. **Supporting materials**

Table S1. Number of occurrence records and AUC values for habitat suitability modeling

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Species | Record | Training AUC | Test AUC | Download link |
| *Acacia mearnsii* | 460 | 0.9572 | 0.9508 | GBIF.org (29 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.grb3g5 |
| *Ardisia elliptica* | 134 | 0.9643 | 0.9464 | GBIF.org (29 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.d5d9yb |
| *Arundo donax* | 1376 | 0.9017 | 0.8966 | GBIF.org (29 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.qsv32q |
| *Caulerpa taxifolia* | 51 | 0.9751 | 0.9459 | GBIF.org (29 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.3zdb3g |
| *Cecropia peltata* | 349 | 0.9658 | 0.9615 | GBIF.org (29 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.uj6whd |
| *Chromolaena odorata* | 1207 | 0.9122 | 0.9091 | GBIF.org (29 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.wpyx8c |
| *Cinchona pubescens* | 168 | 0.9812 | 0.9760 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.m46gy2 |
| *Clidemia hirta* | 868 | 0.9374 | 0.9335 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.fzdb3c |
| *Eichhornia crassipes* | 1443 | 0.877 | 0.8727 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.fepufd |
| *Euphorbia esula* | 1888 | 0.8816 | 0.8783 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.fk7zht |
| *Hedychium gardnerianum* | 105 | 0.9661 | 0.9414 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.38gurq |
| *Hiptage benghalensis* | 116 | 0.9669 | 0.9512 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.s8vaaj |
| *Imperata cylindrica* | 1556 | 0.8468 | 0.8407 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.8v77j4 |
| *Lantana camara* | 3312 | 0.8348 | 0.8328 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.deday5 |
| *Leucaena leucocephala* | 1475 | 0.8833 | 0.8793 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.p64ce2 |
| *Ligustrum robustum* | 71 | 0.9825 | 0.9713 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.dcuyvj |
| *Lythrum salicaria* | 3982 | 0.8472 | 0.8459 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.tm42ux |
| *Melaleuca quinquenervia* | 148 | 0.9738 | 0.9567 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.uadxbh |
| *Miconia calvescens* | 296 | 0.9593 | 0.9526 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.u9ugm2 |
| *Mikania micrantha* | 818 | 0.9345 | 0.9267 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.x55wt9 |
| *Mimosa pigra* | 1188 | 0.9021 | 0.8984 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.nbp2nj |
| *Morella faya* | 18 | 0.9583 | 0.9235 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.d26jev |
| *Opuntia stricta* | 553 | 0.9456 | 0.9395 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.5mz7bc |
| *Pinus pinaster* | 617 | 0.968 | 0.9651 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.wcqfct |
| *Prosopis glandulosa* | 737 | 0.9517 | 0.9478 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.epdrxz |
| *Psidium cattleianum* | 183 | 0.9637 | 0.9537 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.k5zna2 |
| *Pueraria montana* var. *lobata* | 344 | 0.9673 | 0.9625 | GBIF.org (31 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.6sbngb |
| *Reynoutria japonica* | 552 | 0.9697 | 0.9682 | GBIF.org (19 August 2017) GBIF Occurrence Download https://doi.org/10.15468/dl.ukzes6 |
| *Rubus ellipticus* | 134 | 0.9745 | 0.9640 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.azwmp8 |
| *Salvinia molesta* | 281 | 0.9369 | 0.9235 | GBIF.org (30 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.5uc2ye |
| *Schinus terebinthifolia* | 504 | 0.9492 | 0.9425 | GBIF.org (31 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.ycztb4 |
| *Spartina anglica* | 101 | 0.9938 | 0.9921 | GBIF.org (31 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.ku9zkk |
| *Spathodea campanulata* | 512 | 0.9325 | 0.9249 | GBIF.org (31 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.3h62ux |
| *Sphagneticola trilobata* | 880 | 0.9239 | 0.9195 | GBIF.org (31 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.p9vkpv |
| *Tamarix ramosissima* | 805 | 0.9114 | 0.9042 | GBIF.org (31 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.xqjkje |
| *Ulex europaeus* | 1128 | 0.9493 | 0.9474 | GBIF.org (31 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.vhftcz |
| *Undaria pinnatifida* | 55 | 0.9904 | 0.9755 | GBIF.org (31 July 2020) GBIF Occurrence Download https://doi.org/10.15468/dl.fse7eg |

Table S2. Loading values of principal components analysis (PCA).

