Assessing ex situ genetic and ecogeographic conservation in a threatened but widespread oak after range-wide collecting effort

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Figure S1. Histogram of number of seeds collected per maternal plant from the wild populations for the samples used in this study. Consistent with best practices from the Center for Plant Conservation and literature (e.g., Hoban & Schlarbaum, 2014), most plants had fewer than five seeds sampled, which better captures genetic diversity of the overall population. Two plants had >20 seeds collected.
Figure S2. A heatmap showing the Agapow & Burt (2001) index of association, $\bar{r}_d$, for each pair of loci corresponding to the *Quercus havardii* in situ dataset.
**Figure S3.** U.S. EPA Level III Ecoregions in which the species’ range (as determined by a buffer surrounding the occurrence point) occurs.

**Figure S4.** U.S. EPA Level IV Ecoregions in which the species’ range (as determined by a buffer surrounding the occurrence point) occurs.
Figure S5. Locus summary for the percentage of missing data corresponding to the *Quercus havardii* in situ dataset.
**Figure S6.** BIC and number of clusters evaluated for DAPC analysis.

**Figure S7.** DAPC based on genetic data showing the location of each garden population (“G”; colored in grey) relative to the wild East (blue) and West (red) individuals.
Figure S8. Percent of alleles (y-axis) captured for a given population size (number of plants, x-axis) of *Quercus havardii* currently held in botanic gardens, for the full dataset (singletons and doubletons included - complement to Figure 6). For each plot a regression was performed using no transformation, square root transformation and log transformation of number of plants, with the regression line shown and the adjusted $R^2$ shown in the top left corner of each plot.
Figure S9. Percent of genetic variation (alleles; y-axis) captured for a given population size (number of plants, x-axis) for all samples across the geographic range (red line), samples from the East only (blue line), and samples from the West only (black line) of *Quercus havardii* currently held in botanic gardens, for the reduced dataset (singletons and doubletons removed- complement to Figures 6 and S8). Note, the minimum needed considering the ‘rarest alleles dropped’ overall is 246, while for East it is 101, and West it is 148.
Figure S10. PCA based on 13 uncorrelated bioclimatic variables and populations *Quercus havardii*. Ex-situ populations (blue) and collected in-situ populations (red) represent sampling across its eastern (circles) and western (triangles) regions of the disjunct geographic range.
Table S1. A full list of all individuals found in each botanic garden, and their geographic source (region-population-accession).

| DNA name | Tissue name | Accession Number | Region-Population-Maternal Tree | Arboretum |
|----------|-------------|------------------|---------------------------------|-----------|
| SH-Q1392 | QH-G0001    | QH-E-5-1.1       | QH-E-5-1                        | The Morton Arboretum |
| SH-Q1393 | QH-G0002    | QH-E-5-1.2       | QH-E-5-1                        | The Morton Arboretum |
| SH-Q1394 | QH-G0003    | QH-E-5-9         | QH-E-5-9                        | The Morton Arboretum |
| SH-Q1395 | QH-G0004    | QH-E-10-8.1      | QH-E-10-8                       | The Morton Arboretum |
| SH-Q1396 | QH-G0005    | QH-E-11-1.1      | QH-E-11-1                       | The Morton Arboretum |
| SH-Q1397 | QH-G0006    | QH-E-11-1.2      | QH-E-11-1                       | The Morton Arboretum |
| SH-Q1398 | QH-G0007    | QH-E-11-1.3      | QH-E-11-1                       | The Morton Arboretum |
| SH-Q1399 | QH-G0008    | QH-E-11-1.4      | QH-E-11-1                       | The Morton Arboretum |
| SH-Q1400 | QH-G0009    | QH-E-11-4.2      | QH-E-11-4                       | The Morton Arboretum |
| SH-Q1401 | QH-G0010    | QH-E-11-4.3      | QH-E-11-4                       | The Morton Arboretum |
| SH-Q1402 | QH-G0011    | QH-E-11-4.10     | QH-E-11-4                       | The Morton Arboretum |
