Supplementary Materials for the paper

**Small-scale forest restoration in peri-urban areas provides immediate benefits for birds**

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**Appendix S1. Details about the study area**

Within the study area, forest patches are largely dominated by broadleaved species, with oaks, especially pedunculate oak (*Quercus robur*), and hornbeam (*Carpinus betulus*) in mature and other stands not cleared for a relatively long time (several decades), together with field maple (*Acer campestre*) and ash tree (*Fraxinus excelsior*). Aspen (*Populus tremula*) and birch (*Betula pendula*) often dominate recent, secondary woodland, and alder (*Alnus glutinosa*), willows (*Salix* spp) and poplars (*Populus* spp) regularly occur in wetter sites. In most disturbed habitat, non-native species are often frequent or even dominating, with the most widespread species being northern red oak (*Quercus rubra*), black locust (*Robinia pseudoacacia*), tree of heaven (*Ailanthus altissima*) and American black cherry (*Prunus serotina*). Chestnut (*Castanea sativa*) and Scots pine (*Pinus sylvestris*) have been traditionally favoured in many areas and are often the local dominating species.

The restoration activities consisted of the plantation of native shrub (e.g. *Crataegus monogyna*, *Rosa canina*, *Cornus mas*, *Euonymus europaeus*, *Lygustrum vulgare*, *Prunus malus*, *Viburnum opulus*) and tree species (e.g. pedunculate oak, hornbeam, ash tree, field maple, small-leaved lime *Tilia cordata*, common hazel (*Corylus avellana*), field elm (*Ulmus minor*), white poplar (*Populus alba*), depending on the local context).

**Table S1.** Number of surveys per each site (standard: 6 counts) and main type of dominant habitat (“mosaic” stands for a mosaic of farmland and forest habitats).

|  |  |  |  |
| --- | --- | --- | --- |
| **site** | **no. of surveys** | **reasons for differences from the standard no. of counts** | **type of habitat** |
| 1 | 6 |  | forest |
| 2 | 6 |  | mosaic |
| 3 | 6 |  | farmland |
| 4 | 6 |  | farmland |
| 5 | 6 |  | mosaic |
| 6 | 6 |  | mosaic |
| 7 | 2 | surveyed only in 2017, then access became impossible | mosaic |
| 9 | 6 |  | urban |
| 10 | 6 |  | mosaic |
| 11 | 5 | access precluded in one instance | mosaic |
| 12 | 6 |  | mosaic |
| 13 | 6 |  | forest |
| 14 | 6 |  | forest |
| 15 | 6 |  | forest |
| 16 | 6 |  | forest |
| 17 | 6 |  | mosaic |
| 18 | 6 |  | forest |
| 19 | 3 | only early counts | urban |
| 20 | 6 |  | urban |
