Oikos

OIK-04688

Filazzola, A., Sotomayor, D. A. and Lortie, C. J. 2017. Modelling the niche space of desert annuals needs to include positive interactions. – Oikos doi: 10.1111/oik.04688

Appendix 1

BIOCLIM variables responsible for plant occurrence

We used principal component analysis (PCA) to determine the BIOCLIM variables that explained annual occurrence using the *base* and *vegan* package in R (<www.r-project.org>). For each occurrence of the facilitated and unreported plant species, four BIOCLIM variables were extracted for Southern California. These variables were elevation, temperature during the wettest quarter, precipitation during the wettest quarter, and precipitation seasonality. We then used PCA, which identifies orthogonal axes that best explain variation in environmental variables that linear and normally distributed. The four chosen bioclimatic variables explained ~97% of the environmental variation. PC1 represented differences in elevation and PC2 represented aridity (increasing temperature, decreasing precipitation) throughout the Mojave Desert in California (Fig. A1).

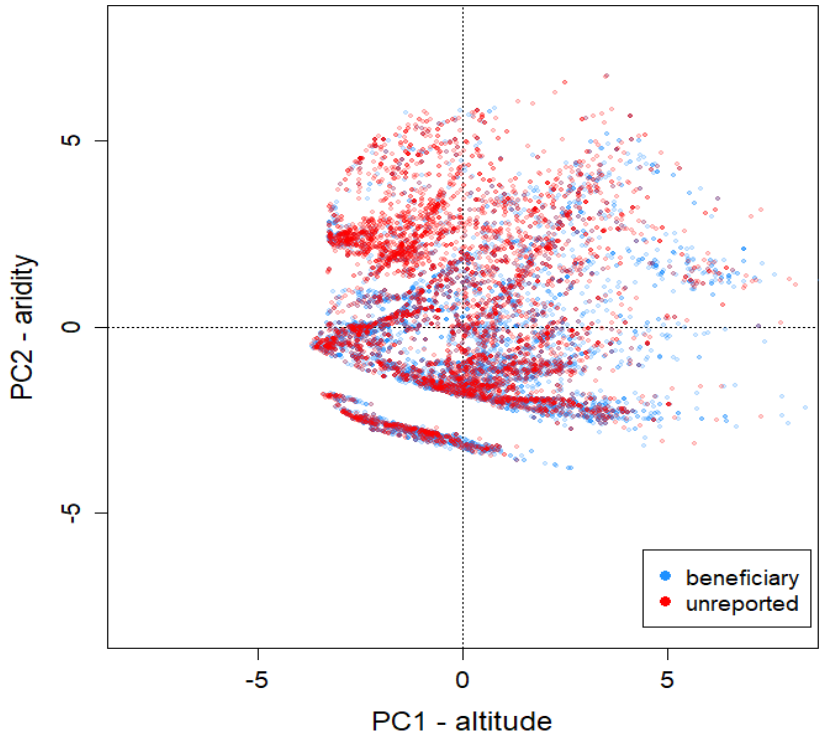


Figure A1. The beneficiary and unreported plant species groups occupy similar climatic niches based a principal component analysis of four bioclimatic variables at each plant occurrence.

Table A1. Correlation matrix of environmental variables for 10,000 background points in Southern California.

Correlation	Elevation	Annual Temp	Temp Seasonality	Temp wettest QR	Annual precip	Precip seasonality	Precipt wettest QR
Elevation	1						
Annual temp	-0.91	1					
Temp Seasonality	-0.05	0.39	1				
Temp wettest QR	-0.61	0.74	0.26	1			
Annual precip	0.59	-0.76	-0.69	-0.50	1		
Precip seasonality	0.014	-0.34	-0.81	-0.31	0.65	1	
Precipt wettest QR	0.49	-0.70	-0.74	-0.49	0.99	0.74	1

Table A2. Best subset results for variables that predict annual plant occurrence. Fit to a binomial distribution with pseudo-absences generated from background climate data.