| SH-Q1403 | QH-G0012    | QH-E-11-4.11     | QH-E-11-4                       | The Morton Arboretum |
| SH-Q1404 | QH-G0013    | QH-W-AUX3        | QH-W-AUX3                       | The Morton Arboretum |
| SH-Q1405 | QH-G0014    | QH-W-3-16        | QH-W-3-16                       | The Morton Arboretum |
| SH-Q1406 | QH-G0015    | QH-W-3-14        | QH-W-3-14                       | The Morton Arboretum |
| SH-Q1407 | QH-G0016    | QH-E-AUX6-1.2    | QH-E-AUX6-1                     | The Morton Arboretum |
| SH-Q1408 | QH-G0017    | QH-W-3-1.4       | QH-W-3-1                        | The Morton Arboretum |
| SH-Q1409 | QH-G0018    | QH-W-AUX10-2.7   | QH-W-AUX10-2                    | The Morton Arboretum |
| SH-Q1410 | QH-G0019    | QH-W-AUX10-3.13  | QH-W-AUX10-3                    | The Morton Arboretum |
| SH-Q1411 | QH-G0020    | QH-W-AUX10-3.14  | QH-W-AUX10-3                    | The Morton Arboretum |
| SH-Q1412 | QH-G0021    | QH-W-AUX10-3.11  | QH-W-AUX10-3                    | The Morton Arboretum |
| SH-Q1413 | QH-G0022    | QH-W-AUX10-3.12  | QH-W-AUX10-3                    | The Morton Arboretum |
| SH-Q1414 | QH-G0023    | QH-W-3-1.6       | QH-W-3-1                        | The Morton Arboretum |
| SH-Q1415 | QH-G0024    | QH-W-3-28.1      | QH-W-3-28                       | The Morton Arboretum |
| SH-Q1416 | QH-G0025    | QH-W-6-30        | QH-W-6-30                       | The Morton Arboretum |
| SH-Q1417 | QH-G0026    | QH-W-AUX10-3.20  | QH-W-AUX10-3                    | The Morton Arboretum |
| SH-Q1418 | QH-G0027    | QH-W-3-17        | QH-W-3-17                       | The Morton Arboretum |
| SH-Q1419 | QH-G0028    | QH-W-1-39        | QH-W-1-39                       | The Morton Arboretum |
| SH-Q1420 | QH-G0029    | QH-E-15-1.1      | QH-E-15-1                       | The Morton Arboretum |
| SH-Q1421 | QH-G0030    | QH-E-15-3.2      | QH-E-15-3                       | The Morton Arboretum |
| SH-Q1422 | QH-G0031    | QH-E-15-5.2      | QH-E-15-5                       | The Morton Arboretum |
| SH-Q1423 | QH-G0032    | QH-E-15-12.1     | QH-E-15-12                      | The Morton Arboretum |
| SH-Q1424 | QH-G0033    | QH-E-15-10.2     | QH-E-15-10                      | The Morton Arboretum |
| SH-Q1425 | QH-G0034    | QH-E-15-3.1      | QH-E-15-3                       | The Morton Arboretum |
| SH-Q1426 | QH-G0035    | QH-E-15-9.1      | QH-E-15-9                       | The Morton Arboretum |
| SH-Q1427 | QH-G0036 | QH-E-14-2.1 | QH-E-14-2 | The Morton Arboretum |
|---------|---------|------------|-----------|----------------------|
| SH-Q1428 | QH-G0037 | 2015.004_1 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1429 | QH-G0038 | 2015.003_1 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1430 | QH-G0039 | 2015.001_1 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1123 | QH-G0040 | 2015.003_2 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1124 | QH-G0041 | 2015.003_3 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1125 | QH-G0042 | 2015.003_4 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1126 | QH-G0043 | 2015.003_2 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1127 | QH-G0044 | 2015.003_5 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1128 | QH-G0045 | 2015.001_2 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1129 | QH-G0046 | 2015.001_3 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1130 | QH-G0047 | 2015.001_4 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1131 | QH-G0048 | 2015.003_6 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1132 | QH-G0049 | 2015.001_5 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1133 | QH-G0050 | 2015.001_6 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1134 | QH-G0051 | 2015.001_7 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1135 | QH-G0052 | 2015.001_8 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1136 | QH-G0053 | 2015.001_9 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1137 | QH-G0054 | 2015.001_10 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1138 | QH-G0055 | 2015.001_11 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1139-2 | QH-G0056 | 2015.001_12 