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | PC1 | PC2 | PC3 |
| Annual mean temperature | -0.2111 | -0.7171 | -0.4066 |
| Temperature seasonality | -0.0003 | 0.3186 | 0.7574 |
| Annual precipitation | -0.0287 | 0.1342 | -0.8749 |
| Precipitation seasonality | -0.2020 | -0.5588 | -0.0639 |
| Bulk density | -0.3210 | -0.7799 | 0.1718 |
| Cation exchange capacity | -0.0703 | 0.8084 | 0.0428 |
| Coarse fragments volumetric | -0.0583 | 0.1908 | 0.3068 |
| Elevation | -0.0109 | -0.0248 | 0.1089 |
| Human footprint | -0.0260 | 0.2135 | 0.0943 |
| Soil organic carbon density | 0.0391 | 0.7899 | -0.3727 |
| Soil pH | -0.2034 | -0.3646 | 0.7628 |
| Soil texture fraction silt | -0.0009 | 0.6695 | 0.2425 |
| Height | 0.9864 | -0.1384 | 0.0265 |
| Nmass | 0.9863 | -0.1375 | 0.0360 |
| Specific leaf area | 0.9866 | -0.1362 | 0.0312 |
| Wood density | 0.9864 | -0.1373 | 0.0340 |

Table S3. Results of paired-samples ANOVA test for Hypothesis 1.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Biome |  |  | *df* | F Ratio | *P*-value |
| Tropical & Subtropical Moist Broadleaf Forests | PC1 | PC2 | 6244 | 2958.1125  | 0.0000  |
| Tropical & Subtropical Moist Broadleaf Forests | PC1 | PC3 | 6244 | 3514.4825  | 0.0000  |
| Tropical & Subtropical Dry Broadleaf Forests | PC1 | PC2 | 1464 | 1015.0623  | 0.0000  |
| Tropical & Subtropical Dry Broadleaf Forests | PC1 | PC3 | 1464 | 2735.3021  | 0.0000  |
| Tropical & Subtropical Coniferous Forests | PC1 | PC2 | 530 | 1118.1576  | 0.0000  |
| Tropical & Subtropical Coniferous Forests | PC1 | PC3 | 530 | 478.5063  | 0.0000  |
| Temperate Broadleaf & Mixed Forests | PC1 | PC2 | 6822 | 23385.5757  | 0.0000  |
| Temperate Broadleaf & Mixed Forests | PC1 | PC3 | 6822 | 672.7298  | 0.0000  |
| Temperate Conifer Forests | PC1 | PC2 | 922 | 2675.1203  | 0.0000  |
| Temperate Conifer Forests | PC1 | PC3 | 922 | 3.8572  | 0.0498  |
| Boreal Forests/Taiga | PC1 | PC2 | 537 | 2629.7440  | 0.0000  |
| Boreal Forests/Taiga | PC1 | PC3 | 537 | 3.0561  | 0.0810  |
| Tropical & Subtropical Grasslands, Savannas & Shrublands | PC1 | PC2 | 2727 | 1501.5630  | 0.0000  |
| Tropical & Subtropical Grasslands, Savannas & Shrublands | PC1 | PC3 | 2727 | 2919.0174  | 0.0000  |
| Temperate Grasslands, Savannas & Shrublands | PC1 | PC2 | 1203 | 3746.4213  | 0.0000  |
| Temperate Grasslands, Savannas & Shrublands | PC1 | PC3 | 1203 | 0.1706  | 0.6796  |
| Flooded Grasslands & Savannas | PC1 | PC2 | 106 | 156.6656  | 0.0000  |
| Flooded Grasslands & Savannas | PC1 | PC3 | 106 | 15.5773  | 0.0001  |
| Montane Grasslands & Shrublands | PC1 | PC2 | 510 | 718.5167  | 0.0000  |
| Montane Grasslands & Shrublands | PC1 | PC3 | 510 | 109.8621  | 0.0000  |
| Tundra | PC1 | PC2 | 17 | 21.0252  | 0.0003  |
| Tundra | PC1 | PC3 | 17 | 42.8141  | 0.0000  |
| Mediterranean Forests, Woodlands & Scrub | PC1 | PC2 | 2006 | 1681.9181  | 0.0000  |
| Mediterranean Forests, Woodlands & Scrub | PC1 | PC3 | 2006 | 802.9028  | 0.0000  |
| Deserts & Xeric Shrublands | PC1 | PC2 | 1906 | 932.9493  | 0.0000  |
| Deserts & Xeric Shrublands | PC1 | PC3 | 1906 | 251.3775  | 0.0000  |
| Mangroves | PC1 | PC2 | 151 | 103.3704  | 0.0000  |
| Mangroves | PC1 | PC3 | 151 | 306.3712  | 0.0000  |

