

Package: LandWebUtils (via r-universe)

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Type Package

Title Helper functions for the LandWeb project

Description Additional utilities for LandWeb analyses.

URL <http://LandWebUtils.predictiveecology.org>,
<https://github.com/PredictiveEcology/LandWebUtils>

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Collate 'CASFRiv4.R' 'LandWebUtils-package.R' 'misc.R' 'boxplots.R'
'cleanLandWebStudyArea.R' 'histograms.R' 'landmine-helpers.R'
'landmine-plot.R' 'landmine.R' 'largePatches.R' 'leading.R'
'rasterListByPoly.R' 'zzz.R'

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`.cleanLandWebStudyArea`

Clean up the LandWeb study area from David Andison

Description

Clean up the LandWeb study area from David Andison

Usage

```
.cleanLandWebStudyArea(poly, minFRI = 40)
```

Arguments

poly	A polygon or character string identifying the path to polygon
minFRI	Numeric or integer, indicating the minimum fire return interval that will be part of the cleanup of polygon. Anything below this will be NA.

analysesOutputsTimes *Simulation timesteps for analyses*

Description

Simulation timesteps for analyses

Usage

```
analysesOutputsTimes(period, interval)
```

Arguments

period	numeric vector of length 2 corresponding to the start and end times to use for analyses.
interval	numeric indicating the interval between timesteps for analyses

Value

numeric vector of timesteps for which to run analyses

CASFRItoSpRasts CASFRItoSpRasts

Description

TODO: description and title needed

Usage

```
CASFRItoSpRasts(
  CASFRIRas,
  CASFRIattrLong,
  CASFRIdt,
  sppEquiv,
  sppEquivCol,
  destinationPath
)
```

Arguments

CASFRIRas	TODO: description needed
CASFRITattrLong	TODO: description needed
CASFRIDt	TODO: description needed
sppEquiv	table with species name equivalencies between the kNN and final naming formats. See <code>data("sppEquivalencies_CA", "LandR")</code> . For functions that have <code>mixedType</code> e.g., <code>vegTypeMapGenerator</code> , this only necessary if <code>mixedType == 2</code> . If not provided and <code>mixedType == 2</code> , will attempt to use <code>data("sppEquivalencies_CA", "LandR")</code> .
sppEquivCol	the column name to use from <code>sppEquiv</code> . For functions that have <code>mixedType</code> e.g., <code>vegTypeMapGenerator</code> , Only necessary if <code>mixedType == 2</code> . If not provided and <code>mixedType == 2</code> , will attempt to use "Boreal".
destinationPath	path to data directory where objects will be downloaded or saved to

Value

TODO: description needed

cleanAreaName	<i>Extract study area name from run name</i>
---------------	--

Description

Extract study area name from run name

Usage

```
cleanAreaName(area)
```

Arguments

area	Simulated area (i.e., run) name
------	---------------------------------

findSimFile	<i>Find LandWeb simulation output file</i>
-------------	--

Description

Find LandWeb simulation output file

Usage

```
findSimFile(outputDir, rep)
```

Arguments

outputDir	path to LandWeb output directory.
rep	integer giving the replicate id, or character string in the form of "rep01".

Value

path to the file

landmine_burn1	<i>Core Burn function for Andison's LandMine Fire Module</i>
----------------	--

Description

The main function for the Andison Fire Module. See details.

Usage

```
landmine_burn1(
  landscape,
  startCells,
  fireSizes = 5,
  nActiveCells1 = c(10, 36),
  spawnNewActive = c(0.46, 0.2, 0.26, 0.11),
  maxRetriesPerID = 10L,
  sizeCutoffs = c(8000, 20000),
  spreadProbRel = spreadProbRel,
  spreadProb = 0.77
)
```

```
landmine_burn(
  landscape,
  startCells,
  fireSizes = 5,
```

```

nActiveCells1 = c(10, 36),
spawnNewActive = c(0.46, 0.2, 0.26, 0.11),
sizeCutoffs = c(8000, 20000),
spreadProbRel = 0.23
)

```

Arguments

landscape	A RasterLayer. This only provides the extent and resolution for the fire spread algorithm.
startCells	A numeric vector indicating the indices on the landscape where the fires will start with 100%% certainty.
fireSizes	A numeric vector indicating the final size of each of the fires. Must be same length as startCells.
nActiveCells1	A numeric vector of length 2. These are cutoffs above and below each of which different values of spawnNewActive are used. See details.
spawnNewActive	A numeric vector of length 4. These are the probabilities of creating spreading to 2 neighbours instead of the 1 default neighbour, each time step. The 4 values are for 4 different fire size conditions. See details.
maxRetriesPerID	Integer. Maximum number of retry attempts per firelet ID.
sizeCutoffs	A numeric vector of length 2. These are 2 size (in hectares) thresholds that affect which spawnNewActive probabilities are used. See details.
spreadProbRel	A raster layer of of relative probabilities, with non-flammable pixels NA.
spreadProb	A raster layer of spread probabilities, with non-flammable pixels NA.