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1140 | QH-G0057 | 2015.001_13 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1141 | QH-G0058 | 2015.0_1 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1142 | QH-G0059 | 2015.001_14 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1143 | QH-G0060 | 2015.001_15 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1144 | QH-G0061 | 2015.001_16 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1145 | QH-G0062 | 2015.001_17 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1146 | QH-G0063 | 2015.001_18 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1147 | QH-G0064 | 2015.001_19 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1148 | QH-G0065 | 2015.003_7 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1149 | QH-G0066 | 2015.003_8 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1150 | QH-G0067 | 2015.001_20 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1151 | QH-G0068 | 2015.003_9 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1152 | QH-G0069 | 2015.001_21 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1153 | QH-G0070 | 2015.003_10 Cannon | Other-source (not our collection) | The Morton Arboretum |
|---|---|---|---|---|
| SH-Q1154 | QH-G0071 | 2015.001_22 Cannon | Other-source (not our collection) | The Morton Arboretum |
| SH-Q1155 | QH-G0072 | 2016-0776 | QH-E-1-4 | Tulsa Botanic Garden |
| SH-Q1156 | QH-G0073 | 2016-0777 | QH-E-1-19 | Tulsa Botanic Garden |
| SH-Q1157 | QH-G0074 | 2016-0778 | QH-E-1-21 | Tulsa Botanic Garden |
| SH-Q1158 | QH-G0075 | 2016-0779 | QH-E-1-25 | Tulsa Botanic Garden |
| SH-Q1159 | QH-G0076 | 2016-0781 | QH-E-4-12 | Tulsa Botanic Garden |
| SH-Q1160 | QH-G0077 | 2016-0782 | QH-E-5-42 | Tulsa Botanic Garden |
| SH-Q1161 | QH-G0078 | 2016-0783 | QH-E-7-5 | Tulsa Botanic Garden |
| SH-Q1162 | QH-G0079 | 2016-0785 | QH-E-10-1 | Tulsa Botanic Garden |
| SH-Q1163 | QH-G0080 | 2016-0786 | QH-E-10-7 | Tulsa Botanic Garden |
| SH-Q1164 | QH-G0081 | 2016-0787 | QH-E-10-9 | Tulsa Botanic Garden |
| SH-Q1165 | QH-G0082 | 2016-0790 | QH-E-AUX8-3 | Tulsa Botanic Garden |
| SH-Q1166 | QH-G0083 | 2016-0792 | QH-W-3-1 | Tulsa Botanic Garden |
| SH-Q1167 | QH-G0084 | 436-2016sd | QH-E-AUX6-2 | The Morton Arboretum |
| SH-Q1168 | QH-G0085 | 436-2016sd | QH-E-AUX6-2 | The Morton Arboretum |
| SH-Q1169 | QH-G0086 | 432-2016sd | QH-E-AUX3 | The Morton Arboretum |
| SH-Q1170 | QH-G0087 | 432-2016sd | QH-E-AUX3 | The Morton Arboretum |
| SH-Q1171 | QH-G0088 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1172 | QH-G0089 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1173 | QH-G0090 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1174 | QH-G0091 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1175 | QH-G0092 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1176 | QH-G0093 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1177 | QH-G0094 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1178 | QH-G0095 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1179 | QH-G0096 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1180 | QH-G0097 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1181 | QH-G0098 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1182 | QH-G0099 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1183 | QH-G0100 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1184 | QH-G0101 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1185 | QH-G0102 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1186 | QH-G0103 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1187 | QH-G0104 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1188 | QH-G0105 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1189 | QH-G0106 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1190 | QH-G0107 | 451-2016sd | QH-W-AUX10-1 | The Morton Arboretum |
| SH-Q1191 | QH-G0108 | 443-2016sd | QH-E-4-9 | The Morton Arboretum |
| SH-Q1192 | QH-G0109 | 443-2016sd | QH-E-4-9 | The Morton Arboretum |
| SH-Q1193 | QH-G0110 | 448-2016sd | QH-E-1-19 | The Morton Arboretum |
| SH-Q1194 | QH-G0111 | 448-2016sd | QH-E-1-19 | The Morton Arboretum |
