**Paper:**

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**Statistical Model Structure**

In the following section, we give the R formula for the final best model (i.e. after stepwise variable selection) of each site-level diversity metric. Response variables are SR (species richness), LA ($\log_e$ total abundance), PH (community-weighted mean $\log_{10}$ plant height) and AM (community-weighted mean $\log_{10}$ animal body mass). Random intercepts considered were SS (study identity, nested within source publication; a source could have multiple studies where sampling methods differed e.g. for different taxonomic groups); SSB (spatial block nested within study nested within source) and – for models with Poisson errors, to control for overdispersion – SSBS (site nested within spatial block nested within study nested within source). Note that when random intercepts are strictly nested, the following two ways of specifying the random-effects structure are exactly equivalent: (1|SS) + (1|SSB) + (1|SSBS) and (1|SS/SSB/SSBS). Explanatory variables considered (fitted as fixed effects) were: LU (land use), UI (land-use intensity), LUI (land use in interaction with land-use intensity), HPD ($\log_e$ human population density), DR ($\log_e$ distance to nearest road), DP ($\log_e$ distance to nearest major population centre and TSC (time since 30% conversion of a landscape to human uses – cropland, pasture and urban).

```
SModel<-glmer(SR ~ LUI + poly(HPD,2) + poly(DR,1) + poly(DP,2) + LU:poly(HPD,2) +
      LU:poly(DP,2) + (1+LU+UI|SS) + (1|SSB) +
      (1|SSBS),family="poisson",control=glmerControl(optimizer="bobyqa"))

AModel<-lmer(LA ~ LUI + poly(HPD,2) + poly(DR,2) + poly(TSC,1) + LU:poly(DR,2) +
      LU:poly(TSC,1) + poly(HPD,2):poly(TSC,1) + (1+LU+UI|SS) + (1|SSB),
      lmerControl(optimizer="bobyqa"))

PHModel<-lmer(PH ~ LU + poly(HPD,1) + (1+LU|SS), lmerControl(optimizer="bobyqa"))

AMModel<-lmer(AM ~ poly(DR,2) + (1+LU+poly(DR,2)|SS) + (1|SSB),
      lmerControl(optimizer="bobyqa"))
```

**Full Statistical Results**

The four types of diversity metric that we analyzed (within-sample species richness, rarefaction-based richness, total abundance, average organism size) are not completely independent of one another. If we were to assume that they were entirely dependent on each other (which is not the case) and correct for multiple testing, we would apply a threshold P-value of 0.0125 instead of 0.05. In the following, we indicate with an * those effects that would not be significant with the more stringent threshold, thus identifying overall the most and least restrictive putative outcomes. The final structure of the model that was used to make the main spatial and temporal projections of species richness would not have changed had the more stringent threshold been applied: accessibility to humans and its interaction with land use were the only terms that would have been dropped from the final models, but these variables were not included in the projections owing to a lack of past and future estimates of accessibility.

For **within-sample species richness**, there was a significant effect of the interaction between land use and land-use intensity ($\chi^2_{18,\,113} = 89.0$; $P < 0.001$; $\Delta AIC = -52.3$), and of land use ($\chi^2_{7,\,71} = 58.3$; $P < 0.001$; $\Delta AIC = -38.3$) and intensity ($\chi^2_{2,71} = 14.1$; $P < 0.001$; $\Delta AIC = -9.47$) separately. Human population density ($\chi^2_{1,\,71} = 5.71$; $P = 0.017$*; $\Delta AIC = -3.85$), distance to roads ($\chi^2_{1,\,71} = 5.68$; $P = 0.017$*; $\Delta AIC = -7.29$) and accessibility to humans ($\chi^2_{1,\,71} = 4.82$; $P = 0.028$*; $\Delta AIC = +0.14$) had significant effects on species richness, with a quadratic polynomial supported for human population density, but only linear terms for proximity to roads and accessibility. Note that the effect of

accessibility was weak with inclusion causing a slight increase in the model's AIC value. Human population density ($\chi^2_{14, 113} = 34.0$; P = 0.0020; ΔAIC = -6.08) and accessibility ($\chi^2_{14, 113} = 24.5$; P = 0.040*; ΔAIC = +2.91) also had significant effects in interaction with land use, although the latter was a weak effect whose inclusion led to an increase in AIC. Human population density, distance to roads and accessibility to humans did not show any significant two-way interactions, nor did distance to roads interact significantly with land use (P > 0.05; ΔAIC > +1.74). Time since substantial conversion to human land use did not have a significant effect on species richness alone, or in interaction with any other variable (P > 0.05; ΔAIC > +0.36).