Table S4. Contribution of functional trait contexts to the habitat suitability of 37 IPS. Codes of functional trait and abiotic contexts: LNC: leaf nitrogen concentration; SLA: specific leaf area; WD: woody density.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Species | Height  | LNC | SLA | WD  |
| *Acacia mearnsii* | 3.7459 | 0.2381 | 1.0594 | 0.0561 |
| *Ardisia elliptica* | 11.3396 | 2.8922 | 1.2679 | 1.7058 |
| *Arundo donax* | 0.1843 | 0.1033 | 0.0473 | 1.3446 |
| *Caulerpa taxifolia* | 20.5031 | 0.0000 | 0.4725 | 0.1241 |
| *Cecropia peltata* | 3.2805 | 1.7114 | 0.6374 | 0.3664 |
| *Chromolaena odorata* | 14.9211 | 0.4601 | 0.4839 | 0.4673 |
| *Cinchona pubescens* | 0.2057 | 0.6608 | 0.2950 | 0.7319 |
| *Clidemia hirta* | 13.5746 | 0.7184 | 0.6565 | 0.5534 |
| *Eichhornia crassipes* | 14.4094 | 0.4501 | 0.4524 | 0.6581 |
| *Euphorbia esula* | 0.4925 | 0.1927 | 1.7276 | 0.5635 |
| *Hedychium gardnerianum* | 7.7732 | 0.0403 | 5.2571 | 0.0112 |
| *Hiptage benghalensis* | 13.2918 | 1.5507 | 0.9333 | 0.7471 |
| *Imperata cylindrica* | 0.6507 | 0.6026 | 0.1367 | 0.4248 |
| *Lantana camara* | 4.0687 | 0.9944 | 1.1603 | 0.5008 |
| *Leucaena leucocephala* | 0.8407 | 0.7959 | 4.0228 | 0.6989 |
| *Ligustrum robustum* | 10.5621 | 4.1018 | 4.3207 | 0.3017 |
| *Lythrum salicaria* | 2.8003 | 0.0327 | 0.2545 | 0.2570 |
| *Melaleuca quinquenervia* | 14.257 | 0.6169 | 2.4645 | 1.0483 |
| *Miconia calvescens* | 9.2996 | 0.1361 | 0.7484 | 1.2771 |
| *Mikania micrantha* | 14.1912 | 0.8644 | 3.5715 | 0.1791 |
| *Mimosa pigra* | 1.6520 | 0.1908 | 1.0546 | 0.3713 |
| *Morella faya* | 4.2576 | 0.5072 | 0.0000 | 0.0000 |
| *Opuntia stricta* | 0.2710 | 0.5768 | 7.3708 | 10.7442 |
| *Pinus pinaster* | 1.8079 | 0.1230 | 0.4267 | 1.6673 |
| *Prosopis glandulosa* | 2.0539 | 0.0934 | 0.1483 | 11.6677 |
| *Psidium cattleianum* | 14.4397 | 0.3254 | 4.0633 | 0.4468 |
| *Pueraria montana* var. *lobata* | 3.2703 | 0.0653 | 0.5327 | 0.1740 |
| *Reynoutria japonica* | 0.2301 | 0.2942 | 1.6083 | 0.3795 |
| *Rubus ellipticus* | 10.3113 | 0.3178 | 0.1544 | 0.1341 |
| *Salvinia molesta* | 9.4500 | 0.5065 | 1.9308 | 1.1534 |
| *Schinus terebinthifolia* | 14.2077 | 0.3391 | 1.2429 | 0.0689 |
| *Spartina anglica* | 2.7058 | 0.0602 | 0.9479 | 0.3229 |
| *Spathodea campanulata* | 2.3137 | 1.1628 | 0.6109 | 0.0089 |
| *Sphagneticola trilobata* | 18.6583 | 0.9453 | 3.6702 | 0.7775 |
| *Tamarix ramosissima* | 3.8093 | 0.5613 | 0.6138 | 3.0654 |
| *Ulex europaeus* | 1.5285 | 0.4966 | 0.1564 | 0.1439 |
| *Undaria pinnatifida* | 12.3637 | 4.0412 | 0.0477 | 0.4459 |