| SH-Q1195 | QH-G0112 | 428-2016sd | QH-E-11-1 | The Morton Arboretum |
| SH-Q1196 | QH-G0113 | 428-2016sd | QH-E-11-1 | The Morton Arboretum |
| SH-Q1197 | QH-G0114 | 428-2016sd | QH-E-11-1 | The Morton Arboretum |
| SH-Q1198 | QH-G0115 | 428-2016sd | QH-E-11-1 | The Morton Arboretum |
| SH-Q1199 | QH-G0116 | 430-2016sd | QH-E-12-1 | The Morton Arboretum |
| SH-Q1200 | QH-G0117 | 430-2016sd | QH-E-12-1 | The Morton Arboretum |
| SH-Q1201 | QH-G0118 | 430-2016sd | QH-E-12-1 | The Morton Arboretum |
| SH-Q1202 | QH-G0119 | 430-2016sd | QH-E-12-1 | The Morton Arboretum |
| SH-Q1203 | QH-G0120 | 430-2016sd | QH-E-12-1 | The Morton Arboretum |
| SH-Q1204 | QH-G0121 | 430-2016sd | QH-E-12-1 | The Morton Arboretum |
| SH-Q1205 | QH-G0122 | 431-2016sd | QH-E-8-19 | The Morton Arboretum |
| SH-Q1206 | QH-G0123 | 431-2016sd | QH-E-8-19 | The Morton Arboretum |
| SH-Q1207 | QH-G0124 | 431-2016sd | QH-E-8-19 | The Morton Arboretum |
| SH-Q1208 | QH-G0125 | 449-2016sd | QH-E-5-38 | The Morton Arboretum |
| SH-Q1209 | QH-G0126 | 449-2016sd | QH-E-5-38 | The Morton Arboretum |
| SH-Q1210 | QH-G0127 | 449-2016sd | QH-E-5-38 | The Morton Arboretum |
| SH-Q1211 | QH-G0128 | 450-2016sd | QH-E-1-31 | The Morton Arboretum |
| SH-Q1212 | QH-G0129 | 450-2016sd | QH-E-1-31 | The Morton Arboretum |
| SH-Q1213 | QH-G0130 | 450-2016sd | QH-E-1-31 | The Morton Arboretum |
| SH-Q1214 | QH-G0131 | 430-2016sd | QH-E-12-1 | The Morton Arboretum |
| SH-Q1215 | QH-G0132 | 450-2016sd | QH-E-1-31 | The Morton Arboretum |
| SH-Q1216 | QH-G0133 | 450-2016sd | QH-E-1-31 | The Morton Arboretum |
| SH-Q1217 | QH-G0134 | 450-2016sd | QH-E-1-31 | The Morton Arboretum |
| SH-Q1218 | QH-G0135 | 450-2016sd | QH-E-1-31 | The Morton Arboretum |
| SH-Q1219 | QH-G0136 | 450-2016sd | QH-E-1-31 | The Morton Arboretum |
| SH-Q1220 | QH-G0137 | 426-2016sd | QH-E-10-9 | The Morton Arboretum |
| SH-Q1221 | QH-G0138 | 426-2016sd | QH-E-10-9 | The Morton Arboretum |
| SH-Q1222 | QH-G0139 | 427-2016sd | QH-E-10-6 | The Morton Arboretum |
| SH-Q1223 | QH-G0140 | 427-2016sd | QH-E-10-6 | The Morton Arboretum |
| SH-Q1224 | QH-G0141 | 433-2016sd | QH-E-AUX4-2 | The Morton Arboretum |
| SH-Q1225 | QH-G0142 | 427-2016sd | QH-E-10-6 | The Morton Arboretum |
| SH-Q1226 | QH-G0143 | 427-2016sd | QH-E-10-6 | The Morton Arboretum |
| SH-Q1227 | QH-G0144 | 427-2016sd | QH-E-10-6 | The Morton Arboretum |
| SH-Q1228 | QH-G0145 | 442-2016sd | QH-E-6-1 | The Morton Arboretum |
| SH-Q1229 | QH-G0146 | 437-2016sd | QH-E-8-5 | The Morton Arboretum |
| SH-Q1230 | QH-G0147 | 437-2016sd | QH-E-8-5 | The Morton Arboretum |
| SH-Q1231 | QH-G0148 | 437-2016sd | QH-E-8-5 | The Morton Arboretum |
| SH-Q1232 | QH-G0149 | 437-2016sd | QH-E-8-5 | The Morton Arboretum |
| SH-Q1233 | QH-G0150 | 437-2016sd | QH-E-8-5 | The Morton Arboretum |
| SH-Q1234 | QH-G0151 | 441-2016sd | QH-E-5-23 | The Morton Arboretum |
| SH-Q1235 | QH-G0152 | 440-2016sd | QH-E-1-28 | The Morton Arboretum |
| SH-Q1236 | QH-G0153 | 440-2016sd | QH-E-1-28 | The Morton Arboretum |
| SH-Q1237 | QH-G0154 | 440-2016sd | QH-E-1-28 | The Morton Arboretum |
| SH-Q1238 | QH-G0155 | 440-2016sd | QH-E-1-28 | The Morton Arboretum |
| SH-Q1239 | QH-G0156 | 440-2016sd | QH-E-1-28 | The Morton Arboretum |
| SH-Q1240 | QH-G0157 | 513-2016sd | QH-W-3-13 | The Morton Arboretum |
| SH-Q1241 | QH-G0158 | 440-2016sd | QH-E-1-28 | The Morton Arboretum |
| SH-Q1242 | QH-G0159 | 440-2016sd | QH-E-1-28 | The Morton Arboretum |
| SH-Q1243 | QH-G0160 | 513-2016sd | QH-W-3-13 | The Morton Arboretum |
| SH-Q1244 | QH-G0161 | 513-2016sd | QH-W-3-13 | The Morton Arboretum |
| SH-Q1245 | QH-G0162 | 513-2016sd | QH-W-3-13 | The Morton Arboretum |
| SH-Q1246 | QH-G0163 | 446-2016sd | QH-E-3-25 | The Morton Arboretum |
| SH-Q1247 | QH-G0164 | 446-2016sd | QH-E-3-25 | The Morton Arboretum |
| SH-Q1248 | QH-G0165 | 4H-E-6-1 | QH-E-6-1 | Denver Botanical Garden |
| SH-Q1249 | QH-G0166 | QH-E-6-1.2 | QH-E-6-1 | Denver Botanical Garden |
| SH-Q1250 | QH-G0167 | QH-E-11-5.1 | QH-E-11-5 | Denver Botanical Garden |
| SH-Q1251 | QH-G0168 | QH-E-AuxZ.1 | QH-E-AuxZ | Denver Botanical Garden |
| SH-Q1252 | QH-G0169 | QH-W-Aux10-3.1 | QH-W-Aux10-3 | Denver Botanical Garden |
