establishment

15 November 2016

Overview

This is a very simple 'spread and establish' module. It has a contagious component, it evaluates conditions in a set of "starting" locations on a raster and a set of "potential arriving locations". This could emulate dispersal of many types of species, where the abundance of a set of locations determines how many "things" (e.g., seeds or insects) leave, and the "quality" of a set of locations which determines how many "things" land and establish.

Teaching

This is currently used in teaching.

Usage

```
library(SpaDES)

## Default paths for SpaDES directories set to:
##    cachePath:   C:\Temp\RtmpKEcB20/SpaDES/cache
##    inputPath:   C:\Temp\RtmpKEcB20/SpaDES/inputs
##    modulePath: C:\Temp\RtmpKEcB20/SpaDES/modules
##    outputPath: C:\Temp\RtmpKEcB20/SpaDES/outputs
## These can be changed using 'setPaths()'. See '?setPaths'.

##
## Attaching package: 'SpaDES'

## The following objects are masked from 'package:stats':
##
##     end, start, time

modulePath <- file.path(dirname(tempdir()), "modules")
downloadModule("establishment", path = modulePath)

## Checking local files

## Finished checking local files

## Download complete for module establishment.

setPaths(modulePath=modulePath)

## $cachePath
## [1] "C:/Temp/RtmpKEcB20/SpaDES/cache"
##
## $inputPath
## [1] "C:/Temp/RtmpKEcB20/SpaDES/inputs"
##
## $modulePath
## [1] "C:/Temp/modules"
```

```
## 
## $outputPath
## [1] "C:/Temp/RtmpKEcB20/SpaDES/outputs"
library(ggplot2)

modules <- list("establishment")

mySim <- simInit(modules = modules)

## Loading required package: raster

## Loading required package: sp

## Loading required package: grid

## 
## Attaching package: 'grid'

## The following object is masked from 'package:SpaDES':
## 
##       gpar
# make sure the plotting device is clear
clearPlot()
spades(mySim)
```

Nsource: 40 , establishThresh: 0.3
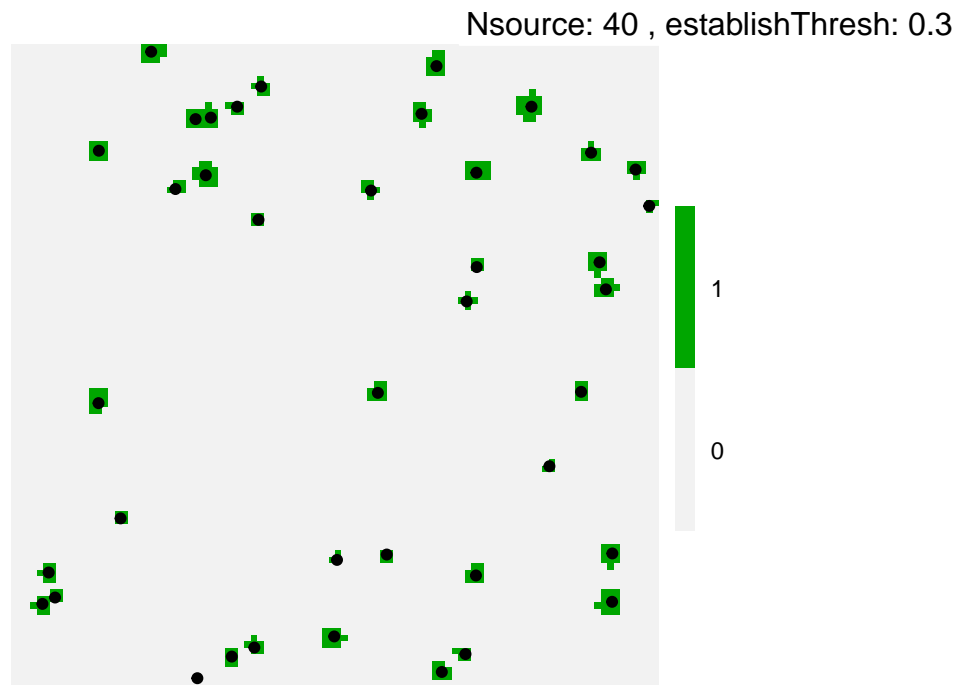
Experiment

