Appendix 3: Additional models results

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1. Models with traits

Specification of the models: We used lme4 package to perform a GLMM with binomial (proportion) distribution. An example of the code for each dataset are as follows:

```
mhigh.spe <- glmer(cbind(occor, n.visit-occor) ~</pre>
        forest_site400*lbody_size +
        forest_site400*nest +
        forest site400*diet +
        forest site400*lower stratum +
        forest land*lbody size +
        forest land*nest +
        forest_land*diet +
        forest_land*lower_stratum +
        (forest site400 + forest land|sp) +
        (1|landscape:sp) + (1|site:sp) +
        (lbody_size + nest + diet + lower_stratum|landscape) +
        (lbody size + nest + diet + lower stratum|site),
        family=binomial, data=high.spe,
        nAGQ = 1, control = glmerControl(optimizer = "bobyqa",
                         optCtrl = list(maxfun = 500000)))
```

We ran separate models for each assemblage and trait. Afterwards, we ran one model with the combination of the traits body mass, diet, nest type and % of lower strata use. Table S3.1 shows the marginal \mathbb{R}^2 of all models terms.

2. Models coeficients

Tables S3.2, S3.3, S3.4, and S3.5 show the coefficients for each model.

Table S3.1: Overall and marginal R-squared of trait models in each dataset. For the marginal R-squared terms see Table 2 (main text).

Model	Total	trait*env	env sp	lands:sp	site:sp	trait lands	trait site
Specialists							
High quality							
Combined	57.6	10.0	36.8	6.7	0.7	1.3	2.2
body mass	56.8	7.7	38.9	6.7	1.6	0.8	1.1
nest type	56.8	4.6	41.9	6.8	1.5	0.6	1.4
main diet	57.4	4.5	42.5	6.5	1.6	1.0	1.3
% frugivory	56.8	4.4	42.4	6.8	1.6	0.5	1.1
% insetivory	56.7	3.8	42.9	6.8	1.6	0.5	1.1
% lower strata	56.7	1.5	45.0	6.8	1.4	0.7	1.4
foraging stratum	56.7	2.0	44.5	6.5	1.5	0.8	1.3
hand-wing	56.6	1.6	44.9	6.8	1.2	0.5	1.6
Low quality							
Combined	71.9	22.2	39.9	3.8	1.0	0.9	4.0
body mass	70.5	15.8	45.6	3.8	2.4	0.1	2.7
nest type	71.0	17.3	44.5	3.9	2.2	0.0	3.1
main diet	71.4	18.4	43.8	3.7	2.5	0.4	2.5
% frugivory	71.3	17.2	45.1	3.8	2.6	0.0	2.6
% insetivory	71.3	18.4	44.0	3.8	2.6	0.1	2.5
% lower strata	71.1	15.5	46.2	3.8	1.9	0.4	3.2
foraging stratum	70.7	17.0	44.5	3.9	2.3	0.3	2.6
hand-wing	70.9	14.0	47.6	3.8	2.4	0.1	2.9
Generalists							
High quality							
Combined	46.2	7.4	31.9	1.3	0.9	1.6	3.1
body mass	44.7	0.2	37.8	1.6	2.9	0.6	1.5
nest type	44.6	0.6	37.4	1.7	3.1	0.6	1.1
main diet	45.8	5.2	33.7	1.5	1.7	1.1	2.7
% frugivory	44.5	0.5	37.4	1.5	3.6	0.7	0.8
% insetivory	44.4	3.2	34.8	1.2	3.7	0.9	0.7
% lower strata	44.5	1.3	36.7	1.5	3.6	0.7	0.7
foraging stratum	44.4	1.9	35.8	1.7	3.2	0.7	1.0
hand-wing	44.4	3.0	34.9	1.6	3.5	0.6	0.8
Low quality							
Combined	47.4	7.5	33.3	2.3	0.9	1.0	2.4
body mass	47.1	0.8	39.7	2.7	2.2	0.4	1.2
nest type	46.7	1.0	39.3	3.1	2.1	0.0	1.1
main diet	47.1	5.3	35.2	2.8	1.9	0.5	1.5
% frugivory	47.0	0.4	40.0	2.9	2.4	0.3	0.9
% insetivory	46.7	1.6	38.7	3.0	2.4	0.2	0.9
% lower strata	47.0	0.9	39.5	3.1	2.1	0.1	1.3
foraging stratum	47.0	1.2	39.2	2.9	2.4	0.1	1.1
hand-wing	46.7	2.5	37.8	3.0	2.4	0.1	0.9

