>=25%TC_PCT	TREECOVER2000_<25%TC_PCT	TREECOVER2000_>=25%TC_AREASQM	TREECOVER2000_<25%TC_AREASQM
1 LOS CACAOS	91.61025	8.389754	170310186	15597171
2 CAMBITA GARABITOS	88.01608	11.983923	152082966	20707019
3 GUANANICO	86.68482	13.315184	51772418	7952480
4 LA CIÉNAGA	86.25875	13.741251	100812553	16059711
5 SAN JOSÉ DE LAS MATAS	84.83461	15.165392	1288326327	230306637
6 ALTAMIRA	84.81078	15.189217	150498020	26953497
7 JARABACOA	83.88671	16.113288	565469306	108617561
8 SABANA DE LA MAR	83.82227	16.177732	428565345	82713285
9 EL VALLE	81.81502	18.184984	133096980	29583401
10 MONCIÓN	81.57768	18.422318	113607682	25655507
11 SAMANÁ	81.37407	18.625933	334161130	76487058
12 POLO	81.24050	18.759498	167925531	38776208
13 SÁNCHEZ	81.01879	18.981205	275912749	64641255
14 BONAO	80.30119	19.698809	544425648	133553899
15 CASTILLO	80.11398	19.886025	106634362	26468959
16 RANCHO ARRIBA	79.64393	20.356072	163233018	41720483
17 PIEDRA BLANCA	79.41746	20.582538	183684957	47605432
18 CONSTANZA	78.95450	21.045497	671456447	178978201
19 VILLA ALTAGRACIA	78.83552	21.164480	336034321	90213039
20 PARAÍSO	78.76318	21.236825	107250173	28917742

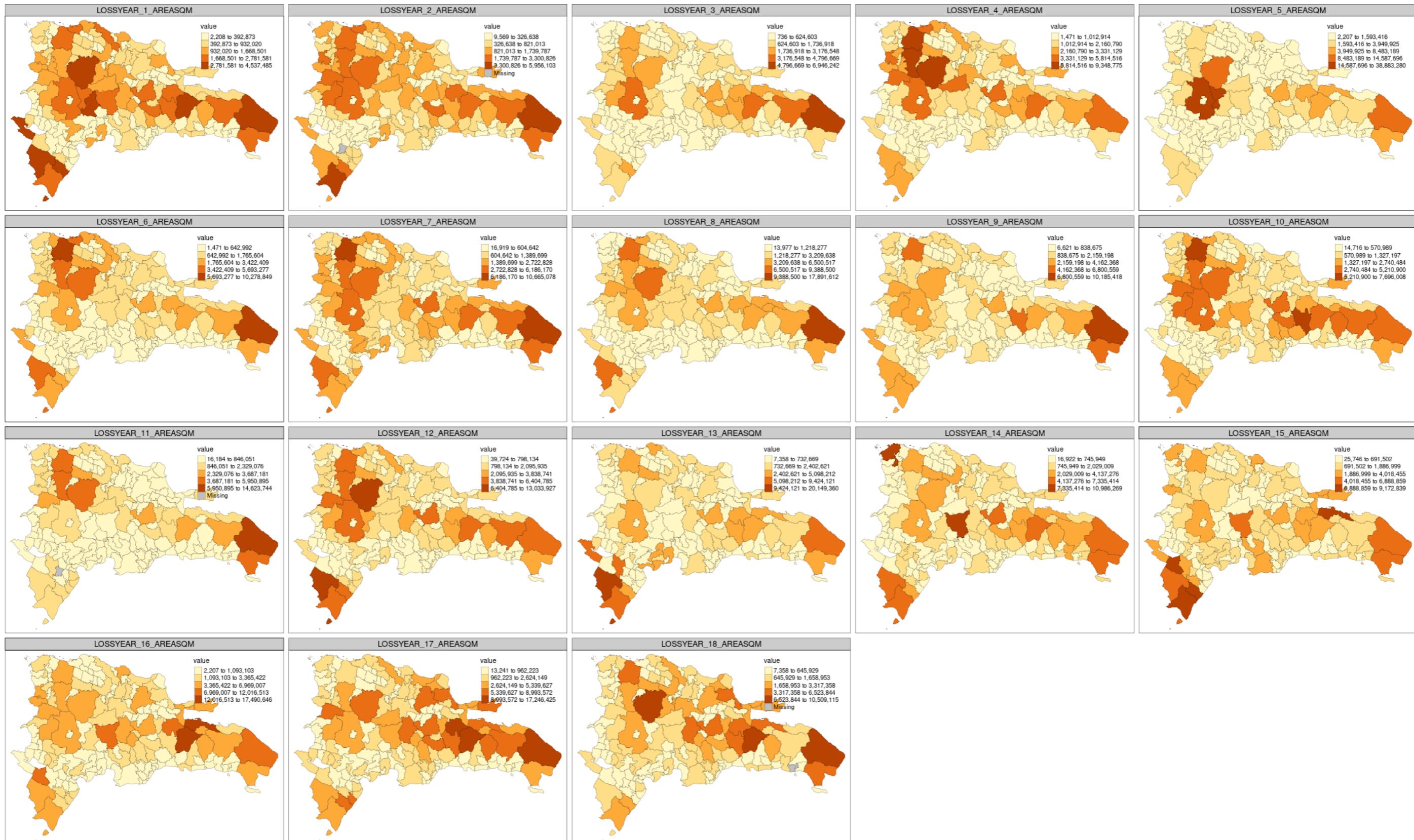
```
# Loss year
# * PCT
munzonal %>% select(matches('^LOSSYEAR_[1-9].*_PCT$')) %>%
gather(variable, value, -geom) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 5, nrow = 4, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 0.75)
```



```
# Top twenty sorted descending by column 2
stripped_table(munzonal %>% select(TOPONIMIA, matches('^LOSSYEAR_[1-9]_*_PCT$')))
```

TOPONIMIA	LOSSYEAR_1_PCT	LOSSYEAR_2_PCT	LOSSYEAR_3_PCT	LOSSYEAR_4_PCT	LOSSYEAR_5_PCT	LOSSYEAR_6_PCT	LOSSYEAR_7_PCT	LOSSYEAR_8_PCT	LOSSYEAR_9_PCT	LOSSYEAR_10_PCT	LOSSYEAR_11_PCT	LOSSYEAR_12_PCT	LOSSYEAR_13_PCT	LOSSYEAR_14_PCT	LOSSYEAR_15_PCT	LOSSYEAR_16_PCT	LOSSYEAR_17_PCT	LOSSYEAR_18_PCT
1 VILLA ISABELA	0.9994303	1.5587222	0.3272379	2.7457410	0.9591335	1.7873023	0.9785871	1.7650696	0.7962093	0.6961621	1.0209682	1.4430425	0.2285802	0.2813829	0.4140844	0.2567185	0.5169108	0.2938888
2 ENRIQUELLO	0.9741060	0.6360274	0.6564287	0.6322161	0.5140679	0.9698464	0.8297276	0.9187311	0.8747898	0.8351082	0.6281807	1.3886336	0.10225311	0.8126892	2.5122744	0.8505773	2.2737361	0.8274857
3 PADRE LAS CASAS	0.7909467	0.2051742	0.1373385	0.2603148	0.6518129	0.0943801	0.1906838	0.2786523	0.1831180	0.3991921	0.1084859	0.1606771	0.0784791	0.1559324	0.0732216	0.2397974	0.2336422	0.1301574
4 JIMANI	0.7506408	0.2061926	0.2002747	0.3275099	0.2027665	0.5861851	0.5534808	0.6794701	0.6883470	0.1169567	0.1164895	0.2161596	1.8974706	0.1579149	0.6850766	0.1737998	0.3672222	0.2677078
5 EL PINO	0.7186764	0.7379641	0.4729679	2.3866429	0.6272694	0.8780095	0.6046274	1.2905985	0.7295781	0.6130133	0.5744379	0.7144834	0.0654105	0.0687648	0.1601717	0.5702450	0.4025258	0.1635261
6 VALLEJUELO	0.7154490	0.2195768	0.1807694	0.7167757	0.4719907	0.4437973	0.5608828	0.8033461	0.8577427	0.3247216	0.2033242	0.4889067	0.4305298	0.3253850	0.3356673	0.8640448	0.3466130	0.4341784
7 SABANA IGLESIA	0.6179326	0.0800560	0.0037526	0.2864505	1.0469829	0.5691484	0.1826278	0.5178625	0.2289102	0.1350946	0.6967377	0.3877714	0.2126489	0.1751226	0.0738017	0.2326629	0.1601121	0.5829080
8 VILLA LOS ALMÁCIGOS	0.6153966	0.5817006	0.4160578	1.3347190	0.5469404	0.5448122	0.6120444	1.0218776	0.7423776	0.6707291	0.4564931	0.9328491	0.2933331	0.2564448	0.6827888	1.2985401	0.9651263	0.5178554
9 IMBERT	0.5791735	0.2706162	0.3579265	0.5074054	0.5869446	0.3085573	0.2962150	0.2825014	0.5810020	0.1220516	0.2980435	0.4356372	0.4552935	0.1572500	0.2751874	0.1993052	1.1652039	0.5668312
10 YAMASÁ	0.5714324	0.4617893	0.5136452	0.6785337	0.7605542	0.2899528	0.3712955	0.5080529	0.3624834	0.8571487	0.3902755	0.3824801	0.2641943	0.6415905	0.2760568	0.6668406	1.4157019	0.7641130
11 PEDRO BRAND	0.5579235	0.4431545	0.6362053	0.9287669	0.6282445	0.6192885	0.8305830	0.6113276	0.5592504	0.7741935	0.3509412	0.4769881	0.6073472	0.7798325	0.4560909	0.6279128	0.0936044	0.6892777
12 LOMA DE CABRERA	0.5183806	0.8317367	0.4897309	1.8267170	0.7105723	0.6750586	0.9466340	1.2996819	0.6046281	0.4828669	0.5512084	0.7445939	0.2581458	0.2572505	0.3491683	1.5339529	0.8627739	0.3351418
13 PIEDRA BLANCA	0.4968462	0.1663576	0.3253993	0.4141445	0.3352599	0.2710070	0.5391513	0.6794261	0.2121616	0.2407891	0.1669938	0.4895303	0.1526800	0.3918787	0.4768070	1.5652882	1.7755413	1.0477666
14 SOSÚA	0.4791335	0.6287596	0.1823568	0.7544565	0.6568144	0.6034552	0.4791335	0.7038476	0.5322177	0.1911583	0.4466778	0.6026300	0.2956765	0.7585822	0.8994067	1.4065951	0.7841616	0.5985043
15 VILLA MONTELLANO	0.4434884	0.4363518	0.2609955	0.6249618	0.1559856	0.2927431	0.3965907	0.4434884	0.3863956	0.2518198	0.1651612	0.8145913	0.1631222	0.5250494	0.4098444	0.8512938	0.4343127	0.2293905
16 PARTIDO	0.4430429	0.4793902	0.4710401	1.5712798	0.7804825	0.8649652	0.7524854	1.4288381	0.3182836	0.4422518	0.7023852	0.5761523	0.2401863	0.2667099	0.1458800	0.8227239	0.3870486	0.1552124
17 BOHECHÍO	0.4351024	0.1731715	0.2097621	0.4023157	7.9629891	0.11181044	0.2718937	0.5387154	0.2539607	0.1228141	0.1693675	0.6142515	0.0547048	0.0599579	0.0157593	0.1889308	0.2244346	0.1488985
18 SABANA GRANDE DE BOYÁ	0.4211248	0.4202882	0.6021249	0.6259700	1.0677328	0.3778968	0.4159654	0.6471657	0.2468182	0.4095509	0.4414839	0.5523429	0.5682397	0.6958321	0.5785586	2.2361451	3.0361428	0.9766750
19 ESPERANZA	0.4145645	0.1649628	0.0564259	0.4112454	0.1052177	0.3066914	0.2346654	0.3773898	0.1301115	0.1530138	0.1387414	0.4089219	0.1390733	0.1925119	0.2127589	0.3053638	0.3013808	0.3123340
20 BAYAGUANA	0.4138005	0.3508456	0.5494867	0.6481751	0.9717992	0.3920571	0.4871216	0.7446724	0.3075271	0.5049884	0.4105137	0.5175456	0.5072638	0.6392418	0.3631500	1.9532903	1.8679176	1.0832978

```
# * AREASQM
munzonal %>% select(matches('`^LOSSYEAR_[1-9]_*_AREASQM$`)) %>%
  gather(variable, value, -geom) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 5, nrow = 4, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 0.75)
```

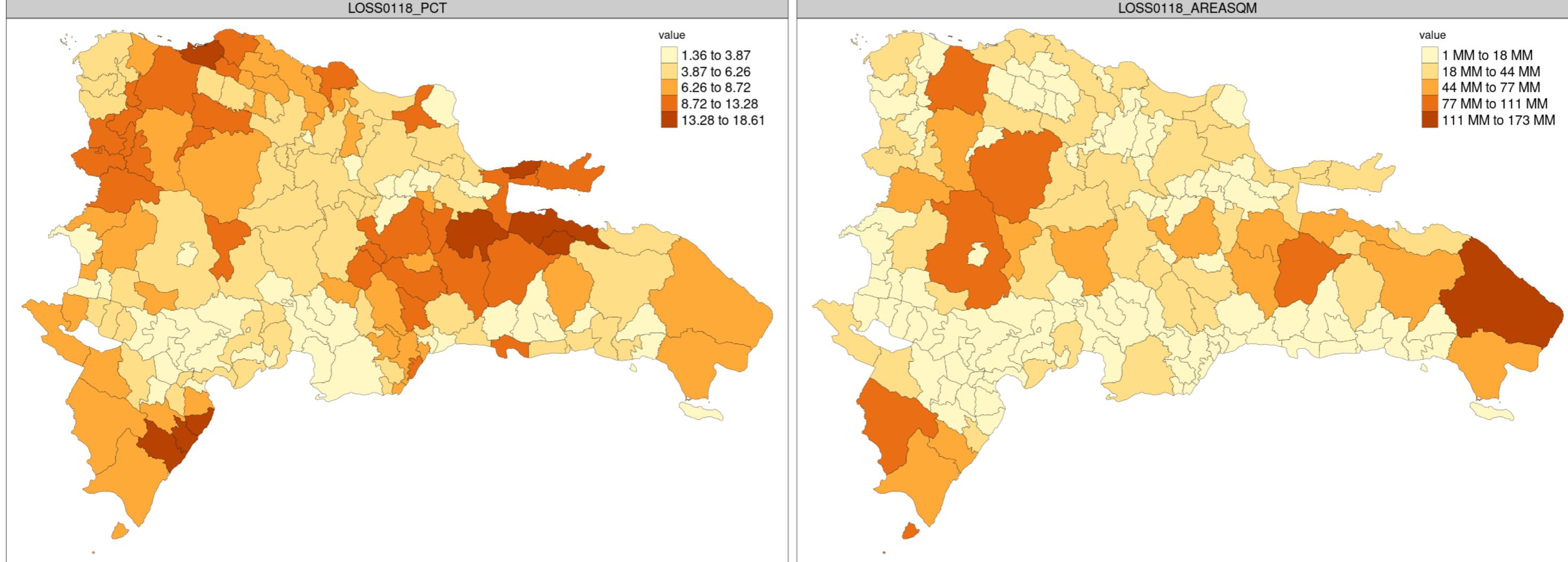


```
# Top twenty sorted descending by column 2
stripped_table(munzonal %>% select(TOPONIMIA, matches(`^LOSSYEAR_[1-9].*_AREASQM$`)))
```

TOPONIMIA	LOSSYEAR_1_AREASQM	LOSSYEAR_2_AREASQM	LOSSYEAR_3_AREASQM	LOSSYEAR_4_AREASQM	LOSSYEAR_5_AREASQM	LOSSYEAR_6_AREASQM	LOSSYEAR_7_AREASQM	LOSSYEAR_8_AREASQM	LOSSYEAR_9_AREASQM	LOSSYEAR_10_AREASQM	LOSSYEAR_11_AREASQM	LOSSYEAR_12_AREASQM	LOSSYEAR_13_AREASQM	LOSSYEAR_14_AREASQM	LOSSYEAR_15_AREASQM	LOSSYEAR_16_AREASQM	LOSSYEAR_17_AREASQM	LOSSYEAR_18_AREASQM
1 PADRE LAS CASAS	4537485	1177039.0	787880.5	1493368	3739305.7	541437.9	1093911	1598566	1050507	2290076.5	622359.4	921768.7	450217.4	894549.6	42005579	1375664.3	1340353.1	746684.1
2 HIGUÉY	4275742	551762.2	6946241.7	4942263	1458769.1	10665078	17891612	10185418	4795864.2	14623744.2	6404785	7417809.3	7335413.7	688859.08	12016512.6	17246425.0	10509114.9	
3 BAYAGUANA	3612216	3062658.6	4796669.3	5658157	8483189.3	3422408.8	4252262	6500517	2684516	4408227.4	3583524.0	4517845.0	442890.9	5580174.4	3170068.73	1630573.0	9456501.1	
4 JIMANI	3545830	973999.8	9460452	1547071	957815.6	2768984.4	2614498	3209638	3251570	552472.7	550265.8	1021081.4	8963152.6	745948.5	3236121.83	820984.8	1734661.4	1264581.4
5 PEDERNALES	3208272	987845.1	1530200.8	3331129	3038331.4	3838008.4	5890537	874243	3671011	1628045.4	2171708.0	13033926.6	20149360.3	6873397.1	5499159.08	5266686.3	4925333.8	1380123.4
6 ENRIQUILLO	3196619	2087182.4	2154131.1	2074675	1686961.3	3182640.5	2722828	3014901	2870703	2740484.4	2061432.9	4556929.0	3355530.1	2666914.4	8244260.07	2791247.8	7461474.7	2715470.6
7 SAN JOSÉ DE LAS MATAS	3020622	2031894.5	2254064.0	9348775	14481478.5	569227.2	6186170	9388800	4162368	3361968.9	10003512.6	1780298.6	2462256.0	1241795.06	6503239.5	6350222.1	7822279.0	
8 SAN JUAN	2781581	2398295.2	3915253.7	4937840	38883280.1	2736704.9	3531968	3927024	3764441	1984111.1	4561910.5	3832858.2	284484.9	20620924.4	3567280.1	3485204.2	2943429.1	
9 YAMASÁ	2480846	2229965.3	2945820	3301908.3	1258815.8	1611961	2205687	1573704	3721268.3	1694361.6	1660518.5	1146986.4	2785433.4	1198486.78	2895055.5	6146199.2	3317358.4	
10 COTÚI	2315862	1338167.8	2551273.2	4146922	5035601.2	2590263.2	4050551	4575077	3281785	4983369.3	3682270.2	5154778.3	3257508.0	6693781.7	3185413.19	5150364.4	8362261.4	6525843.9
11 SAN RAFAEL DEL YUMA	2298977	2665342.5	1678805.3	2037814.2	657407.6	3200912.3	4402266	4931215	6800559	1992201.9	5167365.6	3838740.6	5098212.4	535426.5	6334878.30	3954976.9	4960641.6	5467520.1
12 GUAYUBÍN	2229838	2415964.8	1922146.6	7265551	3673973.2	7808480.6	7467126	8599334	4604605	6685836.8	5950895.0	4369188.4	4340497.0	3244773.8	2710971.44	5528616.1	1859792.6	4998928.3
13 SABANA GRANDE DE BOYÁ	2221671	2217256.7	3176547.6	3302344	5632891.4	1995618.3	2194451	3414163	1302105	2160611.5	2329075.9	2913919.6	2997784.0	3670906.1	3052223.1	11766923.8	1601736.23	5152510.3
14 OVIEDO	2214411	5956103.1	1207258.5	2733804	2053295.9	2253402.1	1995913	2374054	3365022	1732537.4	5608859.9	9424120.6	7030202.7	8209505.20	4069071.9	3278210.9	2720561.9	
15 VILLA ISABELA	2116442	3300826.3	692974.9	2031108.0	3784878.9	2072304	3737998	1686092	1474226.9	2162052.3	3058857.5	484052.5	5958670.1	8768854.45	543639.6	1094635.5	2622533.3	
16 EL SEIBO	2045221	1878955.0	3848400.1	3299975	3949925.4	2794154.7	3629900	5375695	3382708	5210900.0	3212027.3	4325127.9	2363039.8	283382.1	1713424.54	5285204.8	6569721.4	1305116.0
17 COHONZANA	2031879	3882839.7	500013.3	1980100	2680000	3810556	1814935	2418600	8090709	2161353.9	4722204.0	1865598.8	1098385.3	5884400.83	1111050.0	388820.0	947500.0	
18 PUERTO PLATA	1987093	1553939.9	1536116.2	2948237	1227127.3	2203231.1	2072433	21890143	1805378	1110152.9	1401746.6	2415793.8	857948.4	1277889.8	1836276.5	344675.6	2777221.6	
19 BOHECHÍO	1981596	703331.8	851942.8	1633994	3254456.6	478297.7	2104289	1031454	498860	687881.3	249468.2	2222182.0	243817.3	6466.07	913534.7	834747.0		
20 MONTE PLATA	1753875	1341155.1	2901544.5	2867566	3080316.2	1644257.6	2608006	2842690	4920266	7696084	191525.6	3699027.9	5016641.0	3252603.1	2705852.12	2149673.7	587592.19	4255942.0

Total loss 2001-2018

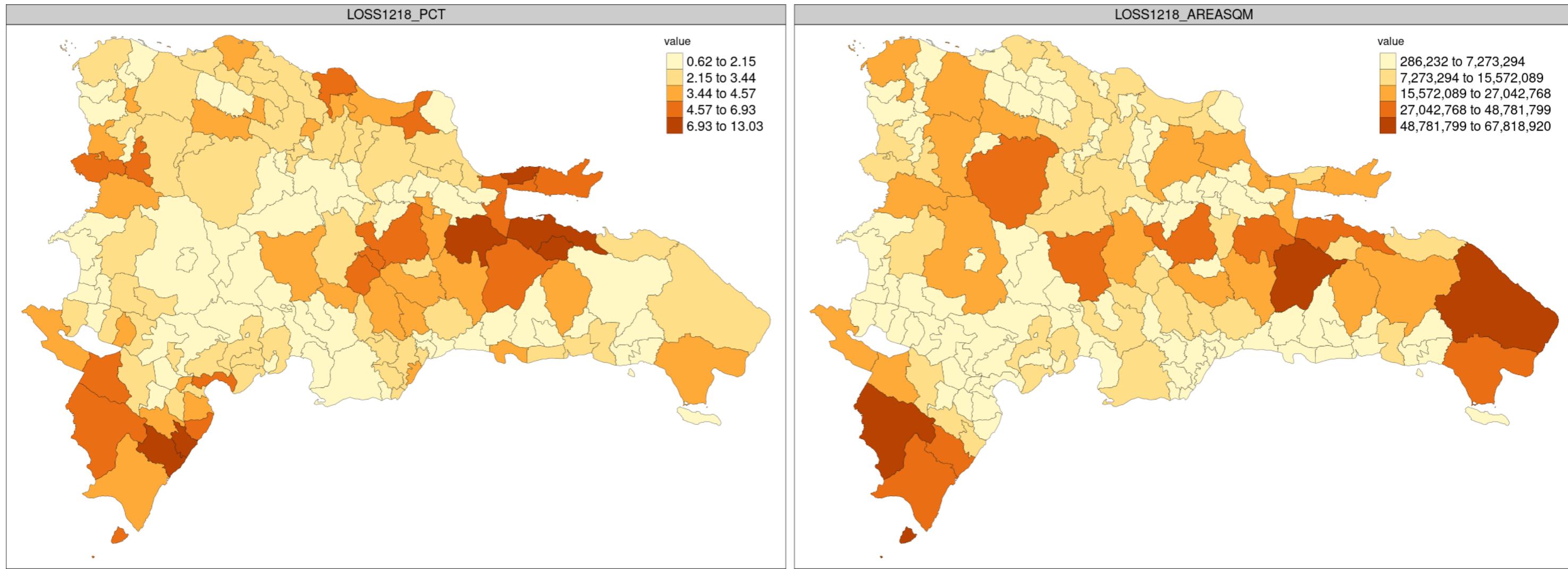
```
munzonal %>% select(matches('`LOSS0118`')) %>% select(-matches('<NA>')) %>%
gather(variable, value, -geom) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1)
```



```
# Top twenty sorted descending by column 2
stripped_table(munzonal %>% select(TOPONIMIA, matches(`^LOSS0118`)) %>% select(-matches(`<NA>`)))
```

