

Tutorial de Uso do Pacote Bioma Stats

iuri

2023-05-13

Instalação

```
#devtools::instal("nome/repo")
library("biomastats")
(caminho_pacote <- system.file(package = "biomastats"))

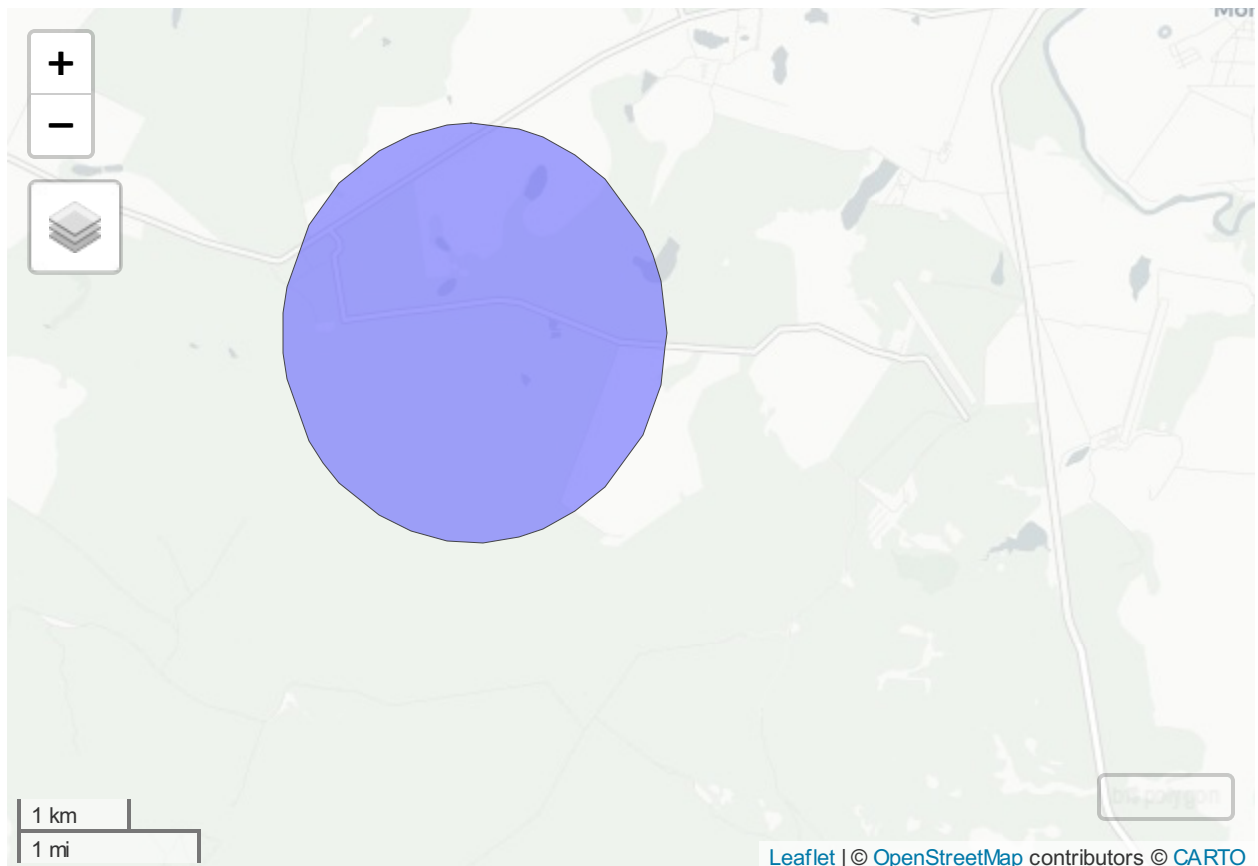
## [1] "C:/Users/ferre/AppData/Local/R/cache/R/renv/library/biomastats-7ce85a70/R-4.1/x86_64-w64-mingw32/
```

criando e visualizando o recorte

```
bf <- make_polygon(lat = -23.62, lon = -48.55, size = 2, shape = "circle")

## Deleting layer `polygon' using driver `ESRI Shapefile'
## Writing layer `polygon' to data source
## `C:/Users/ferre/AppData/Local/R/cache/R/renv/library/biomastats-7ce85a70/R-4.1/x86_64-w64-mingw32/
## Writing 1 features with 0 fields and geometry type Polygon.
## Shapefile created
## Shapefile stored in ./ex_shp as polygon.shp
## biomastats directory: C:/Users/ferre/AppData/Local/R/cache/R/renv/library/biomastats-7ce85a70/R-4.1.
library(mapview)

## Warning: package 'mapview' was built under R version 4.1.3
mapview(bf$polygon)
```



