Package 'rapr'

March 4, 2026

Type Package

Title Interface to 'Rangeland Analysis Platform' (RAP) Products

Version 1.1.3

Maintainer Andrew Brown <andrew.g.brown@usda.gov>

Description Provides access to 'Rangeland Analysis Platform' (RAP) products <https://rangelands.app/products> for arbitrary extents via 'GDAL' virtual file system.

License GPL (>= 3)

Encoding UTF-8

URL https://github.com/brownag/rapr/, https://humus.rocks/rapr/

BugReports https://github.com/brownag/rapr/issues

RoxygenNote 7.3.3

Language en-US

Imports utils, terra

Suggests sf, httr, jsonlite, leaflet, gifski, litedown, tinytest

VignetteBuilder litedown

NeedsCompilation no

Author Andrew Brown [aut, cre] (ORCID: <https://orcid.org/0000-0002-4565-533X>), Georgia Harrison [ctb] (ORCID: <https://orcid.org/0000-0003-0544-4471>), Scott Appleby [ctb] (ORCID: <https://orcid.org/0000-0002-2031-2752>)

Repository CRAN

Date/Publication 2026-03-03 23:00:02 UTC

Contents

get_rap *Get 'Rangeland Analysis Platform' (RAP) Grids*

Description

Two sets of 'Rangeland Analysis Platform' (RAP) products are available (see `source` argument). `"rap-30m"` is Landsat-derived and has approximately 30 meter resolution in WGS84 decimal degrees (`"EPSG:4326"`). This is the data source that has been used in the 'rapr' package since 2022. A newer source (2025), `"rap-10m"`, is Sentinel 2-derived and has 10 meter resolution in the local WGS84 UTM zone (`"EPSG:326XX"`, where XX is the two digit UTM zone number). See Details for the products and bands available for the different resolutions and sources.

Usage

```
get_rap(
  x,
  years,
  product,
  filename = NULL,
  ...,
  source = "rap-30m",
  version = "v3",
  vrt = FALSE,
  sds = FALSE,
  legacy = FALSE,
  verbose = TRUE
)
```

Arguments

`x`	Target extent. Derived from an sf, terra, raster or sp object or numeric vector containing `xmin`, `ymax`, `xmax`, `ymin` in WGS84 decimal degrees (longitude/latitude, `"EPSG:4326"`).
`years`	*integer*. Year(s) to query. Products are available from 1986 (`source="rap-30m"`) or 2018 (`source="rap-10m"`) up to the year prior to the current year, based on availability of the Landsat and Sentinel 2 source data.
`product`	Target data: `"vegetation-biomass"`, `"vegetation-cover"`, and/or `"vegetation-npp"` for `source="rap-30m"`; `"pft"` (plant functional type cover), `"gap"` (canopy gap), `"arte"` (Artemisia spp. cover), `"iag"` (invasive annual grass cover), or `"pj"` (pinyon juniper cover) for `source="rap-10m"`.
`filename`	Output filename (optional; default stores in temporary file or in memory, see `terra::tmpFiles()`)
`...`	Additional arguments passed to internal query function and `terra::writeRaster()` (or `terra::vrt()` when `vrt=TRUE`)
`source`	Grid sources. Options include `"rap-30m"` (default; Landsat) and `"rap-10m"` (Sentinel 2).

version	Target version: "v3" and/or "v2" (for "rap-30m"). Currently ignored for source="rap-10m".
vrt	*logical*. Short circuit to return Virtual Raster Dataset (VRT) for selected grids via terra::vrt(). Default: FALSE. Note: gdalbuildvrt does not support heterogeneous projection systems, so this option is not compatible with source="rap-10m" over multiple UTM zone areas of interest.
sds	*logical*. Return data as a SpatRasterDataset? Helpful for results containing multiple years and products. Default FALSE returns a SpatRaster object.
legacy	*logical*. Use legacy (gdal_translate) method? Default: FALSE (applies only to source="rap-30m").
verbose	logical. Print messages indicating progress? Default: TRUE. For legacy=TRUE progress is shown using utils::txtProgressBar().

Details

Sources, Products, and Band Information:

For "rap-30m" you can query several Landsat derived annual biomass, cover, and Net Primary Productivity products from 1986 to present:

- product = "vegetation-biomass" returns two layers per year:
  - 2 Bands:"annual forb and grass", "perennial forb and grass" (**lbs / acre**)
- product = "vegetation-cover" returns six layers per year:
  - 6 Bands: "annual forb and grass", "bare ground", "litter", "perennial forb and grass", "shrub", "tree" (**% cover**)
- product = "vegetation-npp" returns four layers per year:
  - 4 Bands: "annual forb and grass", "perennial forb and grass", "shrub", "tree" (NPP; kg*C/m^2)

For "rap-10m" you can query several Sentinel 2 derived cover products at 10 meter resolution from 2018 to present:

