Occurrence records for ecological niche modeling:

- GBIF (https://www.gbif.org/en/): global database that comprises many of the following
- VertNet (http://vertnet.org/): vertebrates (mammals, reptiles, amphibians, birds, fish):
- SCAN (https://scan-bugs.org/portal/Invertebrates/): invertebrates (insects, arachnids):
- iNaturalist (https://www.inaturalist.org/): literally everything
- HerpMapper (https://www.herpmapper.org/): reptiles and amphibians
- NAHerp (http://www.naherp.com/): reptiles and amphibians
- Tropicos (https://www.tropicos.org/Home.aspx): plants
- eBird (https://ebird.org/home): birds

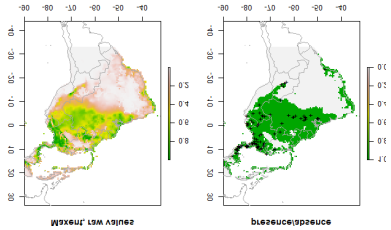
Ecological Niche Modeling with Maxent:

Maxent Website: http://biodiversityinformatics.amnh.org/open_source/maxent/

Maxent tutorial: http://www.amnh.org/content/download/141371/2285439/file/LinC3_SpeciesDistModeling_Ex.pdf

Maxent Google Groups:
https://groups.google.com/forum/#!forum/MAXENT

- browse and post questions about Maxent and associated R packages (ENMeval, dismo, ENMtools)



R packages for niche modeling:

ENMeval: model testing and building ENMs using Maxent

> Muscarella R, Galante PJ, Soley-Guardia M, Boria RA, Kass JM, Uriarte M, Anderson RP. ENM eval: An R package for conducting spatially independent evaluations and estimating optimal model complexity for Maxent ecological niche models. Methods in Ecology and Evolution. 2014 Nov;5(11):1198-205.

dismo: builts ENMs using Maxent, can project on different climate scenarios

> Hijmans RJ, Phillips S, Leathwick J, Elith J. dismo: Species distribution modeling. R package version 0.8-17. 2013.

kuenm: model testing and building ENMs

> Cobos ME, Peterson AT, Barve N, Osorio-Olvera L. kuenm: an R package for detailed development of ecological niche models using Maxent. PeerJ. 2019 Feb 6;7:e6281.

ENMtools: various niche assessments, including tests of niche similarity among species

> Warren DL, Glor RE, Turelli M. ENMTools: a toolbox for comparative studies of environmental niche models. Ecography. 2010 Jun;33(3):607-11.

ecospat

> Di Cola V, Broennimann O, Petitpierre B, Breiner FT, D'amen M, Randin C, Engler R, Pottier J, Pio D, Dubuis A, Pellissier L. ecospat: an R package to support spatial analyses and modeling of species niches and distributions. Ecography. 2017 Jun;40(6):774-87.

Other useful R packages

spThin: thins occurrence records

> Aiello-Lammens ME, Boria RA, Radosavljevic A, Vilela B, Anderson RP. spThin: an R package for spatial thinning of species occurrence records for use in ecological niche models. Ecography. 2015 May;38(5):541-5.

raster, maptools: mapping of spatial data

Environmental Variables for ecological niche modeling:

General tip: some environmental variables are easy to download and process (e.g. Worldclim), some are not. Learning how to process complex variables in weird formats (e.g., SSURGO) is a skill on its own. If you want to use these variables, you might want to seek a GIS expert for help.

Below are a few examples, we are also providing a more complete list

WorldClim (https://www.worldclim.org/): current, past, future climatic variables:

- these are the easiest to download and work smoothly with Maxent

PRISM (http://www.prism.oregonstate.edu/): current, past, future climatic variables:

- these are also easy to download and should work smoothly with Maxent

VARIOUS ENVIRONMENTAL VARIABLES (https://gdg.sc.egov.usda.gov/GDGHome_DirectDownLoad.aspx):

SSURGO (https://nrcs.app.box.com/v/soils**)**: various soil-related variable

- you need to be pretty skilled with GIS to get and process these layers in a way that will make them useful for ENMs. I suggest you seek a GIS expert to help you.
- various variables in one convenient place via USDA website

LANDFIRE (https://landfire.gov/)

Niche Modeling Resources

Dataset name	Site
PRISM	http://www.prism.oregonstate.edu/recent/
World Clim	http://worldclim.org/
USDA: NRCS: Geospatial Data Gateway	https://datagateway.nrcs.usda.gov/
USDA: NRCS: Geospatial Data Gateway Direct Download	https://datagateway.nrcs.usda.gov/GDGHome_DirectDownLoad.aspx
Geology of the conterminous US	https://mrdata.usgs.gov/geology/kb.html
NOAA: Coastal Data Access Viewer	https://coast.noaa.gov/dataviewer/#/landcover/search/
NOAA: Digitial Coast Data	https://coast.noaa.gov/digitalcoast/data/
Web Soil Survey (STATSGO, SSURGO)	https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
MRLC NLCD 2011	https://www.mrlc.gov/nlcd2011.php
LANDFIRE	https://landfire.gov/
A Tapestry of Time and Terrain Map	https://pubs.usgs.gov/imap/i2720/
USGS GAPAnalysis Landcover Data Download	https://www.usgs.gov/core-science-systems/science-analytics-and-synthesis/gap/science/land-cover-data-download
Natural Earth Downloads	http://www.naturalearthdata.com/downloads/
USGS EarthExplorer	https://earthexplorer.usgs.gov/
Open Topography	https://opentopography.org/
NASA Earth Observations (NEO)	https://neo.sci.gsfc.nasa.gov/
GeoNework, portal to spatial data	http://www.fao.org/geonetwork/srv/en/main.home
Data Access Copernicus	https://www.copernicus.eu/en/about-copernicus/international-cooperation
UNEP Environmental Data Explorer	http://geodata.grid.unep.ch/
Terra Populus	https://terra.ipums.org/
Global Map Data Archives	https://globalmaps.github.io/

Notes