carregando rasters

```
path_to_rasters <- "D:/iuri-external-hd/mapbiomas/colecao-sete"
list.files(path_to_rasters)
```

```
## [1] "brasil_coverage_1985.tif" "brasil_coverage_1986.tif"
## [3] "brasil_coverage_1987.tif" "brasil_coverage_1988.tif"
## [5] "brasil_coverage_1989.tif" "brasil_coverage_1990.tif"
## [7] "brasil_coverage_1991.tif" "brasil_coverage_1992.tif"
## [9] "brasil_coverage_1993.tif" "brasil_coverage_1994.tif"
## [11] "brasil_coverage_1995.tif" "brasil_coverage_1996.tif"
## [13] "brasil_coverage_1997.tif" "brasil_coverage_1998.tif"
## [15] "brasil_coverage_1999.tif" "brasil_coverage_2000.tif"
## [17] "brasil_coverage_2001.tif" "brasil_coverage_2002.tif"
## [19] "brasil_coverage_2003.tif" "brasil_coverage_2004.tif"
## [21] "brasil_coverage_2005.tif" "brasil_coverage_2006.tif"
## [23] "brasil_coverage_2007.tif" "brasil_coverage_2008.tif"
## [25] "brasil_coverage_2009.tif" "brasil_coverage_2010.tif"
## [27] "brasil_coverage_2011.tif" "brasil_coverage_2012.tif"
## [29] "brasil_coverage_2013.tif" "brasil_coverage_2014.tif"
## [31] "brasil_coverage_2015.tif" "brasil_coverage_2016.tif"
## [33] "brasil_coverage_2017.tif" "brasil_coverage_2018.tif"
## [35] "brasil_coverage_2019.tif" "brasil_coverage_2020.tif"
## [37] "brasil_coverage_2021.tif"
```

```
recortes <- load_rasters(start=1985, end=2021, data_from = "folder", folder_path = path_to_rasters)

## Reading layer `polygon' from data source
## `C:\Users\ferre\AppData\Local\R\cache\R\renv\library\biomastats-7ce85a70\R-4.1\x86_64-w64-mingw32\'
## using driver `ESRI Shapefile'
## Simple feature collection with 1 feature and 1 field
## Geometry type: POLYGON
## Dimension: XY
## Bounding box: xmin: -48.56645 ymin: -23.63646 xmax: -48.53354 ymax: -23.60354
## Geodetic CRS: WGS 84
```

Calculando areas

```
results <- get_area(recortes)
results$aggregate_data
```

##	land_class	year	area	land_class_name
## 3	3	1985	0.647	Forest Formation
## 4	4	1985	0.004	Savanna Formation
## 9	9	1985	2.139	Forest Plantation
## 11	11	1985	0.469	Wetland
## 15	15	1985	4.594	Pasture
## 21	21	1985	1.033	Mosaic of Uses
## 25	25	1985	0.014	Other Non Vegetated Areas
## 33	33	1985	0.020	River, Lake and Ocean
## 47	47	1985	0.675	Citrus
## 31	3	1986	0.641	Forest Formation
## 91	9	1986	2.139	Forest Plantation
## 111	11	1986	0.450	Wetland
## 151	15	1986	4.545	Pasture
## 211	21	1986	1.092	Mosaic of Uses
## 251	25	1986	0.010	Other Non Vegetated Areas
## 331	33	1986	0.043	River, Lake and Ocean
## 471	47	1986	0.676	Citrus
## 32	3	1987	0.653	Forest Formation
## 92	9	1987	2.139	Forest Plantation
## 112	11	1987	0.462	Wetland
## 152	15	1987	4.397	Pasture
## 212	21	1987	1.192	Mosaic of Uses
## 332	33	1987	0.042	River, Lake and Ocean
## 39	39	1987	0.007	Soybean
## 472	47	1987	0.704	Citrus
## 34	3	1988	0.502	Forest Formation
## 93	9	1988	2.437	Forest Plantation
## 113	11	1988	0.463	Wetland
## 153	15	1988	4.218	Pasture
## 213	21	1988	1.188	Mosaic of Uses
## 333	33	1988	0.040	River, Lake and Ocean
## 391	39	1988	0.041	Soybean
## 473	47	1988	0.705	Citrus
## 35	3	1989	0.491	Forest Formation
## 94	9	1989	2.441	Forest Plantation
## 114	11	1989	0.448	Wetland