- product = "pft" returns fractional cover estimates of plant functional types:
  - 6 Bands: "annual forb and grass", "bare ground", "litter", "perennial forb and grass", "shrub", "tree" (**% cover**)
- product = "gap" returns canopy gap estimates for four canopy gap size classes:
  - 4 Bands: "Gaps 25-50 cm", "Gaps 51-100 cm", "Gaps 100-200 cm", "Gaps >200 cm" (**% cover**)
- product = "arte" returns cover estimates of Artemisia species, including A. arbuscula, A. cana, A. nova, A. tridentata, and A. tripartita.
  - 1 Band: "Artemisia spp." (**% cover**)
- product = "iag" returns fractional cover estimates of Bromus tectorum, B. arvensis, B. rubens, B. hordeaceus, Eremopyrum triticeum, Schismus spp., Taeniatherum caput-medusae, and Ventenata dubia.
  - 1 Band: "invasive annual grass" (**% cover**)
- product = "pj" returns fractional cover estimates of Juniperus monosperma, J. occidentalis, J. osteosperma, J. scopulorum, Pinus edulis, and P. monophylla.
  - 1 Band: "pinyon-juniper" (**% cover**)

Temporary Files:

Large requests may generate intermediate objects that will be stored as temporary files. See `terra::tmpFiles()` to view the file paths. These files will be removed when an **R** session ends.

Alternate Specification of Area of Interest:

In lieu of a spatial object from {terra}, {raster}, {sf} or {sp} packages you may specify a bounding box using a numeric vector containing the top-left and bottom-right coordinates (`xmin`, `ymax`, `xmax`, `ymin`) in WGS84 longitude/latitude decimal degrees. This corresponds to the conventional order used in the `gdal_translate -projwin` option. e.g. `get_rap(x = c(-120, 37, -119.99, 36.99), ...)`.

```
(1: xmin, 2: ymax)--------------------------|
        |                                   |
        |         TARGET EXTENT             |
        |  x = c(xmin, ymax, xmax, ymin)    |
        |                                   |
        |---------------------------(3: xmax, 4: ymin)
```

Native Resolution and Projection Systems:

Native cell resolution of `"rap-30m"` is approximately 30m x 30m in WGS84 geographic coordinate system (longitude, latitude). Native cell resolution of `"rap-10m"` is 10m x 10m in the local (projected) WGS84 Universal Transverse Mercator (UTM) system.

For `"rap-10m"` requests spanning *multiple* UTM zones, either pass a *SpatRaster* object as `x` or specify `template` argument. In lieu of a user-specified grid system for multi-zone requests, a default CONUS Albers Equal Area projection (`"EPSG:5070"`) with 10 m resolution will be used. See `rap_projection()` for options and details.

Value

a *SpatRaster* containing the requested product layers by year. If `sds=TRUE` a SpatRasterDataset where each SpatRaster contains only one product (possibly with multiple years)

References

See `citation("rapr")` for all references related to Rangeland Analysis Platform products.

See Also

`rap_projection()`

Examples

```
library(rapr)    # access RAP products
library(terra)   # spatial data handling

p <- buffer(terra::vect(
  data.frame(x = -105.97133, y = 32.73437),
  geom = c("x", "y"),
  crs = "OGC:CRS84"
```

```
), width = 1000)

rap <- get_rap(
  p,
  product = "vegetation-biomass",
  years = 2020:2024,
  verbose = FALSE
)

plot(rap, type = "continuous")

rap10m <- get_rap(
  p,
  product = "pft",
  source = "rap-10m",
  years = c(2020, 2024),
  sds = TRUE,
  verbose = FALSE
)

plot(
  rap10m$pft_2020,
  type = "continuous",
  range = c(0, 100),
  sub = "Year: 2020"
)

plot(
  rap10m$pft_2024,
  type = "continuous",
  range = c(0, 100),
  sub = "Year: 2024"
)
```

`get_rap_table` *Query RAP Tabular Data*

Description

Retrieves remotely sensed production or cover estimates from the Rangeland Analysis Platform (RAP) using the tabular data API endpoints. This function supports querying one or more spatial features (points, lines, or polygons) provided as a `terra` `SpatVector` object, or any spatial object that can be converted with `terra::vect()`. See Details for the products available.

`get_rap_production16day_table()` is depreciated, please use `get_rap_table(product="production16day")` instead.

