atividade_avaliativa_01_estatistica_espacial

April 8, 2025

[4]:
```
library(sf)
library(sp)
library(raster)
library(terra)
library(geobr)
library(mapview)
```

[6]:
```
install.packages("geobr")
```

```
Updating HTML index of packages in '.Library'

Making 'packages.html' …
Making 'packages.html' …
 done
```

[ ]:
```
install.packages("mapview")
```

```
also installing the dependencies ‘geometries’, ‘jsonify’, ‘rapidjsonr’,
‘sfheaders’, ‘geojsonsf’, ‘crosstalk’, ‘leaflet.providers’, ‘brew’, ‘svglite’,
‘leafem’, ‘leaflet’, ‘leafpop’, ‘satellite’, ‘servr’


Warning message in install.packages("mapview"):
"installation of package ‘svglite’ had non-zero exit status"
```

[5]:
```
##--função genérica para calcular NDVI, NDBI, NDWI
index <- function(img, k, i) {
  bk <- img[[k]]
  bi <- img[[i]]
  index <- (bk - bi) / (bk + bi)
  return(index)
}
```

[6]:
```
##--Outro Exemplo usando usando Alvaraes--##
##--Criando uma caixa de imagem para os municípios do AM
am_muni <- geobr::read_municipality(code_muni = "AM", year = 2019, showProgress␣
 ↪= FALSE)
bbox <- sf::st_bbox(am_muni[55,])
```

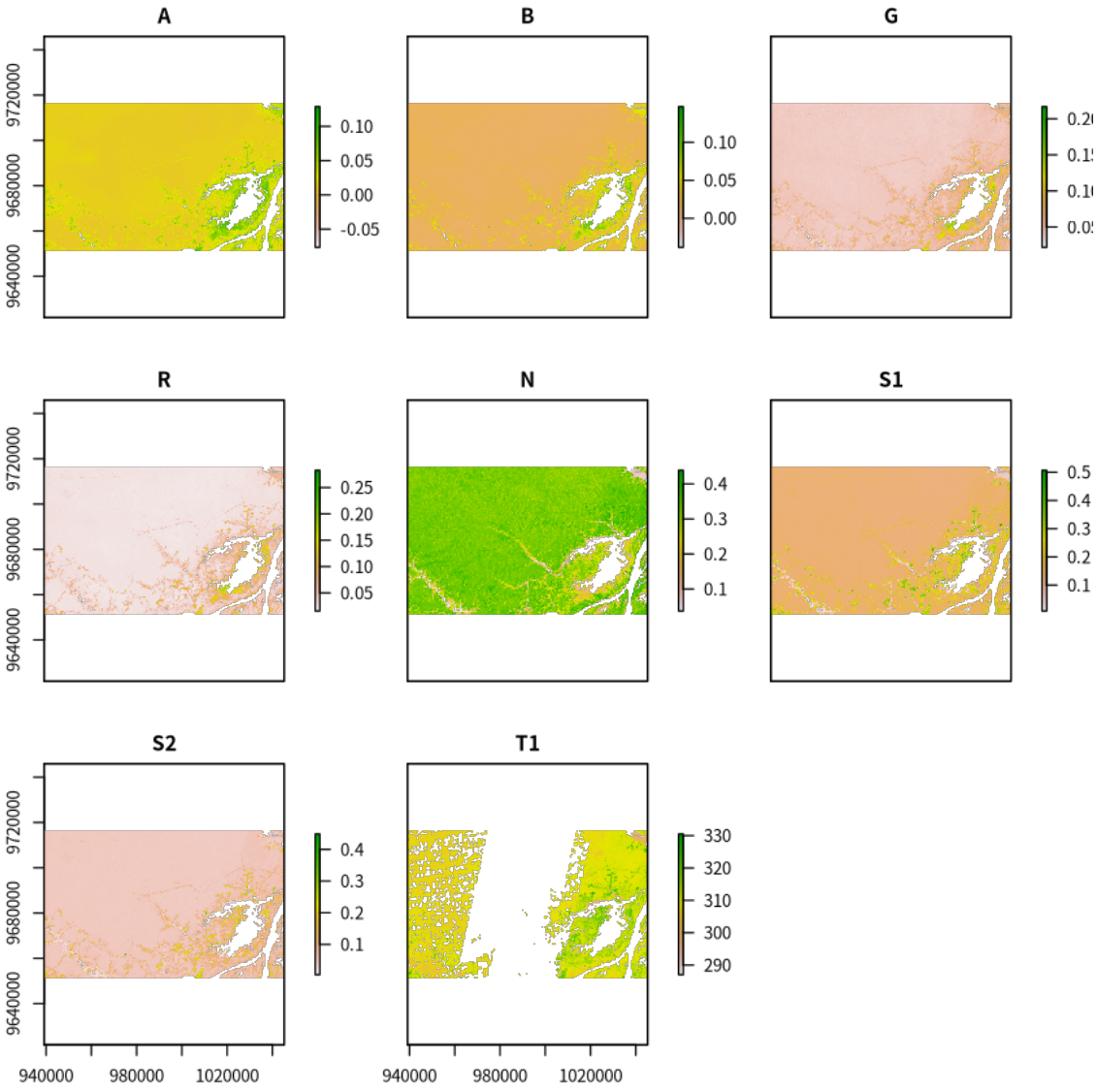
```
bbox <- sf::st_as_sfc(bbox)
silves <- sf::st_transform(bbox, crs = 31980)
```