| 21 | 7 | very high disturb in one instance, one more census performed | forest |
| 22 | 6 |  | mosaic |
| 23 | 6 |  | farmland |
| 24 | 6 |  | mosaic |
| 25 | 6 |  | mosaic |
| 26 | 6 |  | forest |
| 27 | 6 |  | urban |
| 28 | 3 | only early counts | mosaic |
| 29 | 6 |  | farmland |
| 30 | 6 |  | farmland |
| 31 | 6 |  | farmland |
| 32 | 6 |  | farmland |
| 33 | 6 |  | farmland |
| 35 | 6 |  | farmland |
| 36 | 6 |  | mosaic |
| 37 | 6 |  | mosaic |
| 38 | 5 | access precluded in one instance | mosaic |
| 39 | 6 |  | farmland |
| 40 | 6 |  | farmland |
| 41 | 6 |  | farmland |
| 42 | 6 |  | mosaic |
| **Total** | 229 |  |  |

**Table S2.** Model summary for community traits and single species. “Est.Error” is the standard deviation of the posterior distribution. Relevant effects (Estimate plus 95% Credible intervals not encompassing zero) are highlighted in bold.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Community variables** | Estimate | Est.Error | l-95% CI | u-95% CI | Rhat | Bulk\_ESS | Tail\_ESS |
|  |  |  |  |  |  |  |  |
| **Species richness** |  |  |  |  |  |  |  |
| Intercept | 2.30 | 0.05 | 2.20 | 2.41 | 1.00 | 13187 | 8262 |
| factoryear2019 | -0.09 | 0.09 | -0.27 | 0.09 | 1.00 | 12242 | 7865 |
| factoryear2021 | -0.07 | 0.09 | -0.25 | 0.11 | 1.00 | 12934 | 8541 |
| factorfase1 | 0.06 | 0.11 | -0.15 | 0.27 | 1.00 | 12728 | 8139 |
| factorfase2 | 0.17 | 0.11 | -0.04 | 0.38 | 1.00 | 11858 | 8219 |
|  |  |  |  |  |  |  |  |
| **Breeding species richness** |  |  |  |  |  |  |  |
| Intercept | 2.16 | 0.06 | 2.05 | 2.27 | 1.00 | 10316 | 7302 |
| factoryear2019 | -0.09 | 0.10 | -0.28 | 0.10 | 1.00 | 7862 | 6602 |
| factoryear2021 | -0.11 | 0.10 | -0.31 | 0.07 | 1.00 | 7954 | 6963 |
| factorfase1 | 0.11 | 0.12 | -0.12 | 0.33 | 1.00 | 7387 | 6121 |
| factorfase2 | 0.25 | 0.11 | **0.03** | **0.47** | 1.00 | 7851 | 7590 |
|  |  |  |  |  |  |  |  |
| **Forest species** |  |  |  |  |  |  |  |
| Intercept | -1.44 | 0.36 | -2.19 | -0.78 | 1.00 | 6489 | 6495 |
| factoryear2019 | 0.12 | 0.41 | -0.70 | 0.93 | 1.00 | 8443 | 7706 |
| factoryear2021 | 0.12 | 0.41 | -0.68 | 0.93 | 1.00 | 7789 | 7312 |
| factorfase1 | -0.49 | 0.61 | -1.72 | 0.70 | 1.00 | 7863 | 7585 |
| factorfase2 | 0.26 | 0.54 | -0.80 | 1.32 | 1.00 | 6743 | 7138 |
|  |  |  |  |  |  |  |  |
| **Forest individuals** |  |  |  |  |  |  |  |
| Intercept | -1.26 | 0.37 | -2.05 | -0.6 | 1 | 3975 | 4905 |
| factoryear2019 | 0.05 | 0.38 | -0.71 | 0.78 | 1 | 5680 | 6716 |
| factoryear2021 | 0.05 | 0.38 | -0.69 | 0.77 | 1 | 5760 | 6847 |
| factorfase1 | -0.85 | 0.59 | -2.09 | 0.26 | 1 | 5680 | 6097 |
