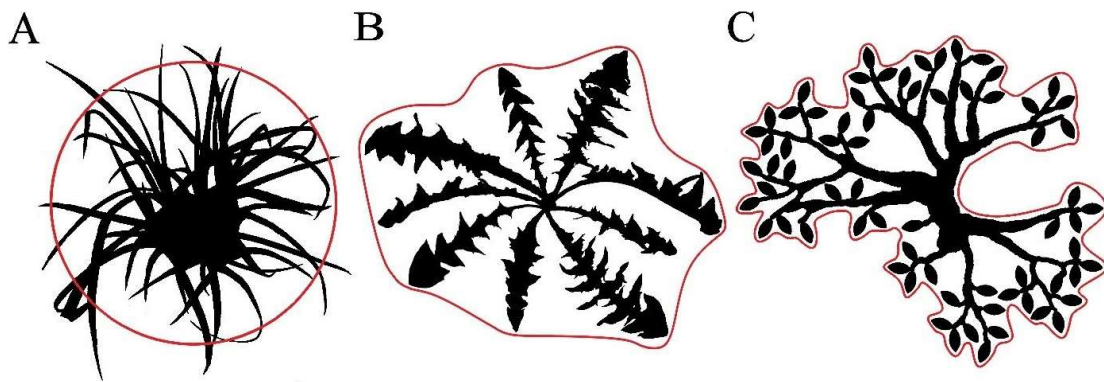## Appendix

Appendix 1. Roadside mowing line.

A clear distinction between mown and unmown land can be seen. Dense stands of *Erigeron annuus*, *Impatiens glandulifera* and *Solidago canadensis* are visible. Location: Isel valley (near Ainet).

Appendix 2. Visualization of cover estimation for plant individuals.

The cover of each plant is the percentage of the plot it occupies with its foliage as seen from directly above. **A** Grasses and other plants with narrow foliage such as horsetails (*Equisetum sp.*) are recorded by determining the surface of the circle in which over 90% of their foliage falls. **B** Smaller herbaceous species or woody species with or lower than 30 cm in height are recorded according to the circumference of the plant. Relatively small spaces between separate leaves are included for practicality. **C** Tree and shrub cover is recorded by circumference, including larger gaps between the foliage. Smaller indentions in the canopy are excluded for practicality.

A   B   C

Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.