	TOPONIMIA	LOSS0118_PCT	LOSS0118_AREASQM
1	LAS TERRENAS	18.60592	20803822
2	ENRIQUILLO	18.15716	59584385
3	VILLA ISABELA	17.06917	36146513
4	EL VALLE	16.79842	27327732
5	LA CIÉNAGA	15.10272	17650896
6	PARAÍSO	15.00678	20434419
7	SABANA GRANDE DE BOYÁ	14.32006	75546364
8	SABANA DE LA MAR	13.85536	70839509
9	LOMA DE CABRERA	13.27824	32730761
10	BAYAGUANA	12.71269	110973740
11	VILLA LOS ALMÁCIGOS	12.49025	25906886
12	BOHECHÍO	11.96513	48596055
13	RESTAURACIÓN	11.95832	33003809
14	EL PINO	11.77891	10334479
15	LAS MATAS DE SANTA CRUZ	11.74594	8424526
16	COTUÍ	11.62869	76879543
17	PEDRO BRAND	11.51339	25532014
18	SOSÚA	11.00357	29431673
19	PEDRO SANTANA	10.95457	60055728
20	PARTIDO	10.84866	16249652

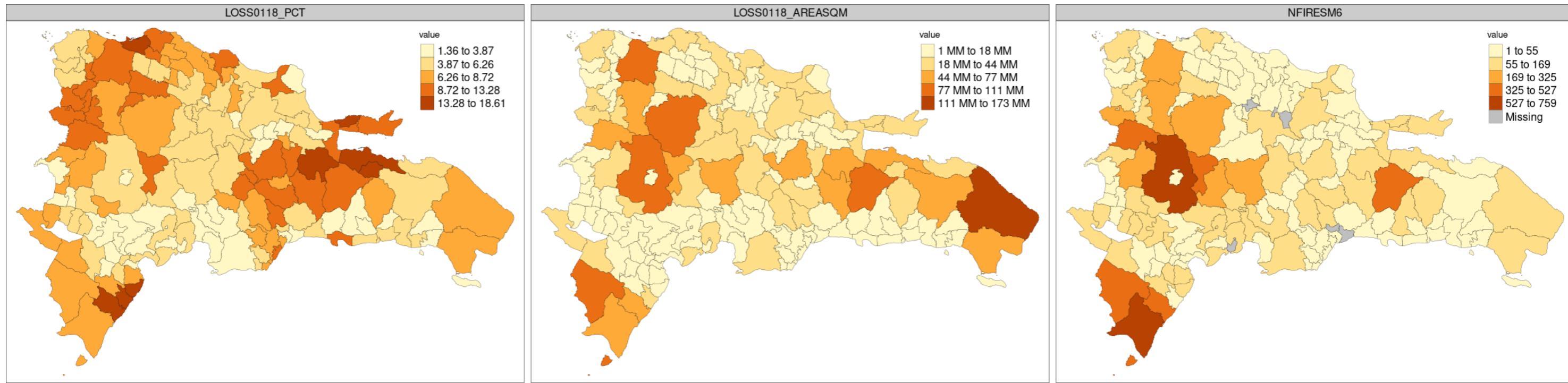
```
# Total loss 2012-2018
munzonal %>% select(matches(`^LOSS1218`)) %>% select(-matches(`<NA>`)) %>%
gather(variable, value, -geom) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1)
```



```
# Top twenty sorted descending by column 2
stripped_table(munzonal %>% select(TOPONIMIA, matches(`^LOSS1218`)) %>% select(-matches(`<NA>`)))
```

	TOPONIMIA	LOSS1218_PCT	LOSS1218_AREASQM
1	LAS TERRENAS	13.025658	14564368
2	ENRIQUILLO	9.687927	31791827
3	SABANA DE LA MAR	9.541138	48781799
4	SABANA GRANDE DE BOYÁ	8.643936	45601628
5	PARAÍSO	8.500673	11575189
6	EL VALLE	7.944483	12924115
7	BAYAGUANA	6.931707	60509395
8	SÁNCHEZ	6.359689	21658175
9	MAIMÓN	6.338366	5242823
10	SAMANÁ	6.082577	24977993
11	PIEDRA BLANCA	5.899492	13644958
12	COTUÍ	5.797430	38327951
13	LA CIÉNAGA	5.664938	6620741
14	RESTAURACIÓN	5.468702	15093089
15	RÍO SAN JUAN	5.459185	13348448
16	SOSÚA	5.345556	14297969
17	PEDERNALES	5.098481	57127986
18	DUVERGÉ	4.993313	22026878
19	VILLA LOS ALMÁCIGOS	4.946938	10260787
20	JAQUIMEYES	4.932285	5672865

```
# Fires M6
munzonal %>% select(matches('`^LOSS0118|NFIRESM6`')) %>% select(-matches('<NA>')) %>%
gather(variable, value, -geom) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 3, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1)
```



```
# Top twenty sorted descending by column 2
stripped_table(munzonal %>% select(TOPONIMIA, matches(`^LOSS0118|NFIRESM6`)) %>% select(-matches('<NA>')))
```

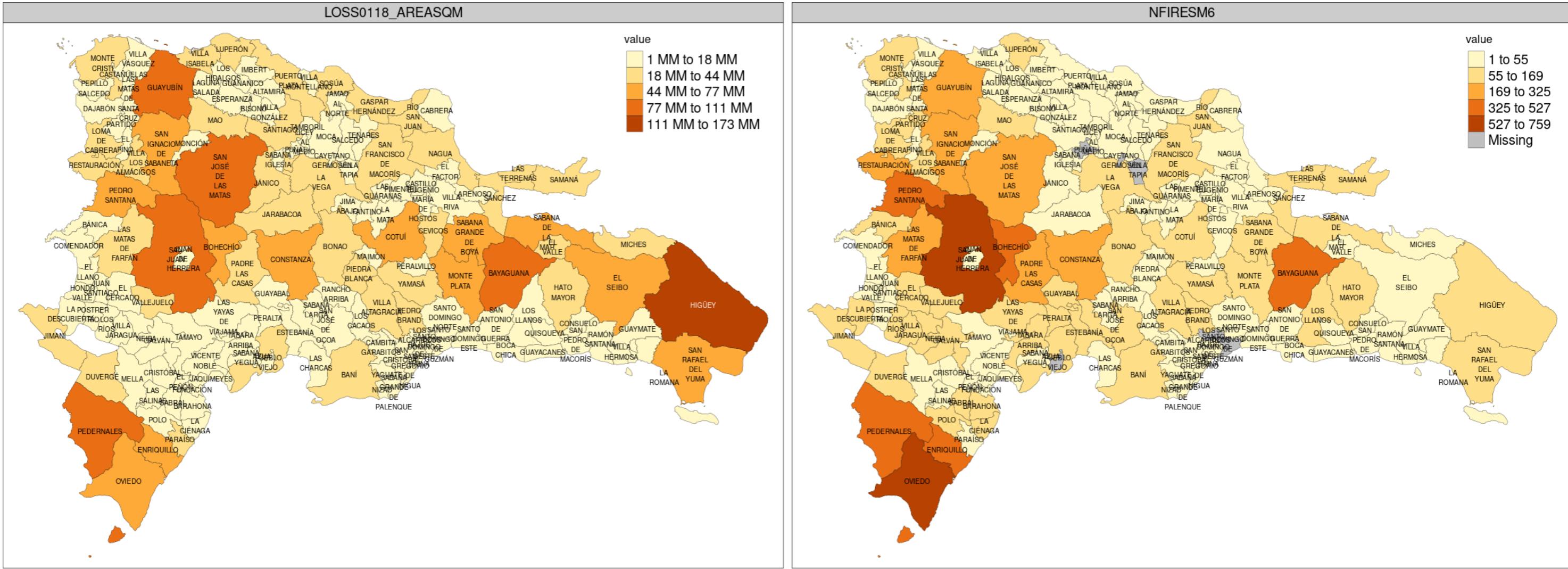
	TOPONIMIA	LOSS0118_PCT	LOSS0118_AREASQM	NFIRESM6
1	LAS TERRENAS	18.60592	20803822	68
2	ENRIQUILLO	18.15716	59584385	463
3	VILLA ISABELA	17.06917	36146513	49
4	EL VALLE	16.79842	27327732	26
5	LA CIÉNAGA	15.10272	17650896	71
6	PARAÍSO	15.00678	20434419	28
7	SABANA GRANDE DE BOYÁ	14.32006	75546364	155
8	SABANA DE LA MAR	13.85536	70839509	102
9	LOMA DE CABRERA	13.27824	32730761	89
10	BAYAGUANA	12.71269	110973740	422
11	VILLA LOS ALMÁCIGOS	12.49025	25906886	109
12	BOHECHÍO	11.96513	48596055	527
13	RESTAURACIÓN	11.95832	33003809	203
14	EL PINO	11.77891	10334479	28
15	LAS MATAS DE SANTA CRUZ	11.74594	8424526	27
16	COTUÍ	11.62869	76879543	136
17	PEDRO BRAND	11.51339	25532014	132
18	SOSÚA	11.00357	29431673	54
19	PEDRO SANTANA	10.95457	60055728	430
20	PARTIDO	10.84866	16249652	81

```
# Fires M6. Only AREASQM and FIRESM6
munzonal %>% select(matches(`^LOSS0118_AREASQM|NFIRESM6|TOPONIMIA`)) %>% select(-matches('<NA>')) %>%
gather(variable, value, -geom, -TOPONIMIA) %>%
mutate(TOPONIMIA=gsub(' ', '\n', TOPONIMIA)) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
```

```

tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1) +
tm_text(text = 'TOPONIMIA', size = 0.5)

```

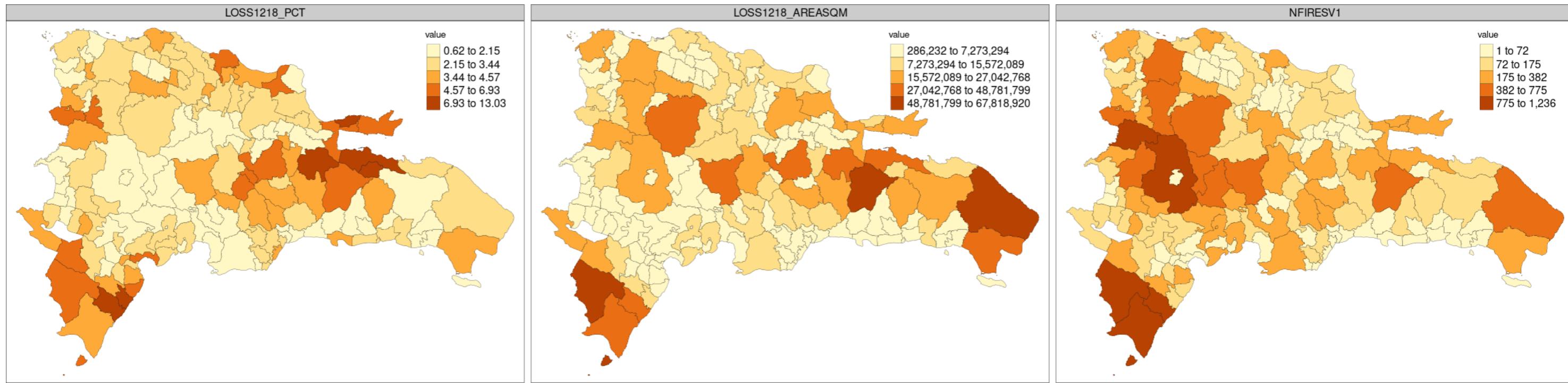


```

# Top twenty sorted descending by column 2
stripped_table(munzonal %>% select(TOPONIMIA, matches(`^LOSS0118_AREASQM|NFIRESM6|TOPONIMIA`)) %>% select(-matches('<NA>')))
```

	TOPONIMIA	LOSS0118_AREASQM	NFIRESM6
1	HIGÜEY	172531196	121
2	BAYAGUANA	110973740	422
3	SAN JOSÉ DE LAS MATAS	100892170	299
4	SAN JUAN	95509530	759
5	PEDERNALES	95166718	413
6	GUAYUBÍN	85736587	325
7	COTUÍ	76879543	136
8	SAN RAFAEL DEL YUMA	76759362	109
9	SABANA GRANDE DE BOYÁ	75546364	155
10	SABANA DE LA MAR	70839509	102
11	OVIEDO	67603535	599
12	EL SEIBO	63022977	55
13	SAN IGNACIO DE SABANETA	61756747	202
14	MONTE PLATA	60527072	82
15	PEDRO SANTANA	60055728	430
16	ENRIQUILLO	59584385	463
17	CONSTANZA	48663568	299
18	BOHECHÍO	48596055	527
19	YAMASÁ	44179210	117
20	SAMANÁ	42187655	73

```
# Fires V1
munzonal %>% select(matches('`^LOSS1218|NFIRESV1`')) %>% select(-matches('<NA>')) %>%
gather(variable, value, -geom) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 3, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1)
```



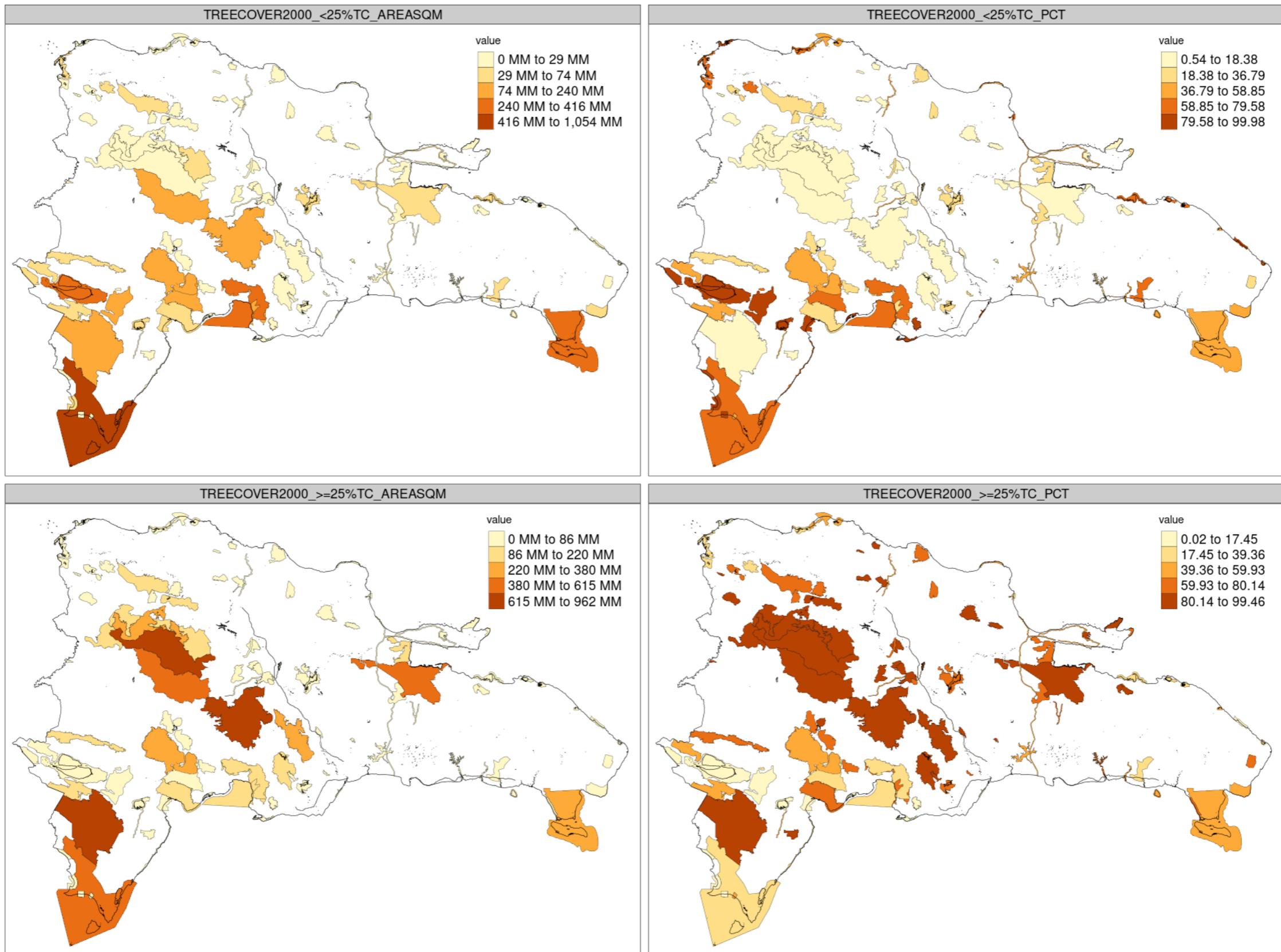
```
# Top twenty sorted descending by column 2
stripped_table(munzonal %>% select(TOPONIMIA, matches('`^LOSS1218|NFIRESV1`')) %>% select(-matches('<NA>')))
```

	TOPONIMIA	LOSS1218_PCT	LOSS1218_AREASQM	NFIRESV1
1	LAS TERRENAS	13.025658	14564368	261
2	ENRIQUILLO	9.687927	31791827	981
3	SABANA DE LA MAR	9.541138	48781799	355
4	SABANA GRANDE DE BOYÁ	8.643936	45601628	382
5	PARAÍSO	8.500673	11575189	100
6	EL VALLE	7.944483	12924115	67
7	BAYAGUANA	6.931707	60509395	775
8	SÁNCHEZ	6.359689	21658175	284
9	MAIMÓN	6.338366	5242823	28
10	SAMANÁ	6.082577	24977993	290
11	PIEDRA BLANCA	5.899492	13644958	126
12	COTUÍ	5.797430	38327951	256
13	LA CIÉNAGA	5.664938	6620741	160
14	RESTAURACIÓN	5.468702	15093089	484
15	RÍO SAN JUAN	5.459185	13348448	120
16	SOSÚA	5.345556	14297969	211
17	PEDERNALES	5.098481	57127986	892
18	DUVERGÉ	4.993313	22026878	340
19	VILLA LOS ALMÁCIGOS	4.946938	10260787	276
20	JAQUIMEYES	4.932285	5672865	58

11.4 Zonal, by protected areas

```
#Zonal statistics object
pazonal <- readRDS('out/pa_zonal_statistics.RDS')
pazonal <- pazonal %>% mutate(CATEGORY_NAME = paste(DESIG, NAME))
pazonal <- pazonal %>% filter(!grepl('Cartagena Convention', DESIG))

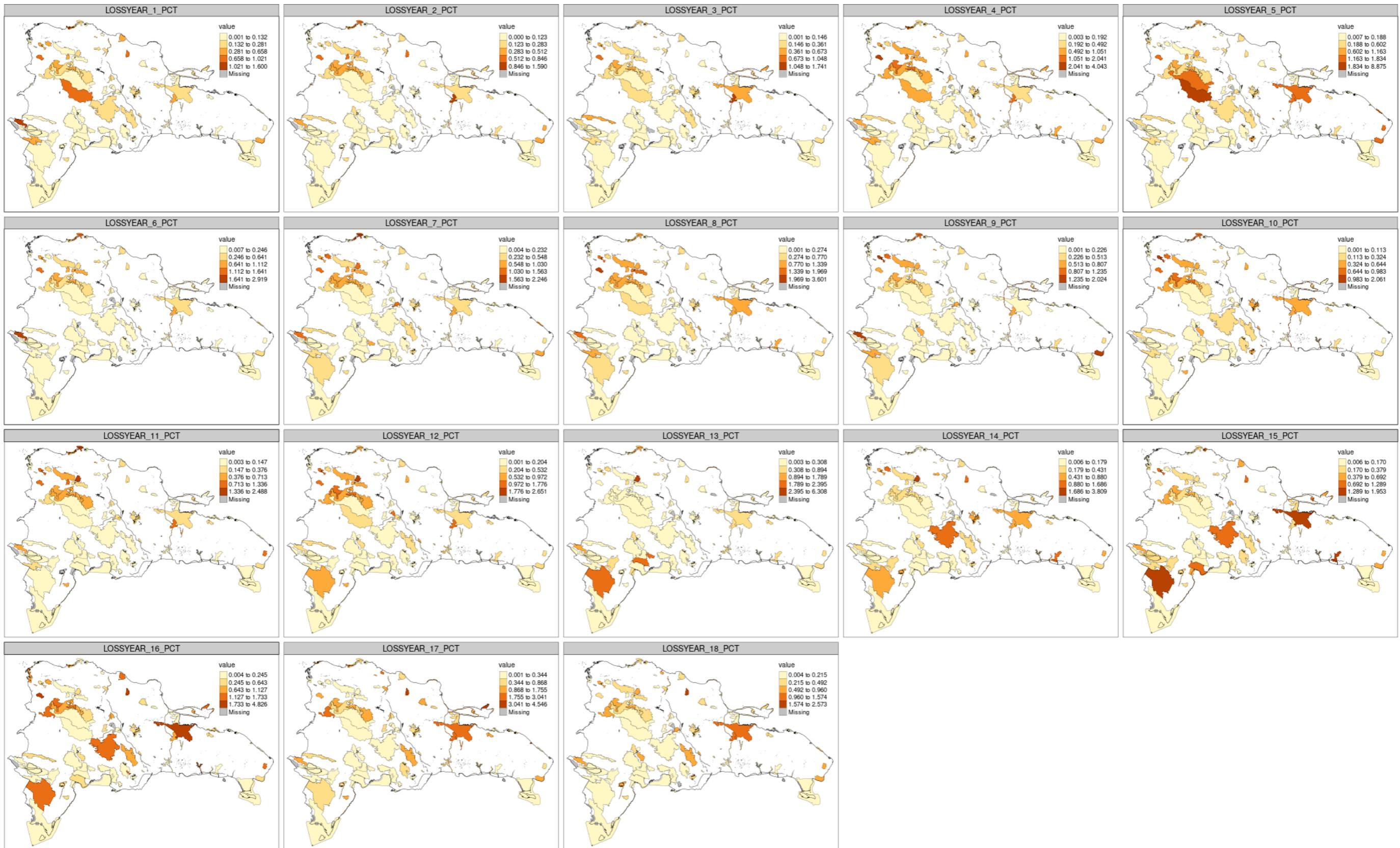
# Tree cover for pctc threshold
pazonal %>% select(matches('^TREECOVER2000')) %>%
  gather(variable, value, -geom) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 2, nrow = 2, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1) +
  tm_shape(shp = cline) + tm_borders(col = 'black', lwd = 0.5)
```



```
# Top twenty sorted descending by column 2
stripped_table(pazonal %>% select(CATEGORY_NAME, matches('^TREECOVER2000')))
```