| SH-Q1253 | QH-G0170 | QH-E-11-5.2 | QH-E-11-5 | Denver Botanical Garden |
| SH-Q1254 | QH-G0171 | QH-E-11-1.2 | QH-E-11-1 | Denver Botanical Garden |
| SH-Q1255 | QH-G0172 | QH-W-3-28.2 | QH-W-3-28 | Denver Botanical Garden |
| SH-Q1256 | QH-G0173 | QH-W-Aux3.2 | QH-W-Aux3 | Denver Botanical Garden |
| SH-Q1257 | QH-G0174 | QH-E-128.3 | QH-E-128 | Denver Botanical Garden |
| SH-Q1258 | QH-G0175 | QH-E-Aux4-Z.1 | QH-E-Aux4-Z | Denver Botanical Garden |
| SH-Q1259 | QH-G0176 | QH-W-Aux3.1 | QH-W-Aux3 | Denver Botanical Garden |
| SH-Q1260 | QH-G0177 | QH-E-11-1.2 | QH-E-11-1 | Denver Botanical Garden |
| SH-Q1261 | QH-G0178 | QH-E-11-1.1 | QH-E-11-1 | Denver Botanical Garden |
| SH-Q1262 | QH-G0179 | QH-E-6-1.1 | QH-E-6-1 | Denver Botanical Garden |
| SH-Q1263 | QH-G0180 | QH-W-Aux3.3 | QH-W-Aux3 | Denver Botanical Garden |
| SH-Q1264 | QH-G0181 | QH-E-128.2 | QH-E-128 | Denver Botanical Garden |
| SH-Q1265 | QH-G0182 | QH-W-7-2.1 | QH-W-7-2 | Denver Botanical Garden |
| SH-Q1266 | QH-G0183 | QH-E-128.1 | QH-E-128 | Denver Botanical Garden |
| SH-Q1267 | QH-G0184 | QH-E-11-1.3 | QH-E-11-1 | Denver Botanical Garden |
| SH-Q1268 | QH-G0185 | QH-E-11-1.1 | QH-E-11-1 | Denver Botanical Garden |
| SH-Q1269 | QH-G0186 | QH-E-Aux8-1.1 | QH-E-Aux8-1 | Denver Botanical Garden |
|----------|----------|---------------|-------------|-------------------------|
| SH-Q1270 | QH-G0187 | QH-E-10-9     | QH-E-10-9   | Tulsa Botanic Garden    |
| SH-Q1271 | QH-G0188 | QH-E-10-9     | QH-E-10-9   | Tulsa Botanic Garden    |
| SH-Q1272 | QH-G0189 | QH-E-7-5      | QH-E-7-5    | Tulsa Botanic Garden    |
| SH-Q1273 | QH-G0190 | QH-E-10-7     | QH-E-10-7   | Tulsa Botanic Garden    |
| SH-Q1274 | QH-G0191 | QH-E-10-1     | QH-E-10-1   | Tulsa Botanic Garden    |
| SH-Q1275 | QH-G0192 | QH-E-10-1     | QH-E-10-1   | Tulsa Botanic Garden    |
| SH-Q1276 | QH-G0193 | QH-E-10-1     | QH-E-10-1   | Tulsa Botanic Garden    |
| SH-Q1277 | QH-G0194 | QH-E-10-1     | QH-E-10-1   | Tulsa Botanic Garden    |
| SH-Q1278 | QH-G0195 | QH-E-10-1     | QH-E-10-1   | Tulsa Botanic Garden    |
| SH-Q1306 | QH-G0196 | QH-E-10-1     | QH-E-10-1   | Tulsa Botanic Garden    |
| SH-Q1307 | QH-G0197 | QH-E-10-1     | QH-E-10-1   | Tulsa Botanic Garden    |
| SH-Q1308 | QH-G0198 | QH-E-1-25     | QH-E-1-25   | Tulsa Botanic Garden    |
| SH-Q1309 | QH-G0199 | QH-E-1-25     | QH-E-1-25   | Tulsa Botanic Garden    |
| SH-Q1310 | QH-G0200 | QH-E-1-21     | QH-E-1-21   | Tulsa Botanic Garden    |
| SH-Q1311 | QH-G0201 | QH-E-1-21     | QH-E-1-21   | Tulsa Botanic Garden    |
| SH-Q1312 | QH-G0202 | QH-E-1-21     | QH-E-1-21   | Tulsa Botanic Garden    |
| SH-Q1313 | QH-G0203 | QH-E-3-1      | QH-E-3-1    | Tulsa Botanic Garden    |
| SH-Q1287 | QH-G0204 | QH-E-3-1      | QH-E-3-1    | Tulsa Botanic Garden    |
| SH-Q1288 | QH-G0205 | QH-E-3-1      | QH-E-3-1    | Tulsa Botanic Garden    |
| SH-Q1314 | QH-G0206 | QH-E-3-1      | QH-E-3-1    | Tulsa Botanic Garden    |
| SH-Q1290 | QH-G0207 | QH-E-3-1      | QH-E-3-1    | Tulsa Botanic Garden    |
| SH-Q1291 | QH-G0208 | QH-E-3-1      | QH-E-3-1    | Tulsa Botanic Garden    |
| SH-Q1315 | QH-G0209 | QH-E-3-1      | QH-E-3-1    | Tulsa Botanic Garden    |
| SH-Q1316 | QH-G0210 | QH-E-5-42     | QH-E-5-42   | Tulsa Botanic Garden    |
| SH-Q1294 | QH-G0211 | QH-E-5-42     | QH-E-5-42   | Tulsa Botanic Garden    |
| SH-Q1317 | QH-G0212 | QH-E-5-42     | QH-E-5-42   | Tulsa Botanic Garden    |
| SH-Q1318 | QH-G0213 | QH-E-4-12     | QH-E-4-12   | Tulsa Botanic Garden    |
| SH-Q1297 | QH-G0214 | QH-E-1-19     | QH-E-1-19   | Tulsa Botanic Garden    |
| SH-Q1319 | QH-G0215 | QH-E-1-4      | QH-E-1-4    | Tulsa Botanic Garden    |
| SH-Q1320 | QH-G0216 | QH-E-1-4      | QH-E-1-4    | Tulsa Botanic Garden    |
| SH-Q1321 | QH-G0217 | QH-E-1-4      | QH-E-1-4    | Tulsa Botanic Garden    |
| SH-Q1302 | QH-G0218 | QH-E-1-4      | QH-E-1-4    | Tulsa Botanic Garden    |
| SH-Q1322 | QH-G0219 | QH-E-Aux8-3   | QH-E-Aux8-3 | Tulsa Botanic Garden    |
| SH-Q1323 | QH-G0220 | QH-E-Aux8-3   | QH-E-Aux8-3 | Tulsa Botanic Garden    |
| SH-Q1324 | QH-G0221 | QH-E-Aux8-3   | QH-E-Aux8-3 | Tulsa Botanic Garden    |