| factorfase2 | 0.38 | 0.49 | -0.57 | 1.32 | 1 | 5274 | 5912 |
|  |  |  |  |  |  |  |  |
| **Single species** |  |  |  |  |  |  |  |
| *Hirundo rustica* |  |  |  |  |  |  |  |
| Intercept | -0.53 | 0.34 | -1.24 | 0.08 | 1.00 | 3103 | 4993 |
| factoryear2019 | -0.01 | 0.20 | -0.42 | 0.38 | 1.00 | 11252 | 8070 |
| factoryear2021 | -0.61 | 0.24 | **-1.10** | **-0.14** | 1.00 | 11432 | 8573 |
| factorfase1 | -0.92 | 0.46 | **-1.85** | **-0.05** | 1.00 | 10161 | 8057 |
| factorfase2 | -0.62 | 0.54 | -1.75 | 0.38 | 1.00 | 10386 | 7778 |
|  |  |  |  |  |  |  |  |
| *Cyanistes caeruleus* |  |  |  |  |  |  |  |
| Intercept | -1.42 | 0.42 | -2.33 | -0.70 | 1.00 | 4125 | 5213 |
| factoryear2019 | -0.91 | 0.61 | -2.21 | 0.16 | 1.00 | 6061 | 5859 |
| factoryear2021 | -1.26 | 0.70 | **-2.79** | **-0.04** | 1.00 | 6114 | 5531 |
| factorfase1 | 0.16 | 0.79 | -1.34 | 1.79 | 1.00 | 5946 | 6166 |
| factorfase2 | 0.76 | 0.84 | -0.76 | 2.53 | 1.00 | 5941 | 5479 |
|  |  |  |  |  |  |  |  |
| *Sylvia atricapilla* |  |  |  |  |  |  |  |
| Intercept | 0.66 | 0.14 | 0.37 | 0.92 | 1.00 | 8567 | 8375 |
| factoryear2019 | -0.13 | 0.21 | -0.53 | 0.27 | 1.00 | 9532 | 7556 |
| factoryear2021 | -0.28 | 0.22 | -0.72 | 0.15 | 1.00 | 10088 | 8073 |
| factorfase1 | 0.15 | 0.25 | -0.35 | 0.65 | 1.00 | 8847 | 8278 |
| factorfase2 | 0.05 | 0.28 | -0.50 | 0.60 | 1.00 | 9712 | 7782 |
|  |  |  |  |  |  |  |  |
| *Parus major* |  |  |  |  |  |  |  |
| Intercept | 0.44 | 0.15 | 0.14 | 0.71 | 1.00 | 9690 | 7205 |
| factoryear2019 | -0.31 | 0.26 | -0.83 | 0.18 | 1.00 | 12160 | 7915 |
| factoryear2021 | -0.31 | 0.26 | -0.83 | 0.17 | 1.00 | 11097 | 7645 |
| factorfase1 | 0.10 | 0.31 | -0.50 | 0.72 | 1.00 | 10998 | 8248 |
| factorfase2 | 0.11 | 0.32 | -0.52 | 0.72 | 1.00 | 9785 | 7524 |
|  |  |  |  |  |  |  |  |
| *Aegithalos caudatus* |  |  |  |  |  |  |  |
| Intercept | -1.20 | 0.40 | -2.08 | -0.49 | 1.00 | 3500 | 5242 |
| factoryear2019 | -1.18 | 0.59 | **-2.45** | **-0.13** | 1.00 | 5864 | 5873 |
| factoryear2021 | -0.08 | 0.40 | -0.88 | 0.68 | 1.00 | 6124 | 7070 |
| factorfase1 | 0.56 | 0.71 | -0.78 | 1.99 | 1.00 | 5552 | 6021 |
| factorfase2 | 0.00 | 0.53 | -1.04 | 1.04 | 1.00 | 5605 | 7108 |
|  |  |  |  |  |  |  |  |
| *Columba palumbus* |  |  |  |  |  |  |  |
| Intercept | 0.26 | 0.16 | -0.07 | 0.55 | 1.00 | 10903 | 7716 |
| factoryear2019 | 0.16 | 0.24 | -0.31 | 0.63 | 1.00 | 10341 | 7122 |
| factoryear2021 | 0.19 | 0.24 | -0.27 | 0.66 | 1.00 | 10574 | 7698 |
| factorfase1 | 0.16 | 0.28 | -0.39 | 0.72 | 1.00 | 9520 | 7660 |
| factorfase2 | 0.24 | 0.28 | -0.31 | 0.77 | 1.00 | 9246 | 7607 |