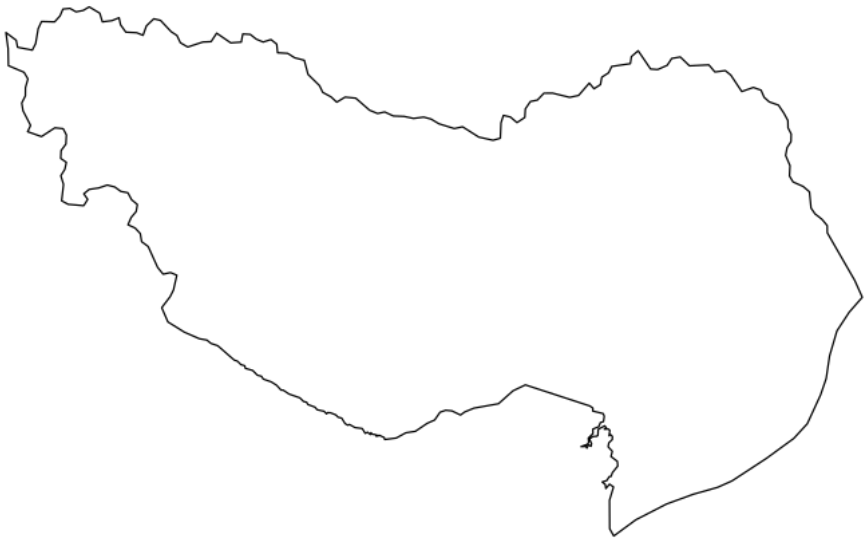
```
Using year/date 2019
```

[ ]:
```
Silves_landsat = rsi::get_landsat_imagery(
  silves,
  start_date = "2023-09-01",
  end_date = "2023-09-30",
  pixel_x_size = 60,
  pixel_y_size = 60,
  output_filename = tempfile(fileext = ".tif")
)
```