## 154	15 1989 4.188	Pasture
## 214	21 1989 1.190	Mosaic of Uses
## 334	33 1989 0.042	River, Lake and Ocean
## 392	39 1989 0.089	Soybean
## 41	41 1989 0.004	Other Temporary Crops
## 474	47 1989 0.701	Citrus
## 36	3 1990 0.524	Forest Formation
## 95	9 1990 2.406	Forest Plantation
## 115	11 1990 0.396	Wetland
## 155	15 1990 4.241	Pasture
## 215	21 1990 0.689	Mosaic of Uses
## 335	33 1990 0.047	River, Lake and Ocean
## 393	39 1990 0.586	Soybean
## 411	41 1990 0.046	Other Temporary Crops
## 475	47 1990 0.660	Citrus
## 37	3 1991 0.530	Forest Formation
## 96	9 1991 2.100	Forest Plantation
## 116	11 1991 0.397	Wetland
## 12	12 1991 0.108	Grassland
## 156	15 1991 4.356	Pasture
## 216	21 1991 1.013	Mosaic of Uses
## 336	33 1991 0.048	River, Lake and Ocean
## 394	39 1991 0.580	Soybean
## 412	41 1991 0.159	Other Temporary Crops
## 476	47 1991 0.303	Citrus
## 38	3 1992 0.477	Forest Formation
## 97	9 1992 1.410	Forest Plantation
## 117	11 1992 0.383	Wetland
## 121	12 1992 0.124	Grassland
## 157	15 1992 4.534	Pasture
## 217	21 1992 1.821	Mosaic of Uses
## 337	33 1992 0.047	River, Lake and Ocean
## 395	39 1992 0.304	Soybean
## 413	41 1992 0.456	Other Temporary Crops
## 477	47 1992 0.039	Citrus
## 310	3 1993 0.453	Forest Formation
## 98	9 1993 0.629	Forest Plantation
## 118	11 1993 0.384	Wetland
## 122	12 1993 0.176	Grassland
## 158	15 1993 4.827	Pasture
## 218	21 1993 2.299	Mosaic of Uses
## 338	33 1993 0.046	River, Lake and Ocean
## 414	41 1993 0.774	Other Temporary Crops
## 478	47 1993 0.007	Citrus
## 311	3 1994 0.414	Forest Formation
## 99	9 1994 0.515	Forest Plantation
## 119	11 1994 0.397	Wetland
## 123	12 1994 0.274	Grassland
## 159	15 1994 4.905	Pasture
## 219	21 1994 2.264	Mosaic of Uses
## 339	33 1994 0.061	River, Lake and Ocean
## 396	39 1994 0.036	Soybean
## 415	41 1994 0.729	Other Temporary Crops
## 312	3 1995 0.406	Forest Formation

## 910	9 1995 0.120	Forest Plantation
## 1110	11 1995 0.466	Wetland
## 124	12 1995 0.383	Grassland
## 1510	15 1995 5.044	Pasture
## 2110	21 1995 2.333	Mosaic of Uses
## 3310	33 1995 0.079	River, Lake and Ocean
## 397	39 1995 0.117	Soybean
## 416	41 1995 0.647	Other Temporary Crops
## 313	3 1996 0.396	Forest Formation
## 911	9 1996 0.068	Forest Plantation
## 1111	11 1996 0.508	Wetland
## 125	12 1996 0.342	Grassland
## 1511	15 1996 5.192	Pasture
## 2111	21 1996 2.082	Mosaic of Uses
## 3311	33 1996 0.073	River, Lake and Ocean
## 398	39 1996 0.163	Soybean
## 417	41 1996 0.770	Other Temporary Crops
## 314	3 1997 0.304	Forest Formation
## 912	9 1997 0.063	Forest Plantation
## 1112	11 1997 0.577	Wetland
## 126	12 1997 0.237	Grassland
## 1512	15 1997 5.651	Pasture
## 2112	21 1997 1.684	Mosaic of Uses
## 3312	33 1997 0.077	River, Lake and Ocean
## 399	39 1997 0.002	Soybean
## 418	41 1997 1.001	Other Temporary Crops
## 315	3 1998 0.302	Forest Formation
## 913	9 1998 0.070	Forest Plantation
## 1113	11 1998 0.650	Wetland
## 127	12 1998 0.175	Grassland
## 1513	15 1998 5.148	Pasture
## 2113	21 1998 2.150	Mosaic of Uses
## 3313	33 1998 0.098	River, Lake and Ocean
## 3910	39 1998 0.070	Soybean
## 419	41 1998 0.931	Other Temporary Crops
## 316	3 1999 0.313	Forest Formation
## 914	9 1999 0.023	Forest Plantation
## 1114	11 1999 0.652	Wetland
## 128	12 1999 0.124	Grassland
## 1514	15 1999 5.147	Pasture
## 2114	21 1999 2.211	Mosaic of Uses
## 3314	33 1999 0.098	River, Lake and Ocean
## 3911	39 1999 0.062	Soybean
## 4110	41 1999 0.965	Other Temporary Crops
## 317	3 2000 0.312	Forest Formation
## 915	9 2000 0.015	Forest Plantation
## 1115	11 2000 0.669	Wetland
## 129	12 2000 0.044	Grassland
## 1515	15 2000 4.682	Pasture
## 2115	21 2000 2.153	Mosaic of Uses
## 3315	33 2000 0.093	River, Lake and Ocean
## 3912	39 2000 0.672	Soybean
## 4111	41 2000 0.955	Other Temporary Crops
## 318	3 2001 0.327	Forest Formation