CATEGORY_NAME	TREECOVER2000_>=25%TC_PCT	TREECOVER2000_<25%TC_PCT	TREECOVER2000_>=25%TC_AREASQM	TREECOVER2000_<25%TC_AREASQM
1 Reserva Científica Ébano Verde	99.45886	0.5411389	29737413	161796.2
2 Parque Nacional Armando Bermúdez	99.44928	0.5507213	798130271	4419814.0
3 Reserva Biológica Sierra Prieta	96.83358	3.1664212	3873387	126658.3
4 Monumento Natural Salto de Jimenoa	96.73826	3.2617410	16862472	568555.0
5 Monumento Natural Salto de La Damajagua	96.29039	3.7096131	5320742	204983.0
6 Reserva Científica Loma Barbacoa	95.98497	4.0150295	13157487	550374.7
7 Reserva Científica Loma Guaconejo	95.74294	4.2570610	22376360	994930.1
8 Área Nacional De Recreio Guagui	95.15097	4.8490329	39462770	2011080.6
9 Monumento Natural Loma Isabel de Torres	94.52917	5.4708282	15696490	908426.4
10 Parque Nacional Los Haitises	94.36072	5.6392834	596059009	35622299.1
11 Parque Nacional Montaña La Humeadora	94.02525	5.9747549	287161000	18247403.6
12 Reserva Científica Las Neblinas	93.37844	6.6215607	38076127	2700017.1
13 Reserva Forestal Loma Novillero	93.31888	6.6811206	12028318	861161.7
14 Parque Nacional Manolo Tavarez Justo	93.04410	6.9558961	327260774	24465730.1
15 Monumento Natural Diego de Ocampo	92.85590	7.1441013	23532983	1810569.0
16 Reserva Científica Loma Quita Espuela	92.70482	7.2951783	70211435	5525116.5
17 Parque Nacional Picky Lora	92.31943	7.6805670	103652897	8623460.9
18 Monumento Natural Cerro de San Francisco	90.71807	9.2819295	3651148	373571.7
19 Reserva Forestal Alto Mao	89.03664	10.9633598	187078973	23035618.6
20 Parque Nacional Saltos de la Jalda	88.18683	11.8131702	32129714	4303973.5

```
# Loss year
# * PCT
pazonal %>% select(matches('LOSSYEAR_[1-9].*_PCT$')) %>%
  gather(variable, value, -geom) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 5, nrow = 4, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 0.75) +
  tm_shape(shp = cline) + tm_borders(col = 'black', lwd = 0.5)
```



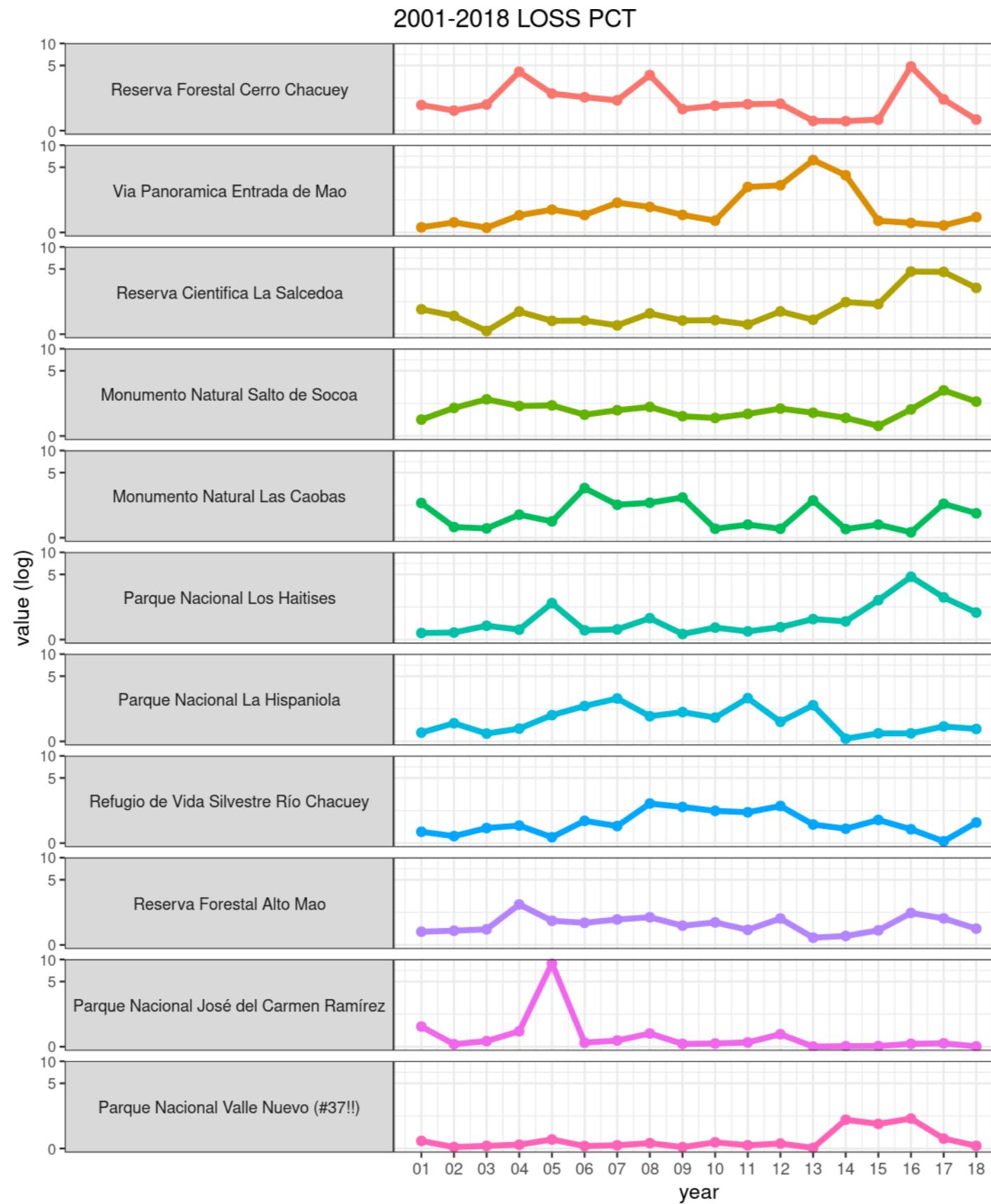
```
# Top twenty sorted descending by column 2
stripped_table(pazonal %>% select(CATEGORY_NAME, matches('`LOSSYEAR_[1-9].*_PCT$')))
```

CATEGORY_NAME	LOSSYEAR_1_PCT	LOSSYEAR_2_PCT	LOSSYEAR_3_PCT	LOSSYEAR_4_PCT	LOSSYEAR_5_PCT	LOSSYEAR_6_PCT	LOSSYEAR_7_PCT	LOSSYEAR_8_PCT	LOSSYEAR_9_PCT	LOSSYEAR_10_PCT	LOSSYEAR_11_PCT	LOSSYEAR_12_PCT	LOSSYEAR_13_PCT	LOSSYEAR_14_PCT	LOSSYEAR_15_PCT	LOSSYEAR_16_PCT	LOSSYEAR_17_PCT	LOSSYEAR_18_PCT
1 Monumento Natural Las Caobas	1.6004519	0.3431034	0.2921958	0.8863505	0.5690496	2.9191685	1.4777157	1.6157939	2.0244496	0.2810380	0.4358529	0.2803406	1.7894377	0.2705775	0.4372476	0.1617886	1.5453601	0.9595738
2 Reserva Forestal Cerro Chacuey	1.0207843	0.7388154	1.047217	4.0434400	1.7636884	1.5014036	1.3015000	3.6011002	0.8067032	0.9825049	1.0689880	1.0973431	0.3048175	0.2977288	0.3516035	4.8260413	1.3996280	0.3558567
3 Reserva Científica La Salcedoa	0.9838056	0.6652752	0.0928455	0.8641777	0.4428018	0.4553002	0.2749656	0.7695467	0.4570857	0.4713697	0.3071045	0.8695342	0.4874391	1.4158944	1.2891246	4.5922831	4.5458603	2.5728927
4 Santuario De Mamíferos Marinos Estero Hondo	0.8517657	0.4021599	NA	1.6786787	0.1061883	0.3298615	0.0406679	0.6100178	0.1852647	0.0542238	0.4654210	0.0180746	0.0474458	0.0361492	0.1355595	1.1274034	1.6131583	0.1174849
5 Parque Nacional José del Carmen Ramírez	0.7393416	0.0711377	0.1653339	0.527965	8.8746504	0.1188245	0.1854487	0.4381102	0.0808517	0.0924300	0.1257911	0.4098513	0.0030418	0.0140313	0.0169749	0.0827160	0.0977285	0.0075553
6 Refugio de Vida Silvestre Cañón Río Gurabo	0.6584242	0.8461970	0.3560368	1.8728510	1.1632160	1.0900578	0.7657229	1.1168825	0.3731070	0.3243349	1.2022338	0.7218280	0.3755456	0.3316507	0.2511766	0.1804570	0.1316848	0.0560880
7 Parque Nacional Punta Espada	0.5804178	0.04480575	0.3398440	0.5249696	1.4461258	0.4730987	0.7825356	0.4471632	1.7537741	0.1529298	0.3434213	0.2808185	0.5687916	0.2468341	0.6743221	0.6179795	1.0544108	0.8353009
8 Monumento Natural Salto de Socoa	0.5684204	1.1616015	1.7407874	1.2789458	1.3187783	0.7955732	1.0302619	1.2218885	0.7212910	0.6416260	0.8354057	1.1239221	0.8935396	0.6448557	0.3197365	1.0744006	2.5019109	1.5739216
9 Monumento Natural Lagunas Cabarete y Goleta	0.4733122	0.2424623	0.2099215	0.4313083	0.4087696	0.5409282	0.4640918	0.4886794	0.4200389	0.0737629	0.2366561	0.3319332	0.0440529	0.2755865	0.6915275	1.3205614	0.5883444	0.2971007
10 Reserva Forestal Las Matas	0.4634477	0.1678266	0.0508099	0.3033196	0.1431915	0.2463509	1.5627887	0.6328139	1.0439121	0.7590688	0.1801441	0.4819240	0.7482909	1.1378333	0.0631274	0.8406725	0.0215557	0.1216358
11 Reserva Forestal Alto Mao	0.4369518	0.4775660	0.2405091	0.9407769	0.8367908	1.0125519	1.1382455	0.6956918	0.8553472	0.5139786	1.0657704	0.2205767	0.2779966	0.4929713	1.4057385	1.0724227	0.5647462	
12 Vía Panorámica Carretera Santiago - La Cumbre - Puerto Plata	0.4204920	0.3574182	0.1051230	0.3013526	0.1156353	0.5396314	0.2242624	0.3013526	0.1927255	0.4239961	0.3434018	0.3784428	0.0560656	0.1051230	0.0770902	0.2873362	0.7358610	0.6307380
13 Reserva Biológica Loma Charco Azul	0.3784711	0.0996866	0.2124676	0.5968523	0.2716037	0.1305218	0.2433028	1.3183128	0.6948492	0.1279874	0.1879683	0.1579779	0.3083526	0.1972612	0.3370758	0.0604033	0.0274560	0.0084480
14 Refugio de Vida Silvestre Río Chacuey	0.3661892	0.2125036	0.5141827	0.6204345	0.1764538	0.8443222	0.5976663	1.9694526	1.7000285	1.4268096	1.3357366	1.7759226	0.6678683	0.4857224	0.8917560	0.4629542	0.0512285	0.7627360
15 Refugio de Vida Silvestre Monumento Natural Miguel Domingo Fuerte	0.2808064	0.2654498	0.0658140	0.1755040	0.3663647	0.1996358	0.2873878	0.5023803	0.1908606	0.4365663	0.4694733	0.6274269	0.0351008	0.0548450	0.2895816	0.6427835	1.4237764	0.2500932
16 Parque Nacional Aniana Vargas	0.2746660	0.0680990	0.1810299	0.2990682	0.3705721	0.2304017	0.4102966	0.3246053	0.1038510	0.4647758	0.2434540	0.1588977	0.1310906	0.5237949	0.1265507	0.2712611	0.7615740	0.3889467
17 Monumento Natural La Tinaja	0.2740955	0.2142928	0.2392106	0.1918668	0.2342271	0.1719326	0.2417024	0.2242599	0.1669491	0.1046546	0.0647862	0.0697698	0.0348849	0.4310774	0.1146217	0.5456992	1.2508721	0.4136350
18 Parque Nacional La Hispaniola	0.2711153	0.6451358	0.2374733	0.4195361	1.0547727	1.6405446	2.2461015	0.9954088	1.2348611	0.9202090	2.2797435	0.7104409	1.6979340	0.0771788	0.2453891	0.2453891	0.5066097	0.4056835
19 Parque Nacional Manolo Távarez Justo	0.2691917	0.3497191	0.2781856	1.0102531	0.6017595	0.4469795	0.7199361	0.9791139	0.3898782	0.4996883	0.5084732	0.8611205	0.1746504	0.2610343	0.2729566	1.1104418	0.7075955	0.4419596
20 Monumento Natural Salto de La Damajagua	0.2659221	0.1861455	0.4653636	0.6913974	0.5717325	0.2393299	0.2925143	0.4121792	0.7179896	0.1462571	0.4653636	0.3324026	0.1196649	0.0398883	0.0664805	0.0664805	1.7550858	0.0132961

```

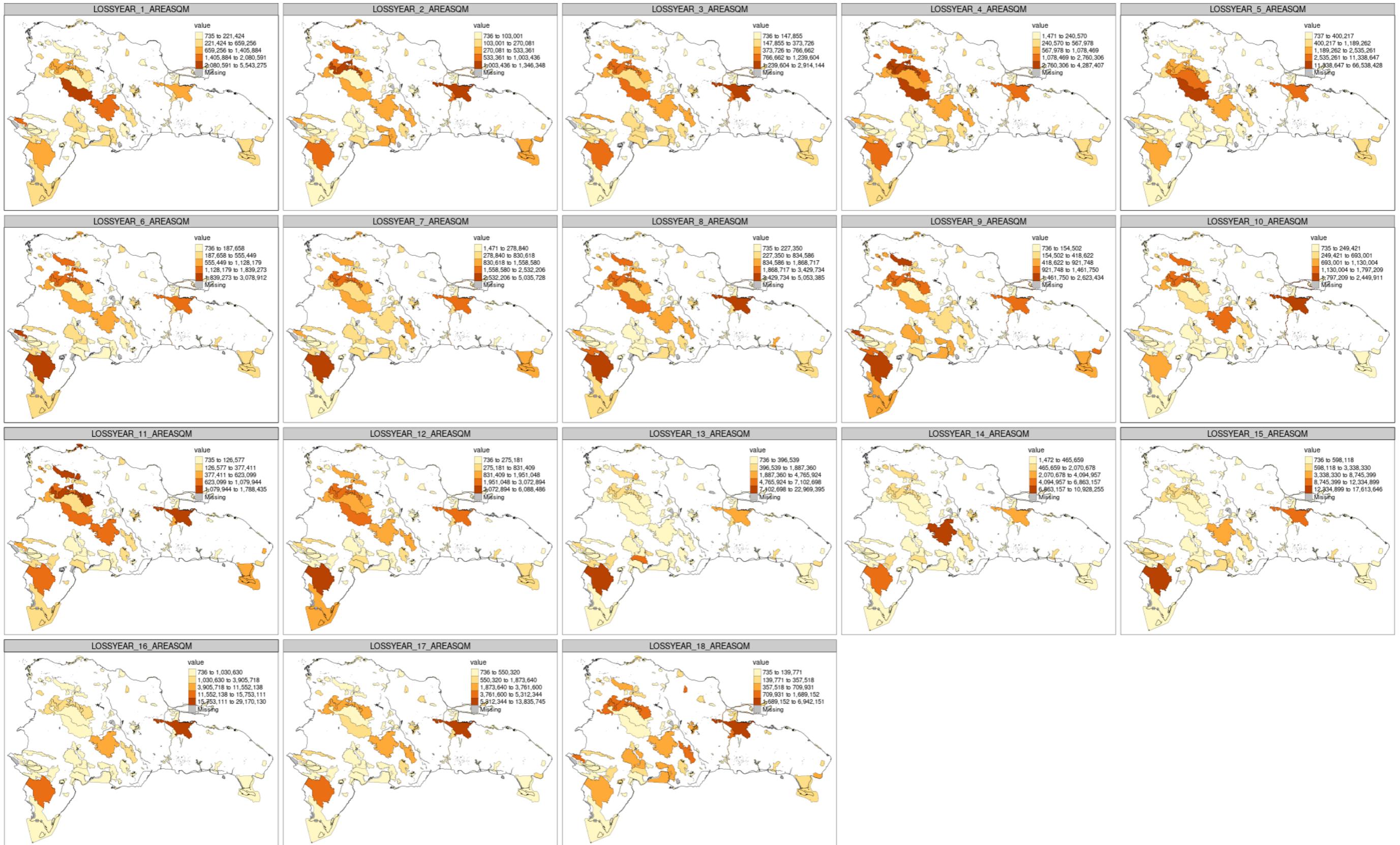
## ggplot
pazonal %>% select(CATEGORY_NAME, matches('`^LOSSYEAR_[1-9].*_PCT$|^LOSS0118_PCT$`)) %>%
  st_drop_geometry() %>%
  replace(is.na(.), 0) %>%
  arrange(desc(LOSS0118_PCT)) %>%
  slice(c(1:10,37)) %>%
  mutate(CATEGORY_NAME = gsub('Valle Nuevo', 'Valle Nuevo (#37!!)', CATEGORY_NAME)) %>%
  mutate(CATEGORY_NAME = fct_reorder(CATEGORY_NAME, desc(LOSS0118_PCT))) %>%
  gather(variable, value, -CATEGORY_NAME, -LOSS0118_PCT) %>%
  mutate(year = lubridate::as_date(
    paste0(2000 + as.numeric(gsub('`LOSSYEAR_`([0-9]{,2})(.*)', '\\\\2', variable)), '-01-01')))) %>%
  ggplot + aes(x=year, y=value, group = CATEGORY_NAME, colour = CATEGORY_NAME) +
  geom_path(lwd = 1.5) +
  geom_point(size = 2) +
  scale_x_date(breaks=date_breaks("1 year"), date_labels = "%y") +
  scale_y_continuous(n.breaks = 3, trans = 'log1p') +
  facet_grid(CATEGORY_NAME ~ ., switch = 'y') +
  ggtitle('2001-2018 LOSS PCT') +
  ylab('value (log)') +
  theme_bw() +
  theme(strip.text.y.left = element_text(angle = 0), legend.position="none",
        axis.text.y = element_text(size = 8), aspect.ratio=0.15)

```



```
# * AREASQM
pazonal %>% select(matches('^LOSSYEAR_[1-9].*_AREASQM$')) %>%
  gather(variable, value, -geom) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
```

```
tm_shape() +  
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +  
  tm_borders(col = 'grey15', lwd = 0.3) +  
  tm_facets(by = "variable", ncol = 5, nrow = 4, free.coords = FALSE, free.scales = TRUE) +  
  tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 0.75) +  
  tm_shape(shp = cline) + tm_borders(col = 'black', lwd = 0.5)
```



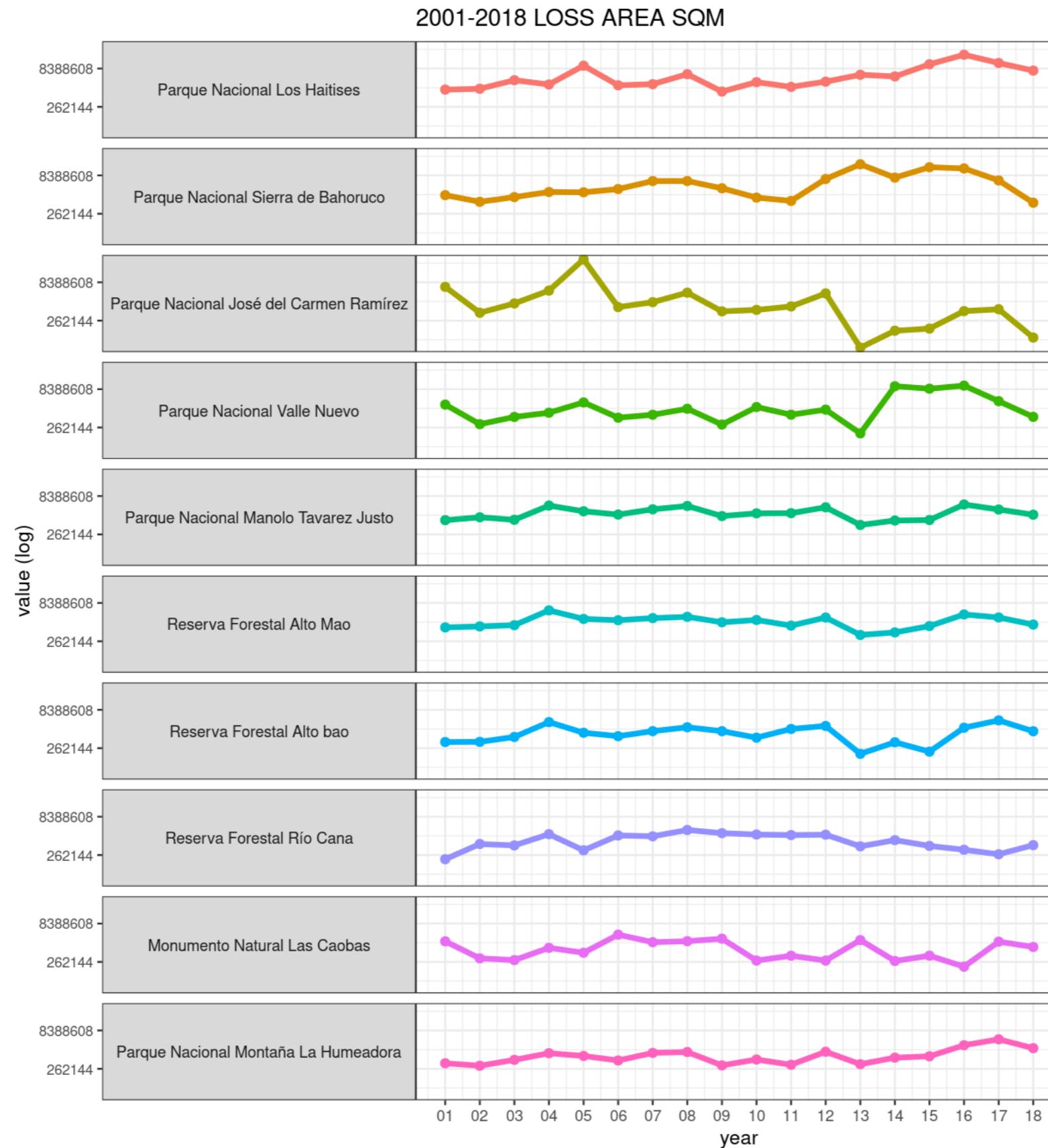
```
# Top twenty sorted descending by column 2
stripped_table(pazonal %>% select(CATEGORY_NAME, matches('^LOSSYEAR_[1-9].*_AREASQM$')))
```