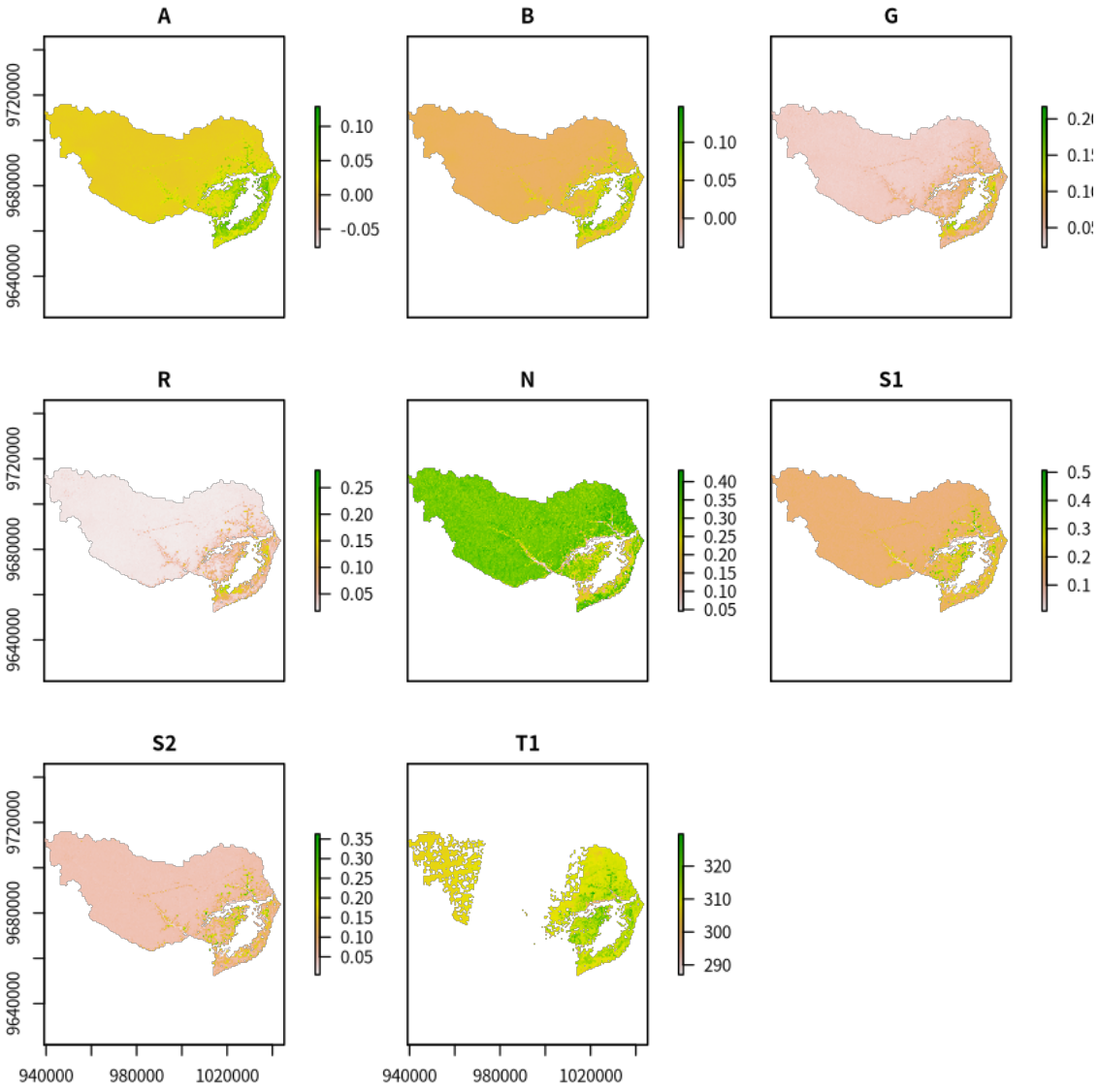
[7]:
```
Silves_landsat <- "/home/huguinho/Documents/GitHub/
 ↪introduction_to_geo_statistics/atividade_avaliativa/silves_landsat.tif"
silves_landsat_rast <- raster::brick(Silves_landsat)
silves_landsat_rast
plot(silves_landsat_rast)
map_silves <- sf::st_union(am_muni[55,]) |> sf::st_sf()
map_silves <- st_transform(map_silves, crs = 31980)
plot(map_silves)
silves_landsat_rast <- mask(silves_landsat_rast, map_silves)
plot(silves_landsat_rast)
mapview::viewRGB(silves_landsat_rast, r=7, g=6, b=4, na.col="transparent")
```

```
class      : RasterBrick
dimensions : 1091, 1768, 1928888, 8  (nrow, ncol, ncell, nlayers)
resolution : 60, 60  (x, y)
extent     : 939086, 1045166, 9651114, 9716574  (xmin, xmax, ymin, ymax)
crs        : +proj=utm +zone=20 +south +ellps=GRS80 +towgs84=0,0,0,0,0,0,0␣
 ↪+units=m +no_defs
source     : silves_landsat.tif
names      : A, B, G, R, N, S1, S2, T1
```