Details

This algorithm is a modified contagious cellular automaton.

Value

A data.table with 4 columns

Algorithm

Core: Each fire starts at a single pixel, startCells and will spread, i.e., visit and convert from a 0 to the fire id number. It will iteratively spread until the number of cells visited is equal to floor(fireSizes).

Adjustments due to current fire size and number of active pixels: That can vary too, but it gets a bit complicated, so use that for now. Spawning probability was originally set at 13%, but created problems with very large and very small fires, so over time has been adjusted to vary depending on: a) number of active "firelets" (NF); and b) fire size (FS), such that:

- If $10 \leq NF < 36$ and $FS < 20,000$ ha then $P = 20\%$
- If $NF > 36$ and $FS < 8,000$ ha, $P = 11\%$
- If $NF < 36$ and $FS > 20,000$ ha, $P = 26\%$
- If $NF < 10$ then $P = 46\%$

These rule create more heterogeneity in the pattern of burning.

Fire jumping: If the fire has not reached its target size, it will try to pick new neighbours among the 8 immediate neighbours up to 4 times. If it still did not find enough neighbours, then it will jump or "spot" up to 4 pixels away. It will then repeat the previous 2 stages again once (i.e., 4 neighbours, 1 jump, repeat), then it will stop, unable to achieve the desired fireSize.

Note

The original version (landmine_burn()) is deprecated and should not be used. Use landmine_burn1() instead.

landmine_optim_burnFun

LandMine burn optimization function

Description

LandMine burn optimization function

Usage

```
landmine_optim_burnFun(
  ros,
  centreCell,
  fireSize,
  spawnNewActive,
  sizeCutoffs,
  spreadProb
)
```

Arguments

ros	RasterLayer of LandMine Raster Of Spread values
centreCell	TODO
fireSize	TODO
spawnNewActive	TODO
sizeCutoffs	TODO
spreadProb	TODO

Value

named list of length 2 containing: burnedMap: rasterLayer of burned pixels; LM: data.frame of patch statistics from SDMTools::PatchStats().

landmine_optim_clusterExport

Export objects used for optimization and load packages on cluster

Description

Export objects used for optimization and load packages on cluster

Usage

```
landmine_optim_clusterExport(cl = NULL, objs = NULL, pkgs = NULL)
```

Arguments

cl	a cluster object or NULL
objs	character vector of names of objects to export
pkgs	character vector of packages to pre-load on the cluster nodes

Value

NULL. Invoked for its side effects.

landmine_optim_clusterSetup

Setup a cluster for LandMine optimization

Description

Setup a cluster for LandMine optimization

Usage

```
landmine_optim_clusterSetup(nodes = NULL)
```

Arguments

nodes	positive integer of length 1 specifying the number of threads to use on the current machine (localhost), or a character vector of hostnames on which to run worker copies.
-------	--

Value

a cluster object

 landmine_optim_clusterWrap

Wrapper function to setup cluster, export objects and load packages

Description

Wrapper function to setup cluster, export objects and load packages

Usage

```
landmine_optim_clusterWrap(cl = NULL, nodes, reps, objs, pkgs)
```

Arguments

cl	a cluster object or NULL
nodes	positive integer of length 1 specifying the number of threads to use on the current machine (localhost), or a character vector of hostnames on which to run worker copies.
reps	integer. number of replicates to run.
objs	character vector of names of objects to export
pkgs	character vector of packages to pre-load on the cluster nodes

Value

named list of length 2 containing: cl - a cluster object; out - a list of burn maps (aka burnMapList)

 landmine_optim_fitSN *LandMine objective functions*

Description

landmine_fitSN() is used for the module.

Usage

```
landmine_optim_fitSN(
  sna,
  ros,
  centreCell,
  fireSizes = 10^(2:5),
  desiredPerimeterArea = 0.004
)

landmine_optim_fitSN2(
```

```

    par,
    ros,
    centreCell,
    fireSizes = 10^(2:5),
    desiredPerimeterArea = 0.003,
    spreadProb = 0.9
  )

```

Arguments

sna	TODO
ros	TODO
centreCell	TODO
fireSizes	TODO
desiredPerimeterArea	TODO
par	parameter vector of length 5
spreadProb	spread probability

Details

landmine_fitSN2() is an alternative version tries the optimization using fewer parameters, to test whether a simpler version gets better/different results. Although this version was not used for the final module, we preserve it here for posterity.