## 916	9	2001	0.019	Forest Plantation
## 1116	11	2001	0.664	Wetland
## 1210	12	2001	0.026	Grassland
## 1516	15	2001	4.474	Pasture
## 2116	21	2001	1.880	Mosaic of Uses
## 3316	33	2001	0.093	River, Lake and Ocean
## 3913	39	2001	1.149	Soybean
## 4112	41	2001	0.963	Other Temporary Crops
## 319	3	2002	0.338	Forest Formation
## 917	9	2002	0.018	Forest Plantation
## 1117	11	2002	0.659	Wetland
## 1211	12	2002	0.022	Grassland
## 1517	15	2002	4.290	Pasture
## 2117	21	2002	1.882	Mosaic of Uses
## 3317	33	2002	0.080	River, Lake and Ocean
## 3914	39	2002	1.081	Soybean
## 4113	41	2002	1.224	Other Temporary Crops
## 320	3	2003	0.374	Forest Formation
## 918	9	2003	0.011	Forest Plantation
## 1118	11	2003	0.608	Wetland
## 1212	12	2003	0.004	Grassland
## 1518	15	2003	4.023	Pasture
## 2118	21	2003	1.602	Mosaic of Uses
## 3318	33	2003	0.077	River, Lake and Ocean
## 3915	39	2003	1.626	Soybean
## 4114	41	2003	1.269	Other Temporary Crops
## 321	3	2004	0.384	Forest Formation
## 919	9	2004	0.007	Forest Plantation
## 1119	11	2004	0.578	Wetland
## 1519	15	2004	4.003	Pasture
## 2119	21	2004	1.591	Mosaic of Uses
## 3319	33	2004	0.069	River, Lake and Ocean
## 3916	39	2004	1.465	Soybean
## 4115	41	2004	1.498	Other Temporary Crops
## 322	3	2005	0.384	Forest Formation
## 1120	11	2005	0.585	Wetland
## 1520	15	2005	3.896	Pasture
## 2120	21	2005	1.631	Mosaic of Uses
## 3320	33	2005	0.070	River, Lake and Ocean
## 3917	39	2005	1.750	Soybean
## 4116	41	2005	1.278	Other Temporary Crops
## 323	3	2006	0.384	Forest Formation
## 1121	11	2006	0.589	Wetland
## 1521	15	2006	3.762	Pasture
## 2121	21	2006	1.741	Mosaic of Uses
## 3321	33	2006	0.093	River, Lake and Ocean
## 3918	39	2006	1.478	Soybean
## 4117	41	2006	1.547	Other Temporary Crops
## 324	3	2007	0.384	Forest Formation
## 1122	11	2007	0.618	Wetland
## 1522	15	2007	3.026	Pasture
## 2122	21	2007	2.409	Mosaic of Uses
## 3322	33	2007	0.085	River, Lake and Ocean
## 3919	39	2007	1.253	Soybean

## 4118	41	2007	1.819	Other Temporary Crops
## 325	3	2008	0.393	Forest Formation
## 1123	11	2008	0.638	Wetland
## 1523	15	2008	2.788	Pasture
## 2123	21	2008	2.365	Mosaic of Uses
## 3323	33	2008	0.079	River, Lake and Ocean
## 3920	39	2008	1.880	Soybean
## 4119	41	2008	1.453	Other Temporary Crops
## 326	3	2009	0.388	Forest Formation
## 1124	11	2009	0.663	Wetland
## 1524	15	2009	2.372	Pasture
## 2124	21	2009	1.113	Mosaic of Uses
## 3324	33	2009	0.075	River, Lake and Ocean
## 3921	39	2009	4.009	Soybean
## 4120	41	2009	0.975	Other Temporary Crops
## 327	3	2010	0.376	Forest Formation
## 1125	11	2010	0.689	Wetland
## 1525	15	2010	2.277	Pasture
## 2125	21	2010	1.182	Mosaic of Uses
## 3325	33	2010	0.076	River, Lake and Ocean
## 3922	39	2010	4.187	Soybean
## 4121	41	2010	0.808	Other Temporary Crops
## 328	3	2011	0.369	Forest Formation
## 1126	11	2011	0.705	Wetland
## 1526	15	2011	2.133	Pasture
## 2126	21	2011	1.278	Mosaic of Uses
## 3326	33	2011	0.078	River, Lake and Ocean
## 3923	39	2011	1.921	Soybean
## 4122	41	2011	3.111	Other Temporary Crops
## 329	3	2012	0.364	Forest Formation
## 1127	11	2012	0.733	Wetland
## 1527	15	2012	1.936	Pasture
## 2127	21	2012	1.439	Mosaic of Uses
## 3327	33	2012	0.070	River, Lake and Ocean
## 3924	39	2012	2.666	Soybean
## 4123	41	2012	2.387	Other Temporary Crops
## 330	3	2013	0.368	Forest Formation
## 1128	11	2013	0.758	Wetland
## 1528	15	2013	1.775	Pasture
## 2128	21	2013	1.613	Mosaic of Uses
## 3328	33	2013	0.054	River, Lake and Ocean
## 3925	39	2013	2.423	Soybean
## 4124	41	2013	2.604	Other Temporary Crops
## 340	3	2014	0.373	Forest Formation
## 920	9	2014	0.001	Forest Plantation
## 1129	11	2014	0.776	Wetland
## 1529	15	2014	1.618	Pasture
## 2129	21	2014	1.734	Mosaic of Uses
## 3329	33	2014	0.048	River, Lake and Ocean
## 3926	39	2014	2.603	Soybean
## 4125	41	2014	2.442	Other Temporary Crops
## 341	3	2015	0.373	Forest Formation
## 921	9	2015	0.001	Forest Plantation
## 1130	11	2015	0.782	Wetland