What happens when we vary the number of source locations and the threshold for establishment?

```
# factorial experiment
expList <- list(establishThresh=as.list(1:9/10),
                Nsource = as.list(1:10*2))

# Run the experiment
set.seed(234)
if(interactive()) dev()
clearPlot()
out <- experiment(mySim, params = list(establishment = expList),
                  .plotInitialTime=NA) # turn off plotting
```

Nsource: 20 , establishThresh: 0.9
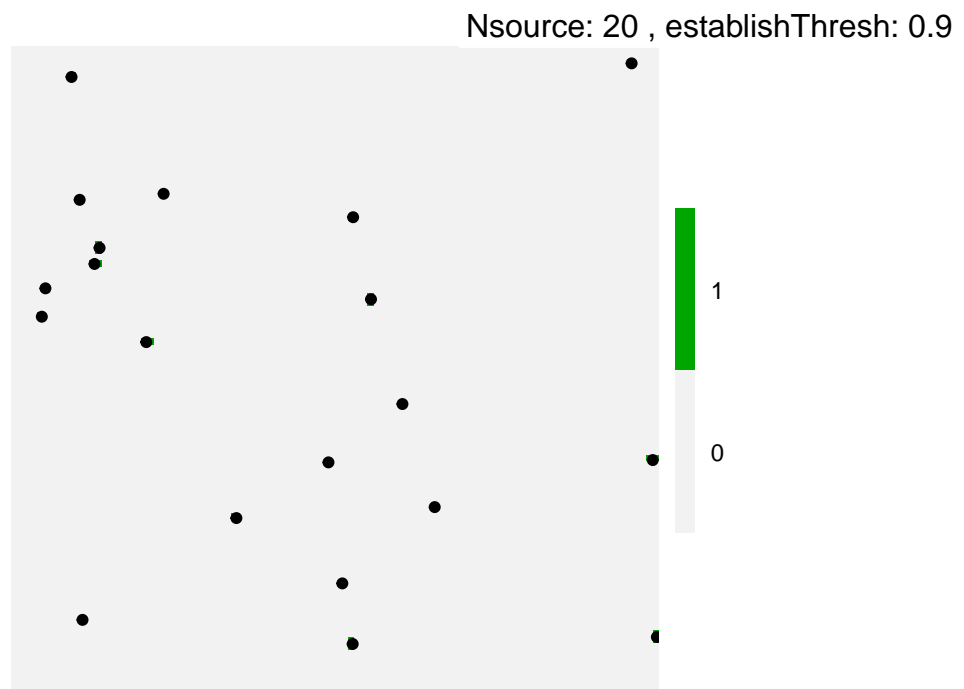

```
# plot the experiment -- how many establish by parameter combo
expDF <- cbind(expand.grid(expList),
               numEstablishments=
                 (sapply(out, function(sim) sum(sim$establish[]))))
expDF <- data.frame(sapply(expDF, unlist, recursive = FALSE))


g <- ggplot(expDF, aes(establishThresh, Nsource)) +
  geom_raster(aes(fill=numEstablishments)) +
  scale_fill_gradient(high="darkgreen", low="lightgreen", trans = "log",
                      breaks=c(1,10,100,500, 1000))
```