Value

data.table (TODO)

landmine_plots	<i>LandMine diagnostic plots</i>
----------------	----------------------------------

Description

- landmine_plot_areaBurnedOverTime() plots the area burned over time by LTHFC polygon;
- landmine_plot_LTHFC() produces a `rasterVis::levelplot()` a map of the LTHFC polygons;
- landmine_plot_FRI() plots

Usage

```
landmine_plot_areaBurnedOverTime(areaBurnedOverTime)
```

```
landmine_plot_LTHFC(lthfc, studyAreaName, ...)
```

```
landmine_plot_FRI(friSummary)
```

Arguments

areaBurnedOverTime	Summary data.frame of area burned over time, containing the following columns: time (numeric) gives the simulation time (year); haBurned (numeric) gives the burned area in hectares; FRI (numeric) identifies the fire return interval polygon.
lthfc	long-term historic fire cycle map (raster).
studyAreaName	study area name (character).
...	additional arguments passed to <code>rasterVis::levelplot()</code> .
friSummary	Summary data.frame of simulated fire return intervals (FRI) vs. the long-term historic fire cycles (LTHFC), containing the following columns: simArea (character) gives the study area name; LTHFC (numeric) is the expected (i.e., historic) FRI; FRI (numeric) is the simulated FRI.

Value

a ggplot2 or rasterVis object; invoked for side effect of creating plots.

LargePatches

Calculate proportion of large patches in NRV

Description

TODO: needs description

Usage

```
LargePatches(
  tsf,
  vtm,
  poly,
  labelColumn,
  id,
  ageClassCutOffs,
  ageClasses,
  sppEquivCol,
  sppEquiv,
  crop2poly = FALSE
)
```

Arguments

tsf	A single filename, relative or absolute, pointing to a Time Since Fire raster. Can be any format that raster can use.
vtm	A single filename, relative or absolute, pointing to a Vegetation Type Map raster. Can be any format that raster can use.

poly	A single SpatialPolygonsDataFrame object or a factor RasterLayer. This layer MUST have a column labelled shinyLabel
labelColumn	TODO: description needed
id	TODO: description needed
ageClassCutOffs	A numeric vector with the endpoints for the ageClasses. Should be length(ageClasses) + 1. See .ageClassCutOffs.
ageClasses	A character vector with labels for age classes to bin the tsf times, e.g., c("Young", "Immature", "Mature", "Old"). See .ageClasses.
sppEquivCol	Character giving the column name to use in sppEquiv.
sppEquiv	Species equivalency table, e.g., derived from LandR::sppEquivalencies_CA.
crop2poly	logical indicating whether to crop/mask vtm and tsf rasters to poly. Default FALSE for backwards compatibility.

LeadingVegTypeByAgeClass

Calculate proportion of landscape occupied by each vegetation class

Description

This function is recursive. If poly is a SpatialPolygon, then the function will enter once, and convert this to a rasterized version, and pass that into the function replacing poly. It is also recursive of passed a vector of filenames for tsf and vtm.

Usage

```
LeadingVegTypeByAgeClass(
  tsf,
  vtm,
  poly,
  ageClassCutOffs,
  ageClasses,
  sppEquivCol,
  sppEquiv
)
```

Arguments

tsf	A single filename, relative or absolute, pointing to a Time Since Fire raster. Can be any format that raster can use.
vtm	A single filename, relative or absolute, pointing to a Vegetation Type Map raster. Can be any format that raster can use.
poly	A single SpatialPolygonsDataFrame object or a factor RasterLayer. This layer MUST have a column labelled shinyLabel

ageClassCutOffs	A numeric vector with the endpoints for the ageClasses. Should be length(ageClasses) + 1. See .ageClassCutOffs.
ageClasses	A character vector with labels for age classes to bin the tsf times, e.g., c("Young", "Immature", "Mature", "Old"). See .ageClasses.
sppEquivCol	Character giving the column name to use in sppEquiv.
sppEquiv	Species equivalency table, e.g., derived from LandR: : sppEquivalencies_CA.

Value

A data . table with proportion of the pixels in each vegetation class, for each given age class within each polygon.

loadCASFRI	<i>Load CASFRI data for LandWeb</i>
------------	-------------------------------------

Description

TODO: description needed

Usage

```
loadCASFRI(
  CASFRIRas,
  attrFile,
  headerFile,
  sppEquiv,
  sppEquivCol,
  type = c("cover", "age")
)
```

Arguments

CASFRIRas	TODO: description needed
attrFile	TODO: description needed
headerFile	TODO: description needed
sppEquiv	table with species name equivalencies between the kNN and final naming formats. See data("sppEquivalencies_CA", "LandR"). For functions that have mixedType e.g., vegTypeMapGenerator, this only necessary if mixedType == 2. If not provided and mixedType == 2, will attempt to use data("sppEquivalencies_CA", "LandR").
sppEquivCol	the column name to use from sppEquiv. For functions that have mixedType e.g., vegTypeMapGenerator, Only necessary if mixedType == 2. If not provided and mixedType == 2, will attempt to use "Boreal".
type	Character string. Either "cover" or "age".