| SH-Q1325 | QH-G0222 | QH-E-Aux8-3   | QH-E-Aux8-3 | Tulsa Botanic Garden    |
| SH-Q1326 | QH-G0223 | 5649-16P      | QH-W-2-12   | Chicago Botanic Garden  |
| SH-Q1327 | QH-G0224 | 5192-16P      | QHE-Aux3    | Chicago Botanic Garden  |
| SH-Q1328 | QH-G0225 | 5190-16P | QH-E-1-11 | Chicago Botanic Garden |
| SH-Q1329 | QH-G0226 | 5649-16P | QH-W-2-12 | Chicago Botanic Garden |
| SH-Q1330 | QH-G0227 | 5190-16P | QH-E-1-11 | Chicago Botanic Garden |
| SH-Q1331 | QH-G0228 | 5647-16P | QH-W-Aux3 | Chicago Botanic Garden |
| SH-Q1332 | QH-G0229 | 5647-16P | QH-W-Aux3 | Chicago Botanic Garden |
| SH-Q1333 | QH-G0230 | 5648-16P | QH-W-3-1  | Chicago Botanic Garden |
| SH-Q1334 | QH-G0231 | 5648-16P | QH-W-3-1  | Chicago Botanic Garden |
| SH-Q1335 | QH-G0232 | 5648-16P | QH-W-3-1  | Chicago Botanic Garden |
| SH-Q1336 | QH-G0233 | 5195-16P | QH-E Aux8-3 | Chicago Botanic Garden |
| SH-Q1337 | QH-G0234 | 5179-16P | QH-E-9     | Chicago Botanic Garden |
| SH-Q1338 | QH-G0235 | 5197-16P | QH-E Aux 6-1 | Chicago Botanic Garden |
| SH-Q1339 | QH-G0236 | 5197-16P | QH-E Aux 6-1 | Chicago Botanic Garden |
| SH-Q1340 | QH-G0237 | 5197-16P | QH-E Aux 6-1 | Chicago Botanic Garden |
| SH-Q1341 | QH-G0238 | 5197-16P | QH-E Aux 6-1 | Chicago Botanic Garden |
| SH-Q1342 | QH-G0239 | 5191-16P | QH-E-10-7  | Chicago Botanic Garden |
| SH-Q1343 | QH-G0240 | 5191-16P | QH-E-10-7  | Chicago Botanic Garden |
| SH-Q1344 | QH-G0241 | 5189-16P | QH-E-12-1  | Chicago Botanic Garden |
| SH-Q1345 | QH-G0242 | 5191-16P | QH-E-10-7  | Chicago Botanic Garden |
| SH-Q1346 | QH-G0243 | 5189-16P | QH-E-12-1  | Chicago Botanic Garden |
| SH-Q1347 | QH-G0244 | 5189-16P | QH-E-12-1  | Chicago Botanic Garden |
| SH-Q1348 | QH-G0245 | 5195-16P | QH-E Aux8-3 | Chicago Botanic Garden |
| SH-Q1349 | QH-G0246 | 5194-16P | QH-E Aux2  | Chicago Botanic Garden |
| SH-Q1350 | QH-G0247 | 5194-16P | QH-E Aux2  | Chicago Botanic Garden |
| SH-Q1351 | QH-G0248 | 5194-16P | QH-E Aux2  | Chicago Botanic Garden |
| SH-Q1352 | QH-G0249 | 5194-16P | QH-E Aux2  | Chicago Botanic Garden |
| SH-Q1353 | QH-G0250 | 5194-16P | QH-E Aux2  | Chicago Botanic Garden |
| SH-Q1354 | QH-G0251 | 5194-16P | QH-E Aux2  | Chicago Botanic Garden |
| SH-Q1355 | QH-G0252 | 5201-16P | QH-E-11-2  | Chicago Botanic Garden |
| SH-Q1356 | QH-G0253 | 5194-16P | QH-E Aux2  | Chicago Botanic Garden |
| SH-Q1357 | QH-G0254 | 5180-16P | QH-E-8-19  | Chicago Botanic Garden |
| SH-Q1358 | QH-G0255 | 5180-16P | QH-E-8-19  | Chicago Botanic Garden |
| SH-Q1359 | QH-G0256 | 5180-16P | QH-E-8-19  | Chicago Botanic Garden |
| SH-Q1360 | QH-G0257 | 5201-16P | QH-E-11-2  | Chicago Botanic Garden |
| SH-Q1361 | QH-G0258 | 5201-16P | QH-E-11-2  | Chicago Botanic Garden |
| SH-Q1362 | QH-G0259 | 5200-16P | QH-E-5-35  | Chicago Botanic Garden |
| SH-Q1363 | QH-G0260 | 5182-16P | QH-E-6-16  | Chicago Botanic Garden |
| SH-Q1364 | QH-G0261 | 5182-16P | QH-E-6-16  | Chicago Botanic Garden |
| SH-Q1365 | QH-G0262 | 5182-16P | QH-E-6-16  | Chicago Botanic Garden |
| SH-Q1366 | QH-G0263 | 5181-16P | QH-E-7-5  | Chicago Botanic Garden |
|   |   |   |   |   |
|---|---|---|---|---|
| SH-Q1367 | QH-G0264 | 5182-16P | QH-E-6-16 | Chicago Botanic Garden |
| SH-Q1368 | QH-G0265 | 5187-16P | QH-E-1-27 | Chicago Botanic Garden |
| SH-Q1369 | QH-G0266 | 5187-16P | QH-E-1-27 | Chicago Botanic Garden |
| SH-Q1370 | QH-G0267 | 5187-16P | QH-E-1-27 | Chicago Botanic Garden |
| SH-Q1371 | QH-G0268 | 5187-16P | QH-E-1-27 | Chicago Botanic Garden |
| SH-Q1372 | QH-G0269 | 5195-16P | QH-E Aux 8-3 | Chicago Botanic Garden |
| SH-Q1373 | QH-G0270 | 5195-16P | QH-E Aux 8-3 | Chicago Botanic Garden |
| SH-Q1374 | QH-G0271 | 5195-16P | QH-E Aux 8-3 | Chicago Botanic Garden |
| SH-Q1375 | QH-G0272 | 5181-16P | QH-E-7-5 | Chicago Botanic Garden |
| SH-Q1376 | QH-G0273 | 5181-16P | QH-E-7-5 | Chicago Botanic Garden |
| SH-Q1377 | QH-G0274 | 5181-16P | QH-E-7-5 | Chicago Botanic Garden |
| SH-Q1378 | QH-G0275 | 5199-16P | QH-E-Aux 4-1 | Chicago Botanic Garden |
| SH-Q1379 | QH-G0276 | 5199-16P | QH-E-Aux 4-1 | Chicago Botanic Garden |
| SH-Q1380 | QH-G0277 | 5199-16P | QH-E-Aux 4-1 | Chicago Botanic Garden |