For **rarefaction-based species richness**, there was a significant effect of land use ($\chi^2_{7, 47} = 16.2$; P = 0.023*; ΔAIC = -2.21), land-use intensity ($\chi^2_{2, 47} = 13.5$; P = 0.001; ΔAIC = -9.46) and their interaction ($\chi^2_{11, 65} = 24.6$; P = 0.011; ΔAIC = -2.55), but not of any of the continuous variables (P > 0.05; ΔAIC > 0.919). We did not consider any interaction terms except for that between land use and intensity owing to the much smaller number of sites for which rarefaction-based richness could be calculated.

Land use and land-use intensity in interaction also had a significant effect on **total abundance** ($\chi^2_{18, 108} = 43.6$; P < 0.001; ΔAIC = -21.4). Land-use intensity also had a significant effect alone ($\chi^2_{2, 13} = 13.7$; P = 0.0011; ΔAIC = -9.67), but land use did not ($\chi^2_{7, 69} = 8.76$; P = 0.27; ΔAIC = +3.28). Human population density had a significant effect alone ($\chi^2_{1, 13} = 5.90$; P = 0.015; ΔAIC = -3.90), and in interaction with time since substantial human conversion of the landscape ($\chi^2_{2, 108} = 11.0$; P = 0.0041; ΔAIC = -6.76). Time since human conversion of the landscape also had a significant effect on total abundance in interaction with land use ($\chi^2_{7, 108} = 29.4$; P < 0.001; ΔAIC = -13.5), but not alone ($\chi^2_{1, 70} = 3.12$; P = 0.077; ΔAIC = +0.837). Proximity to roads did not have a significant effect on total abundance alone ($\chi^2_{1, 74} = 0.045$; P = 0.83; ΔAIC = +1.80) or in interaction with any other variable (P > 0.05; ΔAIC > +0.610).

Land use ($\chi^2_{4, 22} = 19.6$; P < 0.001; ΔAIC = -11.6) and human population density (linear term only: $\chi^2_{1, 22} = 3.9$; P = 0.048*; ΔAIC = -1.90) had significant effects on **community-weighted mean plant height**, but distance to roads ($\chi^2_{1, 25} = 2.77$; P = 0.096; ΔAIC = -0.765) and accessibility ($\chi^2_{1, 27} = 1.74$; P = 0.19; ΔAIC = +1.80) did not. Only proximity to nearest road ($\chi^2_{4, 11} = 41.7$; P < 0.001; ΔAIC = -33.7) had a significant effect on **community-weighted mean animal body mass** (all other variables, P > 0.05; ΔAIC > +0.706). We did not consider land-use intensity, time since substantial human conversion of the landscape, or any interactions between variables in these models, because the datasets were much smaller for these metrics than for those reported above.

**Estimated Effect Sizes**

**Table S1. Relative biodiversity values at each level of each modelled human pressure.** Values are shown relative to an un-impacted baseline (primary vegetation, minimal intensity of use, zero human population density, and maximum observed distance to roads and travel time to major city. Variables other than that presented were held at their reference levels for factors (land use = primary vegetation; land-use intensity = minimal) or at the median observed values of the continuous pressure variables. First numbers give modelled mean estimates and numbers in brackets the 95% confidence limits. Land-use intensity was not considered for mean plant height and mean animal mass, so a single value is given for each land use.

| Pressure level | Species richness | Total abundance | Rarefaction-based richness | Mean plant height | Mean animal mass |
|---|---|---|---|---|---|
| Primary vegetation (Minimal use) | 100 | 100 | 100 | 100 | 100 |
| Primary vegetation (Light use) | 101.4 (94.6 - 108.6) | 103.8 (88.9 - 121.3) | 101.5 (92.6 - 111.1) | | |
| Primary vegetation (Intense use) | 105.4 (92.5 - 120.1) | 130.7 (98.9 - 172.8) | 97.8 (84.8 - 112.8) | | |
| Mature secondary vegetation (Minimal use) | 101.6 (90.2 - 114.5) | 104.0 (82.2 - 131.4) | 97.9 (88.9 - 107.8) | 96.0 (90.4 - 102.0) | NS |
| Mature secondary vegetation (Light/intense use) | 117.1 (99.0 - 138.6) | 128.5 (85.3 - 193.6) | 104.1 (85.6 - 126.6) | | |
| Intermediate secondary vegetation (Minimal use) | 90.8 (82.2 - 100.2) | 95.2 (78.3 - 115.7) | 92.2 (84.6 - 100.4) | | |
| Intermediate secondary vegetation (Light/intense use) | 90.1 (80.4 - 101.0) | 76.6 (59.0 - 99.3) | 85.6 (75.9 - 96.5) | | |
| Young secondary vegetation (Minimal use) | 84.4 (75.4 - 94.5) | 89.0 (72.0 - 110.0) | 91.9 (83.9 - 100.6) | | |
| Young secondary vegetation (Light/intense use) | 79.9 (68.8 - 92.7) | 85.5 (64.0 - 114.2) | 93.6 (84.6 - 103.5) | | |
| Plantation forest (Minimal use) | 80.8 (72.4 - 90.2) | 113.4 (87.0 - 147.8) | 88.2 (75.0 - 103.6) | 90.2 (81.0 - 100.3) | NS |
| Plantation forest (Light use) | 73.1 (63.4 - 84.2) | 77.8 (60.6 - 99.9) | 85.2 (72.7 - 99.8) | | |
| Plantation forest (Intense use) | 60.6 (49.5 - 74.1) | 95.7 (68.1 - 134.5) | 56.6 (46.2 - 69.3) | | |
| Cropland (Minimal use) | 73.1 (64.0 - 83.5) | 89.4 (69.2 - 115.4) | 77.5 (66.1 - 90.8) | 85.8 (77.2 - 95.3) | NS |
| Cropland (Light use) | 61.9 (52.4 - 73.2) | 54.9 (40.1 - 75.1) | 79.1 (68.2 - 91.6) | | |
| Cropland (Intense | 63.7 | 68.7 | 71.5 | | |