Table S3.2: Fixed effects oefficients for the model of specialists in high-quality matrix landscapes.

effect	term	estimate	std.error	statistic	p.value
fixed	(Intercept)	-2.72	0.98	-2.78	0.01
fixed	forest_site400	0.83	0.33	2.49	0.01
fixed	lbody_size	-0.62	0.28	-2.22	0.03
fixed	nestclosed	0.32	0.67	0.48	0.63
fixed	nestopen_semi	-0.28	0.56	-0.50	0.62
fixed	dietinsectivorous	0.07	0.83	0.09	0.93
fixed	dietonivorous	-1.00	1.25	-0.81	0.42
fixed	lower_stratum	0.18	0.23	0.78	0.44
fixed	forest_land	-0.36	0.41	-0.87	0.38
fixed	$forest_site 400: lbody_size$	-0.03	0.09	-0.30	0.76
fixed	$forest_site 400:nest closed$	-0.38	0.19	-1.98	0.05
fixed	$forest_site400:nestopen_semi$	-0.24	0.17	-1.36	0.17
fixed	forest_site400:dietinsectivorous	-0.28	0.29	-0.97	0.33
fixed	$forest_site 400: dietonivorous$	-0.35	0.44	-0.80	0.42
fixed	$forest_site 400: lower_stratum$	0.01	0.07	0.10	0.92
fixed	lbody_size:forest_land	0.00	0.10	0.04	0.97
fixed	nestclosed:forest_land	0.30	0.22	1.35	0.18
fixed	nestopen_semi:forest_land	0.31	0.19	1.61	0.11
fixed	dietinsectivorous:forest_land	-0.04	0.33	-0.11	0.91
fixed	${\it dietonivorous:} forest_land$	0.45	0.47	0.95	0.34
fixed	$lower_stratum:forest_land$	0.00	0.08	-0.03	0.98

Table S3.3: Fixed effects oefficients for the model of specialists in low-quality matrix landscapes.

effect	term	estimate	std.error	statistic	p.value
fixed	(Intercept)	-5.46	1.03	-5.33	0.00
fixed	forest_site400	1.06	0.36	2.94	0.00
fixed	lbody_size	-0.21	0.32	-0.67	0.50
fixed	nestclosed	0.70	0.78	0.90	0.37
fixed	nestopen_semi	-0.12	0.69	-0.18	0.86
fixed	dietgranivorous	0.13	1.82	0.07	0.95
fixed	dietinsectivorous	1.27	0.82	1.54	0.12
fixed	lower_stratum	0.36	0.28	1.28	0.20
fixed	forest_land	1.42	0.44	3.22	0.00
fixed	$forest_site 400: lbody_size$	0.05	0.09	0.51	0.61
fixed	$forest_site400:nestclosed$	-0.39	0.22	-1.78	0.07
fixed	$forest_site 400:nestopen_semi$	-0.06	0.20	-0.29	0.77
fixed	forest_site400:dietgranivorous	-0.41	0.61	-0.67	0.50
fixed	$forest_site 400: diet in sectivo rous$	-0.40	0.28	-1.45	0.15
fixed	$forest_site 400: lower_stratum$	0.02	0.09	0.18	0.86
fixed	lbody_size:forest_land	0.01	0.12	0.04	0.96
fixed	$nestclosed:forest_land$	-0.59	0.28	-2.10	0.04
fixed	$nestopen_semi:forest_land$	-0.16	0.27	-0.62	0.54
fixed	dietgranivorous:forest_land	-0.03	0.73	-0.04	0.96
fixed	$diet in sectivo rous: for est_land$	-0.38	0.34	-1.10	0.27
fixed	$lower_stratum:forest_land$	-0.15	0.12	-1.24	0.22