g
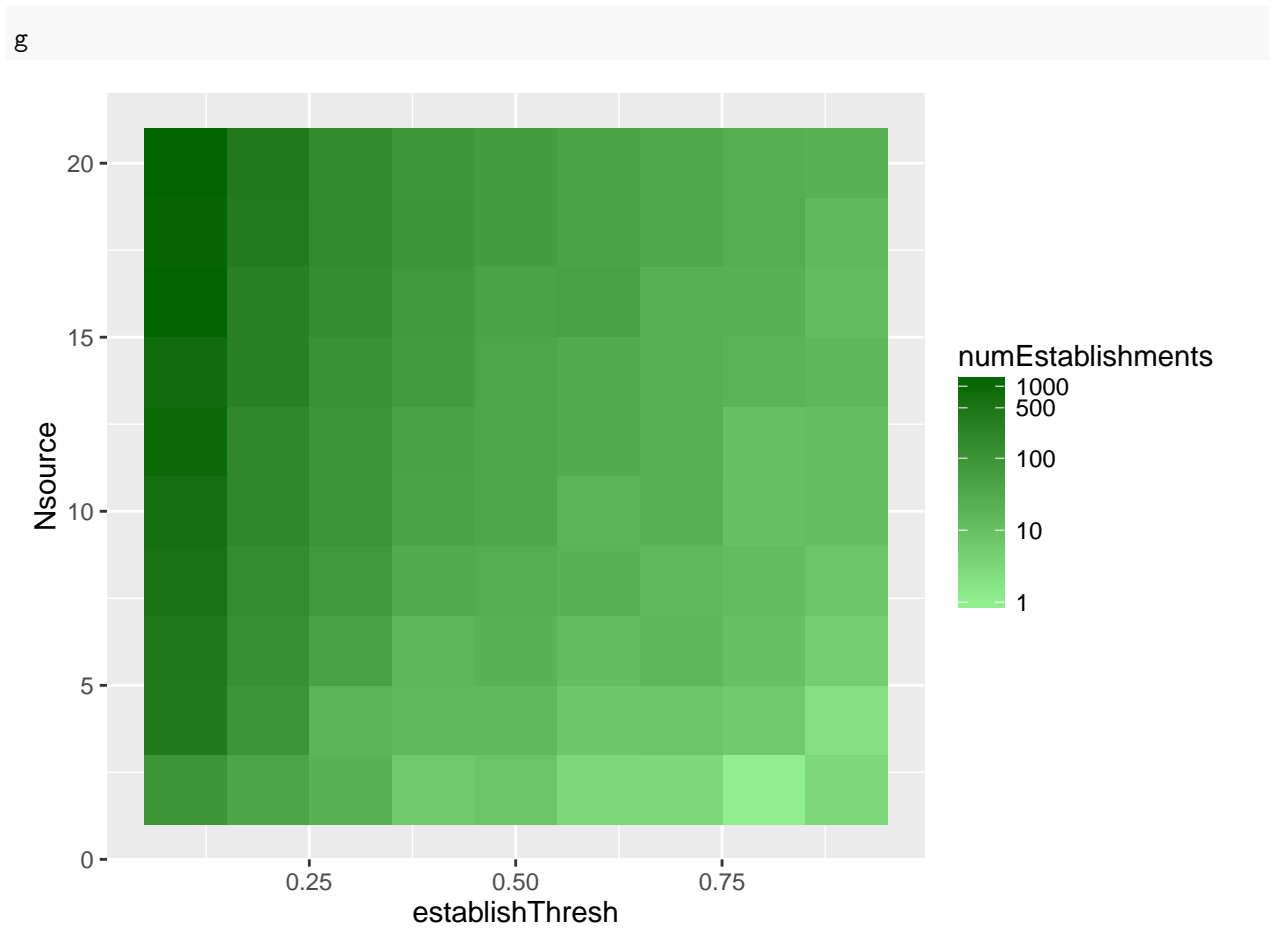
Plotting

The plot is simply a map of where establishment will occur.

Data dependencies

Input data

None required. This is a teaching module that creates its own inputs.

Output data

Description of the module outputs.

Links to other modules

Describe any anticipated linkages to other modules.