Appendix 3A. Post-warmup iterations of the ZIP model. Trace plots of post-warmup iterations. The fours chains seem to have mixed successfully. Some peaks are visible in the plot, but no divergent transitions occur, and the calculated $\hat{R}$ values are 1.00. Thus, the model can be expected to have good predictive power.
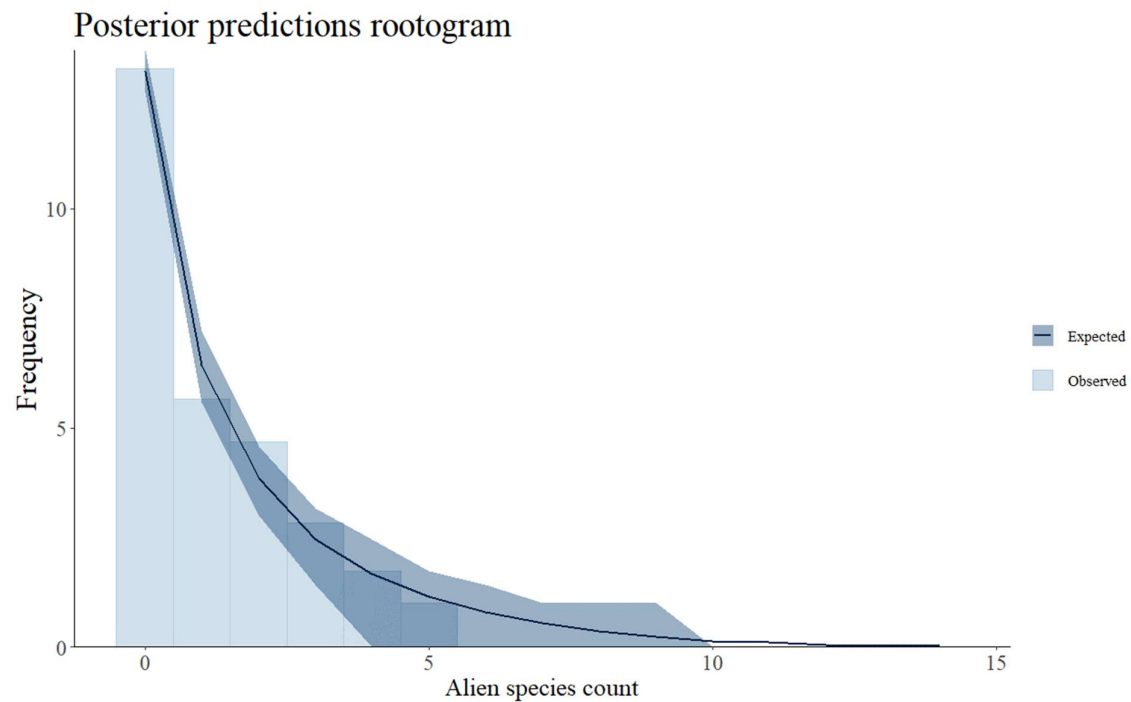
Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.
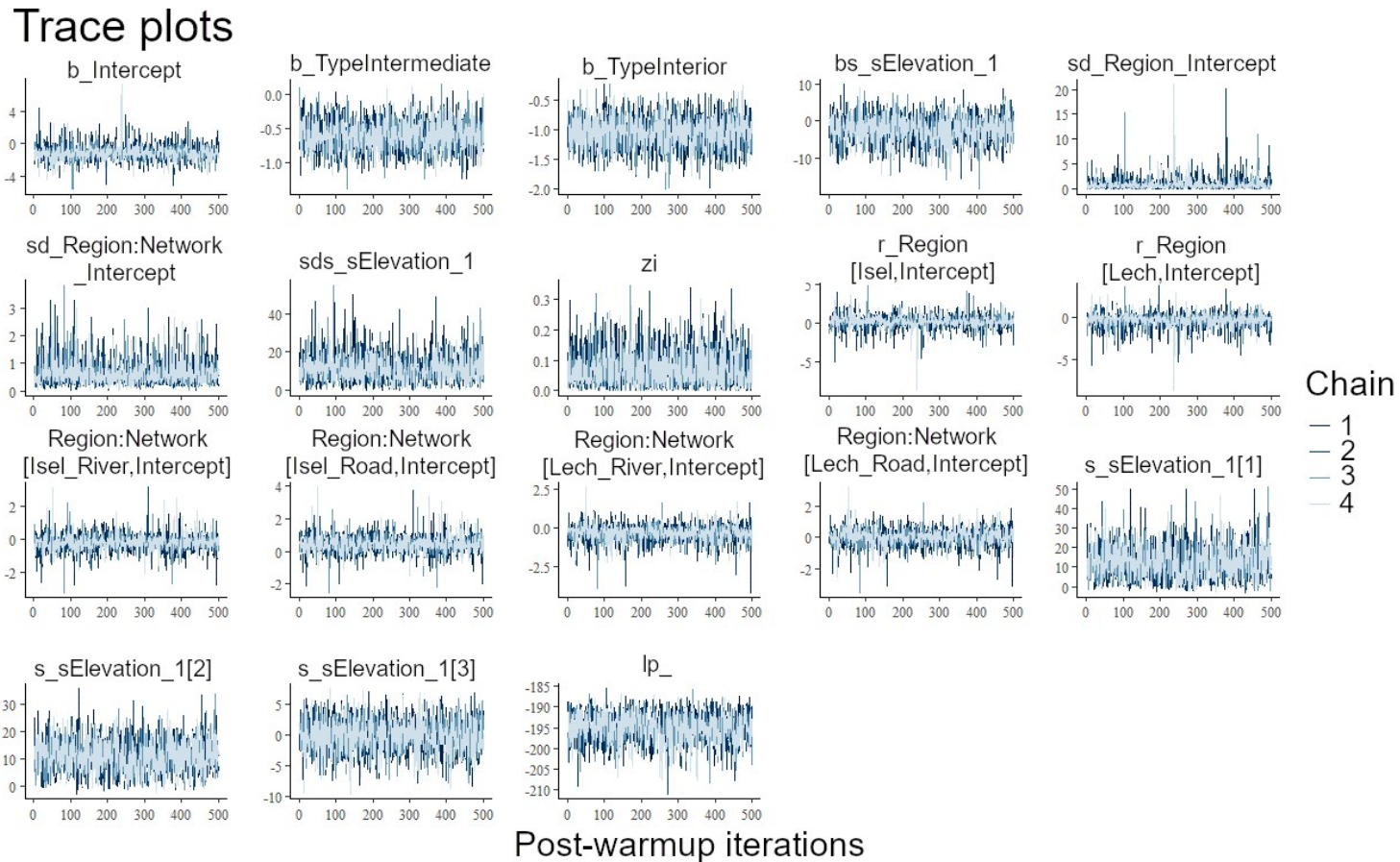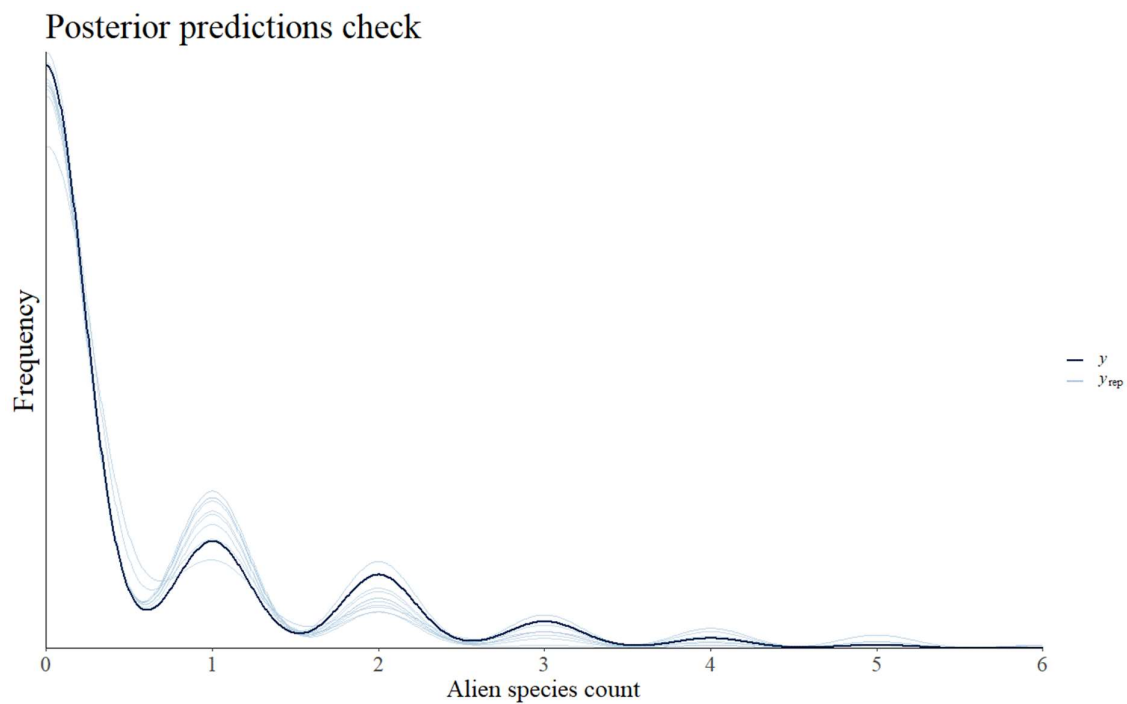
Appendix 3B. Posterior predictions vs. observed data.