Usage

```
get_rap_table(
  aoi,
  years = NULL,
  product,
  version = "V3",
  mask = TRUE,
  nodata_flag = NA_real_
)

get_rap_production16day_table(
  aoi,
  years = NULL,
  mask = TRUE,
  nodata_flag = NA_real_,
  ...
)
```

Arguments

aoi	Area of Interest. A SpatVector object, or any spatial object that can be converted with terra::vect(). The AOI coordinates will be transformed to WGS84 longitude latitude ("EPSG:4326"). The AOI can be specified using point, line and polygon geometries. Each unique feature will be passed separately to the API. The result feature column contains the row index of the input feature from aoi.
years	integer. Optional. Numeric year or vector of years (1986 to last full year). Default: NULL returns all available years.
product	Target data: "cover", "coverMeteorology", "production", or "production16day".
version	Target version: "V3".
mask	logical. Exclude cropland, development, and water? Default: TRUE.
nodata_flag	numeric. Value to use for missing data. The API encodes "NODATA" as -99. Default: NA_real_ replaces -99 with NA.
...	allows backward compatibility with year argument in depreciated version of get_rap_production16day_table().

Details

For each feature - year combination, a separate request is made to the RAP API, and results are returned as a combined data.frame. In the special case of (years=NULL) default, all available years are returned in a single query.

For more information on the API and data products, see the RAP API documentation: https://rangelands.app/support/71-api-documentation

Products Overview:

You can query several Landsat derived biomass, cover, and meteorological products from 1986 to present:

- "cover" – yearly fractional cover, including:
  - "AFG" (Annual Forb and Grass cover)
  - "PFG" (Perennial Forb and Grass cover)
  - "SHR" (Shrub cover)
  - "TRE" (Tree cover)
  - "LTR" (Litter cover)
  - "BGR" (Bare Ground cover)
- "coverMeteorology" – the same data provided by "cover" above, plus:
  - "annualTemp" (Annual average temperature in degrees Fahrenheit)
  - "annualPrecip" (Annual total precipitation in inches)
- "production" – annual production, including:
  - "AFG" (Annual Forb and Grass production)
  - "PFG" (Perennial Forb and Grass production)
  - "HER" (Herbaceous production)
- "production16day" – 16-day production, including:
  - "date" (production estimate date)
  - "doy" (production estimate Julian day of year)
  - "AFG" (Annual Forb and Grass production)
  - "PFG" (Perennial Forb and Grass production)
  - "HER" (Herbaceous production)

Value

A *data.frame* with requested time-series data by year or 16-day production period. In addition to the columns described in Details above, all products include columns for "year" (production estimate year) and "feature" (feature ID, row number from aoi). Units are **% cover** for fractional cover and **lbs / acre** for production.

Examples

```
aoi <- terra::vect(data.frame(x = -119.72330, y = 36.92204),
                   geom = c('x', 'y'),
                   crs = "EPSG:4326")

# all years (years=NULL) fractional cover data
res <- get_rap_table(aoi, product="cover")
str(res)

# specific year fractional cover and meteorological data
res <- get_rap_table(aoi, years = 1992, product="coverMeteorology")
str(res)

# multiple specific years above-ground production (annual)
res <- get_rap_table(aoi, years = 1993:2003, product="production")
str(res)

# 1 kilometer buffer around point, above-ground production (16 days) in 2004
res <- get_rap_table(terra::buffer(aoi, 1000), years = 2004, product="production16day")
```

```
str(res)
```

`rap_projection` *Select Projection System for RAP Extent*

Description

This function provides several "standard" projected Coordinate Reference Systems that are suitable for representing Rangeland Analysis Platform products across the contiguous (lower 48) United States at the specified resolution (in meters).

Usage

```
rap_projection(x, res)
```

Arguments

`x`	*character*. One of `"CONUS_AEA"`, `"CONUS_EQUI7"`, `"CONUS_IGH"`
`res`	*integer*. Resolution in meters.

Details

Currently there are three pre-calculated grid systems that have their extent designed to align at 1, 5, 10, 30, 100, and 300 meter resolutions.

`"CONUS_AEA"` is the default template used with `get_rap(source="rap-10m")` when data spanning multiple UTM zones are requested, unless user specifies their own template via SpatRaster object as `x` or `template` argument.

Grid Specifications:

- `"CONUS_AEA"`: Albers Equal Area Conic projection for CONUS extent.
  - `xmin` = `-2356300`
  - `ymax` = `3172500`
  - `xmax` = `2264000`
  - `ymin` = `270000`
  - `crs` = `"EPSG:5070"`
- `"CONUS_EQUI7`: Equi7Grid projection for CONUS + Hawaii extent.
  - `xmin` = `599500`
  - `ymax` = `4967500`
  - `xmax` = `10737100`
  - `ymin` = `1913500`
  - `crs` = `"EPSG:27705"`
- `"CONUS_IGH"`: Interrupted Goode Homolosine projection for CONUS extent.
  - `xmin` = `-13390500`
  - `ymax` = `5836700`

- xmax = -8268600
- ymin = 2480600
- crs = "+proj=igh"

Value

An empty *SpatRaster* object with a standard extent (xmin,ymax,xmax,ymin), resolution and projected Coordinate Reference System.

See Also

get_rap()

Examples

```
rap_projection("CONUS_AEA", 10)

rap_projection("CONUS_IGH", 100)
```

Index