|  |  |  |  |  |  |  |  |
| *Corvus corone cornix* |  |  |  |  |  |  |  |
| Intercept | 0.48 | 0.15 | 0.17 | 0.76 | 1.00 | 7145 | 7831 |
| factoryear2019 | 0.07 | 0.21 | -0.34 | 0.48 | 1.00 | 7506 | 7515 |
| factoryear2021 | -0.17 | 0.22 | -0.60 | 0.26 | 1.00 | 7425 | 7482 |
| factorfase1 | 0.73 | 0.24 | **0.27** | **1.21** | 1.00 | 6028 | 7176 |
| factorfase2 | 0.34 | 0.27 | -0.19 | 0.89 | 1.00 | 6471 | 6295 |
|  |  |  |  |  |  |  |  |
| *Fringilla coelebs* |  |  |  |  |  |  |  |
| Intercept | 0.28 | 0.16 | -0.05 | 0.57 | 1.00 | 9165 | 7098 |
| factoryear2019 | -0.33 | 0.26 | -0.86 | 0.18 | 1.00 | 8083 | 7530 |
| factoryear2021 | -0.49 | 0.28 | -1.05 | 0.05 | 1.00 | 8221 | 8162 |
| factorfase1 | 0.25 | 0.31 | -0.35 | 0.87 | 1.00 | 7643 | 7417 |
| factorfase2 | 0.34 | 0.34 | -0.33 | 1.02 | 1.00 | 8154 | 7661 |
|  |  |  |  |  |  |  |  |
| *Pica pica* |  |  |  |  |  |  |  |
| Intercept | -1.63 | 0.39 | -2.46 | -0.94 | 1.00 | 4654 | 5281 |
| factoryear2019 | 0.11 | 0.46 | -0.82 | 1.01 | 1.00 | 6772 | 7281 |
| factoryear2021 | -0.16 | 0.50 | -1.17 | 0.79 | 1.00 | 6854 | 6701 |
| factorfase1 | 0.33 | 0.56 | -0.76 | 1.46 | 1.00 | 5534 | 7253 |
| factorfase2 | 1.01 | 0.58 | -0.09 | 2.16 | 1.00 | 5686 | 6976 |
|  |  |  |  |  |  |  |  |
| *Anas platyrhynchos* |  |  |  |  |  |  |  |
| Intercept | -3.61 | 0.87 | -5.61 | -2.15 | 1.00 | 2626 | 3356 |
| factoryear2019 | -0.98 | 0.40 | **-1.80** | **-0.21** | 1.00 | 4478 | 5422 |
| factoryear2021 | 0.56 | 0.26 | **0.06** | **1.08** | 1.00 | 5407 | 6984 |
| factorfase1 | 0.99 | 0.54 | -0.09 | 2.05 | 1.00 | 4365 | 4618 |
| factorfase2 | -0.42 | 0.44 | -1.29 | 0.44 | 1.00 | 5116 | 6525 |
|  |  |  |  |  |  |  |  |
| *Troglodytes troglodytes* |  |  |  |  |  |  |  |
| Intercept | -1.71 | 0.46 | -2.72 | -0.91 | 1.00 | 4053 | 4899 |
| factoryear2019 | 0.25 | 0.44 | -0.62 | 1.12 | 1.00 | 6524 | 6685 |
| factoryear2021 | -0.40 | 0.53 | -1.48 | 0.60 | 1.00 | 6519 | 6835 |
| factorfase1 | -0.42 | 0.60 | -1.63 | 0.75 | 1.00 | 6052 | 7127 |
| factorfase2 | 0.25 | 0.68 | -1.09 | 1.62 | 1.00 | 5751 | 6675 |
|  |  |  |  |  |  |  |  |
| *Streptopelia decaocto* |  |  |  |  |  |  |  |
| Intercept | -2.52 | 0.64 | -3.95 | -1.46 | 1.00 | 3186 | 4143 |
| factoryear2019 | -0.42 | 0.50 | -1.44 | 0.54 | 1.00 | 5942 | 6409 |
| factoryear2021 | 0.15 | 0.42 | -0.67 | 0.97 | 1.00 | 4624 | 6401 |
| factorfase1 | -1.16 | 0.82 | -2.86 | 0.41 | 1.00 | 6263 | 6547 |
| factorfase2 | 0.10 | 0.55 | -0.98 | 1.17 | 1.00 | 4317 | 6528 |
|  |  |  |  |  |  |  |  |
| *Certhia brachydactyla* |  |  |  |  |  |  |  |