Rootogram plot showing the posterior predictions in relation to the raw data of alien species count. The expected frequencies estimated by the model all closely match the values frequencies observed in the field.

Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.

Appendix 3C. Posterior predictions vs. observed data.

Plot showing the posterior predictions in relation to the raw data of alien species count. The frequencies estimated by the model (y_{rep}) all closely match the values frequencies observed in the field (y).

Posterior predictions check

Appendix 3D. Posterior predictions of the zero-probability.

The average of plots in which alien plant species are observed to be absent $T(y)$ is estimated accurately by the model $T(yrep)$. The zero-probability of the model (0.716) fits that of the observed data (0.721) well.
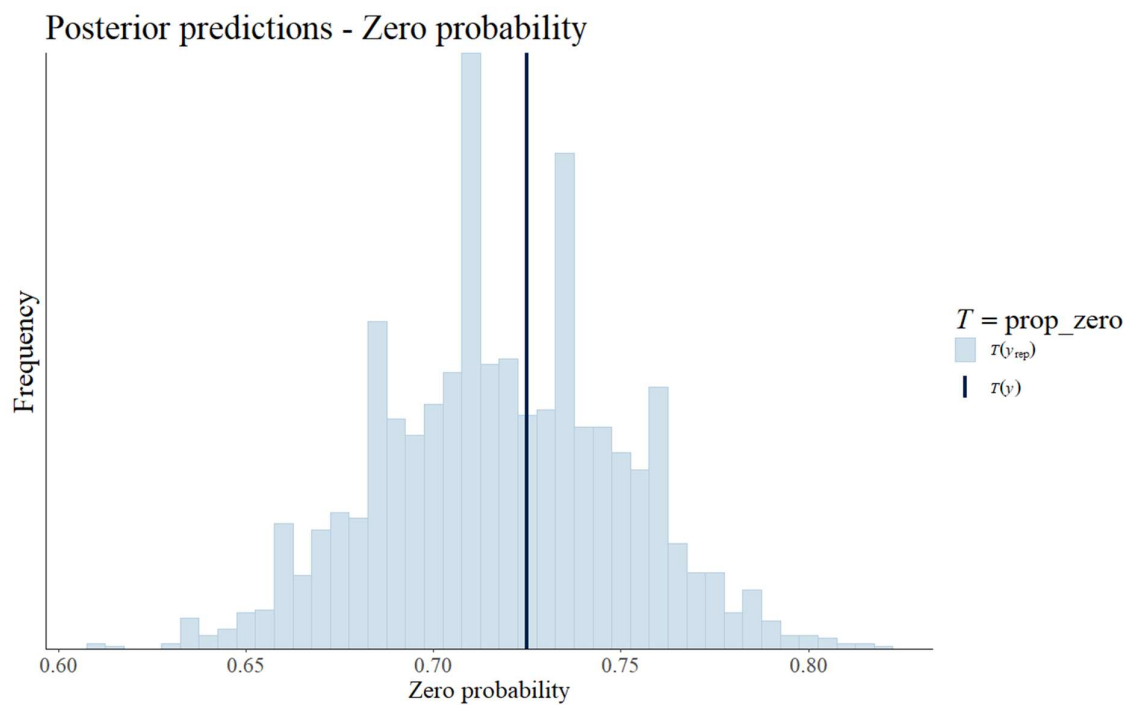
Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.

