

Effective Niche Modeling Script to Compare Niche Overlap

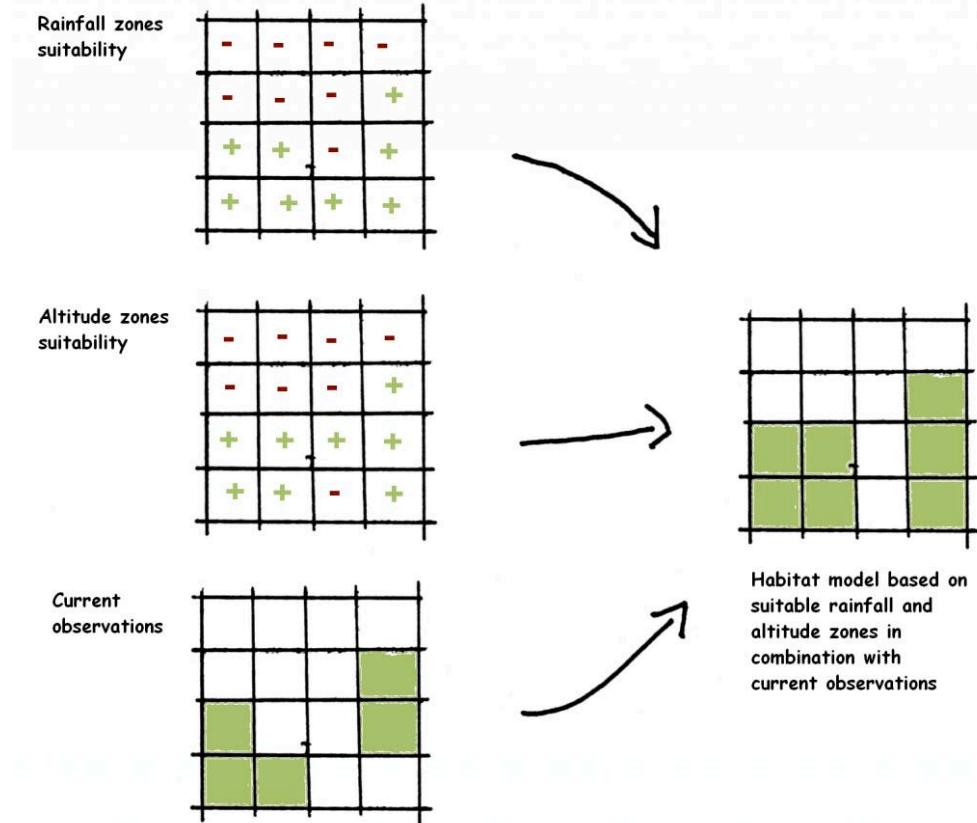
Chelsea Pretz

When comparing different species of *Physalis* how much of their niche overlap with each other?

This will give a foundation in understanding how the different species interact with each other. Understanding this can lead to other questions like: How is self-incompatibility and unilateral compatibility maintained in allopatric and sympatric populations?

What is Niche Modeling?

Mathematical modeling that predicts the geographical distribution of the species based on the known locality points and the climate data (temperature, precipitation, soil type, ect.).



https://en.wikipedia.org/wiki/Environmental_niche_modelling#/media/File:Predicting_habitats.png

Physalis Species

Leucophysalis nana



Physalis crassifolia



Physalis philadelphica

(Tomatillo)



Physalis virginiana



Physalis heterophylla

© 2008 Eleanor S. Schub

Approach

- I will answer this question by using specimen data from SEInet.
- Niche modeling with Dismo Tutorial
 - Creating an effective for-loop for multiple species

The screenshot shows a web page titled "SEInet Arizona - New Mexico Chapter". The header includes links for Home, Specimen Search, Images, Flora Projects, Agency Floras, Dynamic Floras, Additional Portals, Resources, Log In, New Account, and Sitemap. Below the header, the URL is "Home >> Collections >> Search Criteria >> Specimen Records". The main content area displays a search interface with tabs for Species List, Occurrence Records, and Maps. The "Dataset: All Collections" and "Taxa: Physalis" filters are selected. A link "Copy URL to These Results" is visible. The results table shows page 1 of 13533 records, with a total of 100 records per page. The first record listed is "Physalis angulata var. lanceifolia (Nees) Waterfall" with collection number 1428, collected by Roy Morey s.n. on September 19, 2009, from USA, Texas, Presidio, On Rio Grande between stables and movie set. There are three more records listed below it, each with a small thumbnail image and a "Full Record Details" link.