| Intercept | -3.26 | 0.82 | -5.11 | -1.91 | 1.00 | 3903 | 4038 |
| factoryear2019 | -0.53 | 0.75 | -2.12 | 0.86 | 1.00 | 7107 | 6439 |
| factoryear2021 | -0.55 | 0.76 | -2.12 | 0.86 | 1.00 | 6708 | 6669 |
| factorfase1 | 0.43 | 0.98 | -1.46 | 2.39 | 1.00 | 6180 | 6416 |
| factorfase2 | 1.02 | 0.95 | -0.75 | 2.99 | 1.00 | 5652 | 6008 |
|  |  |  |  |  |  |  |  |
| *Serinus serinus* |  |  |  |  |  |  |  |
| Intercept | -1.00 | 0.34 | -1.73 | -0.41 | 1.00 | 4738 | 5112 |
| factoryear2019 | -1.41 | 0.67 | **-2.88** | **-0.25** | 1.00 | 6469 | 5485 |
| factoryear2021 | -1.40 | 0.67 | **-2.84** | **-0.21** | 1.00 | 6515 | 5421 |
| factorfase1 | -0.18 | 0.93 | -2.04 | 1.70 | 1.00 | 6290 | 5353 |
| factorfase2 | 1.07 | 0.76 | -0.35 | 2.68 | 1.00 | 6392 | 5215 |
|  |  |  |  |  |  |  |  |
| *Poecile palustris* |  |  |  |  |  |  |  |
| Intercept | -1.81 | 0.43 | -2.77 | -1.06 | 1.00 | 5081 | 4922 |
| factoryear2019 | -0.45 | 0.72 | -1.99 | 0.85 | 1.00 | 7855 | 6015 |
| factoryear2021 | -1.90 | 1.28 | -4.95 | 0.16 | 1.00 | 5972 | 4369 |
| factorfase1 | -0.63 | 1.04 | -2.78 | 1.34 | 1.00 | 7571 | 6348 |
| factorfase2 | 2.31 | 1.32 | **0.14** | **5.36** | 1.00 | 5513 | 4164 |
|  |  |  |  |  |  |  |  |
| *Psittacula krameri* |  |  |  |  |  |  |  |
| Intercept | -3.52 | 0.81 | -5.36 | -2.16 | 1.00 | 5749 | 5176 |
| factoryear2019 | -0.50 | 0.77 | -2.11 | 0.93 | 1.00 | 9853 | 6717 |
| factoryear2021 | 0.58 | 0.58 | -0.53 | 1.74 | 1.00 | 10252 | 7350 |
| factorfase1 | 1.45 | 0.96 | -0.37 | 3.37 | 1.00 | 7682 | 7046 |
| factorfase2 | 0.19 | 0.84 | -1.45 | 1.83 | 1.00 | 7377 | 7287 |
|  |  |  |  |  |  |  |  |
| *Passer italiae* |  |  |  |  |  |  |  |
| Intercept | -2.13 | 0.62 | -3.57 | -1.07 | 1.00 | 3425 | 4422 |
| factoryear2019 | -1.08 | 0.38 | **-1.85** | **-0.38** | 1.00 | 7289 | 6757 |
| factoryear2021 | -1.46 | 0.43 | **-2.35** | **-0.68** | 1.00 | 8247 | 8044 |
| factorfase1 | 0.48 | 0.59 | -0.71 | 1.64 | 1.00 | 6966 | 7261 |
| factorfase2 | 0.50 | 0.69 | -0.88 | 1.84 | 1.00 | 7194 | 7481 |
|  |  |  |  |  |  |  |  |
| *Passer montanus* |  |  |  |  |  |  |  |
| Intercept | -3.24 | 0.90 | -5.29 | -1.81 | 1.00 | 3624 | 4195 |
| factoryear2019 | -0.33 | 0.50 | -1.34 | 0.62 | 1.00 | 8674 | 7923 |
| factoryear2021 | 0.05 | 0.45 | -0.86 | 0.92 | 1.00 | 7881 | 7827 |
| factorfase1 | -1.05 | 0.99 | -3.15 | 0.77 | 1.00 | 7997 | 6951 |
| factorfase2 | 0.03 | 0.70 | -1.34 | 1.38 | 1.00 | 6887 | 7497 |
|  |  |  |  |  |  |  |  |
| *Erithacus rubecula* |  |  |  |  |  |  |  |
| Intercept | -2.21 | 0.48 | -3.26 | -1.35 | 1.00 | 4750 | 5218 |