Table S3.4: Fixed effects oefficients for the model of generalists in high-quality matrix landscapes.

effect	term	estimate	std.error	statistic	p.value
fixed	(Intercept)	-3.45	0.55	-6.29	0.00
fixed	$forest_site400$	0.37	0.19	2.01	0.04
fixed	lbody_size	0.08	0.27	0.29	0.77
fixed	nestclosed	0.20	0.61	0.32	0.75
fixed	nestopen_semi	0.20	0.53	0.38	0.71
fixed	dietgranivorous	-0.91	0.86	-1.06	0.29
fixed	dietinsectivorous	1.00	0.50	2.00	0.05
fixed	dietnectarivorous	-0.12	0.75	-0.16	0.88
fixed	dietonivorous	0.14	0.67	0.21	0.83
fixed	lower_stratum	0.36	0.17	2.06	0.04
fixed	forest_land	-0.11	0.22	-0.50	0.62
fixed	$forest_site 400: lbody_size$	0.05	0.09	0.61	0.54
fixed	$forest_site 400:nest closed$	-0.43	0.20	-2.12	0.03
fixed	forest_site400:nestopen_semi	-0.22	0.17	-1.28	0.20
fixed	$forest_site 400: diet granivorous$	-0.61	0.35	-1.75	0.08
fixed	$forest_site 400: diet in sectivo rous$	-0.13	0.18	-0.75	0.46
fixed	$forest_site 400: diet nectari vorous$	-0.16	0.27	-0.61	0.54
fixed	forest_site400:dietonivorous	-0.50	0.25	-2.04	0.04
fixed	$forest_site 400: lower_stratum$	0.04	0.05	0.71	0.48
fixed	$lbody_size:forest_land$	-0.01	0.10	-0.09	0.93
fixed	nestclosed:forest_land	0.18	0.21	0.88	0.38
fixed	nestopen_semi:forest_land	0.07	0.17	0.38	0.71
fixed	dietgranivorous:forest_land	0.68	0.36	1.87	0.06
fixed	dietinsectivorous:forest_land	-0.13	0.19	-0.65	0.51
fixed	${\it dietnectarivorous:} {\it forest_land}$	-0.11	0.28	-0.40	0.69
fixed	dietonivorous:forest_land	0.06	0.27	0.22	0.83
fixed	$lower_stratum: forest_land$	-0.03	0.06	-0.58	0.56

 ${\it Table S3.5: Fixed effects oefficients for the model of generalists in low-quality matrix landscapes.}$

effect	term	estimate	std.error	statistic	p.value
fixed	(Intercept)	-4.23	0.49	-8.66	0.00
fixed	forest_site400	0.26	0.20	1.32	0.19
fixed	lbody_size	0.22	0.26	0.83	0.41
fixed	nestclosed	0.79	0.59	1.33	0.18
fixed	nestopen_semi	0.55	0.50	1.10	0.27
fixed	dietgranivorous	0.87	1.12	0.78	0.44
fixed	dietinsectivorous	1.06	0.48	2.20	0.03
fixed	dietnectarivorous	-0.19	0.76	-0.25	0.80
fixed	dietonivorous	0.39	0.64	0.62	0.54
fixed	lower_stratum	0.24	0.18	1.33	0.18
fixed	forest_land	0.04	0.18	0.25	0.81
fixed	forest_site400:lbody_size	0.03	0.10	0.32	0.75
fixed	forest_site400:nestclosed	-0.52	0.21	-2.45	0.01
fixed	forest_site400:nestopen_semi	-0.26	0.17	-1.49	0.14
fixed	forest_site400:dietgranivorous	0.55	0.39	1.41	0.16
fixed	forest_site400:dietinsectivorous	0.02	0.19	0.12	0.90
fixed	forest_site400:dietnectarivorous	0.09	0.30	0.30	0.77
fixed	forest_site400:dietonivorous	-0.05	0.23	-0.21	0.84
fixed	forest_site400:lower_stratum	-0.10	0.06	-1.62	0.11
fixed	$lbody_size:forest_land$	0.00	0.09	-0.05	0.96
fixed	nestclosed:forest_land	0.27	0.18	1.46	0.14
fixed	nestopen_semi:forest_land	0.20	0.15	1.37	0.17
fixed	dietgranivorous:forest land	-0.48	0.34	-1.42	0.15
fixed	dietinsectivorous:forest land	-0.21	0.17	-1.23	0.22
fixed	${\it dietnectarivorous:} {\it forest_land}$	-0.26	0.28	-0.94	0.35
fixed	dietonivorous:forest_land	-0.25	0.20	-1.27	0.21
fixed	lower_stratum:forest_land	0.07	0.06	1.17	0.24