| SH-Q1381 | QH-G0278 | 5181-16P | QH-E-7-5 | Chicago Botanic Garden |
| SH-Q1382 | QH-G0279 | 5199-16P | QH-E-Aux 4-1 | Chicago Botanic Garden |
| SH-Q1383 | QH-G0280 | 2018.047*1 | QH-E-1-4 #2 | Boyce Thompson Arboretum (BTA) |
| SH-Q1384 | QH-G0281 | 2018.050*1 | QH-E-1-21 #4 | Boyce Thompson Arboretum (BTA) |
| SH-Q1385 | QH-G0282 | 2018.051*1 | QH-E-1-25 #2 | Boyce Thompson Arboretum (BTA) |
| SH-Q1386 | QH-G0283 | 2018.051*2 | QH-E-1-25 #3 | Boyce Thompson Arboretum (BTA) |
| SH-Q1387 | QH-G0284 | 2018.049*1 | QH-E-1-26 #3 | Boyce Thompson Arboretum (BTA) |
| SH-Q1388 | QH-G0285 | 2018.048*1 | QH-E-5-42 #3 | Boyce Thompson Arboretum (BTA) |
| SH-Q1389 | QH-G0286 | NA | QH-E-10-4 | Private individual |
| SH-Q1390 | QH-G0287 | QH-E-6-16 (seed) | QH-E-6-16 | Starhill Forest Arboretum |
| SH-Q1391 | QH-G0288 | QH-E-10-3 (seed) | QH-E-10-3 | Starhill Forest Arboretum |
| SH-Q2011 | QH-G0289 | QUHA_E-7-5A | QH-E-7-5 | Lady Bird Johnson |
| SH-Q2012 | QH-G0290 | QUHA_E-7-5B | QH-E-7-5 | Lady Bird Johnson |
| SH-Q2013 | QH-G0291 | QUHA_E-7-5C | QH-E-7-5 | Lady Bird Johnson |
| SH-Q2014 | QH-G0292 | QUHA_AUX8-3A | QUHA_AUX8-3 | Lady Bird Johnson |
| SH-Q2015 | QH-G0293 | QUHA_AUX8-3B | QUHA_AUX8-3 | Lady Bird Johnson |
| SH-Q2016 | QH-G0294 | QUHA_AUX8-3C | QUHA_AUX8-3 | Lady Bird Johnson |
| SH-Q2017 | QH-G0295 | QUHA_E-1-31 | QUHA_E-1-31 | Lady Bird Johnson |
| SH-Q2018 | QH-G0296 | QUHA_WC2016-01 | Other-source (not our collection) | Lady Bird Johnson |
| SH-Q2019 | QH-G0297 | QUHA_WC2016-02 | Other-source (not our collection) | Lady Bird Johnson |
**Table S2.** Forward and reverse sequence of each locus, repeat motif, multiplex groupings (Mpx), fluorescent dye used, the observed range of base pair numbers (size range), annealing temperature used in PCR reaction (Tₐ), and literature source.

| Locus          | Primer sequences (5′–3′) | Repeat motif | Mpx | Fluorescent dye | Size range (bp) | Tₐ (°C) | Source               |
|----------------|--------------------------|--------------|-----|-----------------|-----------------|---------|----------------------|
| MSQ4           | F: TCTCCTCTCCATAAACAGG R: GTTCCTCTATCCATCGGTAGTGAG | (AG)₁₇      | 2   | VIC             | 178-248         | 50      | Dow et al. 1995      |
| MSQ13          | F: TGGCTGACCTATGGCTCTTAG R: ACACTCAGACCCACCTTTTCC | (TC)₁₄      | 1   | 6-FAM          | 190-244         | 54      | Dow et al. 1995      |
| QrZAG20        | F: CCATTAAAAAGAAGCAGATTGTGT R: GCAACACTCAGCTATATCTAGAA | (TC)₁₈      | 1   | VIC             | 155-189         | 50      | Kampfer et al. 1998  |
| QrZAG87        | F: TCCCCACCCTTTGGTCTCTCA R: GGGTCAGCAGTGGGATGGGTA | (TC)₂₀      | 3   | NED             | 93-170          | 56      | Kampfer et al. 1998  |
| QpZAG110       | F: GGAGGCTTCTTCAACCTACT R: GATCTCTTTGTGTGCTGATTTT | (AG)₁₅      | 1   | NED             | 161-243         | 50      | Steinkellner et al. 1997 |
| QpZAG1.5       | F: GCTTGAGAGTTGAGATTTGT R: GCAACACCCTTTAICTACCA | (GT)₃(GA)₉ | 3   | PET             | 152-187         | 56      | Steinkellner et al. 1997 |
| QM69.2M1       | F: CACCACTGCCCACATCAG R: GGATGGACGAAGAGAAGAT | (TGG)₃(CGG)(TGG)₂ | 3   | 6-FAM          | 220-260         | 56      | Isagi and Suhandono 1997 |
| QS00314        | F: TCAAAAACGAAGTTTTCAG R: TCGGGTTTTTTTTGGTCGTC | (GAA)₆      | 1   | PET             | 161-190         | 50      | Chatwin et al. 2014  |
| QS00562        | F: ACCCCCCACCTAACTCCCCAC R: TGCAAAAAACACACAGACACTTTT | (GA)₇      | 3   | 6-FAM          | 214-282         | 56      | Steinkellner et al. 1997 |
| QS01904        | F: TGATCAAAAAACCCACCTTC C R: GGGTTTCTTTGAGTGTGCTGTTG | (TC)₁₀     | 2   | 6-FAM          | 131-155         | 54      | Chatwin et al. 2014  |
| QS03797        | F: AGTTTTGTGTGATTGTGACCG R: GCAAGGCTGTCATGGGT | (CA)₇      | 1   | 6-FAM          | 140-169         | 50      | Chatwin et al. 2014  |
Table S3. Results for the frequency of null alleles and a bootstrap confidence interval for each locus using the methods of Chakraborty et al. (1994) and Brookfield (1996). If the 95% confidence interval includes zero, it indicates that the frequency of null alleles at a locus does not significantly differ from zero.