CATEGORY_NAME	LOSSYEAR_1_AREASQM	LOSSYEAR_2_AREASQM	LOSSYEAR_3_AREASQM	LOSSYEAR_4_AREASQM	LOSSYEAR_5_AREASQM	LOSSYEAR_6_AREASQM	LOSSYEAR_7_AREASQM	LOSSYEAR_8_AREASQM	LOSSYEAR_9_AREASQM	LOSSYEAR_10_AREASQM	LOSSYEAR_11_AREASQM	LOSSYEAR_12_AREASQM	LOSSYEAR_13_AREASQM	LOSSYEAR_14_AREASQM	LOSSYEAR_15_AREASQM	LOSSYEAR_16_AREASQM	LOSSYEAR_17_AREASQM	LOSSYEAR_18_AREASQM	
1 Parque Nacional José del Carmen Ramírez	5543275.0	533360.902	1239604.3	3955698.72	66538427.81	890896.6	1390416.7	3284767.49	606192.3	693001.34	943129.21	3072894.47	22805.78	10520.8	127270.9	620170.0	732727.53	56464.61	
2 Parque Nacional Valle Nuevo	2080591.4	353877.104	682004.3	996153.01	2535260.92	637861.6	1428751.22	342105.7	1667857.37	835032.25	1316187.40	154499.36	1092824.7	8745399.4	11552137.8	2833223.97	68618.58		
3 Monumento Natural Caobas	1688032.2	361878.800	308185.4	934853.57	600189.23	3078911.9	1558579.6	1704213.78	2135232.0	296416.98	4597037.36	295681.46	1887397.76	285384.1	461174.8	170642.0	1629925.65	1012083.80	
4 Parque Nacional Sierra de Bahoruco	1405884.1	770992.424	1182237.4	1873040.76	1824485.89	2444664.0	5035782.1	2623434.1	1130004.16	836467.93	6088485.98	22966394.53	6863156.8	17613645.6	15753111.4	5312343.79	709931.00		
5 Parque Nacional Los Haitises	12477626.6	1346347.660	2914143.8	1986414.38	10892908.99	1839272.8	2040857.7	5036664.52	1044706.9	2449911.32	1993545.92	2581739.10	4766923.57	409464.59	12334898.8	29470130.3	13833745.41	6942151.10	
6 Parque Nacional Monte Verde Justo	948332.7	123003.749	97945.6	1002455.01	2116547.55	1572145.3	2535260.9	304526.9	1371391.1	1788436.26	3072894.47	916127.0	96295.07	304526.9	248801.97	155412.07	248801.97	155412.07	
7 Reserva Forestal Alto Maro	918099.6	1002455.01	1110012.1	4287607.21	1995898.58	1786309.5	2237592.2	2291639.97	1449489.1	1292942.85	1039944.05	2238939.03	888011.4	1008804.6	2985601.73	2333163.61	1186914.28	1186914.28	
8 Reserva Biológica Loma Charco Azul	659256.4	173643.414	370095.9	1039653.15	473104.72	227355.1	423807.7	2294361.57	1210353.5	222940.48	275180.66	537117.34	343607.9	587150.2	105216.1	47825.52	14715.54	14715.54	
9 Parque Nacional Cotubanama (Océano)	5406904.4	438437.356	237609.5	103742.74	432552.59	995311.6	712828.52	921748.3	224368.11	559816.82	521563.90	235402.61	183908.3	213333.6	177287.6	387678.67	357317.71	357317.71	
10 Reserva Forestal Cerro Chacuey	529715.1	381836.335	543693.7	2086260.55	915230.06	779122.7	675386.8	1868717.32	418622.1	509850.83	554729.47	569443.78	158178.83	154500.3	182457.5	2504375.5	705551.15	184664.59	
11 Parque Nacional Pintad Espada	477322.9	368472.701	279480.3	431723.50	1189962.19	388006.0	643540.1	367737.23	1442765.4	125766.13	284272.19	230938.98	467761.75	202990.9	554547.7	508212.8	867124.38	686933.14	
12 Reserva Forestal Alto bao	456127.4	464219.973	719504.2	2760306.40	1054978.51	773209.5	1219772.9	1730341.32	1215358.8	676834.19	1488299.53	1951048.13	156701.83	447299.1	190543.5	1662657.9	3226733.44	1207266.20	
13 Parque Nacional Montaña La Humeadora	432587.7	345775.901	587819.0	1072640.99	837954.79	555448.5	1104275.8	1192559.01	357547.0	607682.75	377410.72	1224193.83	396538.75	715829.7	812941.2	2205608.8	376160.39	1689152.06	
14 Parque Nacional Nalga de Maco	422265.6	361941.939	598822.6	1078469.27	782000.57	642961.9	733447.4	1092446.70	663560.2	1030651.74	623099.23	1371259.70	136831.71	150073.5	923246.2	2805785.7	1018145.62	1018145.62	
15 Parque Nacional Francisco Alcaíno Díaz	409038.8	481871.299	186127.4	309721.86	331792.30	108880.8	434052.0	359748.39	658434.8	173620.80	126537.20	169942.40	204519.42	240567.8	764372.9	251603.0	356096.78	468629.03	
16 Reserva Científica La Selvadilla	405489.4	270080.935	38267.6	356183.03	182507.01	187658.4	113331.0	317179.52	188394.3	194281.65	126577.44	358390.78	531330.9	1892774.3	1873640.49	1060454.02	1060454.02		
17 Reserva Forestal de Torno	3890915.5	220630.0	1235991.4	617957.50	831299.93	112556.8	443604.9	306993.0	564899.3	112556.8	66588.8	846582.61	985380.9	103380.93	226584.2	11034.95	1942150.0	1942150.0	
18 Monumento Natural Salto de Socoa	388523.9	739359.39	11166.6	873404.04	90452.52	543410.2	703095.5	833558.18	497264.52	438249.66	570636.84	70795.22	610314.12	444455.6	713895.5	733847.6	170870.34	107300.24	107300.24
19 Parque Nacional Atacorao	3737256.6	2207.041	379258.6	625328.83	193488.92	251602.7	646663.0	47083.54	696268.6	112589.09	104466.61	153275.19	264844.92	320203.9	278800.1	297634.7	80189.15	512033.50	
20 Reserva Forestal Hatillo	365633.5	520126.470	27958.8	303175.62	113294.9	430373.4	359748.01	388439.6	202312.28	112559.19	225118.39	267787.89	404624.6	868839.3	282501.5	347241.43	497320.36	497320.36	

```

## ggplot
pazonal %>% select(CATEGORY_NAME, matches('^LOSSYEAR_[1-9]_*_AREASQM|^LOSS0118_AREASQM')) %>%
  st_drop_geometry() %>%
  replace(is.na(.), 0) %>%
  arrange(desc(LOSS0118_AREASQM)) %>%
  slice(c(1:10)) %>%
  mutate(CATEGORY_NAME = fct_reorder(CATEGORY_NAME, desc(LOSS0118_AREASQM))) %>%
  gather(variable, value, -CATEGORY_NAME, -LOSS0118_AREASQM) %>%
  mutate(year = lubridate::as_date(
    paste0(2000 + as.numeric(gsub('LOSSYEAR_([0-9]{2})', '\1\2', variable)), '-01-01'))) %>%
  ggplot + aes(x=year, y=value, group = CATEGORY_NAME, colour = CATEGORY_NAME) +
  geom_path(lwd = 1.5) +
  geom_point(size = 2) +
  scale_x_date(breaks=date_breaks("1 year"), date_labels = "%y") +
  scale_y_continuous(n.breaks = 3, trans = 'log2') +
  facet_grid(CATEGORY_NAME ~ ., switch = 'y') +
  ggtitle('2001-2018 LOSS AREA SQM') +
  ylab('value (log)') +
  theme_bw() +
  theme(strip.text.y.left = element_text(angle = 0), legend.position="none",
        axis.text.y = element_text(size = 8), aspect.ratio=0.15)

```

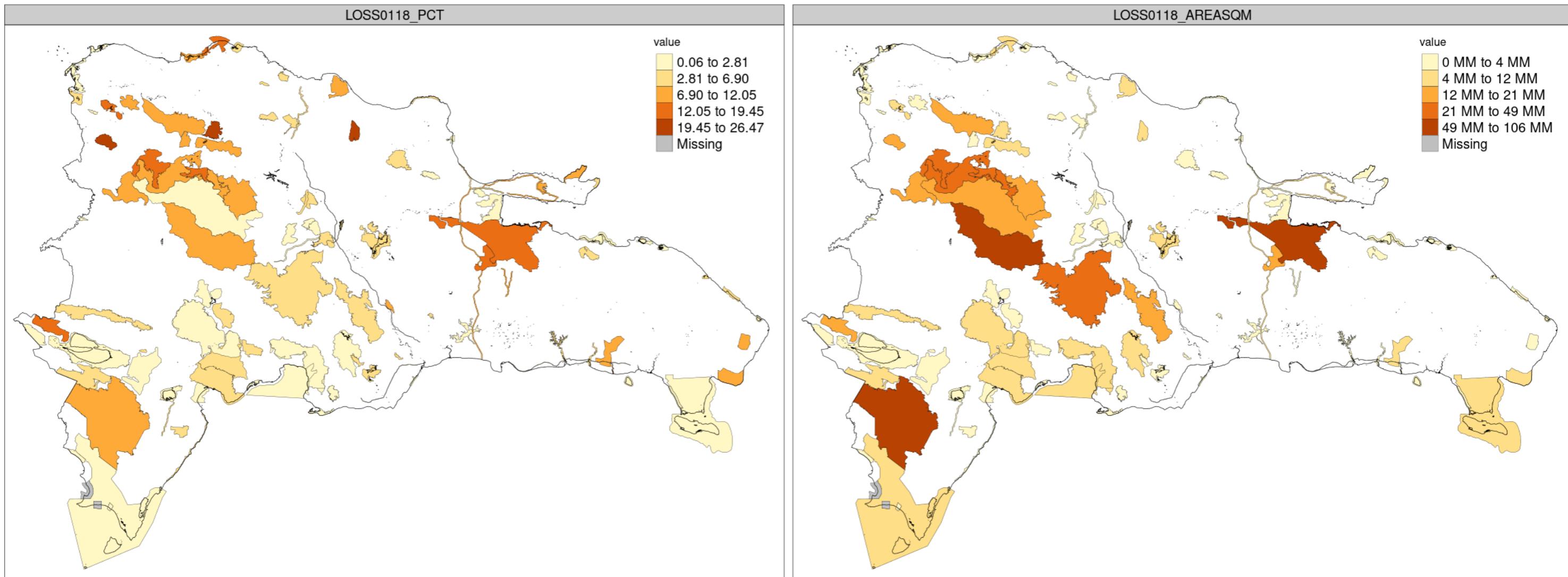


```
# Total loss 2001-2018
pazonal %>% select(matches('^LOSS0118')) %>% select(-matches('<NA>')) %>%
  gather(variable, value, -geom) %>%
```

```

mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1) +
tm_shape(shp = cline) + tm_borders(col = 'black', lwd = 0.5)

```



```

# ALL sorted descending by column 2
stripped_table(
  pazonal %>% select(CATEGORY_NAME, matches('^LOSS0118')) %>% select(-matches('<NA>')),
  n = nrow(pazonal),
  long_table = T
)

```

	CATEGORY_NAME	LOSS0118_PCT	LOSS0118_AREASQM
1	Reserva Forestal Cerro Chacuey	26.4666686	1.373434e+07
2	Via Panoramica Entrada de Mao	22.6278261	1.230196e+07
3	Reserva Cientifica La Salcedoa	21.5473066	8.881026e+06
4	Monumento Natural Salto de Socoa	19.4468667	1.328279e+07

(continued)

	CATEGORY_NAME	LOSS0118_PCT	LOSS0118_AREASQM
5	Monumento Natural Las Caobas	17.8894956	1.886845e+07
6	Parque Nacional Los Haitises	16.7961407	1.060981e+08
7	Parque Nacional La Hispaniola	15.8335312	8.680829e+06
8	Refugio de Vida Silvestre Río Chacuey	14.8619676	5.762642e+06
9	Reserva Forestal Alto Mao	14.5829176	3.064084e+07
10	Parque Nacional José del Carmen Ramírez	12.0514154	9.035649e+07
11	Refugio de Vida Silvestre Cañón Río Gurabo	11.8174946	3.564134e+06
12	Parque Nacional Punta Espada	11.5707949	9.515568e+06
13	Via Panoramica Autovia Santo Domingo - Samana - Boulevard del Atlantico	11.5427912	1.192278e+07
14	Parque Nacional Nalga de Maco	10.8284097	1.795879e+07
15	Parque Nacional Cabo Cabrón	10.8114248	3.851405e+06
16	Monumento Natural Hoyo Claro	10.4508619	4.106759e+06
17	Parque Nacional Manolo Tavarez Justo	9.8789370	3.474684e+07
18	Parque Nacional Sierra de Bahoruco	9.1085863	9.949039e+07
19	Reserva Forestal Las Matas	8.9687134	4.285024e+06
20	Monumento Natural Río Cumayasa y Cueva de las Maravillas	8.4629858	7.511724e+06
21	Monumento Natural Salto El Limón	8.3638311	1.377940e+06
22	Reserva Forestal Alto bao	8.1503086	2.140120e+07
23	Monumento Natural Salto Grande	7.9794657	1.177706e+06
24	Parque Nacional Picky Lora	7.8947713	8.863962e+06
25	Santuario De Mamiferos Marinos Estero Hondo	7.8195251	2.544674e+06
26	Reserva Forestal Loma Novillero	7.7993952	1.005301e+06
27	Reserva Forestal Río Cana	7.4888845	1.946716e+07
28	Monumento Natural Lagunas Cabarete y Goleta	7.4869378	5.375732e+06
29	Monumento Natural Salto de La Damajagua	6.9006781	3.813125e+05
30	Refugio de Vida Silvestre Monumento Natural Miguel Domingo Fuerte	6.5638506	2.200773e+06
31	Via Panoramica Carretera Nagua - Sánchez	6.5527937	1.103949e+06
32	Via Panoramica Mirador del Paraíso	6.4120055	1.347963e+06
33	Parque Nacional Saltos de la Jalda	6.3589184	2.316788e+06
34	Parque Nacional Montaña La Humeadora	5.9846313	1.827757e+07
35	Monumento Natural Loma Isabel de Torres	5.8831353	9.768897e+05
36	Via Panoramica Carretera Santiago - La Cumbre - Puerto Plata	5.5960474	1.174054e+06
37	Parque Nacional Valle Nuevo	5.3641486	4.860623e+07
38	Monumento Natural Cabo Samaná	5.3621004	4.970983e+05
39	Reserva Biológica Loma Charco Azul	5.3589984	9.334805e+06
40	Parque Nacional Aniana Vargas	5.3429353	6.925885e+06
41	Via Panoramica Carretera Bayacanes-Jarabacoa	5.1178604	8.304956e+05
42	Monumento Natural La Tinaja	4.9885378	1.472586e+06
43	Via Panoramica Mirador del Atlántico	4.8032548	5.819625e+05
44	Reserva Cientifica Las Neblinas	4.7686062	1.944454e+06
45	Refugio de Vida Silvestre Río Soco	4.4230649	5.203307e+05
46	Via Panoramica Vía Panorámica Costa Azul	4.3664582	8.322460e+05
47	Reserva Forestal Loma El 20	4.2928178	2.147130e+06
48	Via Panoramica Carretera Cabral - Polo	4.2766019	4.345775e+05
49	Refugio de Vida Silvestre Ría Maimón	4.2676421	2.060333e+05
50	Corredor Ecológico Autopista 6 de Noviembre	4.2652112	1.549519e+05
51	Reserva Forestal Villarpando	4.2454794	3.377307e+06
52	Area Nacional De Recreo Guagui	4.2107689	1.746368e+06
53	Parque Nacional Máximo Gómez	4.2038593	1.778012e+06
54	Parque Nacional Sierra de Neiba	3.8649577	7.072866e+06
55	Refugio de Vida Silvestre Río Higuamo	3.8293304	7.081435e+05

(continued)

	CATEGORY_NAME	LOSS0118_PCT	LOSS0118_AREASQM
56	Monumento Natural Las Marías	3.8115492	1.716999e+05
57	Reserva Científica Loma Quita Espuela	3.4800012	2.635633e+06
58	Refugio de Vida Silvestre Bahía de Luperón	3.2791403	6.126976e+05
59	Reserva Forestal Barrero	3.2605838	1.012874e+07
60	Parque Nacional Sierra Martín García	3.2280569	8.441457e+06
61	Monumento Natural Reserva Antropológica Cuevas de Borbón o del Pomier	3.1927358	1.603398e+05
62	Monumento Natural Diego de Ocampo	3.1409661	7.960324e+05
63	Corredor Ecológico Autopista Juan Bosch	3.1337140	1.738543e+05
64	Reserva Biológica Sierra Prieta	3.0743741	1.229764e+05
65	Refugio de Vida Silvestre Laguna Saladilla	3.0472813	9.481367e+05
66	Reserva Científica Loma Barbacoa	2.9683306	4.068947e+05
67	Monumento Natural Saltos de Jima	2.9440900	5.465493e+05
68	Parque Nacional Luis Quin	2.8069861	5.538027e+06
69	Vía Panorámica Carretera El Abanico - Constanza	2.7128399	6.170540e+05
70	Monumento Natural Cerro de San Francisco	2.6310981	1.058943e+05
71	Parque Nacional Baiguate	2.5817049	1.353512e+06
72	Refugio de Vida Silvestre Laguna Cabral o Rincón	2.5207767	1.412513e+06
73	Reserva Forestal Guanito	2.2209652	1.531254e+06
74	Parque Nacional Armando Bermúdez	2.1521028	1.727170e+07
75	Corredor Ecológico Autopista Duarte	2.0818581	2.158105e+05
76	Reserva Forestal Hatillo	1.9647072	6.270945e+06
77	Parque Nacional La Gran Sabana	1.9438134	4.268147e+06
78	Parque Nacional Humedales del Ozama	1.9053804	8.844452e+05
79	Reserva Científica Loma Guaconejo	1.8671873	4.363857e+05
80	Parque Nacional Manglares del Bajo Yuna	1.7645273	2.137810e+06
81	Reserva Forestal Arroyo Cano	1.4002585	3.346449e+05
82	Reserva Científica Ébano Verde	1.3922027	4.162576e+05
83	Reserva Forestal Cayuco	1.3722628	6.914752e+04
84	Parque Nacional El Morro	1.1670811	2.143125e+05
85	Refugio de Vida Silvestre Lagunas Redonda y Limón	1.1499667	3.053692e+05
86	Refugio de Vida Silvestre Humedales del Bajo Yaque del Sur	1.1086223	6.481264e+05
87	Parque Nacional Cotubanamá (Del Este)	1.0818280	8.615735e+06
88	Parque Nacional Francisco Alberto Caamaño Deñó	1.0273068	6.035530e+06
89	Parque Nacional Anacaona	0.8662760	4.668627e+06
90	Parque Nacional Manglares de Estero Balsa	0.8484612	4.797743e+05
91	Monumento Natural Salto de Jimenoa	0.8439175	1.471035e+05
92	Reserva Forestal Cabeza de Toro	0.7569748	2.843338e+06
93	Parque Nacional Lago Enriquillo e Isla Cabritos	0.6845694	2.772054e+06
94	Área Nacional De Recreación Boca de Nigua	0.6713110	3.903465e+04
95	Refugio de Vida Silvestre La Gran Laguna o Perúcho	0.6343772	4.643403e+04
96	Refugio de Vida Silvestre Manglar de la Jina	0.4690262	2.479481e+05
97	Monumento Natural Las Dunas de las Calderas	0.4461092	7.797633e+04
98	Refugio de Vida Silvestre Manglares de Puerto Viejo	0.4427118	4.929034e+04
99	Reserva Forestal Cerro de Bocanigua	0.3878312	1.132792e+05
100	Parque Nacional Jaragua	0.3557469	5.460767e+06
101	Monumento Natural Los Cachos	0.2519722	1.405244e+05
102	Monumento Natural Isla Catalina	0.2263980	3.676560e+04
103	Área Nacional De Recreación Playa de Cabo Rojo - Pedernales	0.1847187	3.235779e+04
104	Refugio de Vida Silvestre Lagunas de Bávaro y El Caletón	0.1494940	9.567537e+03
105	Área Nacional De Recreación Guaraguao - Punta Catuano	0.1465114	2.724377e+04
106	Área Nacional De Recreación Playa Blanca	0.0551998	3.677716e+03

(continued)

	CATEGORY_NAME	LOSS0118_PCT	LOSS0118_AREASQM
107	Area Nacional De Recreo Bahía de las Águilas	NA	NA
108	Area Nacional De Recreo Playa Larga	NA	NA

```
# ALL sorted descending by column 3
stripped_table(
  pazonal %>% select(CATEGORY_NAME, matches('^LOSS0118')) %>% select(-matches('<NA>')),
  n = nrow(pazonal),
  order_col = 3,
  long_table = T
)
```

	CATEGORY_NAME	LOSS0118_PCT	LOSS0118_AREASQM
1	Parque Nacional Los Haitises	16.7961407	1.060981e+08
2	Parque Nacional Sierra de Bahoruco	9.1085863	9.949039e+07
3	Parque Nacional José del Carmen Ramírez	12.0514154	9.035649e+07
4	Parque Nacional Valle Nuevo	5.3641486	4.860623e+07
5	Parque Nacional Manolo Tavarez Justo	9.8789370	3.474684e+07
6	Reserva Forestal Alto Mao	14.5829176	3.064084e+07
7	Reserva Forestal Alto bao	8.1503086	2.140120e+07
8	Reserva Forestal Río Cana	7.4888845	1.946716e+07
9	Monumento Natural Las Caobas	17.8894956	1.886845e+07
10	Parque Nacional Montaña La Humeadora	5.9846313	1.827757e+07
11	Parque Nacional Nalga de Maco	10.8284097	1.795879e+07
12	Parque Nacional Armando Bermúdez	2.1521028	1.727170e+07
13	Reserva Forestal Cerro Chacuey	26.4666686	1.373434e+07
14	Monumento Natural Salto de Socoá	19.4468667	1.328279e+07
15	Via Panoramica Entrada de Mao	22.6278261	1.230196e+07
16	Via Panoramica Autovía Santo Domingo - Samana - Boulevard del Atlantico	11.5427912	1.192278e+07
17	Reserva Forestal Barrero	3.2605838	1.012874e+07
18	Parque Nacional Punta Espada	11.5707949	9.515568e+06
19	Reserva Biológica Loma Charco Azul	5.3589984	9.334805e+06
20	Reserva Científica La Salcedoa	21.5473066	8.881026e+06
21	Parque Nacional Picky Lora	7.8947713	8.863962e+06
22	Parque Nacional La Hispaniola	15.8335312	8.680829e+06
23	Parque Nacional Cotubanamá (Del Este)	1.0818280	8.615735e+06
24	Parque Nacional Sierra Martín García	3.2280569	8.441457e+06
25	Monumento Natural Río Cumayasa y Cueva de las Maravillas	8.4629858	7.511724e+06
26	Parque Nacional Sierra de Neiba	3.8649577	7.072866e+06
27	Parque Nacional Aniana Vargas	5.3429353	6.925885e+06
28	Reserva Forestal Hatillo	1.9647072	6.270945e+06
29	Parque Nacional Francisco Alberto Caamaño Deñó	1.0273068	6.035530e+06
30	Refugio de Vida Silvestre Río Chacuey	14.8619676	5.762642e+06
31	Parque Nacional Luis Quin	2.8069861	5.538027e+06
32	Parque Nacional Jaragua	0.3557469	5.460767e+06
33	Monumento Natural Lagunas Cabarete y Goleta	7.4869378	5.375732e+06
34	Parque Nacional Anacaona	0.8662760	4.668627e+06
35	Reserva Forestal Las Matas	8.9687134	4.285024e+06
36	Parque Nacional La Gran Sabana	1.9438134	4.268147e+06
37	Monumento Natural Hoyo Claro	10.4508619	4.106759e+06
38	Parque Nacional Cabo Cabrón	10.8114248	3.851405e+06
39	Refugio de Vida Silvestre Cañón Río Gurabo	11.8174946	3.564134e+06