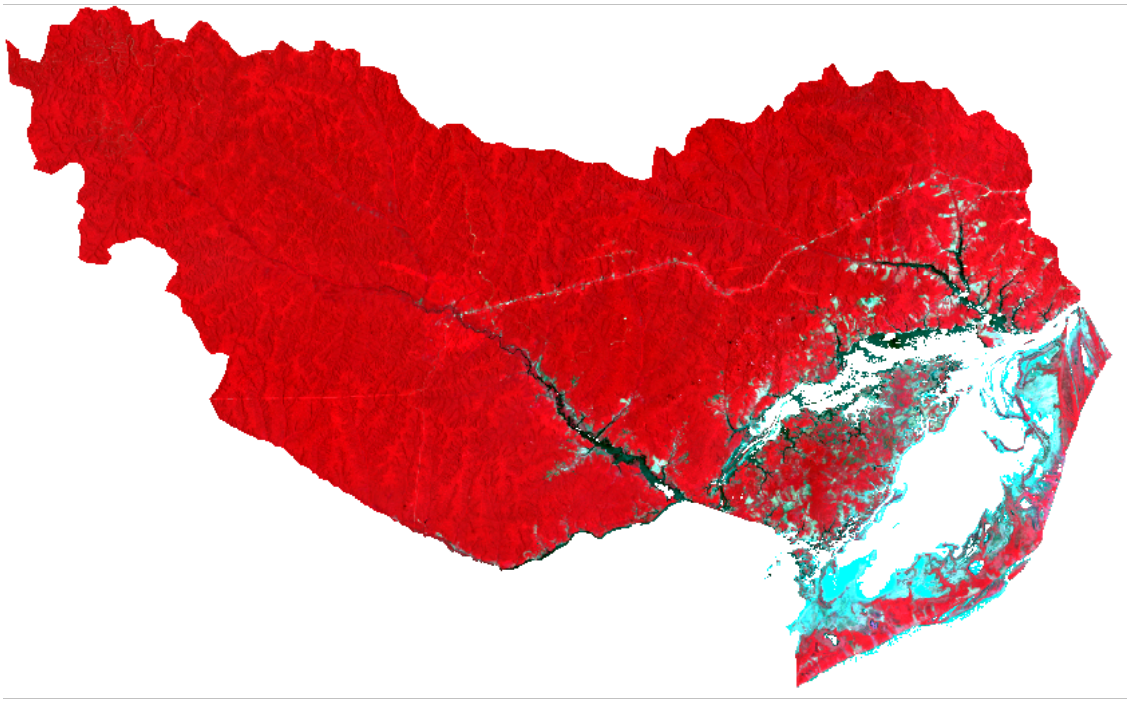

A
B
G
R
N
S1
S2
T1
9720000
9680000
9640000
940000
980000
1020000
0.10
0.05
0.00
-0.05
0.25
0.20
0.15
0.4
0.3
0.2
0.1
330
320
310
300
290



```
Warning message in rasterCheckSize(x, maxpixels = maxpixels):
"maximum number of pixels for Raster* viewing is 5e+05 ;
the supplied Raster* has 1928888
 … decreasing Raster* resolution to 5e+05 pixels
 to view full resolution set 'maxpixels =  1928888 '"
Warning message in CPL_crs_from_input(x):
"GDAL Message 1: +init=epsg:XXXX syntax is deprecated. It might return a CRS
with a non-EPSG compliant axis order."
```



[10]:
```
plotRGB(silves_landsat_rast, r=5, g=4, b=3, stretch="lin")
ndbi <- index(silves_landsat_rast, 6, 5)
```