Value

TODO: description needed

meanTruncPareto	<i>Calculate the mean of a truncated Pareto distribution</i>
-----------------	--

Description

Calculate the mean of a truncated Pareto distribution

Usage

```
meanTruncPareto(k, lower, upper, alpha)
```

Arguments

k	TODO: description needed
lower	TODO: description needed
upper	TODO: description needed
alpha	TODO: description needed

Value

TODO: description needed

polygonClean	<i>Do an arbitrary set of operations on a polygon</i>
--------------	---

Description

Do an arbitrary set of operations on a polygon

Usage

```
polygonClean(poly, fn = NULL, type = NULL, ...)
```

Arguments

poly	A polygon object, or a character string identifying the shapefile path to load, and clean.
fn	A function identifying the type of cleaning to do.
type	If fn is not known, an character string can be specified to identify which fn to use. This MUST be a known type for this function.
...	Passed to fn

```
prepSpeciesLayers_CASFRI
```

Prepare species layers from CASFRI v4

Description

Prepare species layers from CASFRI v4

Usage

```
prepSpeciesLayers_CASFRI(  
  destinationPath,  
  outputPath,  
  url = NULL,  
  studyArea,  
  rasterToMatch,  
  sppEquiv,  
  sppEquivCol,  
  ...  
)
```

Arguments

destinationPath	path to data directory where objects will be downloaded or saved to
outputPath	TODO: description needed
url	if NULL, the default, use the default source url
studyArea	A SpatialPolygons* object used as the principle study region, passed to reproducible::prepInputs()
rasterToMatch	A RasterLayer objects to use as the template for all subsequent raster operations (i.e., the one used throughout the simulation).
sppEquiv	table with species name equivalencies between the kNN and final naming formats. See <code>data("sppEquivalencies_CA", "LandR")</code> . For functions that have <code>mixedType</code> , this only necessary if <code>mixedType == 2</code> . If not provided and <code>mixedType == 2</code> , will attempt to use <code>data("sppEquivalencies_CA", "LandR")</code> .
sppEquivCol	the column name to use from <code>sppEquiv</code> . For functions that have <code>mixedType</code> , only necessary if <code>mixedType == 2</code> . If not provided and <code>mixedType == 2</code> , will attempt to use "Boreal".
...	other arguments, used for compatibility with other <code>prepSpeciesLayers</code> functions.

rasterListByPoly	<i>Create a list of rasters in each rep, at each timestep, for each polygon area</i>
------------------	--

Description

Create a list of rasters in each rep, at each timestep, for each polygon area

Usage

```
rasterListByPoly(files, polys, names, col, filter)
```

Arguments

files	character vector giving paths to raster files
polys	polygon object of class sf
names	character vector giving the names of each of the subpolygons in poly
col	character string giving the column name in poly to use
filter	regex string giving partial filename in files to be filtered out (i.e., when extracting reps, times, etc. from filenames) (e.g., 'rstTimeSinceFire_', 'vegTypeMap_')

Value

list of RasterLayer objects with attributes reps, times, polyNames

Note

uses future_lapply internally to loop across files; set e.g., option future.availableCores.fallback appropriately for your system.

runBoxPlotsVegCover	<i>Generate box and whisker plots for leading vegetation cover</i>
---------------------	--

Description

TODO: description needed

Usage

```
runBoxPlotsVegCover(map, functionName, analysisGroups, dPath)
```

Arguments

map	A map object.
functionName	TODO: description needed
analysisGroups	TODO: description needed
dPath	Destination path for the resulting PNG files.

runHistsLargePatches *Generate histograms for large patches*

Description

TODO: description needed

Usage

```
runHistsLargePatches(map, functionName, analysisGroups, dPath)
```

Arguments

map	A map object.
functionName	TODO: description needed
analysisGroups	TODO: description needed
dPath	Destination path for the resulting PNG files.

runHistsVegCover *Generate histograms for leading vegetation cover*

Description

TODO: description needed

Usage

```
runHistsVegCover(map, functionName, analysisGroups, dPath)
```

Arguments

map	A map object.
functionName	TODO: description needed
analysisGroups	TODO: description needed
dPath	Destination path for the resulting PNG files.

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