| | | | | | |
|---|---|---|---|---|---|
| use) | (52.6 - 77.3) | (47.1 - 100.2) | (61.4 - 83.4) | | |
| Pasture (Minimal use) | 78.2 (67.8 - 90.1) | 95.2 (73.6 - 123.1) | 89.7 (79.9 - 100.7) | 72.0 (62.5 - 83.1) | NS |
| Pasture (Light use) | 70.6 (61.3 - 81.2) | 72.2 (56.0 - 93.0) | 82.2 (73.3 - 92.1) | | |
| Pasture (Intense use) | 62.9 (50.8 - 77.9) | 65.1 (44.1 - 96.0) | 76.0 (65.8 - 87.7) | | |
| Urban (Minimal use) | 96.0 (79.4 - 116.0) | 81.8 (51.6 - 129.7) | 109.7 (84.9 - 141.8) | Not estimated | NS |
| Urban (Light use) | 65.3 (52.6 - 81.0) | 55.1 (34.8 - 87.3) | 83.2 (72.4 - 95.6) | | |
| Urban (Intense use) | 49.8 (37.5 - 66.0) | 37.6 (21.1 - 67.2) | 71.1 (54.9 - 92.1) | | |
| Human population density (minimum) | 100 | 100 | NS | 100 | NS |
| Human population density (median) | 102.8 (90.7 - 116.6) | 114.6 (86.9 - 151.2) | NS | 95.3 (78.2 - 116.1) | NS |
| Human population density (maximum) | 81.8 (66.1 - 101.2) | 82.5 (54.2 - 125.5) | NS | 88.2 (71.6 - 108.6) | NS |
| Distance to nearest road (furthest) | 100 | NS | NS | NS | 100 |
| Distance to nearest road (median) | 95.2 (84.0 - 108.0) | NS | NS | NS | 100.5 (84.8 - 119.0) |
| Distance to nearest road (closest) | 86.8 (74.8 - 100.7) | NS | NS | NS | 108.5 (82.7 - 142.3) |
| Travel time to nearest city (longest) | 100 | NS | NS | Not estimated | Not estimated |
| Travel time to nearest city (median) | 95.8 (84.5 - 108.6) | NS | NS | Not estimated | Not estimated |
| Travel time to nearest city (shortest) | 90.2 (76.7 - 106.2) | NS | NS | Not estimated | Not estimated |

**Table S2. Sample size in each land-use and use-intensity combination.** Numbers of sites in each combination and numbers of studies in which a given combination is sampled are given.

| **Land-use—Use-intensity combination** | **Number of sites** | **Number of studies** |
|---|---|---|
| Primary vegetation (Minimal use) | 1546 | 183 |
| Primary vegetation (Light use) | 860 | 76 |
| Primary vegetation (Intense use) | 449 | 33 |
| Mature secondary vegetation (Minimal use) | 198 | 52 |
| Mature secondary vegetation (Light/intense use) | 213 | 23 |
| Intermediate secondary vegetation (Minimal use) | 404 | 55 |
| Intermediate secondary vegetation (Light/intense use) | 269 | 30 |

| | | |
|---|---|---|
| Young secondary vegetation (Minimal use) | 431 | 50 |
| Young secondary vegetation (Light/intense use) | 331 | 34 |
| Plantation forest (Minimal use) | 356 | 47 |
| Plantation forest (Light use) | 402 | 42 |
| Plantation forest (Intense use) | 238 | 29 |
| Cropland (Minimal use) | 427 | 45 |
| Cropland (Light use) | 632 | 43 |
| Cropland (Intense use) | 703 | 36 |
| Pasture (Minimal use) | 525 | 43 |
| Pasture (Light use) | 434 | 52 |
| Pasture (Intense use) | 174 | 23 |
| Urban (Minimal use) | 174 | 23 |
| Urban (Light use) | 244 | 26 |
| Urban (Intense use) | 195 | 18 |