Appendix 4A. Trace plots of post-warmup iterations for the ZINB model that estimates the effect of mowing. No abnormalities can be seen among the iterations. The $\hat{R}$ for all parameters equals 1.00, indicating the model has converged.
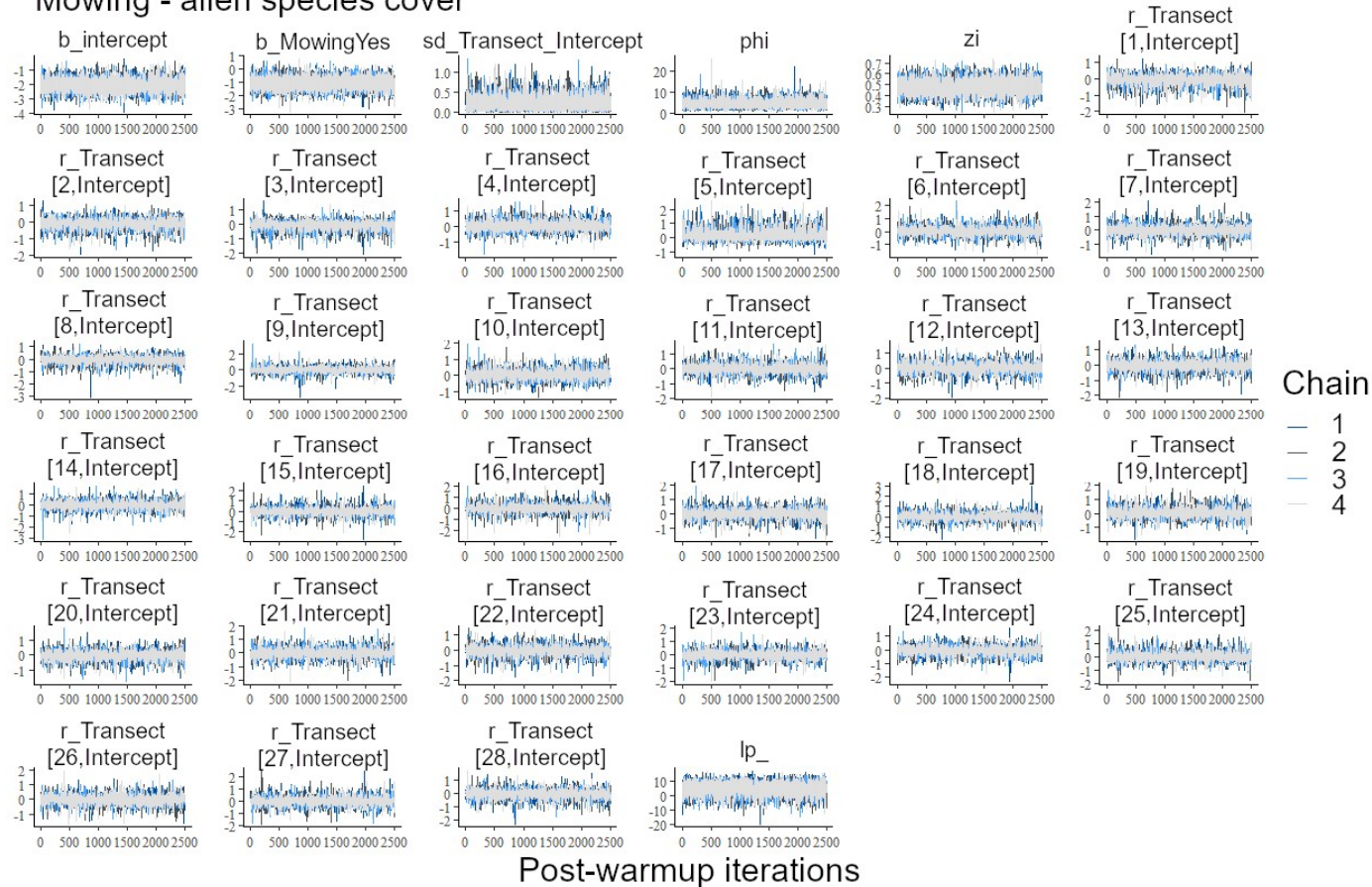
Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.

Appendix 4B. Posterior predictions vs. observed data.

For the ZINB model used to estimate the effect of mowing on alien species cover. There is high variability in the cover between plots, with most plots having no to little alien plant species and others being relatively highly invaded. The model deals with this hurdle effectively, however.

Posterior predictions check
Mowing - Alien species cover

Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.