Species distribution modeling with R

Robert J. Hijmans and Jane Elith

Chapter 1

January 8, 2017

Introduction

This document provides an introduction to species distribution modeling with R. Species distribution modeling (SDM) is also known under other names including climate envelope-modeling, habitat modeling, and (environmental or ecological) niche-modeling. The aim of SDM is to estimate the similarity of the conditions at any site to the conditions at the locations of known occurrence (and perhaps of non-occurrence) of a phenomenon. A common application of this method is to predict species ranges with climate data as predictors.

Understanding the Data

A1	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
coreid	identifiedBy	identifiedBy	date	identifiedBy	identification	scientificName	identification	scientificName	genus	specificEpithet	taxonRank	infraspecific	identification	identification	recordId		
1	10299853	Liz Makings	7/2/08 0:00		Physalis acut.	0 (Miers) Sandw.									urn:uuid:2d440116-ac6b-4586-979d-466dd9edaabd		
2	10299857	Liz Makings		11-Nov	Physalis acut.	0 (Miers) Sandw.									urn:uuid:58d3d083-80ef-421b-a306-5d296e03fdb		
3	10299857	unknown		unknown	Physalis angu.	0 L.									urn:uuid:f7e74f5c-789e-4d0f-894a-1ff8145af3e7		
4	3276628	Liz Makings	#####	#####	Physalis crass.	0 Benth.									urn:uuid:412f544d-ed7f-4dfb-9009-0135f019ba72		
5	3276683	Les Landrum	2012		Physalis crass.	1 Benth.									urn:uuid:c62a65b-bb51-46e5-92f3-9a1866f94eba		
6	3276683	unknown	unknown		Physalis crass.	0 (Rydb.) Waterfall									urn:uuid:c44d0904-b7fc-4321-bb52-c5d48e4b4674		
7	3276760	B. Sivinski	1-Sep-11		Physalis heter.	0 Holz.									urn:uuid:ed094d8f-9df1-4fd9-99d4-45c726999cab		
8	3276760	unknown	unknown		Physalis virgin.	0 (Torr.) Waterfall									urn:uuid:59e1f413-a2ac-4717-ab43-b665a2e9dc86		
9	3197362	Janet Sullivan	12-Jul		Physalis heter.	0 Nees									urn:uuid:09c0058b-5fc8-49bc-8089-4c710c897f1e		
10	3197362	unknown	unknown		Physalis virgin.	0 P. Mill.									urn:uuid:182484e6-ad69-4b76-adb8-a5f39439ac9f		
11	778150	L. R. Landrum	5-Aug-11		Margaranthu.	0 Schlecht.									urn:uuid:55e78f39-d3e1-4326-8700-90e07756f090		
12	778150	unknown	unknown		Physalis long.	0 Nutt.									urn:uuid:518130d7-5800-4c30-b09d-cc0a946bb1e6		
13	4925094	Frankie S. Coburn	6/6/15		Physalis solan.	0 (Schltdl.) Axelius									urn:uuid:34be61eb-3240-4501-a576-abcdaced6393		
14	4925094	unknown	unknown		Physalis solan.	0 (Schltdl.) Axelius									urn:uuid:9863e259-bcc1-4003-9c47-91dc4dd4a2bb		
15	1910676	R.C. Sivinski	1/1/08		Physalis hisp.	0 (Waterf.) Cronquist									urn:uuid:c8666a0a-4a93-4d3e-b9a8-e0969a466cd4		
16	996799	L.R. Stanford	8/11/41		Physalis ixoc.	0 Hort. Bonn. ex Nees									urn:uuid:c336ca68-d961-487c-bca0-299b9ca02084		
17	996795	L. Hernández S.	7/11/90		Physalis ixoc.	0 Hort. Bonn. ex Nees									urn:uuid:57720ea1-ea68-4a10-bfff-acf2af0d1f24		
18	996795	C.L. Lundell	7/1/34		Physalis ixoc.	0 Hort. Bonn. ex Nees									urn:uuid:f17f3831-89bd-4159-99ac-89d2351bcb77		
19	3240128	T. S. Elias	1/1/88		Physalis crass.	0 (Rydb.) Waterfall									urn:uuid:ad636381-cb9c-4287-a78c-732f1e72844a		
20	3240128	Janet R. Sullivan	12/1/95		Physalis ixoc.	0 Hort. Bonn. ex Nees									urn:uuid:fe000eb3-d5f4-4bed-a7b0-94235476c403		
21	946411	T. R. Van Devender	9/15/06		Physalis laga.	0 Roem. & Schult.									urn:uuid:62802a0d-b2e5-4472-a4f2-6fa3f77d6ee0		
22	946411	M. Martinez	1/1/07		Physalis laga.	0 Roem. & Schult.									urn:uuid:9e0c1e5d-798c-4f12-b569-4f48c90814eb		
23	958932	M. Martinez	1/1/09		Physalis laga.	0 Roem. & Schult.									urn:uuid:828cb4df-6437-4800-b313-40c8e4dd3b30		
24	996797	T. R. Van Devender	6/5/78		Physalis lanc.	0 Rugel ex Kunze									urn:uuid:eb3b5313-6108-4a8b-98ef-8ee329b7a2bf		
25	996798	R. S. Felger	2/11/68		Physalis lanc.	0 Rugel ex Kunze									urn:uuid:a46f69cc-574b-4b3d-a7fc-e032d099711		
26	996799	R. S. Felger	9/20/63		Physalis lanc.	0 Rugel ex Kunze									urn:uuid:e7e137ca-47d9-4766-9a32-5644706c9e08		
27	996800	R. S. Felger	9/23/63		Physalis lanc.	0 Rugel ex Kunze									urn:uuid:4c7b8fc1-3c7a-4d55-8fe4-e8e043b6c8a1		
28	996801	R. S. Felger	9/7/60		Physalis lanc.	0 Rugel ex Kunze									urn:uuid:84f06106-f5d8-4386-8c9f-0057319ab624		
29	996802	M.B. Moser	10/30/66		Physalis lanc.	0 Rugel ex Kunze									urn:uuid:e55b1659-55d4-4a8a-a2e3-91399020fdbc		
30	996803	R. S. Felger	12/18/66		Physalis lanc.	0 Rugel ex Kunze									urn:uuid:d4501597-f072-40a6-a0ef-3f831b28a89f		
31	893396	F. Reichenbacher	9/23/82		Physalis lanc.	0 Michx.									urn:uuid:89b3281b-7574-4cff-b9f3-b053f8c34a45		
32	949679	F. Reichenbacher	s.d.		Physalis lanc.	0 Michx.									urn:uuid:60796e3d-fd6f-42e2-90d6-f8c5d220bb65		
33	953201	CEMML	s.d.		Physalis lanc.	0 Michx.									urn:uuid:dc86b7d6-136a-4e34-ac98-efc65fd86bf3		
34	953402	R.S. Felger	s.d.		Physalis lanc.	0 Michx.									urn:uuid:67e875ac-8774-4178-b0e3-d80822d88d4		
35	855416	R. H. Peebles	9/23/39		Physalis latif.	0 Waterfall									urn:uuid:474b519c-5e2c-4f98-8571-0f8dbd191a9c		
36	855417	G.J. Harrison	9/11/32		Physalis latif.	0 Waterfall									urn:uuid:a85ac5b6-d3b4-4aca-8de7-c4f10ad97d42		
37	922012	G.A. Levin, 1992	s.d.		Physalis latif.	0 Waterfall									urn:uuid:04fd1bc6-934a-4558-a4da-0a892a689a31		
38	3240128	M. Martinez	1/1/05		Physalis latif.	0 Waterfall									urn:uuid:d1b7e2a0-1b6f-45d2-a17c-8262a9bd5774		