BIOCLIM variable	Estimate	Std. Error	z value	Pr(>|z|)
Facilitated species				
(Intercept)	-22.3	1.16	-19.2	<0.001
Elevation	0.005	0.0004	12.3	<0.001
Annual temp	0.099	0.006	16.8	<0.001
Temp seasonality	-0.0005	0.00007	-7.6	<0.001
Temp wettest QR	-0.009	0.0005	-18.4	<0.001
Annual precip	0.18	0.003	6.17	<0.001
Precip seasonality	0.067	0.005	12.4	<0.001
Precipt wettest QR	-0.036	0.0053	-6.7	<0.001
Unknown species				
(Intercept)	-14.9	9.8	-15.25	<0.001
Elevation	0.003	0.0003	7.25	<0.001
Annual temp	0.061	0.005	11.8	<0.001
Temp seasonality	-0.0003	0.00005	-5.11	<0.001
Temp wettest QR	-0.0041	0.0004	-9.98	<0.001
Annual precip	0.0083	0.003	3.30	0.009
Precip seasonality	0.054	0.0048	11.2	<0.001
Precipt wettest QR	-0.016	0.005	-3.40	<0.001

Appendix 2

Workflow of model inputs for MaxEnt

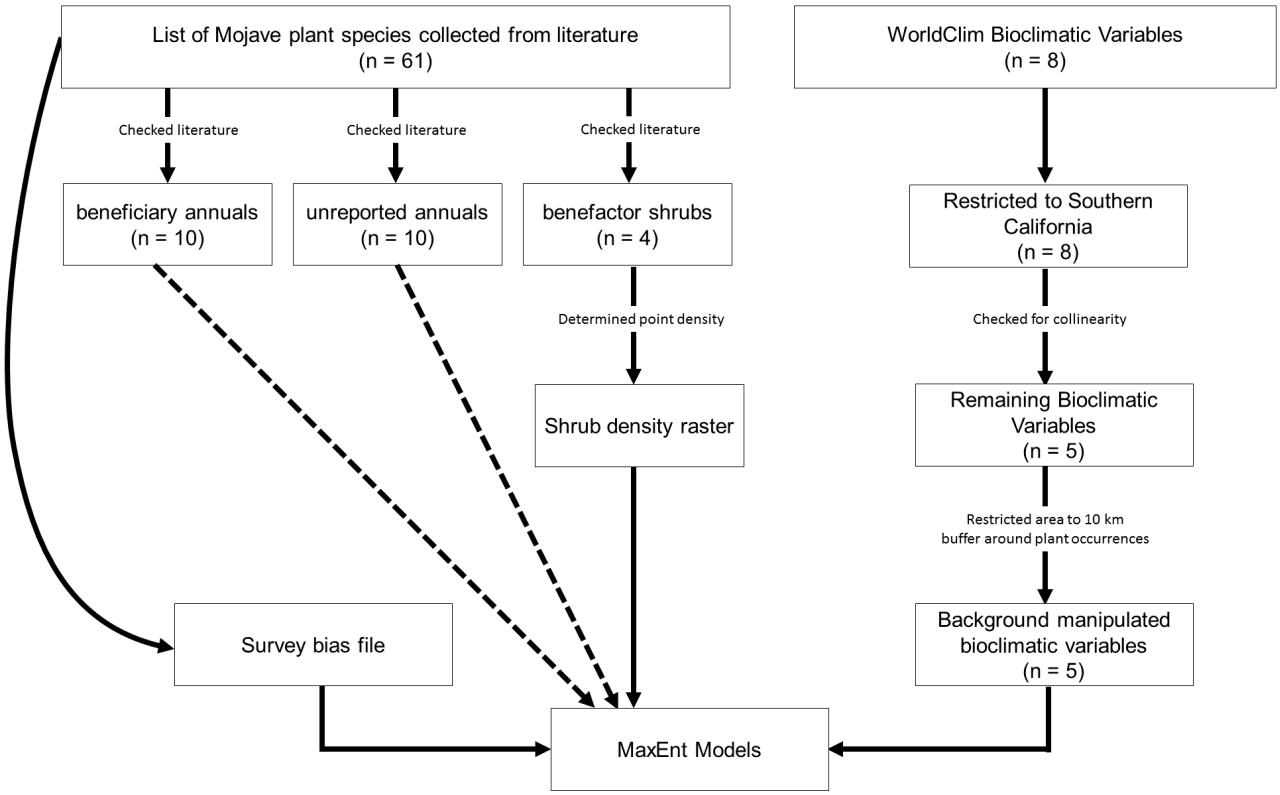
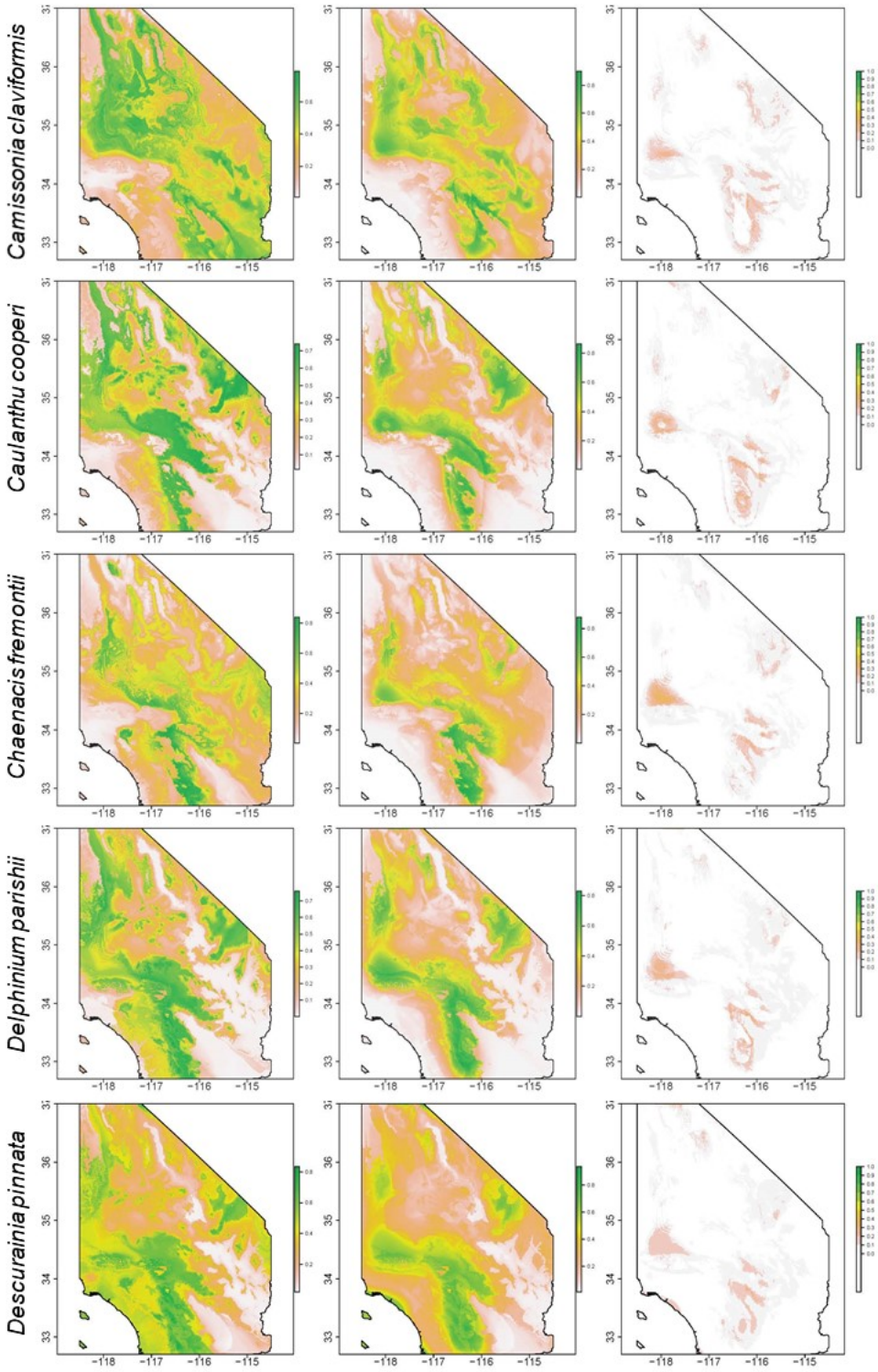