Appendix 4C. Posterior predictions of the zero-probability.

For the ZINB model used to estimate the effect of mowing. The plot indicates that the zero-probability is well estimated by the model.

Posterior predictions - Zero probability
Mowing - Alien species cover

Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.

Appendix 5A. Post-warmup iterations for the ZIP model that estimates the effect of mowing. No abnormalities can be seen among the iterations. The $\hat{R}$ for all parameters equals 1.00, indicating the model has converged.
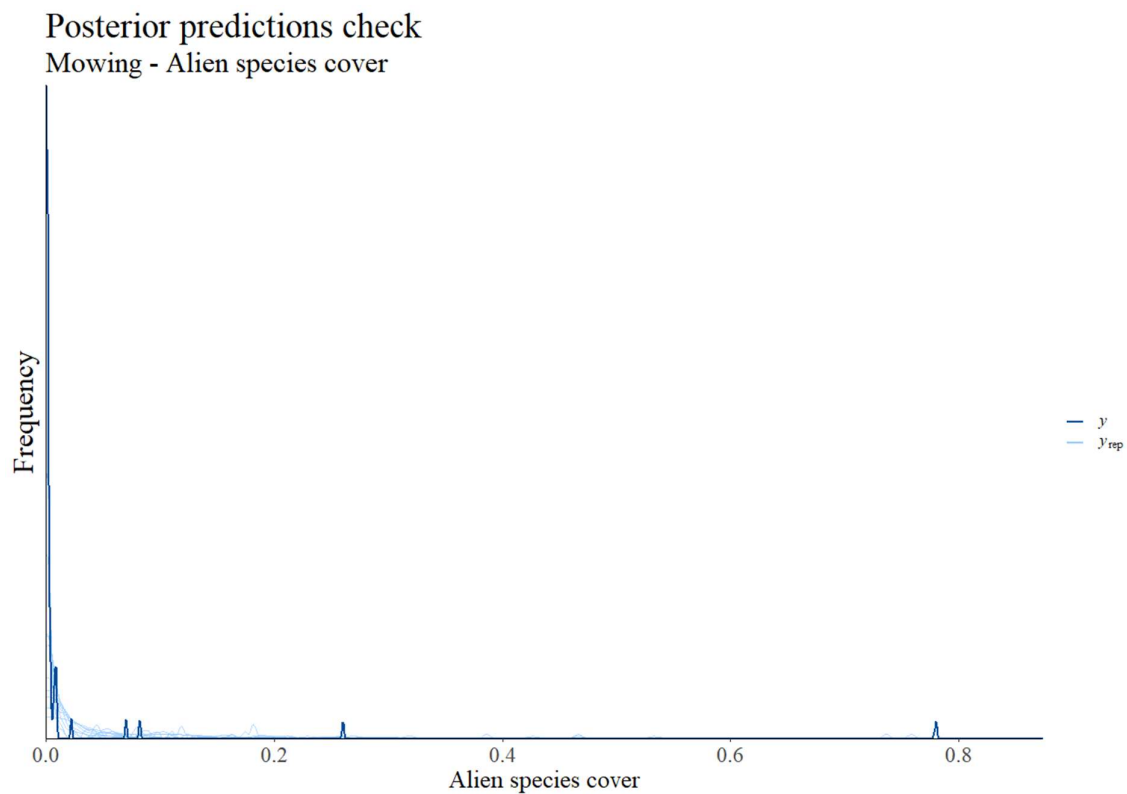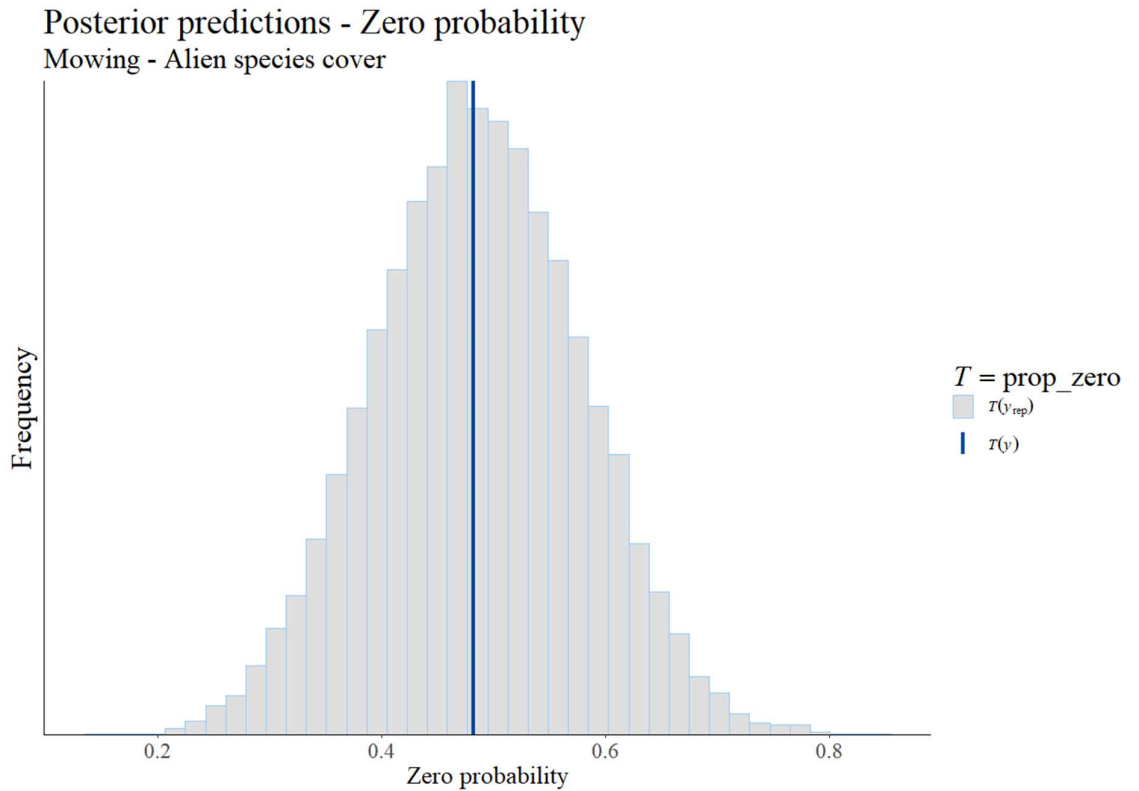