Table S3.6: Variance Inflation Factor index for combined traits models in each dataset.

	Specialists		Generalists		
parameter	High-quality	Low-quality	High-quality	Low-quality	
forest.local	1.24	1.04	1.17	1.17	
$body_mass$	1.23	1.08	1.15	1.15	
$\operatorname{nest_closed}$	1.78	1.43	2.37	2.37	
$\operatorname{nest_open_semi}$	2.15	1.99	1.96	1.96	
$\operatorname{diet_insectivorous}$	1.83	1.94	2.16	2.16	
$diet_onivorous$	1.83	1.49	2.04	2.04	
lower_strata	1.37	NA	2.22	2.22	
$diet_granivorous$	1.18	1.19	1.15	1.15	
forest.landscape	NA	1.16	1.20	1.20	
$diet_nectarivorous$	NA	NA	2.46	2.46	

3. Models diagnostic

Variance Inflation Factor of the model parameters for each dataset in Table S3.6.

Example of the residual diagnostic of the model with the combined traits (main diet, body mass, nest type and % of lower strata use) for the forest specialists in high-quality matrix landscapes. The models' diagnostics for the other assemblages were all similar and can be checked in this Rmd file.

Residual correlations among species and sites

Below we present the Kendall correlations for the residuals among species and sites for the models using the predictions for site:sp random effect (Observation Level Random Effect). For the residual correlations we followed the code provided by Miller, Damschen & Ives (2018).

Range of species correlations: -0.4, 0.43. Range of sites correlations: -0.3, 0.27.

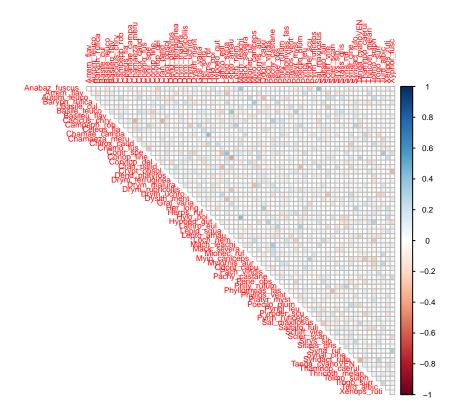


Figure S3.1: Species residual Kendall correlations for the specialist species in high-quality matrix landscapes.

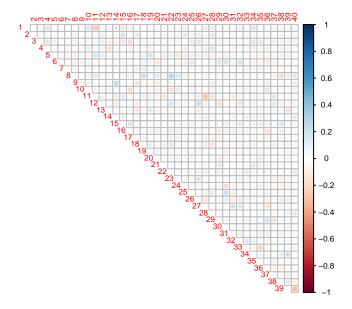


Figure S3.2: Sites residual Kendall correlations for the specialist species in high-quality matrixlandscapes.

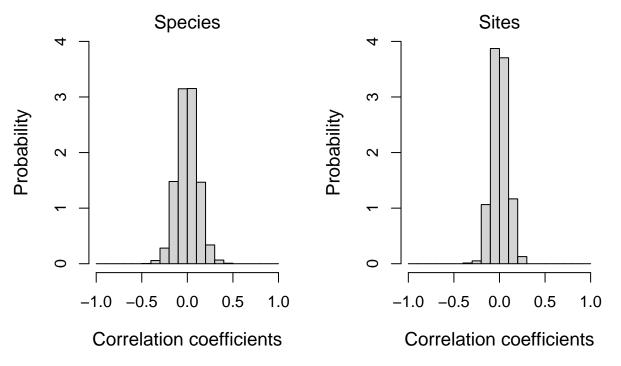


Figure S3.3: Histograms of the residual Kendall correlations for the specialists species in high-quality matrix landscapes.