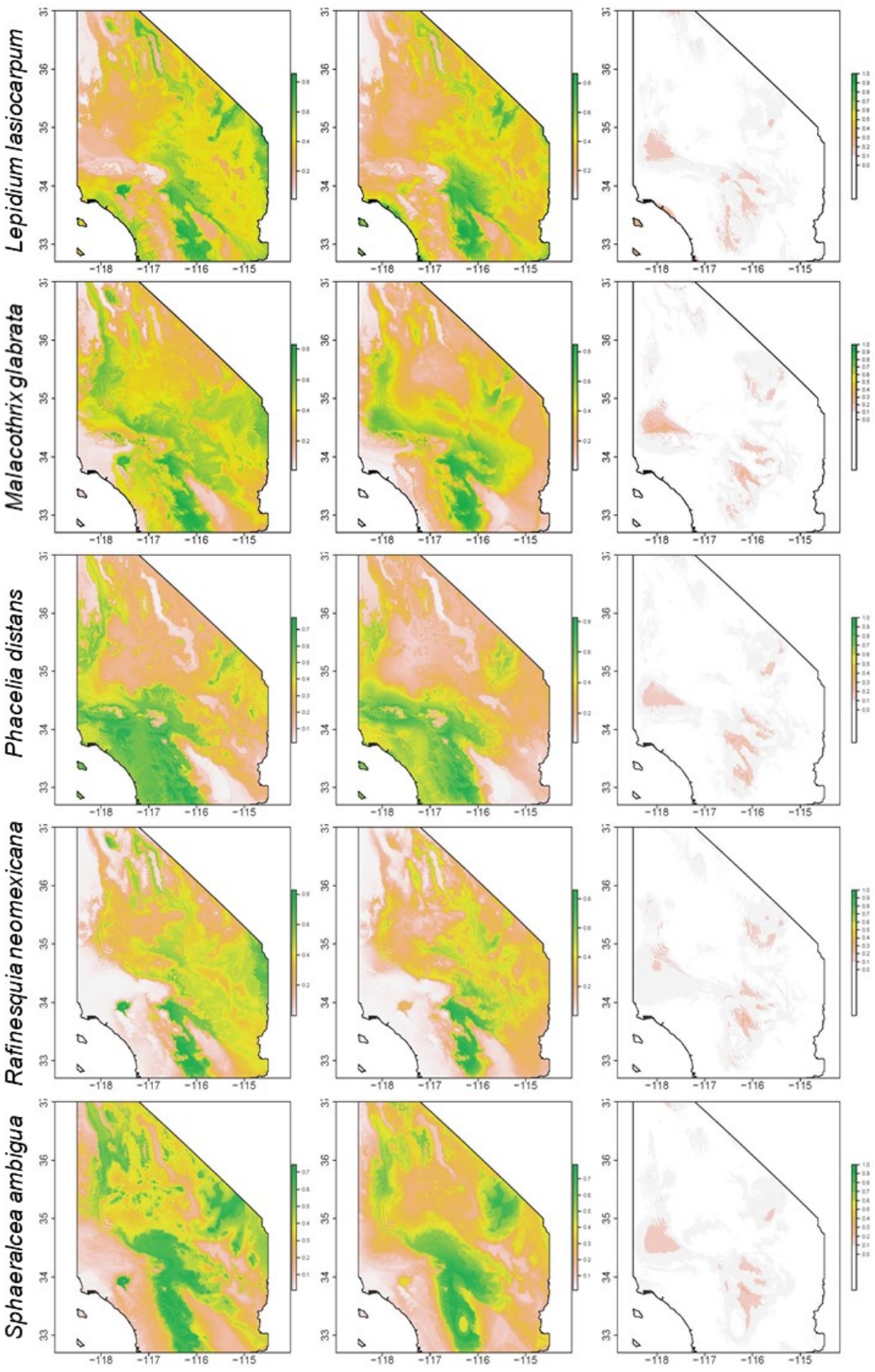
Figure A2. A workflow of species selection, model inputs, and adjustments for survey bias in MaxEnt models. Solid lines represent consistent inputs for every MaxEnt model and dashed lines represents the changing input of species. Every species was modelled 40 times and a mean was used for the output statistics, such as AUC.