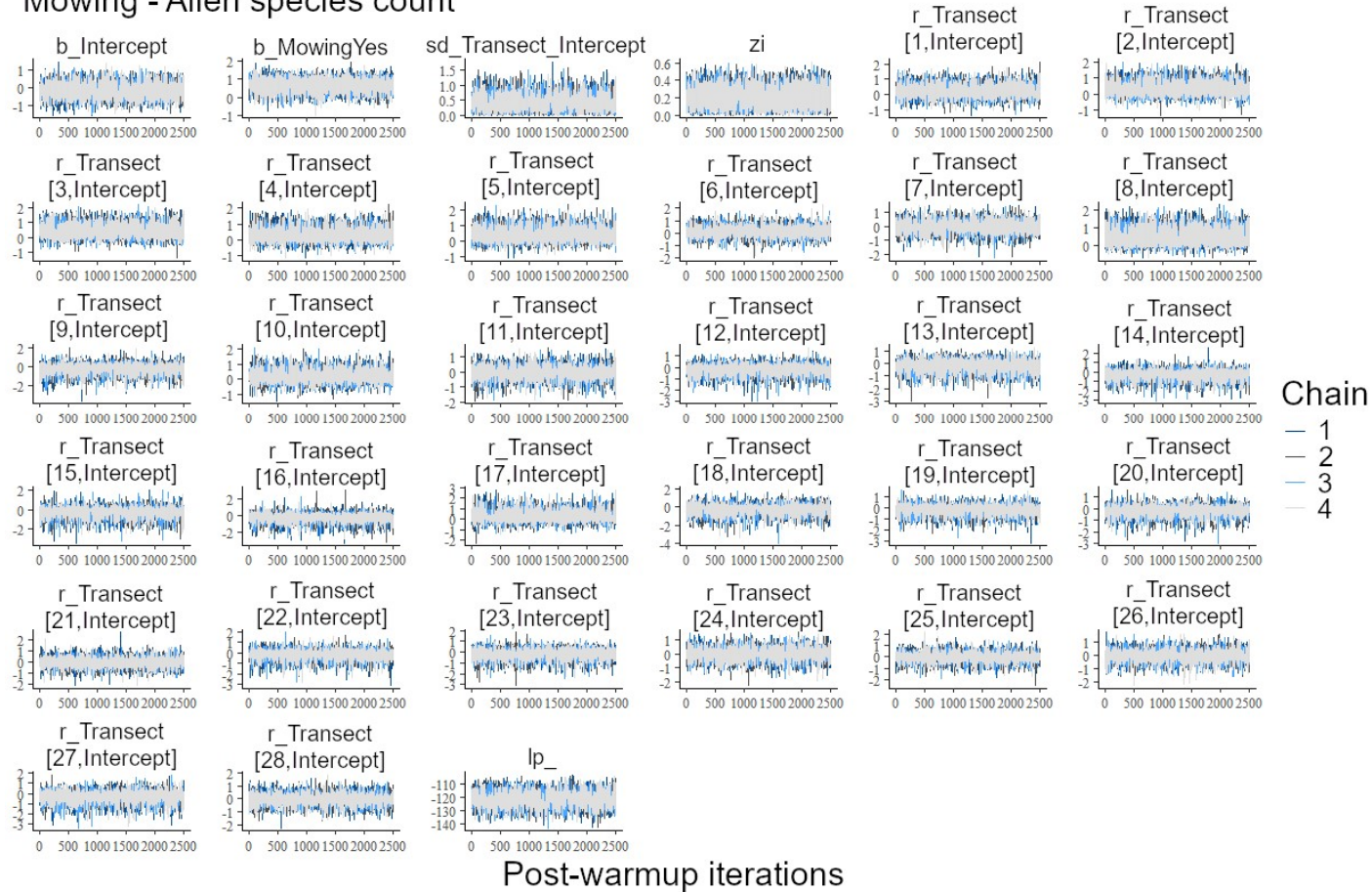Trace plots
Mowing - Alien species count

Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.
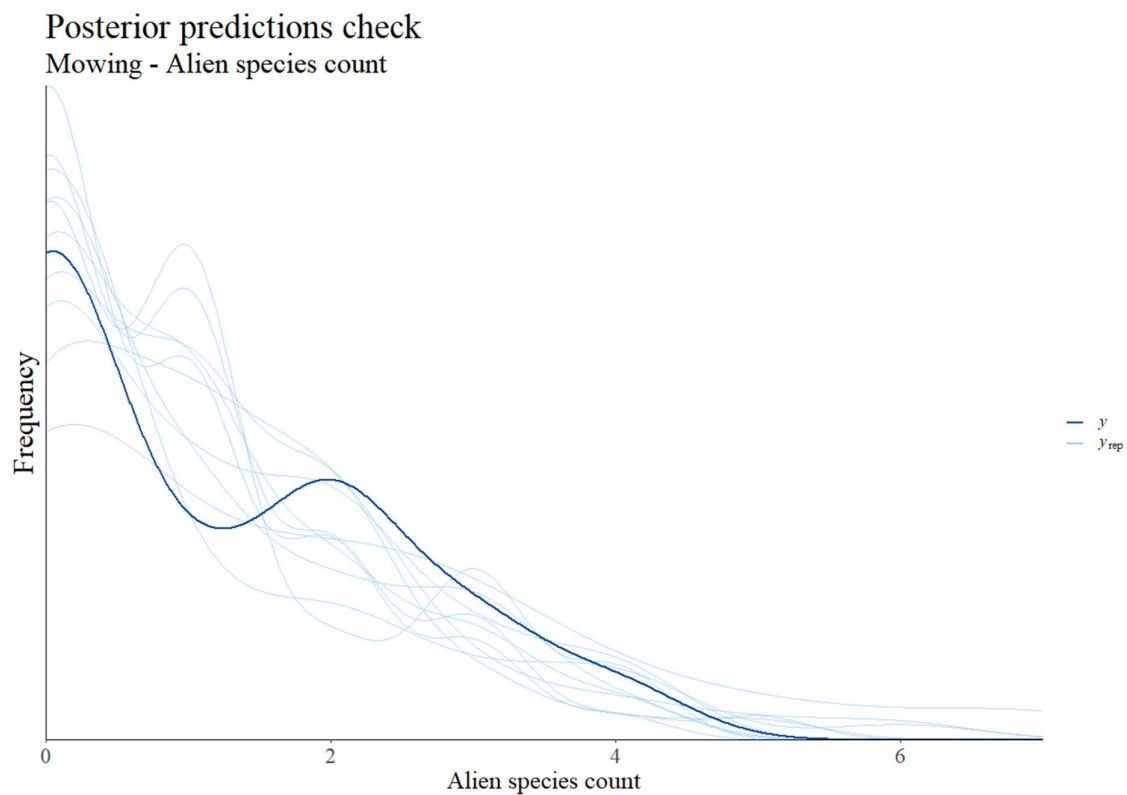
Appendix 5B. Posterior predictions vs. observed data.

Plot showing the posterior predictions alongside the observed data of alien species count for the ZIP model focusing on mowing. The ZIP model (y_{rep}) fits the observed data (y) moderately well.

Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.

Appendix 5C. Posterior predictions of the zero-probability.

For the ZIP model used to estimate the effect of mowing on alien species count. The plot indicates that the observed zero-probability $T(y)$ is well estimated by the model $T(y_{rep})$.