## 1530	15	2015	1.082	Pasture
## 2130	21	2015	2.073	Mosaic of Uses
## 3330	33	2015	0.050	River, Lake and Ocean
## 3927	39	2015	3.859	Soybean
## 4126	41	2015	1.376	Other Temporary Crops
## 342	3	2016	0.369	Forest Formation
## 922	9	2016	0.002	Forest Plantation
## 1131	11	2016	0.764	Wetland
## 1531	15	2016	0.994	Pasture
## 2131	21	2016	2.077	Mosaic of Uses
## 3331	33	2016	0.051	River, Lake and Ocean
## 3928	39	2016	4.851	Soybean
## 4127	41	2016	0.488	Other Temporary Crops
## 343	3	2017	0.370	Forest Formation
## 923	9	2017	0.002	Forest Plantation
## 1132	11	2017	0.740	Wetland
## 1532	15	2017	0.574	Pasture
## 2132	21	2017	2.334	Mosaic of Uses
## 3332	33	2017	0.052	River, Lake and Ocean
## 3929	39	2017	5.396	Soybean
## 4128	41	2017	0.127	Other Temporary Crops
## 344	3	2018	0.370	Forest Formation
## 924	9	2018	0.002	Forest Plantation
## 1133	11	2018	0.763	Wetland
## 1533	15	2018	0.397	Pasture
## 2133	21	2018	1.898	Mosaic of Uses
## 3333	33	2018	0.034	River, Lake and Ocean
## 3930	39	2018	6.110	Soybean
## 4129	41	2018	0.022	Other Temporary Crops
## 345	3	2019	0.383	Forest Formation
## 925	9	2019	0.002	Forest Plantation
## 1134	11	2019	0.727	Wetland
## 1534	15	2019	0.349	Pasture
## 2134	21	2019	1.269	Mosaic of Uses
## 3334	33	2019	0.034	River, Lake and Ocean
## 3931	39	2019	6.822	Soybean
## 4130	41	2019	0.010	Other Temporary Crops
## 346	3	2020	0.404	Forest Formation
## 926	9	2020	0.002	Forest Plantation
## 1135	11	2020	0.726	Wetland
## 1535	15	2020	0.347	Pasture
## 2135	21	2020	1.233	Mosaic of Uses
## 3335	33	2020	0.024	River, Lake and Ocean
## 3932	39	2020	6.830	Soybean
## 4131	41	2020	0.030	Other Temporary Crops
## 347	3	2021	0.441	Forest Formation
## 927	9	2021	0.002	Forest Plantation
## 1136	11	2021	0.645	Wetland
## 1536	15	2021	0.393	Pasture
## 2136	21	2021	1.241	Mosaic of Uses
## 3336	33	2021	0.017	River, Lake and Ocean
## 3933	39	2021	6.832	Soybean
## 4132	41	2021	0.024	Other Temporary Crops


```
results$Years
```

```
## [1] 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999
## [16] 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
## [31] 2015 2016 2017 2018 2019 2020 2021
```

```
results$`Occupied area`
```

```
## [[1]]
##          3          4          9          11          15          21
## 0.646597113 0.004097928 2.138881930 0.468787931 4.594312184 1.033414207
##          25          33          47
## 0.013930358 0.019669148 0.675259574
##
## [[2]]
##          3          9          11          15          21          25
## 0.640860347 2.138881930 0.449938071 4.545142528 1.091598753 0.009833187
##          33          47
## 0.042616517 0.676079040
##
## [[3]]
##          3          9          11          15          21          33
## 0.653152719 2.138881888 0.462231299 4.396796975 1.191592114 0.041796977
##          39          47
## 0.006556248 0.703942152
##
## [[4]]
##          3          9          11          15          21          33          39
## 0.50234562 2.43721237 0.46305061 4.21814479 1.18830110 0.04015789 0.04097640
##          47
## 0.70476161
##
## [[5]]
##          3          9          11          15          21          33
## 0.490871091 2.441310313 0.448298237 4.187821594 1.189942472 0.041796987
##          39          41          47
## 0.089328520 0.004097679 0.701483480
##
## [[6]]
##          3          9          11          15          21          33          39
## 0.52446932 2.40607139 0.39584675 4.24108991 0.68922020 0.04671424 0.58595296
##          41          47
## 0.04589623 0.65968940
##
## [[7]]
##          3          9          11          12          15          21          33
## 0.53020333 2.10040510 0.39748578 0.10816984 4.35581745 1.01292071 0.04753379
##          39          41          47
## 0.58021208 0.15899052 0.30321178
##
## [[8]]
##          3          9          11          12          15          21          33
## 0.47693450 1.41038679 0.38273429 0.12373995 4.53445266 1.82096109 0.04671424
##          39          41          47
```

```

## 0.30403670 0.45647406 0.03851609
##
## [[9]]
##          3          9          11          12          15          21
## 0.453179419 0.629379978 0.383553037 0.176187292 4.827011590 2.298746006
##          33          41          47
## 0.045894674 0.773623029 0.007375347
##
## [[10]]
##          3          9          11          12          15          21          33
## 0.41384366 0.51464976 0.39748518 0.27370892 4.90484478 2.26352311 0.06146697
##          39          41
## 0.03605927 0.72936872
##
## [[11]]
##          3          9          11          12          15          21          33
## 0.40564877 0.12047314 0.46632724 0.38270061 5.04414918 2.33318370 0.07867849
##          39          41
## 0.11719385 0.64659537
##
## [[12]]
##          3          9          11          12          15          21          33
## 0.39581384 0.06802596 0.50812348 0.34172865 5.19246131 2.08241396 0.07294175
##          39          41
## 0.16309770 0.77034374
##
## [[13]]
##          3          9          11          12          15          21
## 0.304017926 0.063108471 0.576964329 0.236834343 5.650548585 1.684155351
##          33          39          41
## 0.077039655 0.001639077 1.000642637
##
## [[14]]
##          3          9          11          12          15          21          33
## 0.30237946 0.06966386 0.64990630 0.17537169 5.14814457 2.15049627 0.09752783
##          39          41
## 0.07047903 0.93098137
##
## [[15]]
##          3          9          11          12          15          21          33
## 0.31303503 0.02294573 0.65154648 0.12374329 5.14730837 2.21115715 0.09834697
##          39          41
## 0.06228429 0.96458307
##
## [[16]]
##          3          9          11          12          15          21          33
## 0.31221556 0.01474970 0.66875789 0.04425232 4.68177934 2.15295667 0.09342944
##          39          41
## 0.67205737 0.95475208
##
## [[17]]
##          3          9          11          12          15          21          33
## 0.32696669 0.01884683 0.66384045 0.02622356 4.47362684 1.88002647 0.09342971
##          39          41