Appendix 3

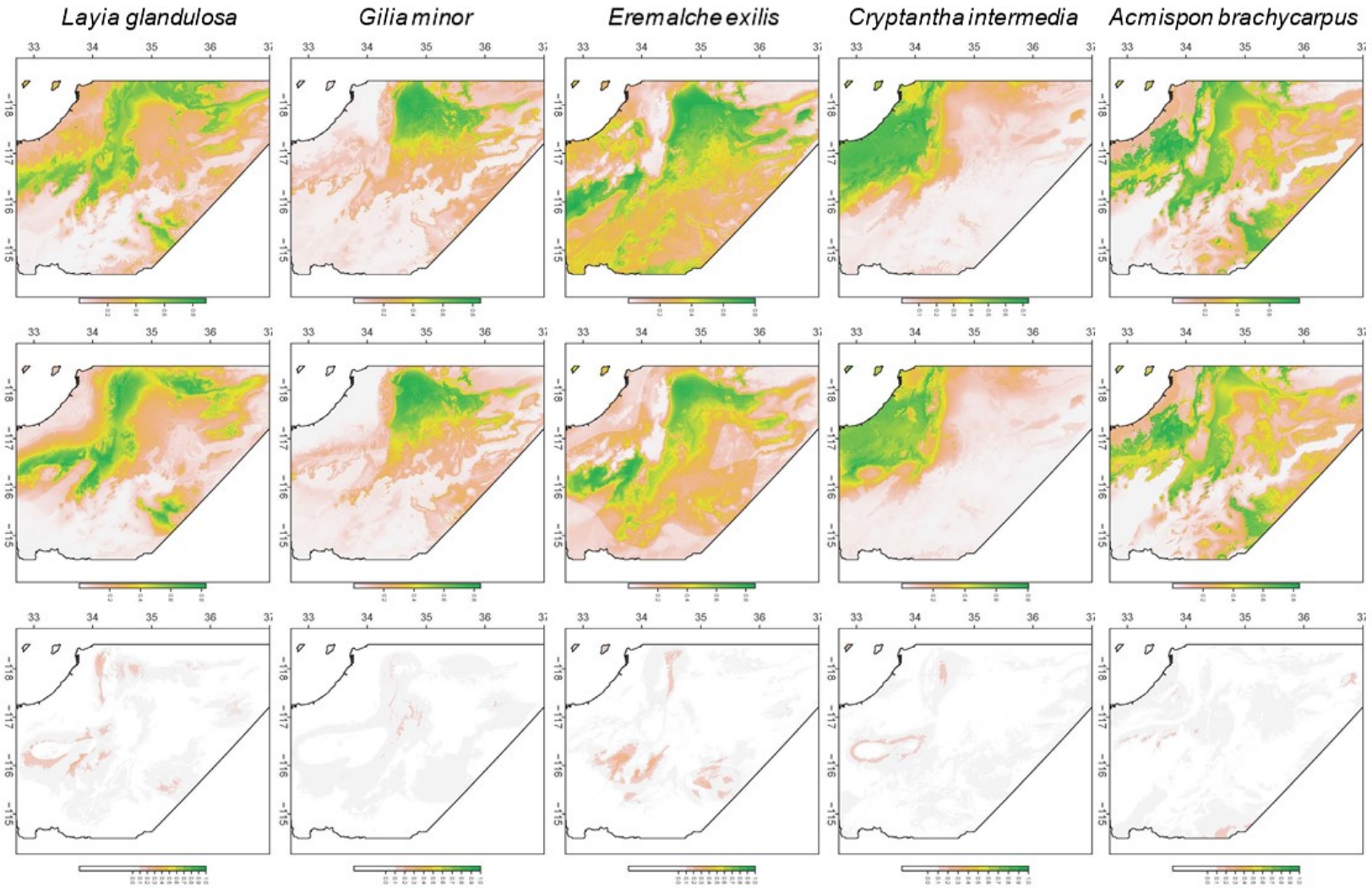
An example iteration of the species distribution models for each species. Each map represents probability of occurrence for each species between 0 (low) and 1 (high probability). The panels from left to right correspond to the climate only model (m_{env}), climate and shrub model ($m_{shrub.env}$), and the difference between both models (HS_{diff}).