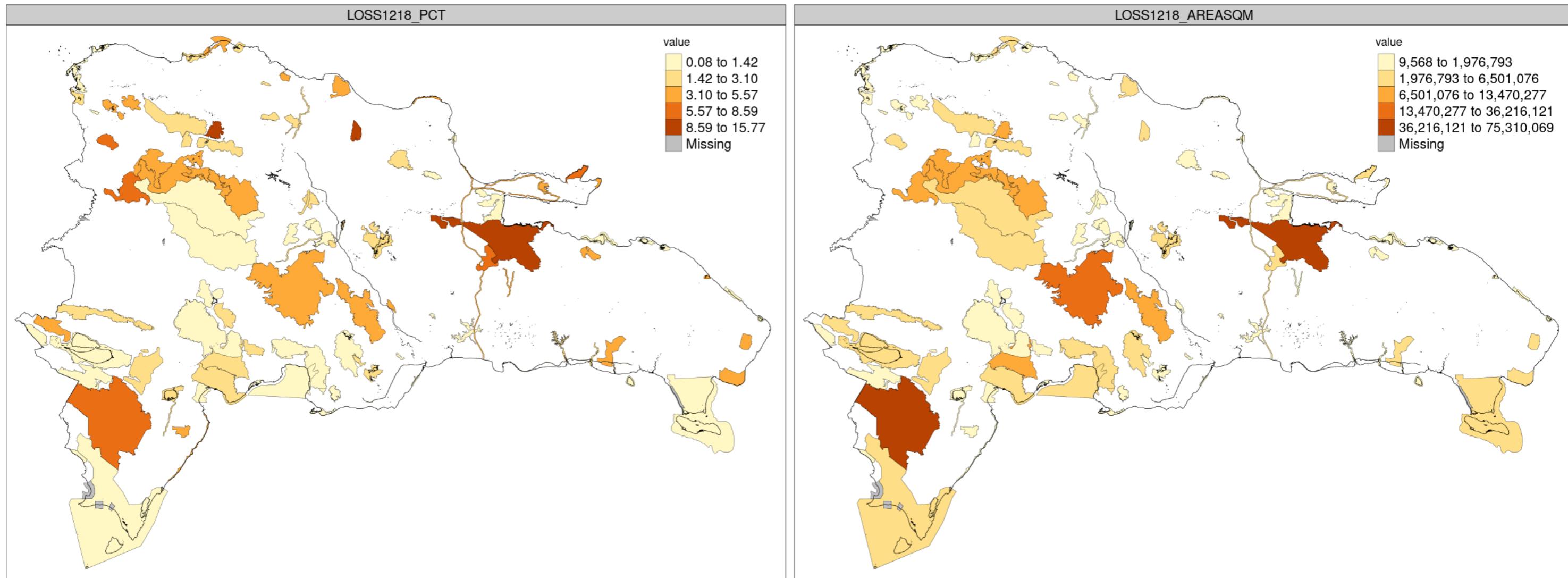
(continued)

	CATEGORY_NAME	LOSS0118_PCT	LOSS0118_AREASQM
40	Reserva Forestal Villarpando	4.2454794	3.377307e+06
41	Reserva Forestal Cabeza de Toro	0.7569748	2.843338e+06
42	Parque Nacional Lago Enriquillo e Isla Cabritos	0.6845694	2.772054e+06
43	Reserva Cientifica Loma Quita Espuela	3.4800012	2.635633e+06
44	Santuario De Mamiferos Marinos Estero Hondo	7.8195251	2.544674e+06
45	Parque Nacional Saltos de la Jalda	6.3589184	2.316788e+06
46	Refugio de Vida Silvestre Monumento Natural Miguel Domingo Fuerte	6.5638506	2.200773e+06
47	Reserva Forestal Loma El 20	4.2928178	2.147130e+06
48	Parque Nacional Manglares del Bajo Yuna	1.7645273	2.137810e+06
49	Reserva Cientifica Las Neblinas	4.7686062	1.944454e+06
50	Parque Nacional Máximo Gómez	4.2038593	1.778012e+06
51	Area Nacional De Recreo Guagui	4.2107689	1.746368e+06
52	Reserva Forestal Guanito	2.2209652	1.531254e+06
53	Monumento Natural La Tinaja	4.9885378	1.472586e+06
54	Refugio de Vida Silvestre Laguna Cabral o Rincón	2.5207767	1.412513e+06
55	Monumento Natural Salto El Limón	8.3638311	1.377940e+06
56	Parque Nacional Baiguate	2.5817049	1.353512e+06
57	Via Panoramica Mirador del Paraíso	6.4120055	1.347963e+06
58	Monumento Natural Salto Grande	7.9794657	1.177706e+06
59	Via Panoramica Carretera Santiago - La Cumbre - Puerto Plata	5.5960474	1.174054e+06
60	Via Panoramica Carretera Nagua - Sánchez	6.5527937	1.103949e+06
61	Reserva Forestal Loma Novillero	7.7993952	1.005301e+06
62	Monumento Natural Loma Isabel de Torres	5.8831353	9.768897e+05
63	Refugio de Vida Silvestre Laguna Saladilla	3.0472813	9.481367e+05
64	Parque Nacional Humedales del Ozama	1.9053804	8.844452e+05
65	Via Panoramica Vía Panorámica Costa Azul	4.3664582	8.322460e+05
66	Via Panoramica Carretera Bayacanes-Jarabacoa	5.1178604	8.304956e+05
67	Monumento Natural Diego de Ocampo	3.1409661	7.960324e+05
68	Refugio de Vida Silvestre Río Higuamo	3.8293304	7.081435e+05
69	Refugio de Vida Silvestre Humedales del Bajo Yaque del Sur	1.1086223	6.481264e+05
70	Via Panoramica Carretera El Abanico - Constanza	2.7128399	6.170540e+05
71	Refugio de Vida Silvestre Bahía de Luperón	3.2791403	6.126976e+05
72	Via Panoramica Mirador del Atlántico	4.8032548	5.819625e+05
73	Monumento Natural Saltos de Jima	2.9440900	5.465493e+05
74	Refugio de Vida Silvestre Río Soco	4.4230649	5.203307e+05
75	Monumento Natural Cabo Samaná	5.3621004	4.970983e+05
76	Parque Nacional Manglares de Estero Balsa	0.8484612	4.797743e+05
77	Reserva Cientifica Loma Guaconejo	1.8671873	4.363857e+05
78	Via Panoramica Carretera Cabral - Polo	4.2766019	4.345775e+05
79	Reserva Cientifica Ébano Verde	1.3922027	4.162576e+05
80	Reserva Cientifica Loma Barbacoa	2.9683306	4.068947e+05
81	Monumento Natural Salto de La Damajagua	6.9006781	3.813125e+05
82	Reserva Forestal Arroyo Cano	1.4002585	3.346449e+05
83	Refugio de Vida Silvestre Lagunas Redonda y Limón	1.1499667	3.053692e+05
84	Refugio de Vida Silvestre Manglar de la Jina	0.4690262	2.479481e+05
85	Corredor Ecologico Autopista Duarte	2.0818581	2.158105e+05
86	Parque Nacional El Morro	1.1670811	2.143125e+05
87	Refugio de Vida Silvestre Ría Maimón	4.2676421	2.060333e+05
88	Corredor Ecologico Autopista Juan Bosch	3.1337140	1.738543e+05
89	Monumento Natural Las Marías	3.8115492	1.716999e+05
90	Monumento Natural Reserva Antropológica Cuevas de Borbón o del Pomier	3.1927358	1.603398e+05

(continued)

	CATEGORY_NAME	LOSS0118_PCT	LOSS0118_AREASQM
91	Corredor Ecológico Autopista 6 de Noviembre	4.2652112	1.549519e+05
92	Monumento Natural Salto de Jimenoa	0.8439175	1.471035e+05
93	Monumento Natural Los Cacheos	0.2519722	1.405244e+05
94	Reserva Biológica Sierra Prieta	3.0743741	1.229764e+05
95	Reserva Forestal Cerro de Bocanigua	0.3878312	1.132792e+05
96	Monumento Natural Cerro de San Francisco	2.6310981	1.058943e+05
97	Monumento Natural Las Dunas de las Calderas	0.4461092	7.797633e+04
98	Reserva Forestal Cayuco	1.3722628	6.914752e+04
99	Refugio de Vida Silvestre Manglares de Puerto Viejo	0.4427118	4.929034e+04
100	Refugio de Vida Silvestre La Gran Laguna o Perucho	0.6343772	4.643403e+04
101	Area Nacional De Recreo Boca de Nigua	0.6713110	3.903465e+04
102	Monumento Natural Isla Catalina	0.2263980	3.676560e+04
103	Area Nacional De Recreo Playa de Cabo Rojo - Pedernales	0.1847187	3.235779e+04
104	Area Nacional De Recreo Guaraguao - Punta Catuano	0.1465114	2.724377e+04
105	Refugio de Vida Silvestre Lagunas de Bávaro y El Caletón	0.1494940	9.567537e+03
106	Area Nacional De Recreo Playa Blanca	0.0551998	3.677716e+03
107	Area Nacional De Recreo Bahía de las Águilas	NA	NA
108	Area Nacional De Recreo Playa Larga	NA	NA

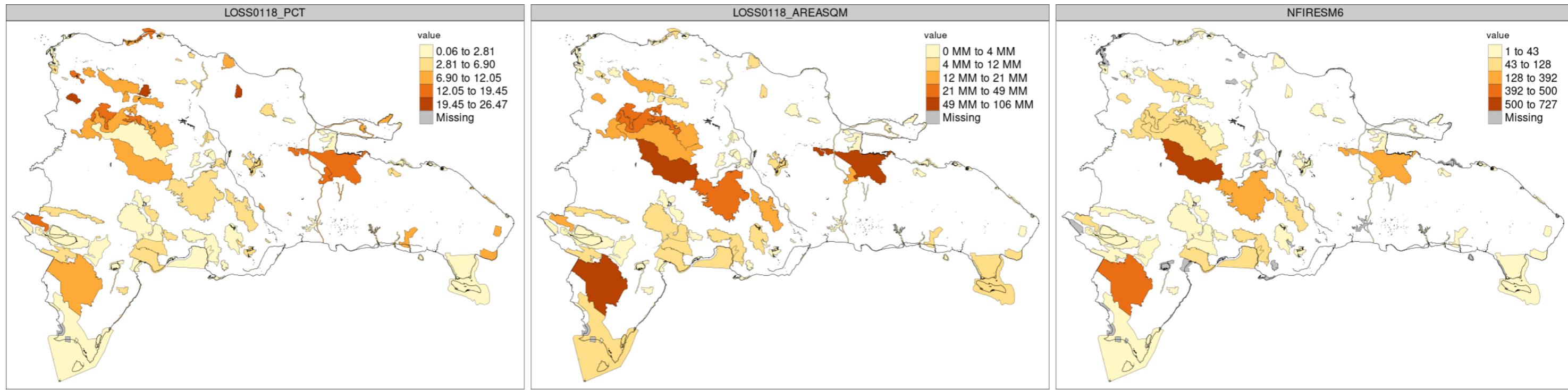
```
# Total loss 2012-2018
pazonal %>% select(matches('`LOSS1218`')) %>% select(-matches('`NA`')) %>%
  gather(variable, value, -geom) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1) +
  tm_shape(shp = cline) + tm_borders(col = 'black', lwd = 0.5)
```



```
# Top twenty sorted descending by column 2
stripped_table(pazonal %>% select(CATEGORY_NAME, matches('^LOSS1218')) %>% select(-matches('<NA>')))
```

	CATEGORY_NAME	LOSS1218_PCT	LOSS1218_AREASQM
1	Reserva Cientifica La Salcedoa	15.773028	6501076.2
2	Via Panoramica Entrada de Mao	14.178246	7708217.1
3	Parque Nacional Los Haitises	11.668154	73705545.1
4	Reserva Forestal Cerro Chacuey	8.593019	4459171.5
5	Monumento Natural Salto de Socoá	8.132287	5554593.8
6	Parque Nacional Cabo Cabrón	7.604139	2708858.5
7	Parque Nacional Sierra de Bahoruco	6.894819	75310069.2
8	Parque Nacional Nalga de Maco	5.986853	9929126.7
9	Monumento Natural Hoyo Claro	5.567929	2187967.0
10	Monumento Natural Las Caobas	5.444326	5742251.6
11	Monumento Natural Salto El Limón	5.137017	846322.8
12	Reserva Forestal Alto Mao	5.100222	10716311.3
13	Refugio de Vida Silvestre Río Chacuey	5.098188	1976792.9
14	Monumento Natural Río Cumayasa y Cueva de las Maravillas	4.811717	4270867.5
15	Monumento Natural Cabo Samaná	4.624415	428710.5
16	Parque Nacional Punta Espada	4.278458	3518509.8
17	Monumento Natural Loma Isabel de Torres	4.185139	694938.9
18	Via Panoramica Mirador del Atlántico	4.129220	500296.5
19	Parque Nacional Saltos de la Jalda	4.004362	1458936.7
20	Parque Nacional Valle Nuevo	3.996785	36216121.2

```
# Fires M6
pazonal %>% select(matches('^LOSS0118|NFIRESM6')) %>% select(-matches('<NA>')) %>%
gather(variable, value, -geom) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 3, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1) +
tm_shape(shp = cline) + tm_borders(col = 'black', lwd = 0.5)
```



```
# Top twenty sorted descending by column 2
stripped_table(pazonal %>% select(CATEGORY_NAME, matches('^LOSS0118|NFIRESM6')) %>% select(-matches('<NA>')))
```

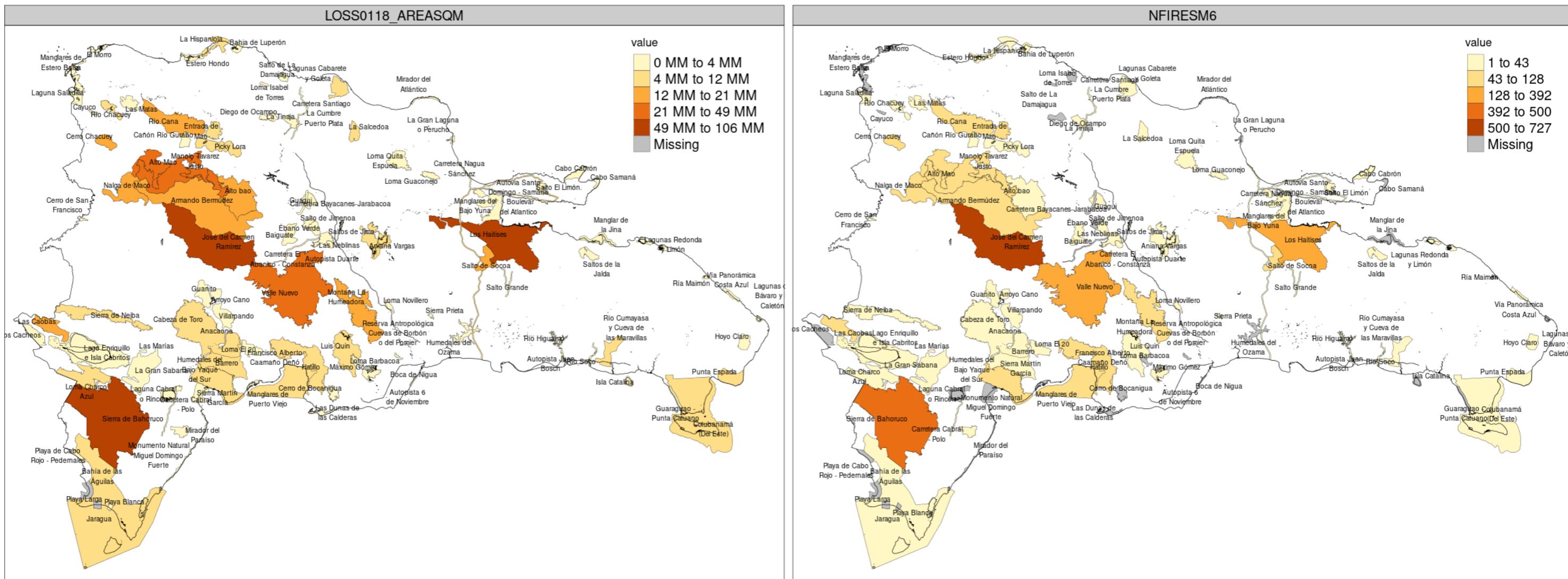
CATEGORY_NAME	LOSS0118_PCT	LOSS0118_AREASQM	NFIRESM6
1 Reserva Forestal Cerro Chacuey	26.466669	13734337	82
2 Via Panoramica Entrada de Mao	22.627826	12301958	69
3 Reserva Cientifica La Salcedoa	21.547307	8881026	27
4 Monumento Natural Salto de Socoa	19.446867	13282788	53
5 Monumento Natural Las Caobas	17.889496	18868449	76
6 Parque Nacional Los Haitises	16.796141	106098081	308
7 Parque Nacional La Hispaniola	15.833531	8680829	14
8 Refugio de Vida Silvestre Río Chacuey	14.861968	5762642	38
9 Reserva Forestal Alto Mao	14.582918	30640838	104
10 Parque Nacional José del Carmen Ramírez	12.051415	90356487	727
11 Refugio de Vida Silvestre Cañón Río Gurabo	11.817495	3564134	8
12 Parque Nacional Punta Espada	11.570795	9515568	16
13 Via Panoramica Autovia Santo Domingo - Samana - Boulevard del Atlantico	11.542791	11922785	18
14 Parque Nacional Nalga de Maco	10.828410	17958794	117
15 Parque Nacional Cabo Cabrón	10.811425	3851405	8
16 Monumento Natural Hoyo Claro	10.450862	4106759	8
17 Parque Nacional Manolo Tavarez Justo	9.878937	34746840	128
18 Parque Nacional Sierra de Bahoruco	9.108586	99490393	500
19 Reserva Forestal Las Matas	8.968713	4285024	15
20 Monumento Natural Río Cumayasa y Cueva de las Maravillas	8.462986	7511724	15

```
# Fires M6. Only AREASQM and FIRESM6
pazonal %>% select(matches('^LOSS0118_AREASQM|NFIRESM6|^NAME')) %>% select(-matches('<NA>')) %>%
gather(variable, value, -geom, -NAME) %>%
mutate(NAME = gsub(".{10,}?", "\\s", "\\\\1\\n", NAME)) %>%
# mutate(NAME=gsub(' ', '\n', NAME)) %>%
```

```

mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1) +
tm_text(text = 'NAME', size = 0.5, auto.placement = T, col = 'black') +
tm_shape(shp = cline) + tm_borders(col = 'black', lwd = 0.5)

```



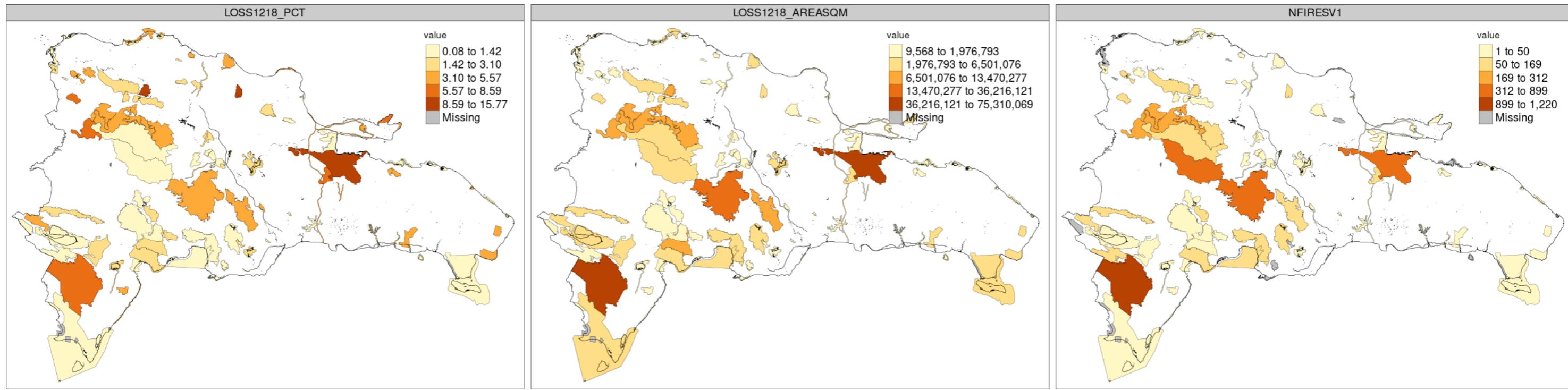
```

# Top twenty sorted descending by column 2
stripped_table(
  pazonal %>% select(CATEGORY_NAME, matches('^LOSS0118_AREASQM|NFIRESM6')) %>%
  select(-matches('<NA>'))
)

```

CATEGORY_NAME	LOSS0118_AREASQM	NFIRESM6
1 Parque Nacional Los Haitises	106098081	308
2 Parque Nacional Sierra de Bahoruco	99490393	500
3 Parque Nacional José del Carmen Ramírez	90356487	727
4 Parque Nacional Valle Nuevo	48606234	392
5 Parque Nacional Manolo Tavarez Justo	34746840	128
6 Reserva Forestal Alto Mao	30640838	104
7 Reserva Forestal Alto bao	21401203	23
8 Reserva Forestal Río Cana	19467164	53
9 Monumento Natural Las Caobas	18868449	76
10 Parque Nacional Montaña La Humeadora	18277567	82
11 Parque Nacional Nalga de Maco	17958794	117
12 Parque Nacional Armando Bermúdez	17271703	79
13 Reserva Forestal Cerro Chacuey	13734337	82
14 Monumento Natural Salto de Socoá	13282788	53
15 Vía Panoramica Entrada de Mao	12301958	69
16 Vía Panoramica Autovía Santo Domingo - Samana - Boulevard del Atlántico	11922785	18
17 Reserva Forestal Barrero	10128739	20
18 Parque Nacional Punta Espada	9515568	16
19 Reserva Biológica Loma Charco Azul	9334805	22
20 Reserva Científica La Salcedoa	8881026	27

```
# Fires V1
pazonal %>% select(matches('^LOSS1218|NFIRESV1')) %>% select(-matches('<NA>')) %>%
gather(variable, value, -geom) %>%
mutate(variable = factor(variable, levels = unique(variable))) %>%
tm_shape() +
tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'jenks') +
tm_borders(col = 'grey15', lwd = 0.3) +
tm_facets(by = "variable", ncol = 3, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
tm_layout(panel.label.size = 1, legend.title.size = 1, legend.text.size = 1) +
tm_shape(shp = cline) + tm_borders(col = 'black', lwd = 0.5)
```