```

```

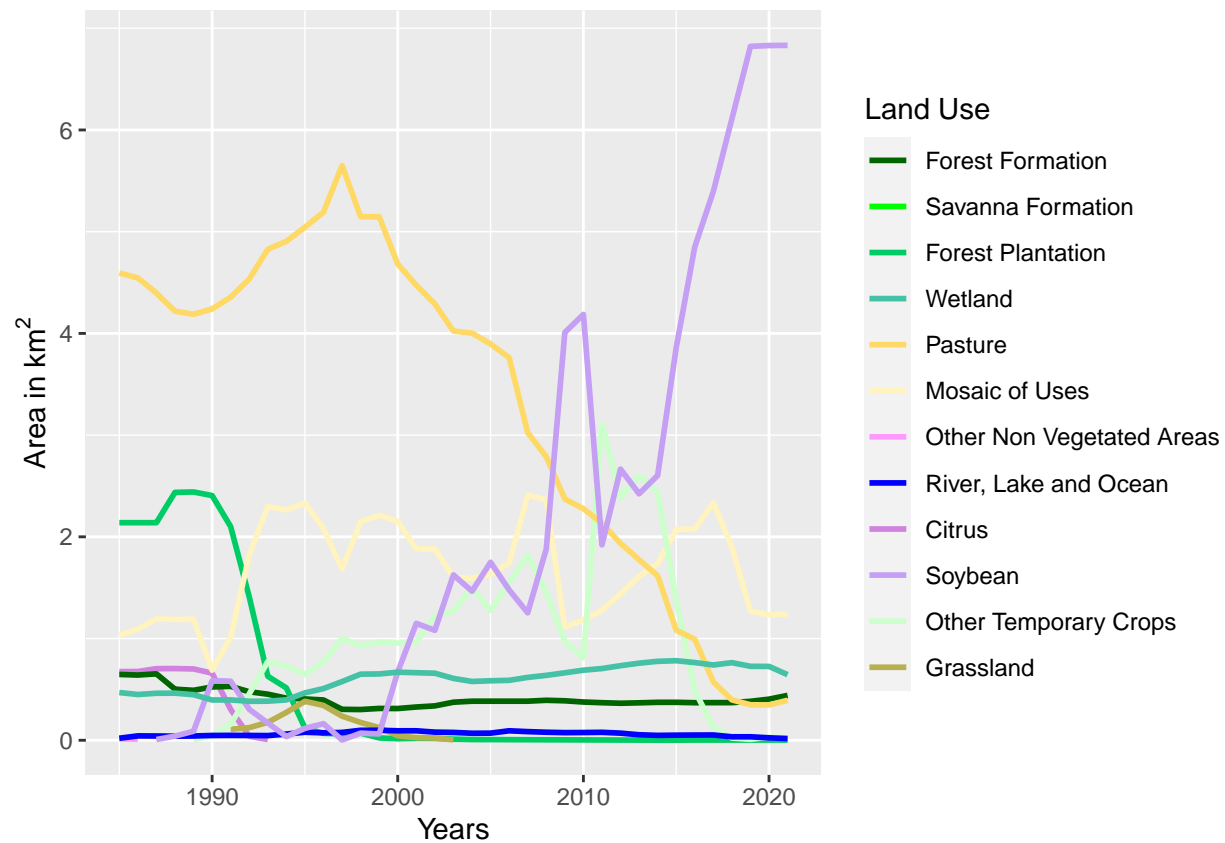
## 1.14904591 0.96294391
##
## [[18]]
##          3          9          11          12          15          21          33
## 0.33843895 0.01802740 0.65892361 0.02212621 4.29005453 1.88165106 0.08031685
##          39          41
## 1.08102110 1.22439065
##
## [[19]]
##          3          9          11          12          15          21
## 0.374499323 0.010652521 0.608111930 0.004097328 4.022900763 1.602159280
##          33          39          41
## 0.077038468 1.626009264 1.269481496
##
## [[20]]
##          3          9          11          15          21          33
## 0.384334021 0.006555378 0.577789549 4.003229782 1.590682413 0.068842568
##          39          41
## 1.465380306 1.498136357
##
## [[21]]
##          3          11          15          21          33          39          41
## 0.38433415 0.58516548 3.89587447 1.63083337 0.07048158 1.74976462 1.27849670
##
## [[22]]
##          3          11          15          21          33          39          41
## 0.38433447 0.58926302 3.76229258 1.74064798 0.09342916 1.47767122 1.54731194
##
## [[23]]
##          3          11          15          21          33          39          41
## 0.38433478 0.61794681 3.02638034 2.40853625 0.08523391 1.25311192 1.81940637
##
## [[24]]
##          3          11          15          21          33          39          41
## 0.39253041 0.63761433 2.78791689 2.36509662 0.07867757 1.88002757 1.45308699
##
## [[25]]
##          3          11          15          21          33          39          41
## 0.38761357 0.66301912 2.37160707 1.11288721 0.07539938 4.00912770 0.97529633
##
## [[26]]
##          3          11          15          21          33          39          41
## 0.37613965 0.68924387 2.27653952 1.18173125 0.07621894 4.18697369 0.80810345
##
## [[27]]
##          3          11          15          21          33          39          41
## 0.36876367 0.70481420 2.13312858 1.27843073 0.07785772 1.92102887 3.11092661
##
## [[28]]
##          3          11          15          21          33          39          41
## 0.36384495 0.73267826 1.93562716 1.43905527 0.07048248 2.66597768 2.38728457
##
## [[29]]
##          3          11          15          21          33          39          41