| factoryear2019 | 0.67 | 0.49 | -0.28 | 1.66 | 1.00 | 6419 | 6930 |
| factoryear2021 | 0.57 | 0.51 | -0.44 | 1.58 | 1.00 | 5777 | 6906 |
| factorfase1 | -0.91 | 0.72 | -2.38 | 0.47 | 1.00 | 6592 | 7750 |
| factorfase2 | 0.26 | 0.61 | -0.93 | 1.47 | 1.00 | 5035 | 6566 |
|  |  |  |  |  |  |  |  |
| *Dendrocopos major* |  |  |  |  |  |  |  |
| Intercept | -0.94 | 0.29 | -1.55 | -0.42 | 1.00 | 5154 | 5553 |
| factoryear2019 | -0.37 | 0.48 | -1.36 | 0.50 | 1.00 | 7193 | 5798 |
| factoryear2021 | 0.12 | 0.40 | -0.69 | 0.88 | 1.00 | 7705 | 6973 |
| factorfase1 | 0.68 | 0.52 | -0.35 | 1.74 | 1.00 | 6748 | 5699 |
| factorfase2 | -0.09 | 0.50 | -1.08 | 0.87 | 1.00 | 7544 | 6660 |
|  |  |  |  |  |  |  |  |
| *Picus viridis* |  |  |  |  |  |  |  |
| Intercept | -2.30 | 0.50 | -3.40 | -1.45 | 1.00 | 7494 | 5318 |
| factoryear2019 | 0.11 | 0.80 | -1.55 | 1.60 | 1.00 | 7006 | 5394 |
| factoryear2021 | 0.10 | 0.79 | -1.54 | 1.60 | 1.00 | 7415 | 5616 |
| factorfase1 | 0.02 | 0.90 | -1.74 | 1.80 | 1.00 | 8049 | 6344 |
| factorfase2 | 0.08 | 0.89 | -1.70 | 1.87 | 1.00 | 7471 | 5977 |
|  |  |  |  |  |  |  |  |
| *Columba livia var. domestica* |  |  |  |  |  |  |  |
| Intercept | 0.28 | 0.35 | -0.43 | 0.96 | 1.00 | 924 | 1092 |
| factoryear2019 | 0.39 | 0.15 | **0.09** | **0.69** | 1.00 | 4613 | 6449 |
| factoryear2021 | 0.63 | 0.14 | **0.35** | **0.93** | 1.00 | 4491 | 5994 |
| factorfase1 | 0.23 | 0.20 | -0.16 | 0.62 | 1.00 | 4151 | 5966 |
| factorfase2 | -1.12 | 0.22 | **-1.56** | **-0.69** | 1.00 | 4787 | 6344 |
|  |  |  |  |  |  |  |  |
| *Turdus merula* |  |  |  |  |  |  |  |
| Intercept | 0.69 | 0.12 | 0.45 | 0.92 | 1.00 | 7827 | 4652 |
| factoryear2019 | -0.21 | 0.21 | -0.64 | 0.19 | 1.00 | 7803 | 6270 |
| factoryear2021 | -0.18 | 0.21 | -0.58 | 0.23 | 1.00 | 6956 | 6160 |
| factorfase1 | 0.59 | 0.23 | **0.13** | **1.05** | 1.00 | 6678 | 7041 |
| factorfase2 | 0.57 | 0.23 | **0.12** | **1.02** | 1.00 | 6095 | 5414 |
|  |  |  |  |  |  |  |  |
| *Hippolais polyglotta* |  |  |  |  |  |  |  |
| Intercept | -2.89 | 0.78 | -4.69 | -1.64 | 1.00 | 3762 | 3282 |
| factoryear2019 | -0.53 | 0.95 | -2.58 | 1.18 | 1.00 | 6498 | 6047 |
| factoryear2021 | -0.03 | 0.80 | -1.67 | 1.49 | 1.00 | 6579 | 6160 |
| factorfase1 | -0.08 | 1.15 | -2.35 | 2.23 | 1.00 | 6545 | 6241 |
| factorfase2 | -0.56 | 1.04 | -2.67 | 1.47 | 1.00 | 6547 | 6399 |

**Figure S1.** Differences in dependent variables considered for modelling response to restoration, according to restoration phase (0: no restoration; 1: during intervention; 2: after restoration) and year.