Posterior predictions - Zero probability
Mowing - Alien species count

Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.
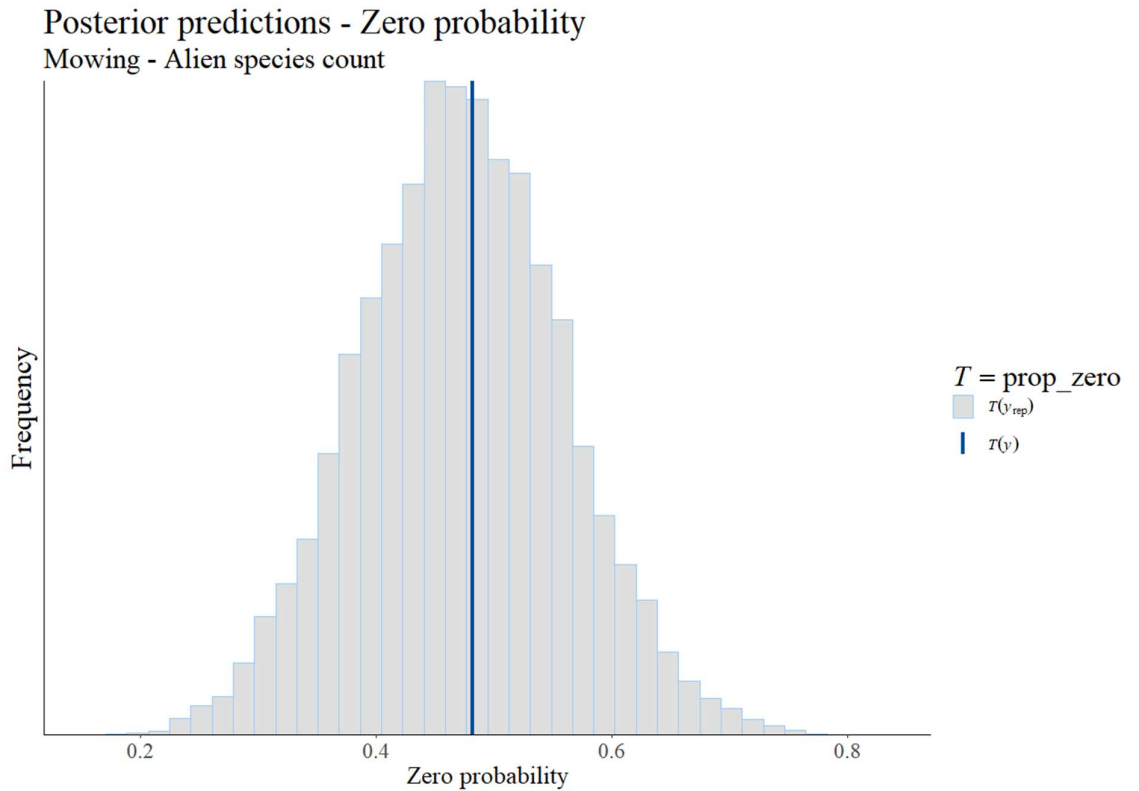
Appendix 6. Estimated intercepts for the levels of the grouping factors in the ZIP model. Shown are the estimated intercept, standard error (SD), as well as the lower and upper bounds of the 50% and 89% credible interval (CI). The type of corridor for the spread of alien plant species (river/road) is nested in the region (Isel/Lech).

Group	Intercept	SD	50% CI	89% CI
Isel	1.14	0.52	[0.91 – 1.67]	[0.41 – 3.77]
Lech	0.84	0.39	[0.54 – 1.06]	[0.19 – 2.05]
Isel river	0.83	0.30	[0.65 – 1.06]	[0.40 – 1.73]
Isel road	1.49	0.55	[1.17 – 1.98]	[0.76 – 3.28]
Lech river	0.74	0.33	[0.54 – 0.98]	[0.30 – 1.44]
Lech road	1.01	0.38	[0.81 – 1.29]	[0.44 – 2.14]

Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.

Appendix 7. ZINB model posterior densities for the effect of mowing on alien species cover. Shown are the estimated mean, standard deviation (SD), the lower and upper bounds of the 95% credible interval, as well as the 50% and 89% highest density intervals. Further, the overdispersion (Φ) and zero-inflation parameters (z_i) are listed.

Terms	Coefficient	Mean	SD	95% CI	50% HDI	89% HDI
Population level	*Intercept*	-2.04	0.42	[-2.88 – -1.19]	[-2.36 – -1.81]	[-2.74 – -1.39]
	Mowing	-1.08	0.45	[-1.93 – -0.16]	[-1.37 – -0.77]	[-1.79 – -0.36]
Group level	*Transect*	0.21	0.17	[0.01 – 0.63]		
Family specific	Φ	4.63	1.84	[1.87 – 8.85]		
	z_i	0.48	0.07	[0.36 – 0.61]		

Vorstenbosch, T., Essl, F., Lenzner, B. (2020) An uphill battle? The elevational distribution of alien plant species along rivers and roads in the Austrian Alps. Neobiota.

Appendix 8. ZIP model posterior densities for the effect of mowing on alien species count. Shown are the estimated mean, standard deviation (SD), lower and upper bounds of the 95% credible interval (CI), the 50% and 89% highest density intervals (HDI), as well as the zero-inflation parameter (z_i).

Terms	Coefficient	Mean	SD	95% CI	50% HDI	89% HDI
Population level	*Intercept*	-0.19	0.40	[-0.92 – 0.61]	[-0.49 – 0.04]	[-0.83 – 0.42]
	Mowing	0.67	0.34	[-0.04 – 1.31]	[0.47 – 0.92]	[0.11 – 1.20]
Group level	*Transect*	0.43	0.26	[0.02 – 0.98]		
Family specific	z_i	0.20	0.12	[0.01 – 0.45]		