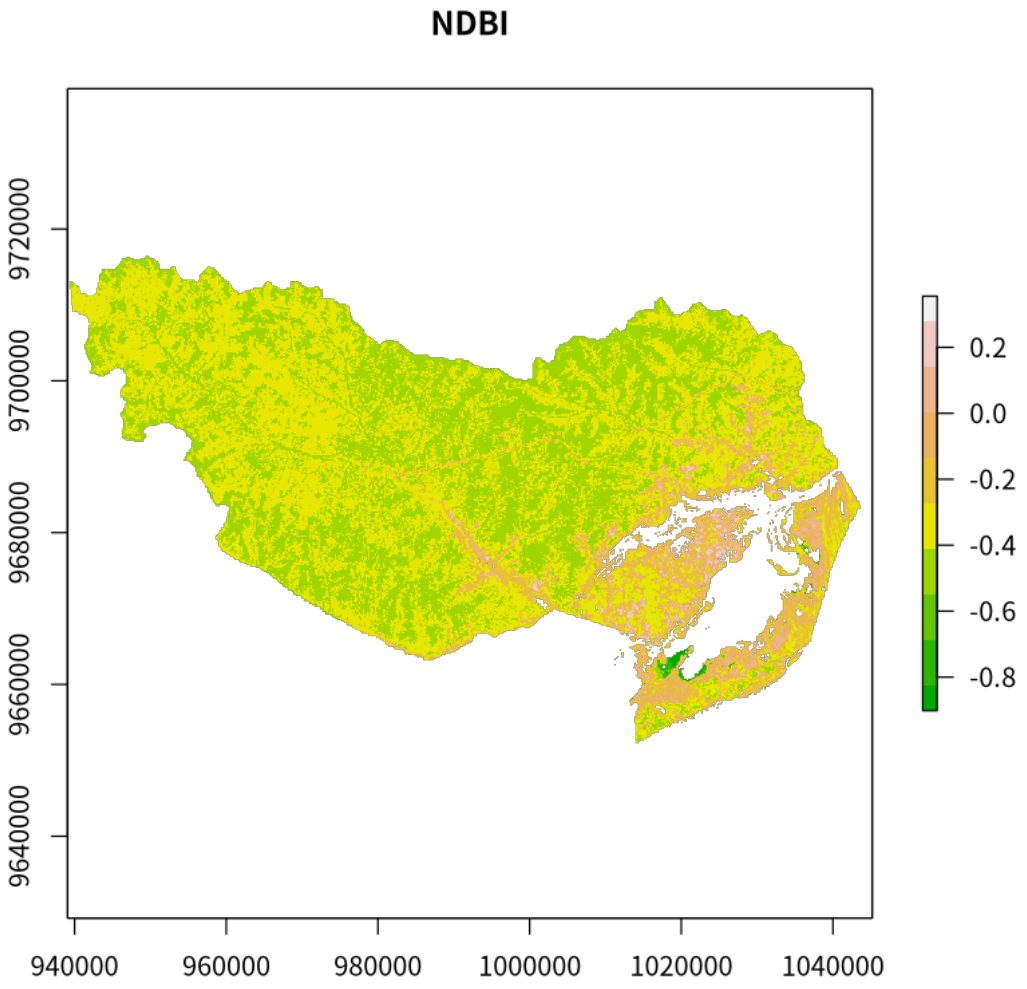
[11]:
```
View(ndbi)
```

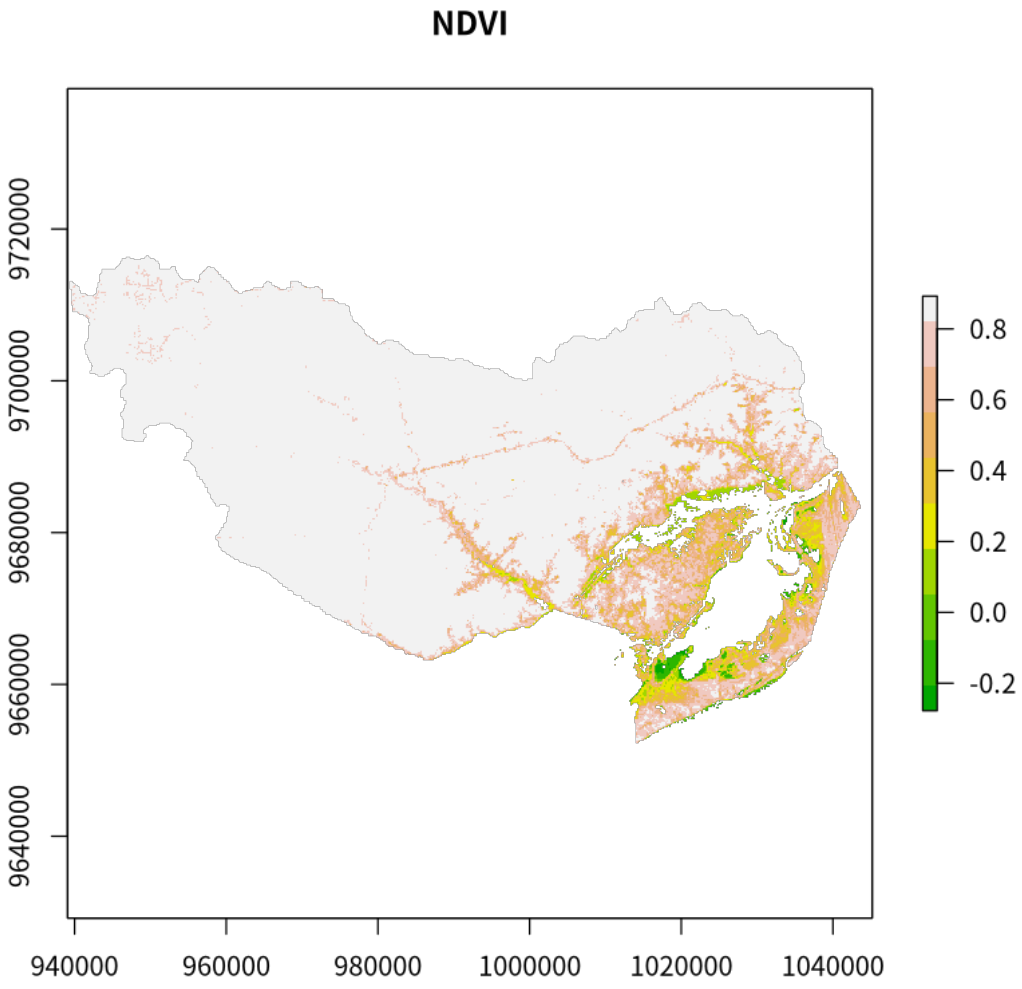
```
class       : RasterLayer
dimensions  : 1091, 1768, 1928888  (nrow, ncol, ncell)
resolution  : 60, 60  (x, y)
extent      : 939086, 1045166, 9651114, 9716574  (xmin, xmax, ymin, ymax)
crs         : +proj=utm +zone=20 +south +ellps=GRS80 +towgs84=0,0,0,0,0,0,0␣
 ↪+units=m +no_defs
source      : memory
names       : layer
values      : -0.9020404, 0.3615322  (min, max)
```

