Package 'rapr'

July 23, 2025

Type Package

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

Version 1.0.0

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 7.3.2

Language en-US

Imports terra

Suggests sf, httr, 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>)

Repository CRAN

Date/Publication 2025-05-12 08:40:02 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: TRUE (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()`

`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 487) 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

A *SpatRaster* object using 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