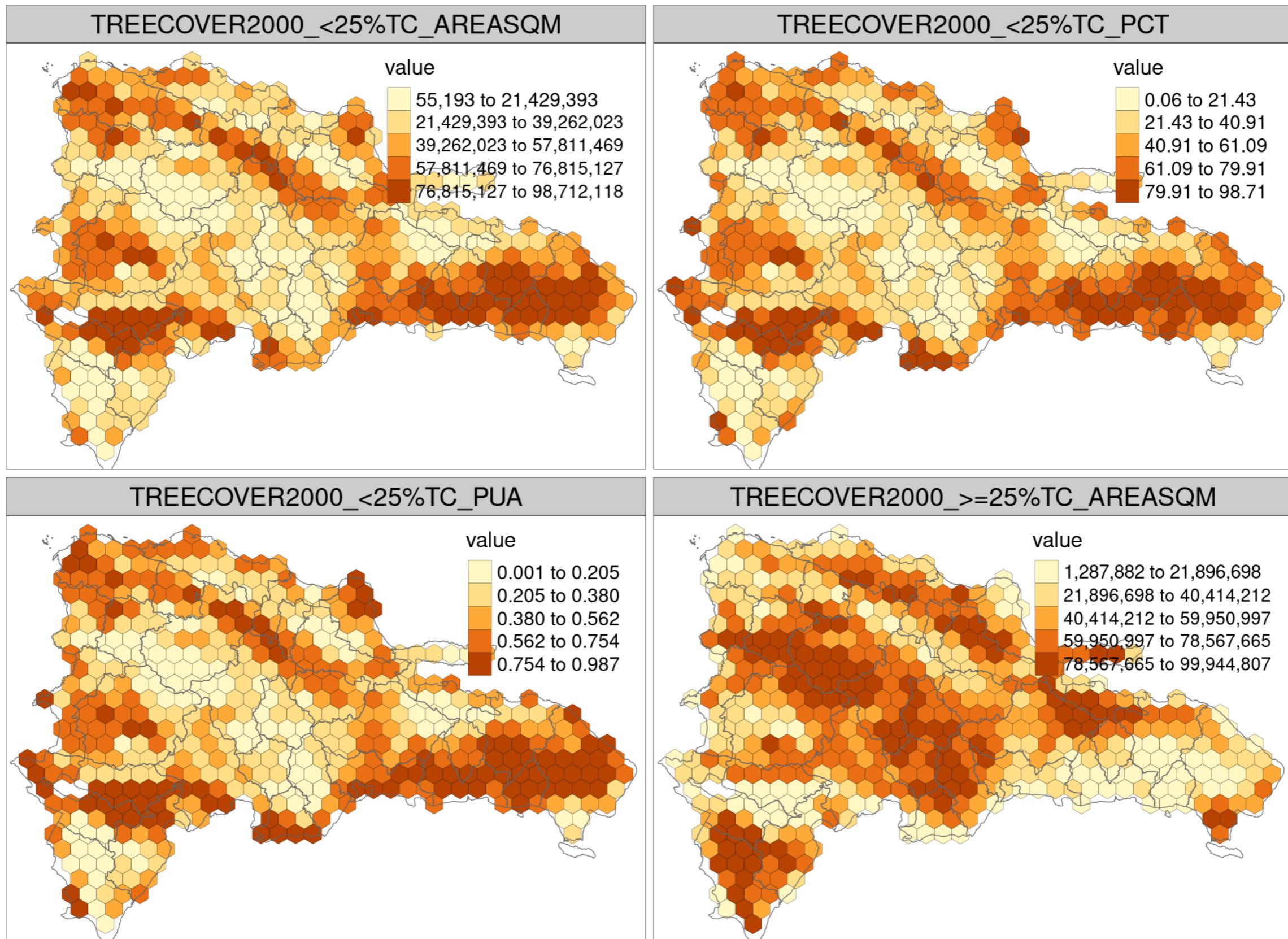
```
# Top twenty sorted descending by column 2
stripped_table(pazonal %>% select(CATEGORY_NAME, matches('^LOSS1218|NFIRESV1')) %>% select(-matches('<NA>')))
```

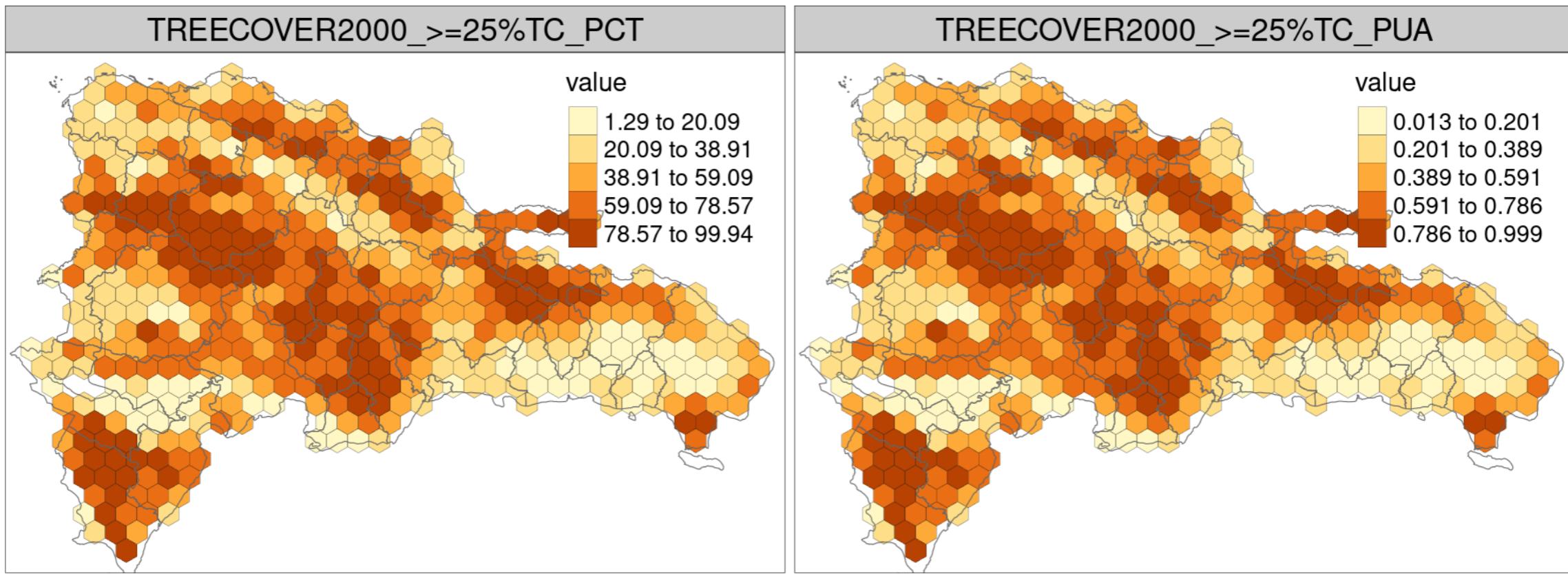
	CATEGORY_NAME	LOSS1218_PCT	LOSS1218_AREASQM	NFIRESV1
1	Reserva Cientifica La Salcedoa	15.773028	6501076.2	66
2	Via Panoramica Entrada de Mao	14.178246	7708217.1	132
3	Parque Nacional Los Haitises	11.668154	73705545.1	694
4	Reserva Forestal Cerro Chacuey	8.593019	4459171.5	106
5	Monumento Natural Salto de Socoá	8.132287	5554593.8	92
6	Parque Nacional Cabo Cabrón	7.604139	2708858.5	16
7	Parque Nacional Sierra de Bahoruco	6.894819	75310069.2	1220
8	Parque Nacional Nalga de Maco	5.986853	9929126.7	259
9	Monumento Natural Hoyo Claro	5.567929	2187967.0	27
10	Monumento Natural Las Caobas	5.444326	5742251.6	85
11	Monumento Natural Salto El Limón	5.137017	846322.8	16
12	Reserva Forestal Alto Mao	5.100222	10716311.3	240
13	Refugio de Vida Silvestre Río Chacuey	5.098188	1976792.9	67
14	Monumento Natural Río Cumayasa y Cueva de las Maravillas	4.811717	4270867.5	41
15	Monumento Natural Cabo Samaná	4.624415	428710.5	8
16	Parque Nacional Punta Espada	4.278458	3518509.8	30
17	Monumento Natural Loma Isabel de Torres	4.185139	694938.9	1
18	Via Panoramica Mirador del Atlántico	4.129220	500296.5	NA
19	Parque Nacional Saltos de la Jalda	4.004362	1458936.7	2
20	Parque Nacional Valle Nuevo	3.996785	36216121.2	899

11.5 Zonal, by grid used in the long-term analytical approach

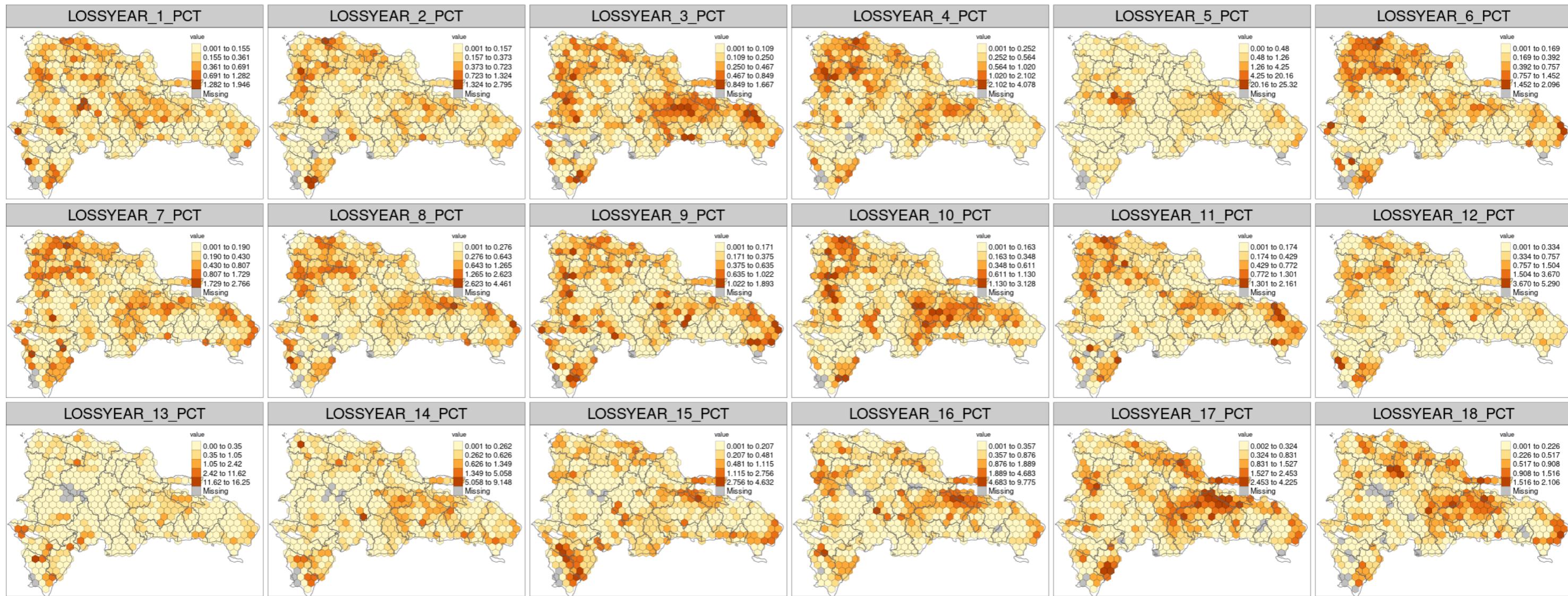
```
#Zonal statistics object
grdzonal <- readRDS('out/grd_zonal_statistics.RDS')

# Tree cover for pctc threshold
grdzonal %>% select(matches('^TREECOVER2000')) %>%
  gather(variable, value, -geometry) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'kmeans') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 2, nrow = 2, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 2, legend.title.size = 2, legend.text.size = 1.5) +
  tm_shape(prov) + tm_borders()
```

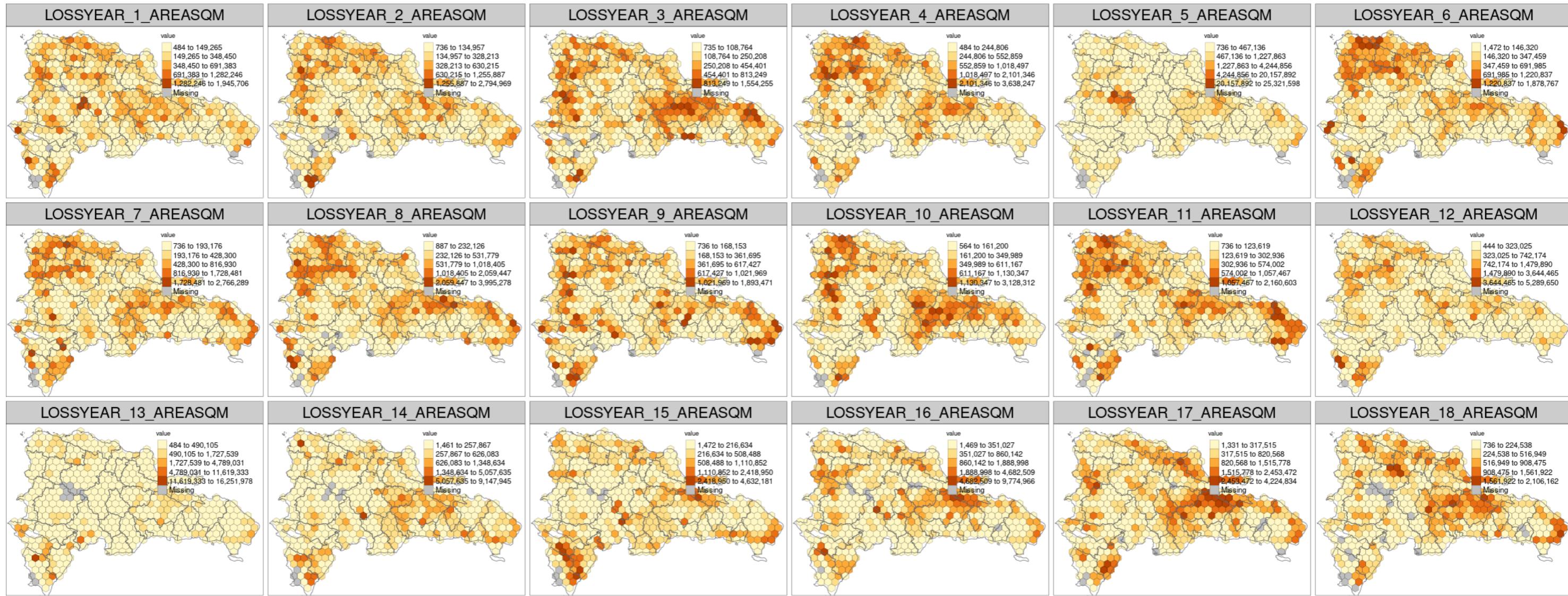




```
# Loss year
# * PCT
grdzonal %>% dplyr::select(matches('LOSSYEAR_[1-9].*_PCT$')) %>%
  gather(variable, value, -geometry) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'kmeans') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 6, nrow = 3, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 2, legend.title.size = 1, legend.text.size = 1) +
  tm_shape(prov) + tm_borders()
```

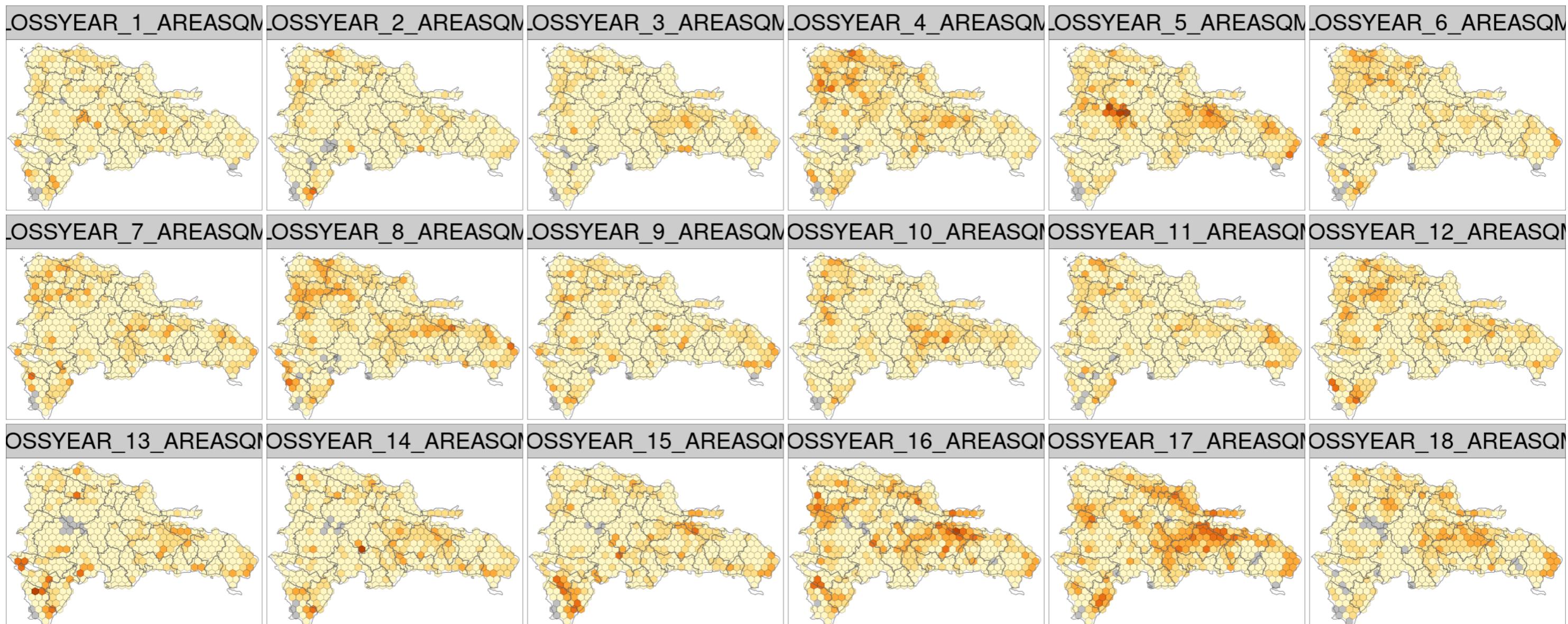


```
# * AREASQM
grdzonal %>% dplyr::select(matches('`LOSSYEAR_[1-9].*AREA.*')) %>%
  gather(variable, value, -geometry) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'kmeans') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 6, nrow = 3, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 2, legend.title.size = 1, legend.text.size = 1) +
  tm_shape(prov) + tm_borders()
```



```
# * Provinces overlaid, single scale
grdzonal %>% dplyr::select(matches('`LOSSYEAR_[1-9].*AREA.*')) %>%
  gather(variable, value, -geometry) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1,
         style = 'kmeans', legend.is.portrait = F, title = 'Area (square meters)',
         textNA = "No tree cover loss") +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 6, nrow = 3, free.coords = FALSE, free.scales = FALSE) +
  tm_layout(panel.label.size = 3, legend.title.size = 2.5, legend.text.size = 1.5,
            legend.outside.position = "bottom", legend.outside.size = .1,
            main.title = 'Dominican Republic. Tree cover loss 2001-2018',
            main.title.size = 2.5, attr.outside=TRUE) +
  tm_credits('Author: José Martínez B.\nSource: Hansen et al. 2013', size = 2) +
  tm_shape(prov) + tm_borders()
```

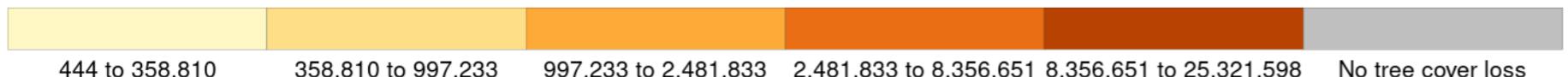
Dominican Republic. Tree cover loss 2001-2018



Author: Jose Martinez B.