What the Analysis will involve...

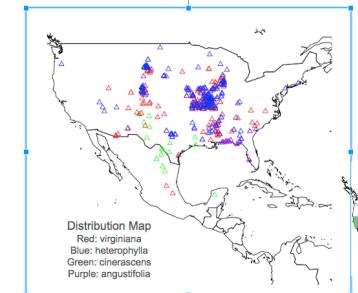
RAW Data

Phytalis Heterophylla New Mexico L. Sullivan
100834343.13232 13994039.1123
Phytalis Heterophylla New Mexico L. Sullivan
100834343.13232 13994039.1123
Phytalis Heterophylla New Mexico L. Sullivan
100834343.13232 13994039.1123

Filtered Data

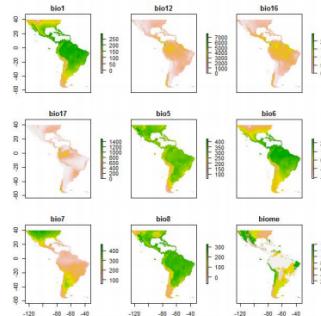
Phytalis 100834343.13232
13994039.1123
Phytalis 100834343.13232
13994039.1123
Phytalis 100834343.13232
13994039.1123

Raw points mapped for Nth species



New taxa

Niche Model for Nth species



Anticipated Results