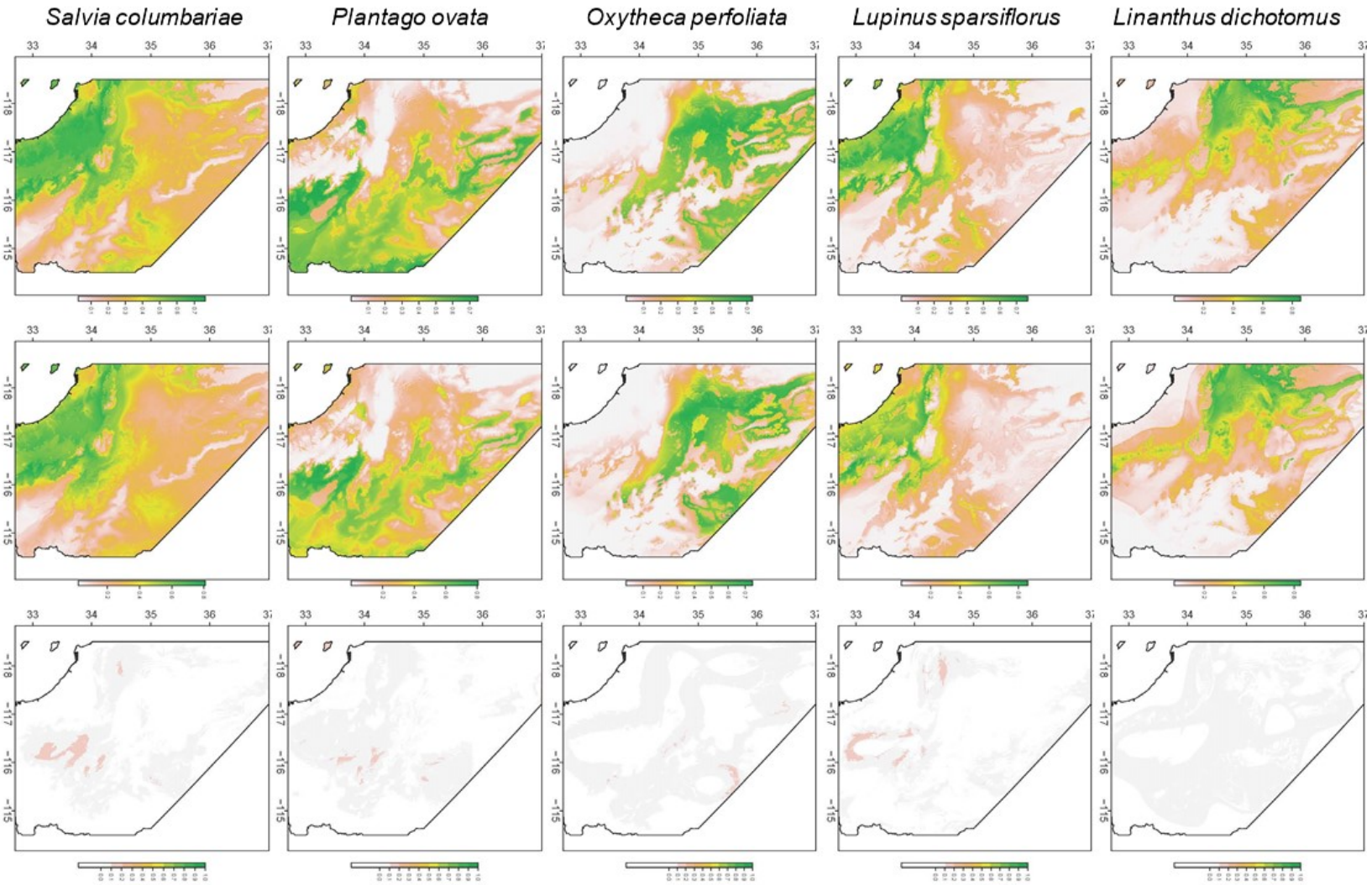
Beneficiary




Lepidium lasiocarpum
Malacothrix glabrata
Phacelia distans
Rafinesquia neomexicana
Sphaeralcea ambigua

Unreported


Layia glandulosa
Gilia minor
Eremalche exilis
Cryptantha intermedia
Acmispon brachycarpus


Salvia columbariae
Plantago ovata
Oxytheca perfoliata
Lupinus sparsiflorus
Linanthus dichotomus