Source: Hansen et al. 2013

Area (square meters)



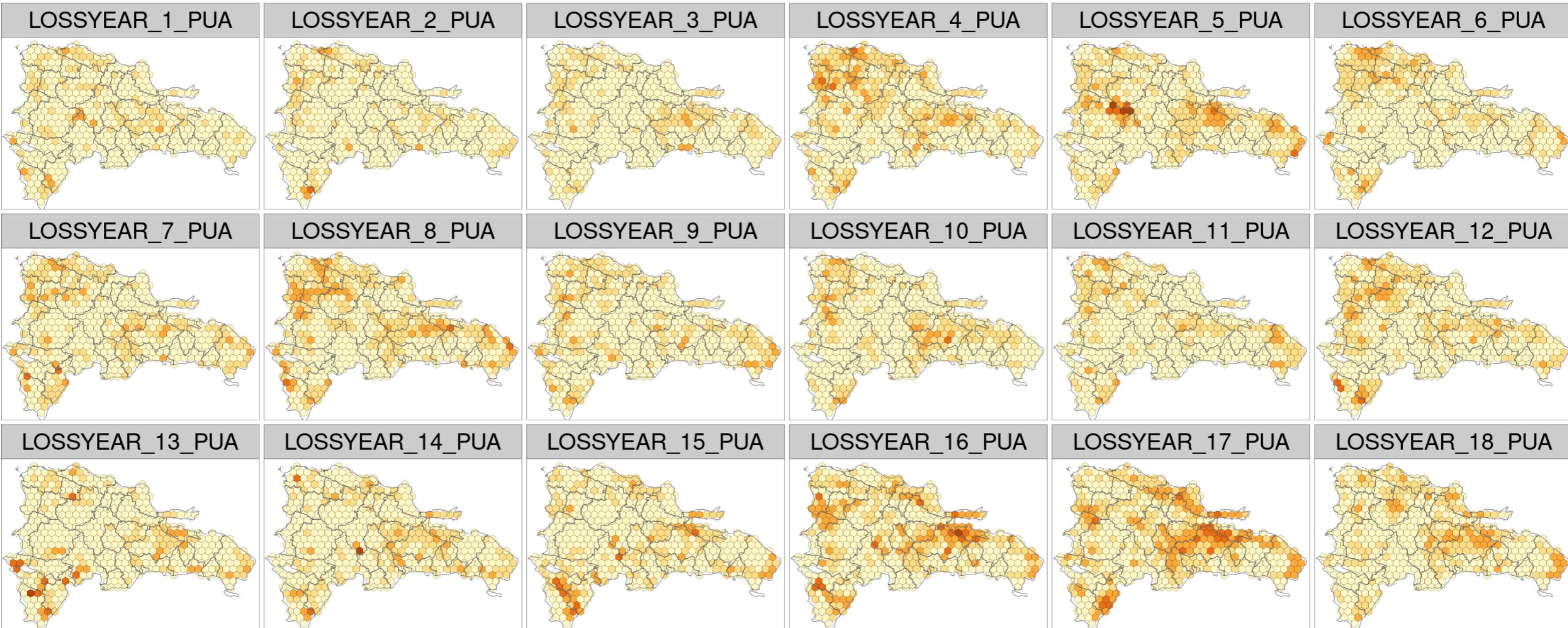
```
# * Loss per unit area (PUA). Provinces overlaid, single scale
grdzonal %>% dplyr::select(matches('`LOSSYEAR_[1-9].*PUA.*')) %>%
  replace(is.na(.), 0) %>%
  gather(variable, value, -geometry) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1,
         style = 'kmeans', legend.is.portrait = F, legend.format = list(digits = 3, text.separator = '-'),
         title = 'Per unit area loss', textNA = "No tree cover loss") +
  tm_borders(col = 'grey15', lwd = 0.3) +
```

```

tm_facets(by = "variable", ncol = 6, nrow = 3, free.coords = FALSE, free.scales = FALSE) +
  tm_layout(panel.label.size = 3, legend.title.size = 2, legend.text.size = 0.8,
            legend.outside.position = "bottom", legend.outside.size = .1,
            main.title = 'Dominican Republic. Tree cover loss 2001-2018',
            main.title.size = 2.5, attr.outside=TRUE) +
  tm_credits('\nAuthor: José Martínez B.\nSource: Hansen et al. 2013', size = 2) +
  tm_shape(prov) + tm_borders()

```

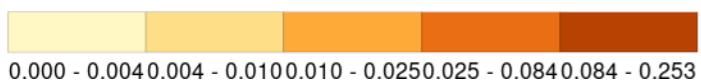
Dominican Republic. Tree cover loss 2001-2018



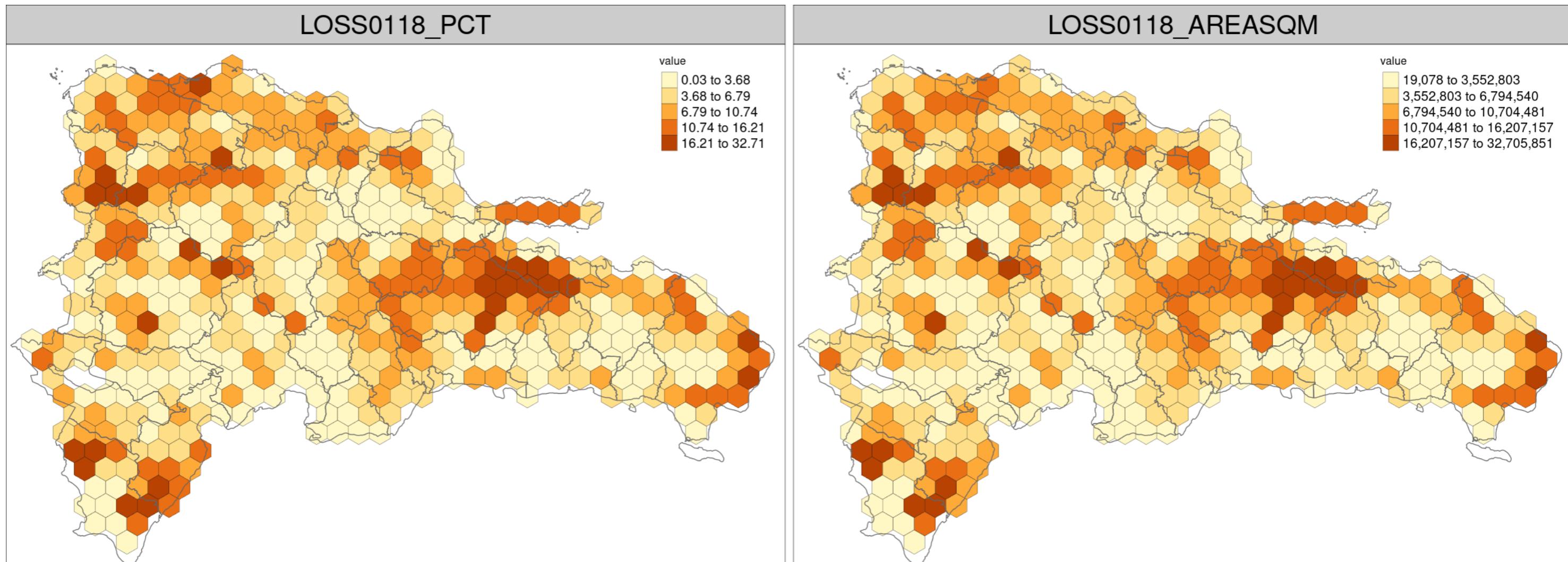
Author: José Martínez B.

Source: Hansen et al. 2013

Per unit area loss

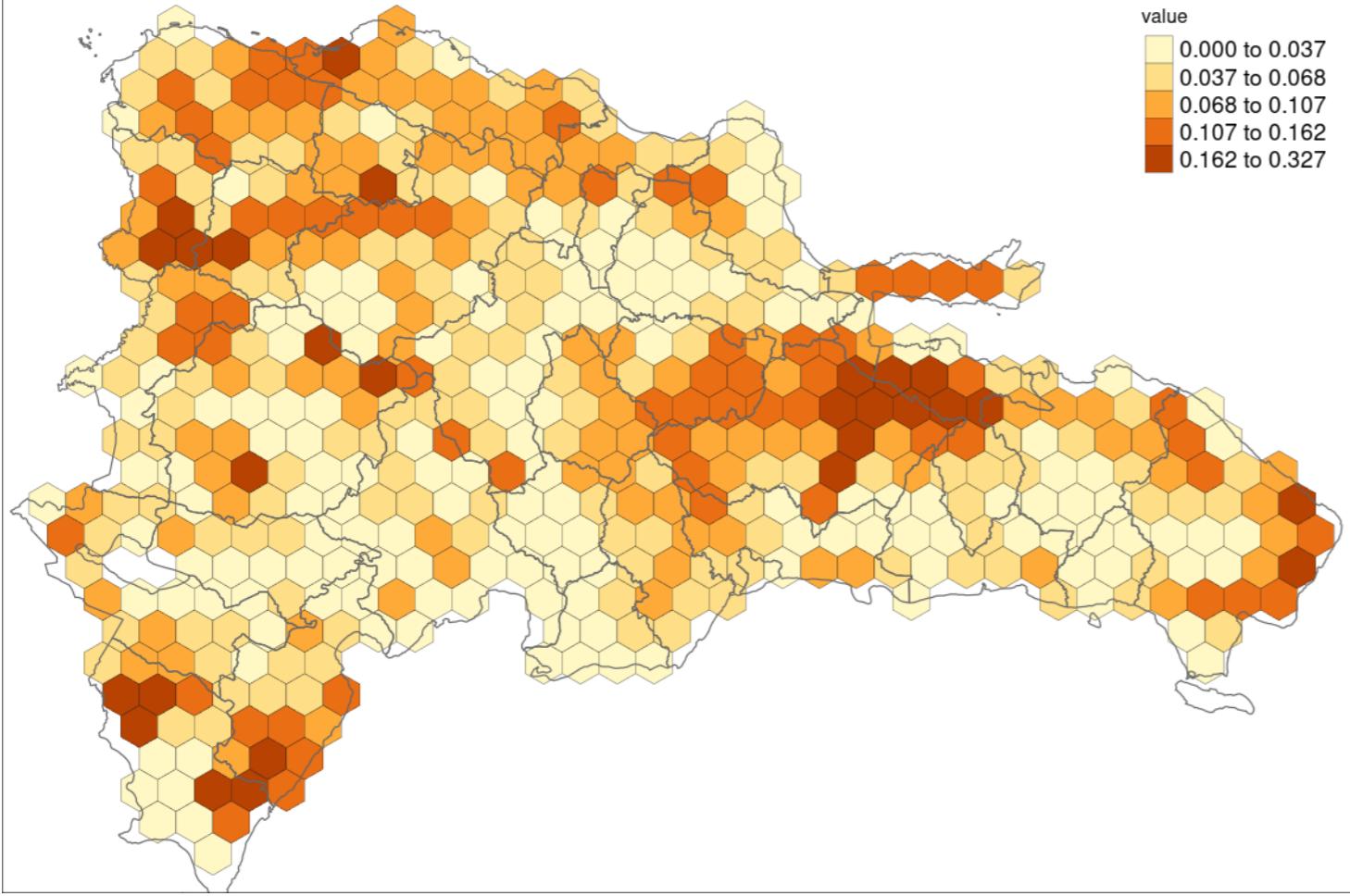


```
# Total loss 2001-2018
grdzonal %>% select(matches('`LOSS0118`')) %>% select(-matches('<NA>')) %>%
  gather(variable, value, -geometry) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'kmeans') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 2, legend.title.size = 1, legend.text.size = 1) +
  tm_shape(prov) + tm_borders()
```

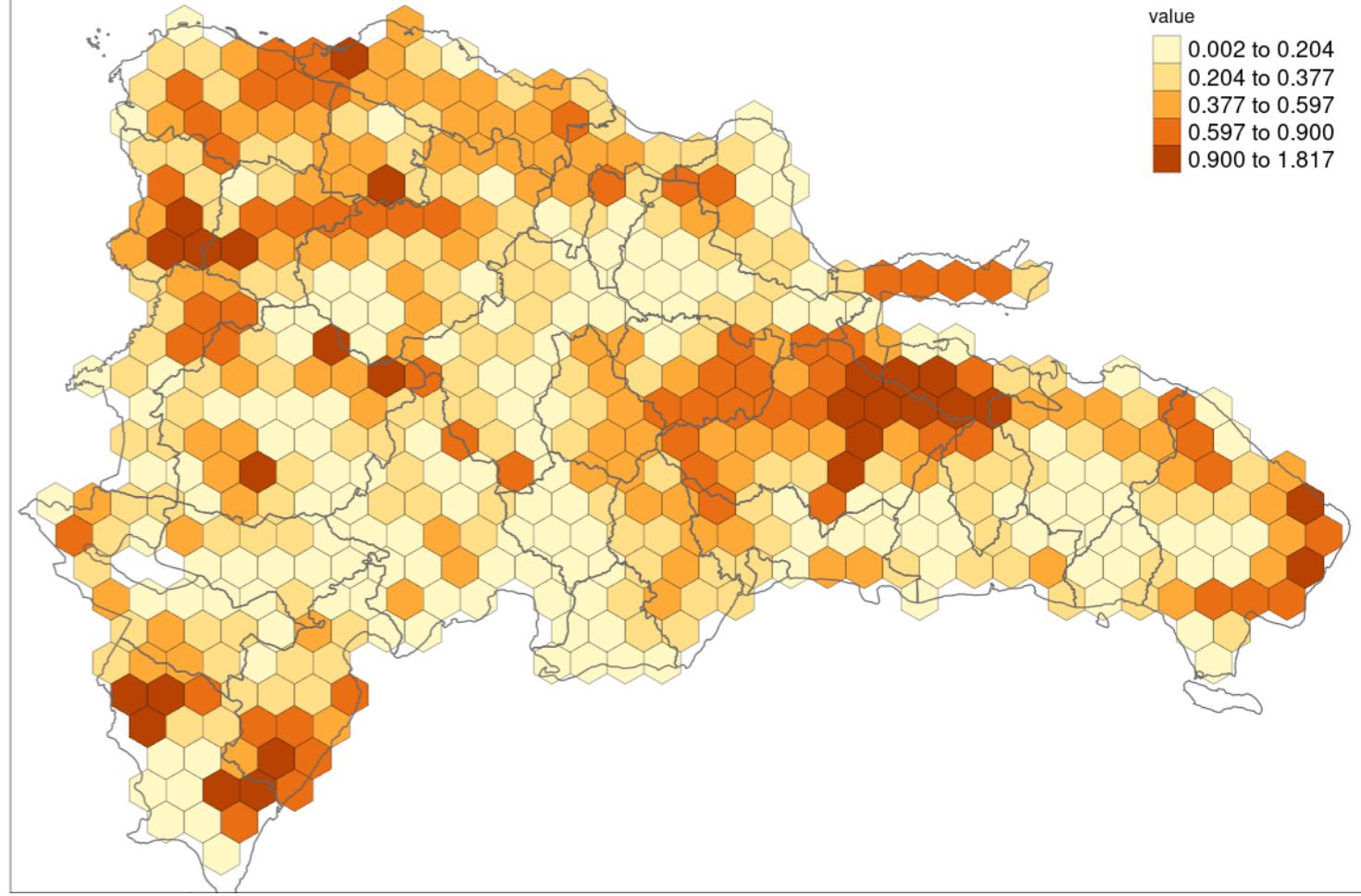


```
## =====
```

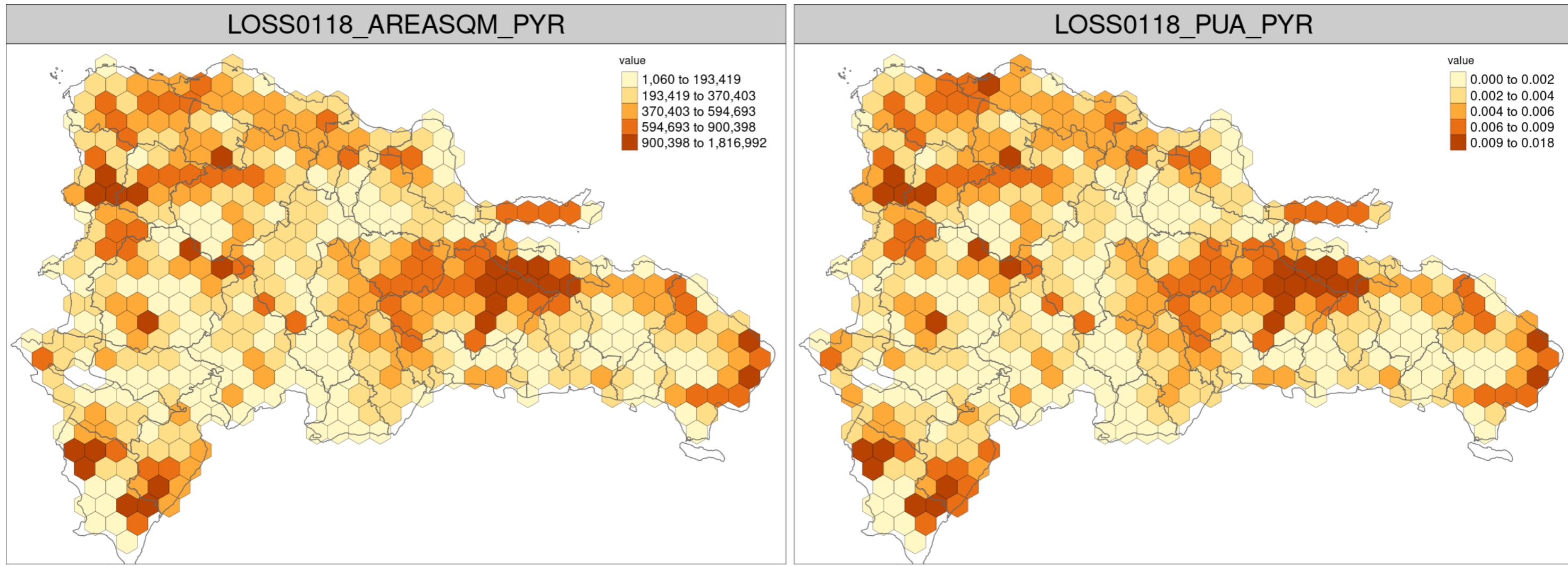
LOSS0118_PUA



LOSS0118_PCT_PYR

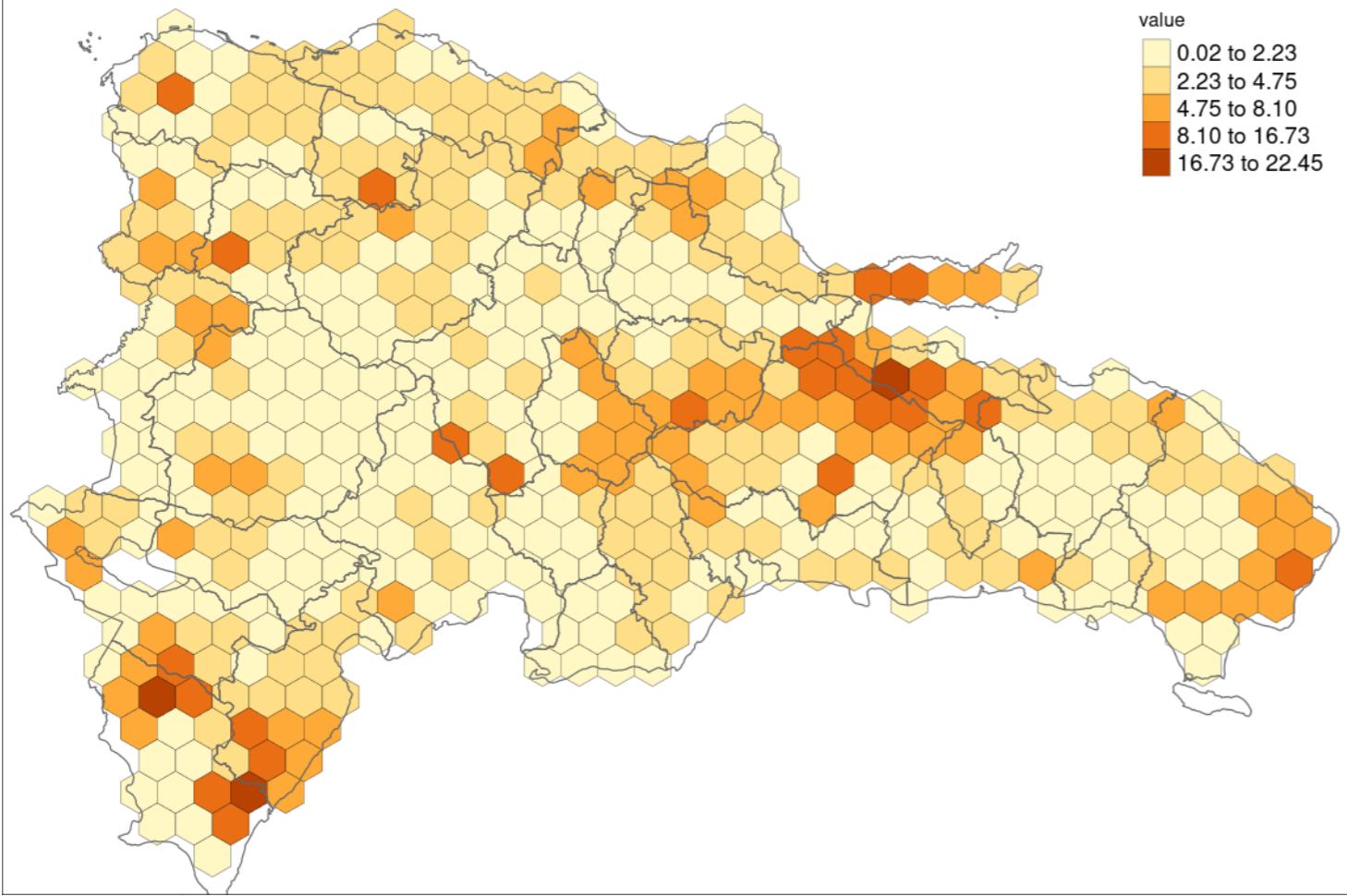


=====

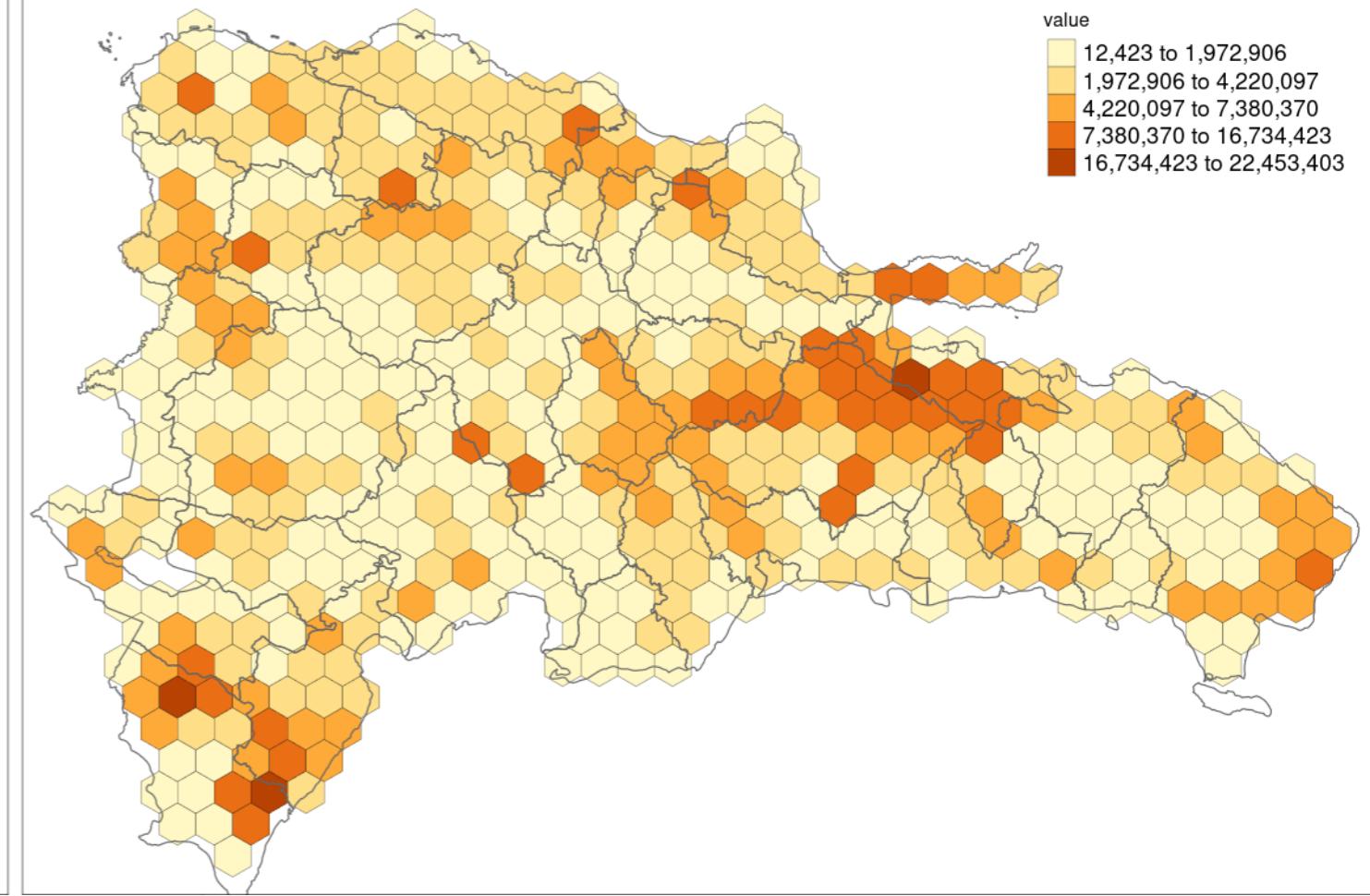


```
# Total loss 2012-2018
grdzonal %>% select(matches('`LOSS1218`')) %>% select(-matches('`NA`')) %>%
  gather(variable, value, -geometry) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'kmeans') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 2, legend.title.size = 1, legend.text.size = 1) +
  tm_shape(prov) + tm_borders()
```