```

```

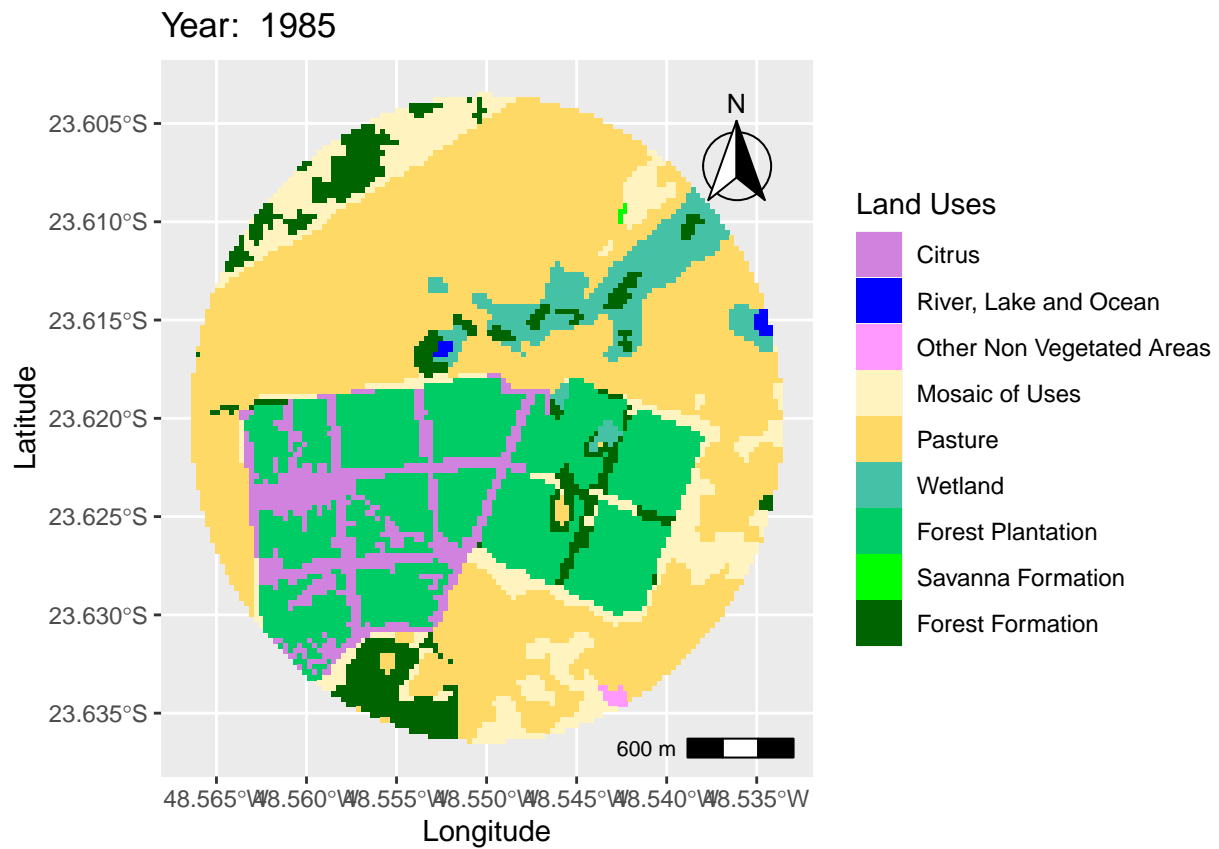
## 0.36794239 0.75808444 1.77500281 1.61279026 0.05409197 2.42257109 2.60446742
##
## [[30]]
##          3          9          11          15          21          33
## 0.3728587383 0.0008194254 0.7761142554 1.6184792890 1.7340740819 0.0475357876
##          39          41
## 2.6028759956 2.4421927987
##
## [[31]]
##          3          9          11          15          21          33
## 0.3728585070 0.0008194254 0.7818511086 1.0817160899 2.0725075144 0.0499944226
##          39          41
## 3.8592353945 1.3759679097
##
## [[32]]
##          3          9          11          15          21          33
## 0.368760822 0.001638854 0.763822508 0.994030555 2.076598286 0.050814016
##          39          41
## 4.850846770 0.488438562
##
## [[33]]
##          3          9          11          15          21          33
## 0.369579664 0.001638854 0.740056872 0.574454957 2.333910137 0.052453157
##          39          41
## 5.395832050 0.127024682
##
## [[34]]
##          3          9          11          15          21          33
## 0.369579521 0.001638854 0.763004043 0.396626802 1.897936780 0.034422461
##          39          41
## 6.109615169 0.022126741
##
## [[35]]
##          3          9          11          15          21          33
## 0.382692390 0.001638854 0.726944646 0.349096182 1.269403445 0.033602861
##          39          41
## 6.821737257 0.009834736
##
## [[36]]
##          3          9          11          15          21          33
## 0.403999524 0.001638854 0.726125130 0.347457256 1.232527823 0.023767792
##          39          41
## 6.829929512 0.029504482
##
## [[37]]
##          3          9          11          15          21          33
## 0.440879651 0.001638854 0.644990278 0.393351133 1.240723589 0.017211019
##          39          41
## 6.832388466 0.023767382
results$time_series