Residual diagnostic

We used DHARMa package (Hartig (2018)) for the diagnostic of quantile residuals.

DHARMa residual diagnostics

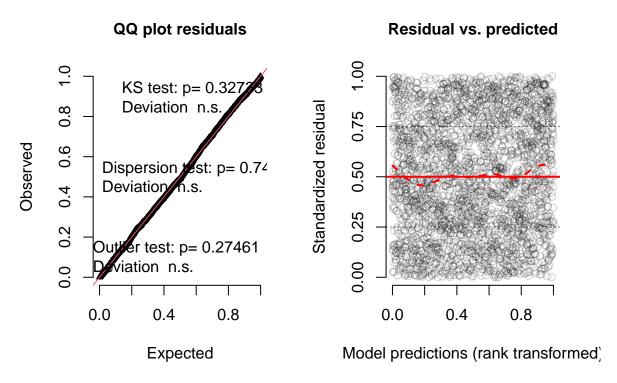


Figure S3.4: Plots for model diagnostic form DHARMa package.

Residuals against predictors:

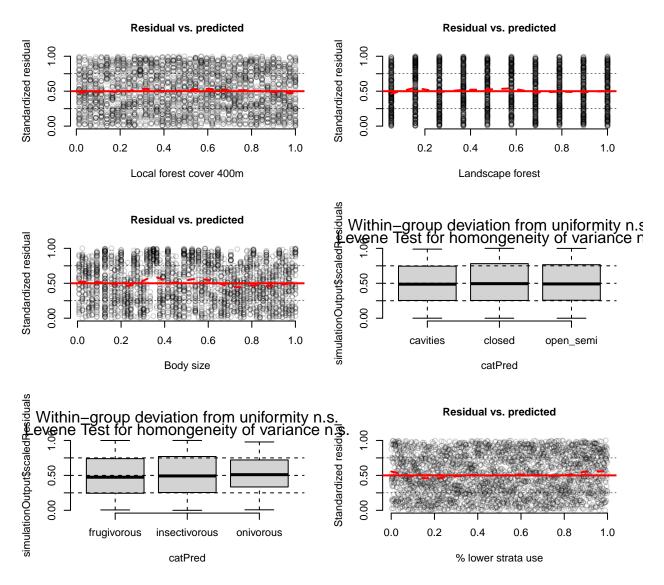


Figure S3.5: More for model diagnostic form DHARMa package.

Predictions for each species local forest cover

Landscape forest cover was fixed in 30%.

Forest specialists Matrix quality - High - Low Anabaz_fuscus Arrem_flav Arremon_sem Attila_phoenicurus Attila_rufus Autom_leuco Bailoni_Bailo Baryph_rufica 0.75 0.50 0.25 0.00 Basileu_flav Batara_cine Cacicus_chry Campeph_rob Carpor_cuc 0.75 0.50 0.25 0.00 Chamae_campa Chamaeza_meru Chirox_caud Ciss_leverianus Cnemo_fus Conir_spe Conop_line Corytop del 0.75 0.50 0.25 0.00 Crypt_obsol Dend_platyros Drom_pavoni Dry_squamata Drym_ferruginea Drym_malura Drym_rubricollis 0.75 0.50 0.25 0.00 Eup_chalibea Eupho_pectoralis Geotry_montana Geotry_vio Gral_varia 0.75 0.50 0.25 0.00 Hypoed_gut Lathro_eul Lepid_squa 0.75 0.75 - 0.50 - 0.25 - 0.00 - 0.75 - 0.50 - 0.50 - 0.25 - 0. Mack_severa Malac_stri Mionec_ruf Myio_caniceps Myiornis_aur Myrmoderus_squa 0.00 Odont_capu Pach_validus Pach_viridis Pachy_castane Pene_obs Phily_rufum Phyl_exim Phyllomyias_fas 0.75 0.50 0.25 0.00 Platyr_myst Poecilo_plum Psilor_gutattus Pyrigl_leu Pyrrd_ruficeps Sal_maxilosus 0.75 0.50 0.25 0.00 Schiff_vire Sirys_sib Sitass_gris Spo_frontalis Syna_ruf 0.75 0.50 0.25 0.00 Tan_desmaresti Tanga_cyanoVEN Terenura_mac Thamnop_caerul Thricoth_melan Tolmo_sulph 0.75 0.50 0.25 0.00 20 40 60 80 20 40 60 80 Turd_flavipes Xenops_ruti Xyphor_fusc Turd_albic 0.75 0.50 0.25