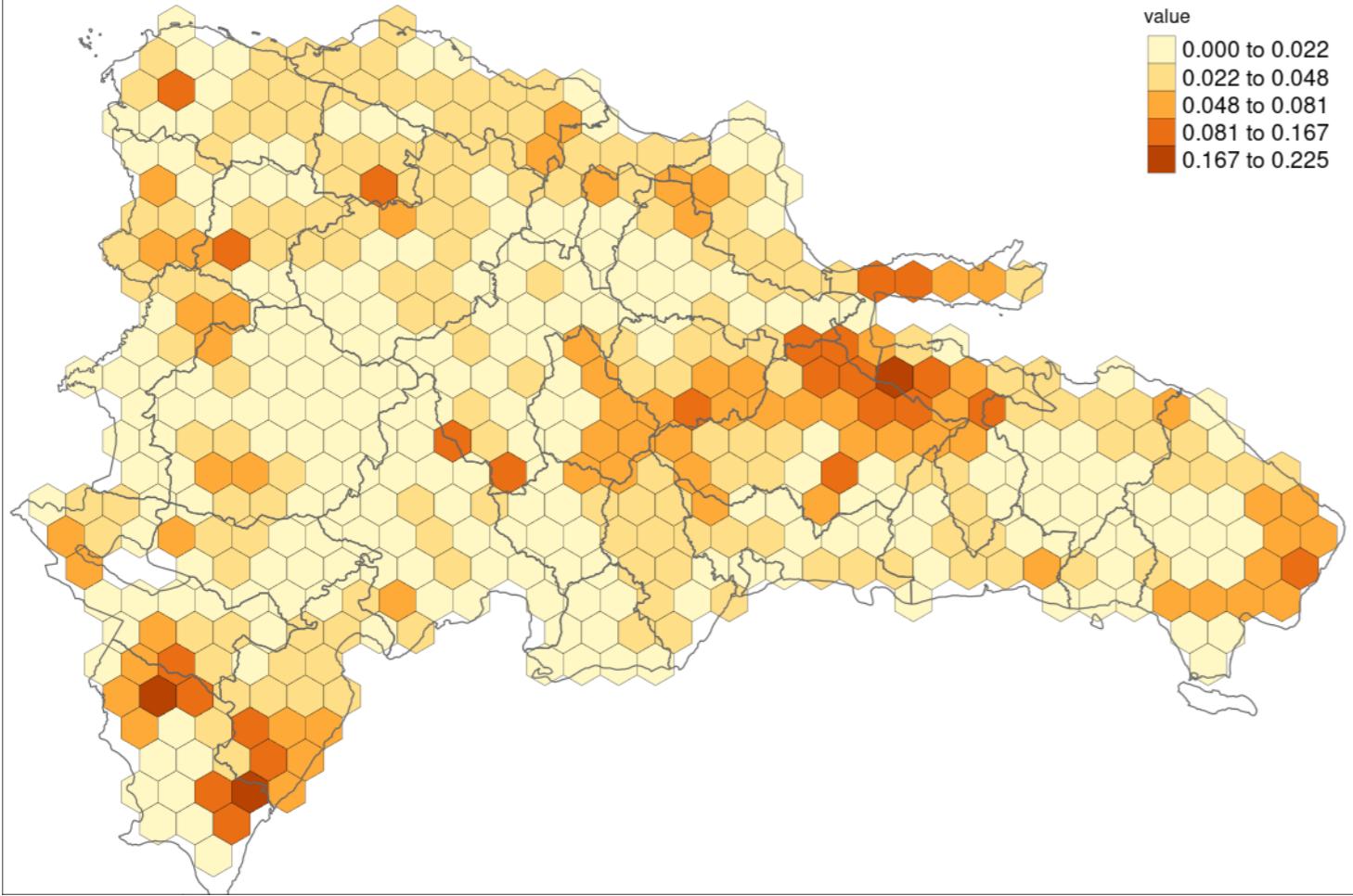
LOSS1218_PCT



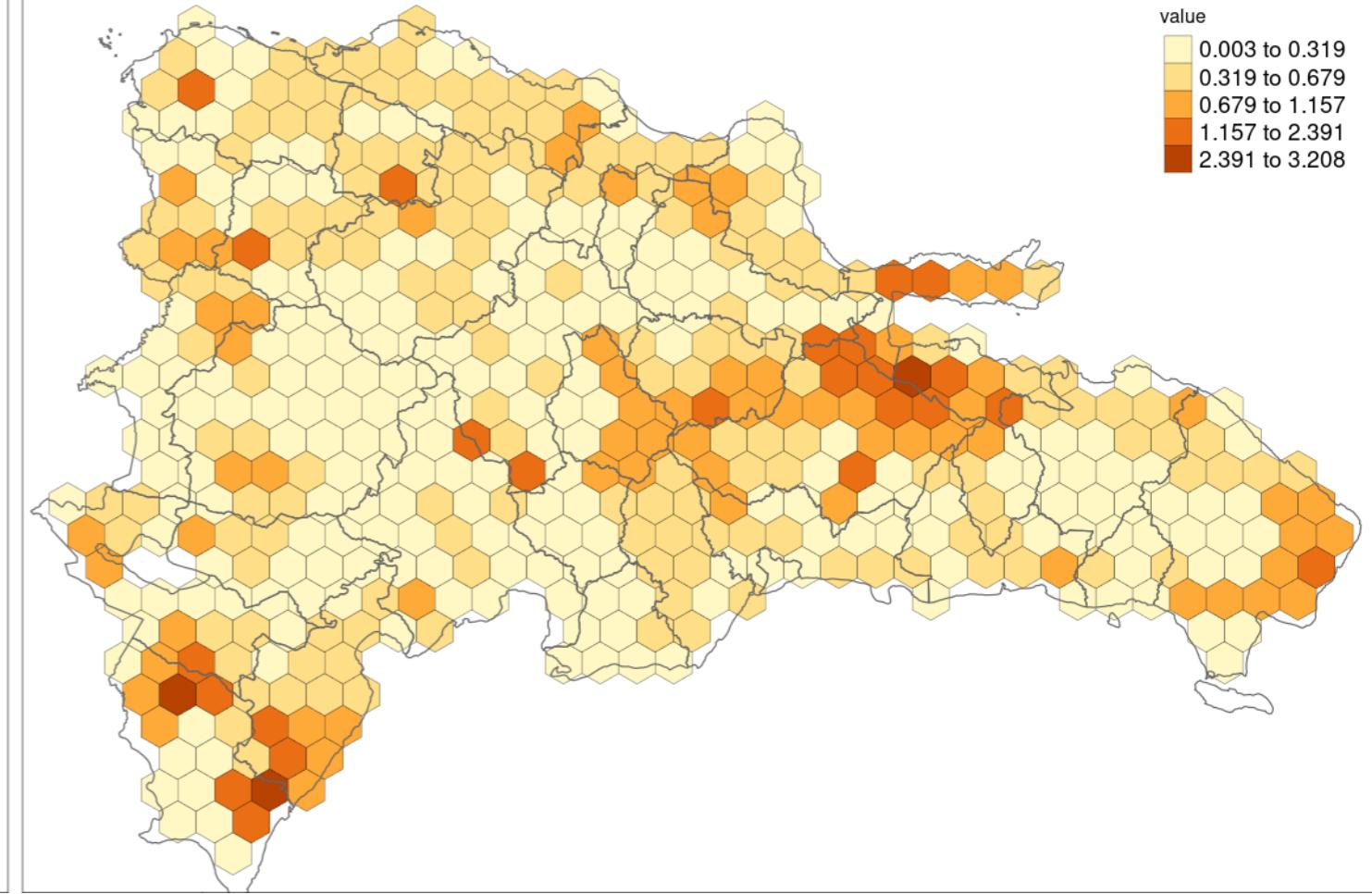
LOSS1218_AREASQM



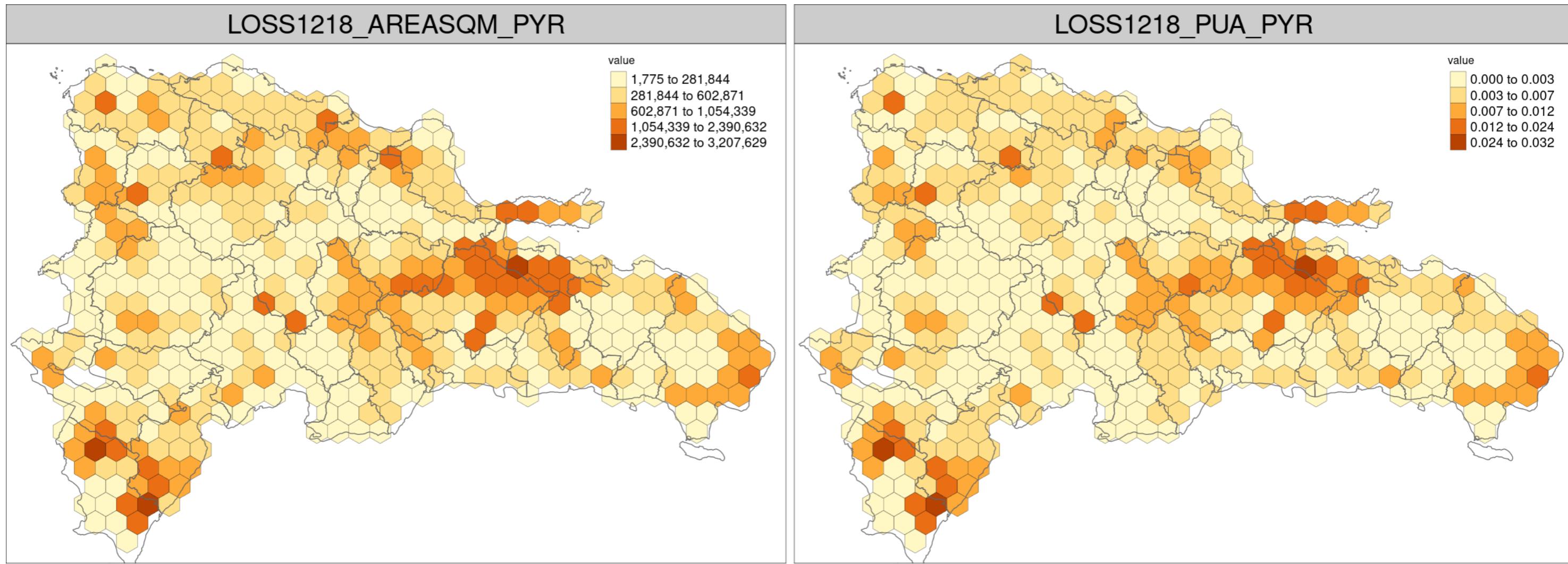
LOSS1218_PUA



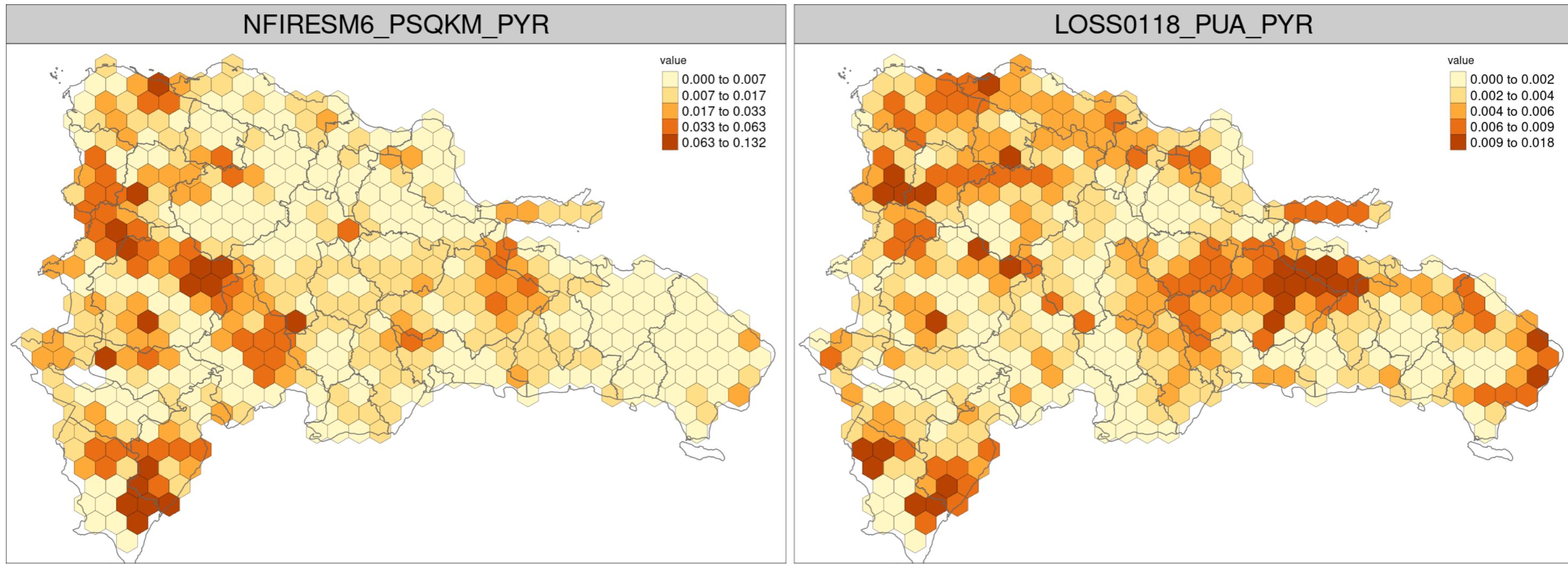
LOSS1218_PCT_PYR



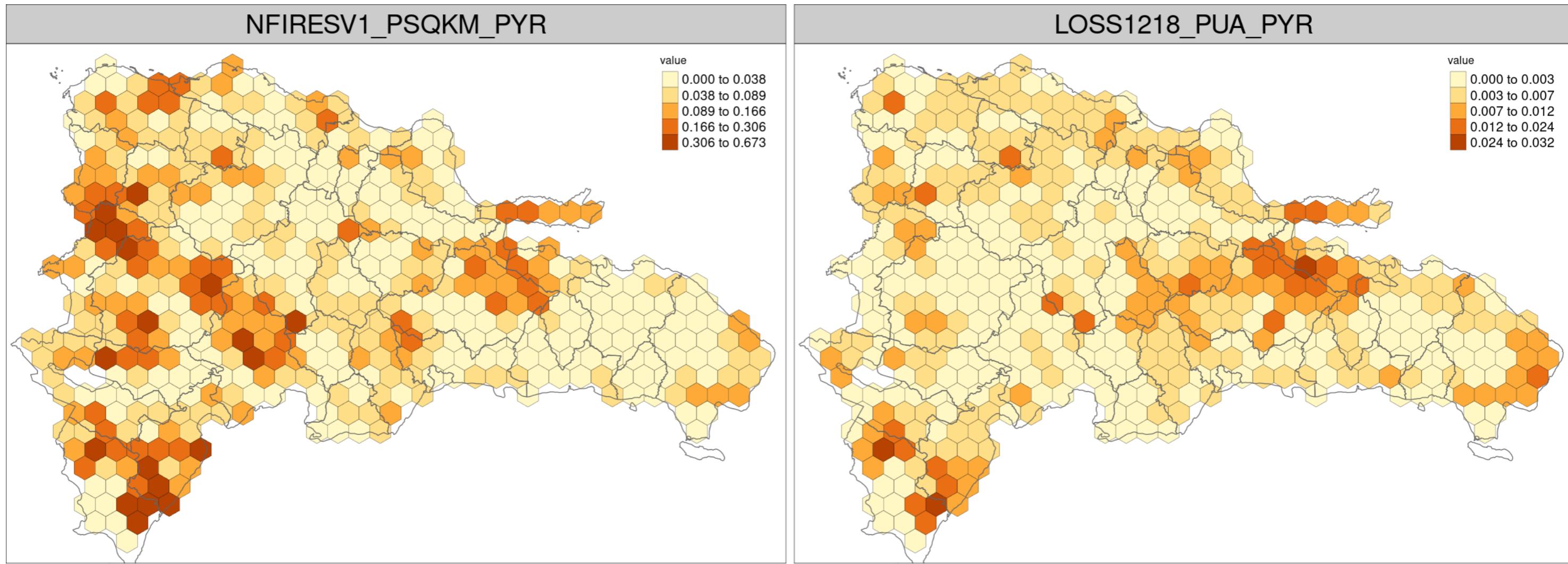
=====



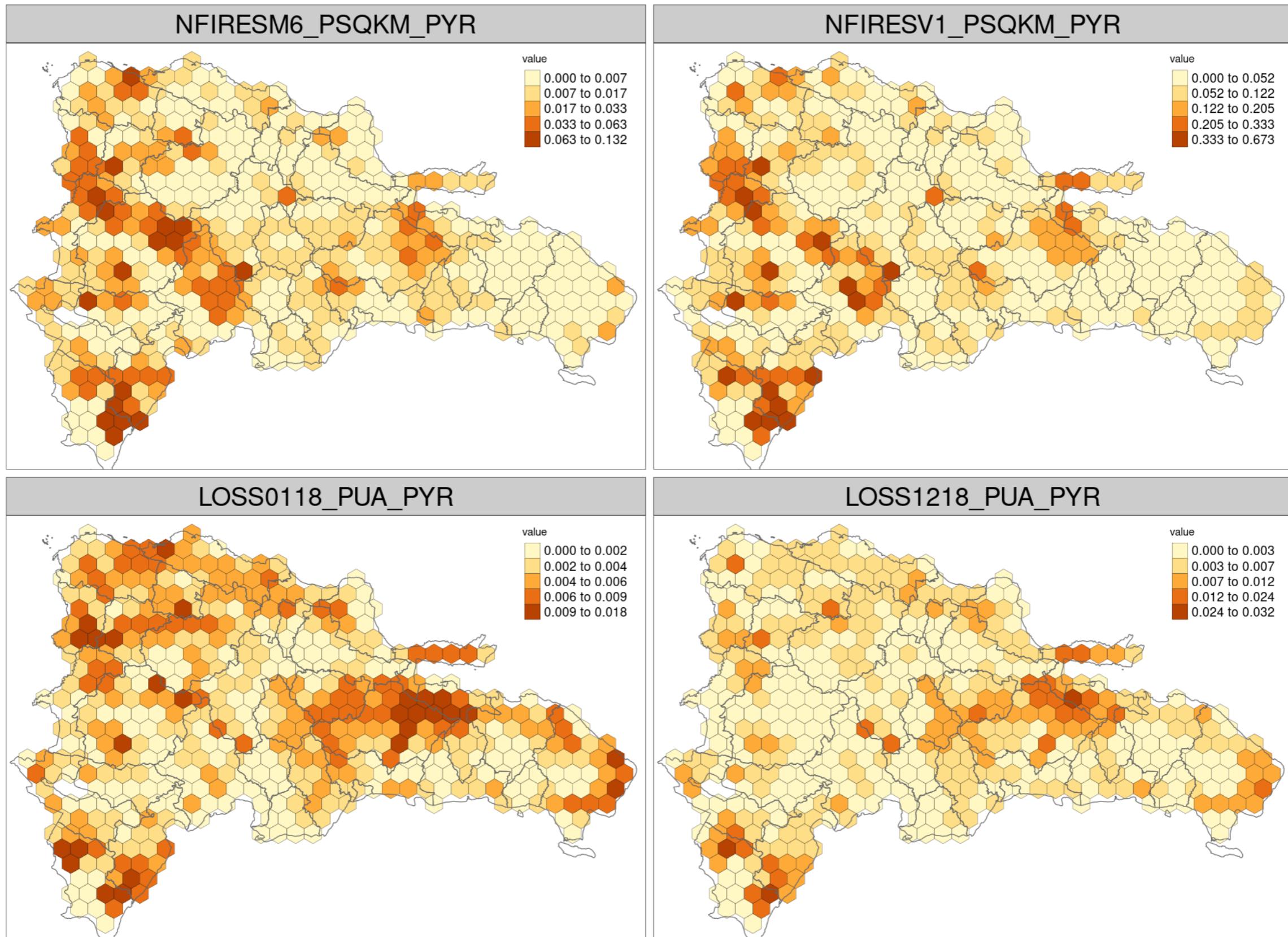
```
# Fires M6 and LOSS0118
grdzonal %>% dplyr::select(matches('LOSS0118_PUA_PYR|NFIRESM6_PSQKM_PYR')) %>%
  replace(is.na(.), 0) %>%
  gather(variable, value, -geometry) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'kmeans') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 2, legend.title.size = 1, legend.text.size = 1) +
  tm_shape(prov) + tm_borders()
```



```
# Fires V1 and LOSS1218
grdzonal %>% dplyr::select(matches('LOSS1218_PUA_PYR|NFIRESV1_PSQKM_PYR')) %>%
  replace(is.na(.), 0) %>%
  gather(variable, value, -geometry) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'kmeans') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 2, nrow = 1, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 2, legend.title.size = 1, legend.text.size = 1) +
  tm_shape(prov) + tm_borders()
```



```
# Fires M6 and LOSS1218, fires V1 and LOSS1218
grdzonal %>% dplyr::select(matches('LOSS1218_PUA_PYR|NFIRESV1_PSQKM_PYR|LOSS0118_PUA_PYR|NFIRESM6_PSQKM_PYR')) %>%
  replace(is.na(.), 0) %>%
  gather(variable, value, -geometry) %>%
  mutate(variable = factor(variable, levels = unique(variable))) %>%
  tm_shape() +
  tm_fill(col='value', palette = "YlOrBr", size = 0.1, style = 'kmeans') +
  tm_borders(col = 'grey15', lwd = 0.3) +
  tm_facets(by = "variable", ncol = 2, nrow = 2, free.coords = FALSE, free.scales = TRUE) +
  tm_layout(panel.label.size = 2, legend.title.size = 1, legend.text.size = 1) +
  tm_shape(prov) + tm_borders()
```



11.6 Zonal, by grid used in the long-term analytical approach

```
#Zonal statistics object  
# hexzonal <- readRDS('out/hex_zonal_statistics.RDS')
```

References

- 10 Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S., Tyukavina, A., ... others. (2013). High-resolution global maps of 21st-century forest cover change. *Science*, 342(6160), 850–853.
- Martínez Batlle, J. R. (2021). Forest loss and fire in the Dominican Republic during the 21st Century. *bioRxiv*. <https://doi.org/10.1101/2021.06.15.448604>
- Oficina Nacional de Estadística -ONE-. (2015). Datos georeferenciados. <https://www.one.gob.do/informaciones-cartograficas/shapefiles>.
- UNEP-WCMC and IUCN. (October 2021). *Protected Planet: The World Database on Protected Areas (WDPA) and World Database on Other Effective Area-based Conservation Measures (WD-OECM)* [Online]. www.protectedplanet.net; Cambridge, UK: UNEP-WCMC and IUCN.