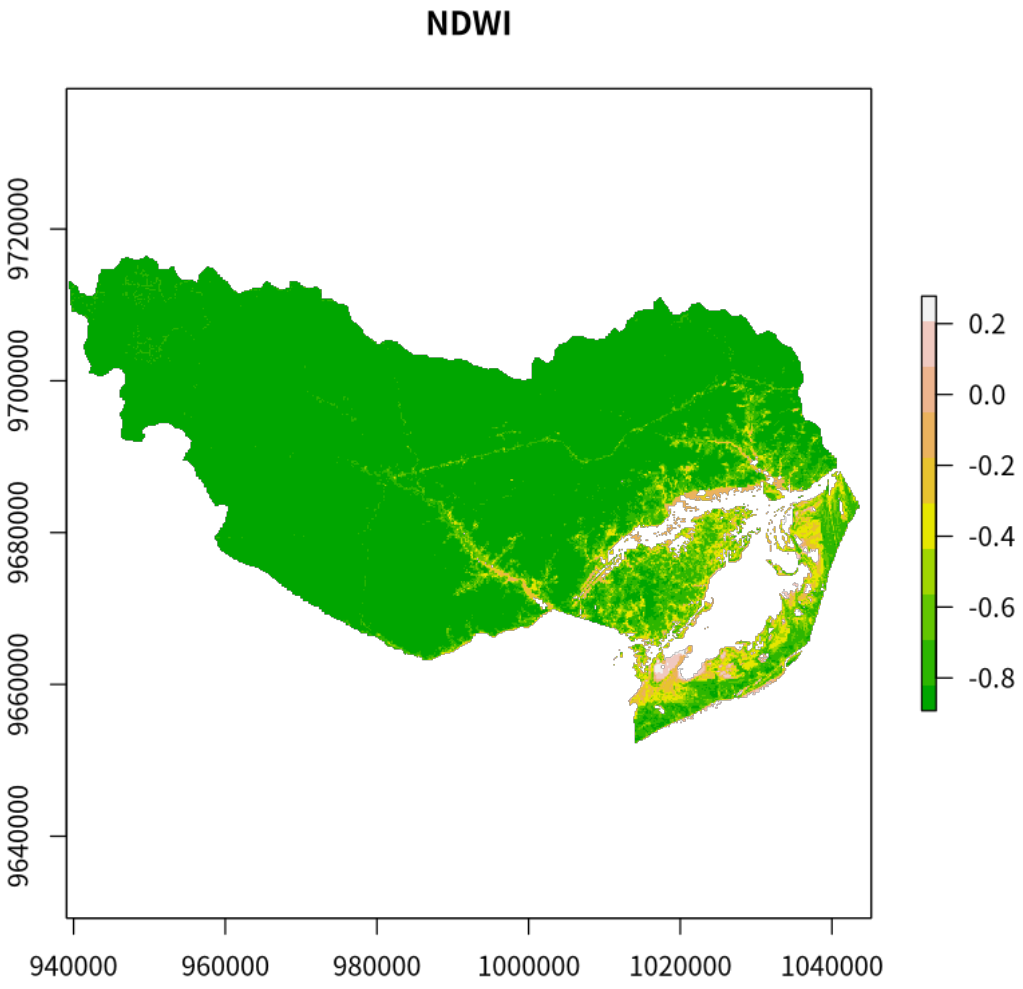
[ ]:

[13]:
```
View(ndbi)
plot(ndbi, main = "NDBI", col = terrain.colors(10))
ndvi <- index(silves_landsat_rast, 5, 4)
plot(ndvi, main = "NDVI", col = terrain.colors(10))
ndwi <- index(silves_landsat_rast, 4, 5)
plot(ndwi, main = "NDWI", col = terrain.colors(10))
ndwi <- index(silves_landsat_rast, 4, 5)
```

```
class      : RasterLayer
dimensions : 1091, 1768, 1928888  (nrow, ncol, ncell)
resolution : 60, 60  (x, y)
extent     : 939086, 1045166, 9651114, 9716574  (xmin, xmax, ymin, ymax)
crs        : +proj=utm +zone=20 +south +ellps=GRS80 +towgs84=0,0,0,0,0,0,0␣
 ↪+units=m +no_defs
source     : memory
names      : layer
values     : -0.9020404, 0.3615322  (min, max)
```


NDBI
9720000
9700000
9680000
9660000
9640000
940000
960000
980000
1000000
1020000
1040000
0.2
0.0
-0.2
-0.4
-0.6
-0.8


NDVI
9720000
9700000
9680000
9660000
9640000
940000
960000
980000
1000000
1020000
1040000
0.8
0.6
0.4
0.2
0.0
-0.2


NDWI
9720000
9700000
9680000
9660000
9640000
940000
960000
980000
1000000
1020000
1040000
0.2
0.0
-0.2
-0.4
-0.6
-0.8