Figure S3.6: Forest specialist birds. 10

Local forest cover (%)

20 40 60 80

20 40 60 80

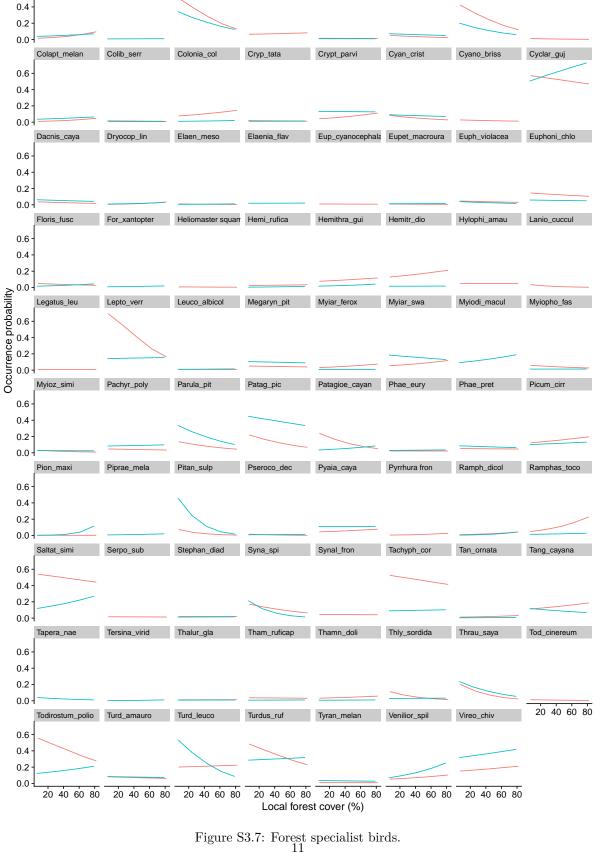
0.00

20 40 60 80

20 40 60 80

20 40 60 80

Forest generalists Matrix quality - High - Low Amazilia_lact Amazon_aest Aphant_cirr Aramid_sarac Aramides_caj Arati_leuco Aratin_auri Broto_tirica 0.6 0.4 0.2 0.0 Campto_obso Capsiempsi_fla Chlor_cyanea Chlorost_luci Coereba_fla 0.6 Colonia_col Cryp_tata Crypt_parvi Cyan_crist Cyano_briss Cyclar_guj Dryocop_lin Eup_cyanocephala Eupet_macroura Euph_violacea Euphoni_chlo Heliomaster squarr Hemi_rufica Hemithra_gui Hemitr_dio Hylophi_amau Lanio_cuccul Leuco_albicol Megaryn_pit Myiar_ferox Myiar_swa Myiodi_macul Myiopho_fas Parula_pit Pitan sulp Pseroco_dec Pyaia_caya Pyrrhura fron



References

Hartig, F. (2018). DHARMa: Residual Diagnostics for Hierarchical (Multi-Level / Mixed) Regression Models.

Miller, J.E.D., Damschen, E.I. & Ives, A.R. (2018). Functional traits and community composition: A comparison among community-weighted means, weighted correlations, and multilevel models. $Methods\ in\ Ecology\ and\ Evolution\ {\bf 0}.$