```



Visualização do uso e ocupação

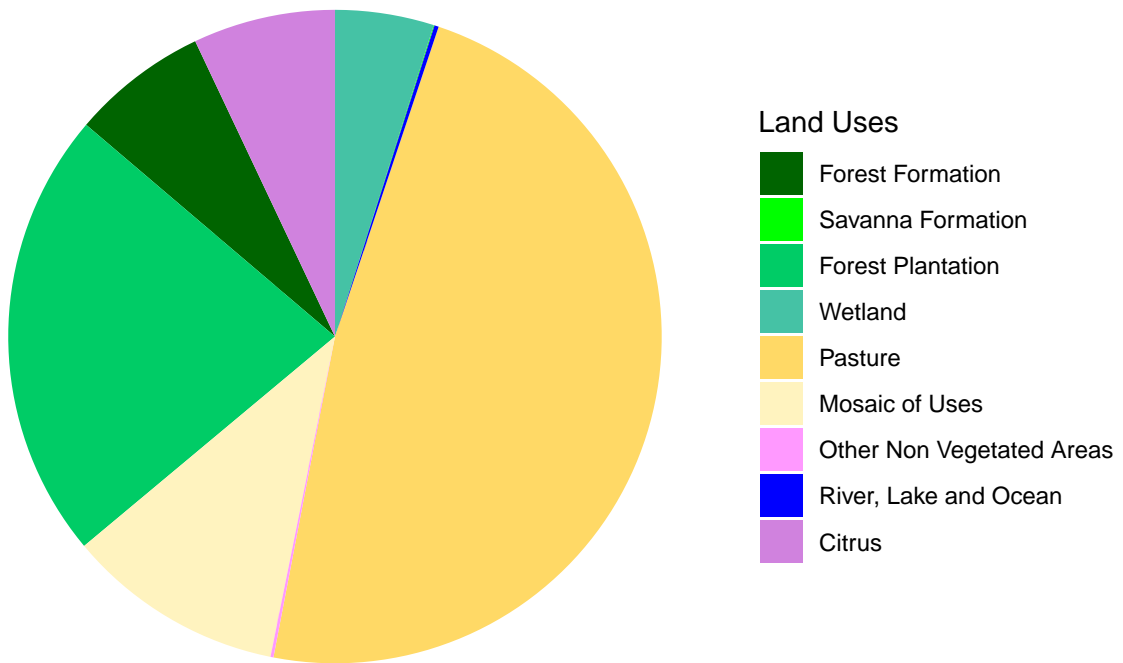
```
land_vis(recortes, year = 1985)
```



Distribuição do uso e ocupação

```
land_dist(results, year = 1985, type = "pie")
```

Year: 1985



```
land_dist(results, year = 1985, type = "barplot")
```