| Locus                | Brookfield (1996) |               |               |               |               |               |               |               |               |
|----------------------|-------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                      | Observed frequency | 0.18          | 0.06          | 0.04          | 0.05          | 0.14          | 0.01          | 0.16          | 0.28          | 0.13          | 0.13          | 0.09          |
|                      | Median frequency  | 0.18          | 0.05          | 0.04          | 0.05          | 0.14          | 0.01          | 0.16          | 0.29          | 0.13          | 0.13          | 0.09          |
|                      | 2.5th percentile  | 0.14          | 0.04          | 0.02          | 0.03          | 0.11          | 0             | 0.13          | 0.24          | 0.1           | 0.1           | 0.06          |
|                      | 97.5th percentile | 0.21          | 0.08          | 0.06          | 0.07          | 0.17          | 0.03          | 0.19          | 0.33          | 0.15          | 0.16          | 0.11          |
|                      | Chakraborty et al. (1994) |               |               |               |               |               |               |               |               |               |               |               |
|                      | Observed frequency | 0.22          | 0.07          | 0.05          | 0.06          | 0.16          | 0.06          | 0.17          | 0.53          | 0.14          | 0.14          | 0.1           |
|                      | Median frequency  | 0.22          | 0.07          | 0.05          | 0.06          | 0.16          | 0.05          | 0.17          | 0.54          | 0.14          | 0.14          | 0.1           |
|                      | 2.5th percentile  | 0.18          | 0.04          | 0.03          | 0.03          | 0.13          | 0             | 0.14          | 0.46          | 0.11          | 0.11          | 0.07          |
|                      | 97.5th percentile | 0.27          | 0.09          | 0.07          | 0.09          | 0.2           | 0.13          | 0.2           | 0.62          | 0.17          | 0.17          | 0.12          |
Table S4. Results for each population for each locus for the following parameters: \(N\) = Number of individuals per population sample genotyped per locus, \(A\) = Total number of alleles observed per population sample per locus, \(\%\) = Percentage of total alleles observed across population samples per population sample per locus, \(Ar\) = Allelic richness per locus, \(Ho\) = observed heterozygosity per locus, \(He\) = expected heterozygosity per locus, \(HWE\) = Hardy–Weinberg Equilibrium P-value from the \(X^2\) goodness-of-fit tests per locus.

| QH- E-1 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|---------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N       | 20      | 18    | 20      | 20       | 20      | 20      | 20   | 20      | 20      | 20      | 20      | 19.82   |
| A       | 2       | 3     | 9       | 5        | 3       | 3       | 10   | 3       | 4       | 9       | 7       | 58      |
| %       | 18.18   | 10.71 | 50      | 17.24    | 16.67   | 37.5    | 35.71| 21.43   | 12.5    | 36      | 24.14   | 25.46   |
| Ar      | 2       | 2.26  | 6.17    | 3.23     | 2.72    | 2.1     | 6.76 | 2.2     | 3.02    | 5.39    | 4.4     | 3.66    |
| Ho      | 0.5     | 0.33  | 0.85    | 0.5      | 0.55    | 0.15    | 0.75 | 0.1     | 0.6     | 0.55    | 0.9     | 0.53    |
| He      | 0.42    | 0.29  | 0.79    | 0.57     | 0.56    | 0.18    | 0.84 | 0.33    | 0.46    | 0.71    | 0.68    | 0.52    |
| HWE     | 0.3929  | 0.8685| 0.6733  | 0.0186   | 0.2328  | 0.03    | 0.0056| 0       | 0.7212  | 0.202   | 0.8917  | 0.0013  |

| QH- E-10 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|----------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N        | 9       | 6     | 9       | 8        | 8       | 9       | 9    | 9       | 9       | 9       | 8       | 8.45    |
| A        | 4       | 4     | 9       | 4        | 4       | 3       | 3    | 8       | 4       | 8       | 5       | 55      |
| %        | 36.36   | 14.29 | 50      | 13.79    | 22.22   | 37.5    | 28.57| 21.43   | 12.5    | 32      | 13.79   | 25.68   |
| Ar       | 3.82    | 2.84  | 7.01    | 3.24     | 3.9     | 2.24    | 5.86 | 2.49    | 3.49    | 5.9     | 3.21    | 4       |
| Ho       | 0.67    | 0.5   | 1       | 0.62     | 0.75    | 0.22    | 0.62 | 0       | 0.78    | 0.56    | 0.67    | 0.58    |
| He       | 0.73    | 0.42  | 0.85    | 0.58     | 0.73    | 0.2     | 0.84 | 0.49    | 0.56    | 0.81    | 0.5     | 0.61    |
| HWE      | 0.1145  | 0.9951| 0.4002  | 0.5235   | 0.3841  | 0.9866  | 0.5242| 4.00E-04| 0.7253  | 0.2123  | 0.8953  | 0.2524  |

| QH- E-13 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|----------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N        | 8       | 8     | 8       | 8        | 8       | 8       | 8    | 8       | 8       | 8       | 8       | 8       |
| A        | 3       | 6     | 8       | 5        | 4       | 2       | 7    | 2       | 5       | 5       | 6       | 53      |
| %        | 27.27   | 21.43 | 44.44   | 17.24    | 22.22   | 25      | 25   | 14.29   | 15.62   | 20      | 20.69   | 23.02   |
| Ar       | 2.65    | 4.6   | 6.58    | 4.3      | 3.44    | 1.66    | 5.39 | 1.9     | 4.17    | 3.96    | 5.49    | 4.01    |
| Ho       | 0.62    | 0.75  | 0.88    | 0.88     | 0.5     | 0.12    | 0.62 | 0.25    | 0.75    | 0.75    | 1       | 0.65    |
| He       | 0.55    | 0.67  | 0.83    | 0.73     | 0.49    | 0.12    | 0.78 | 0.22    | 0.69    | 0.64    | 0.81    | 0.59    |
| HWE      | 0.68    | 0.9238| 0.2256  | 0.2693   | 0.2478  | 0.8415  | 0.5213| 0.6892  | 0.4872  | 0.971   | 0.6623  | 0.7722  |
Table S4. Continued.

| QH-E-14 | QSO3797 | MSQ13 | QrZAG20 | QpZAG110 | QSO0314 | QSO01904 | MSQ4 | QSO00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|---------|---------|-------|---------|----------|---------|-----------|------|-----------|---------|---------|---------|---------|
| N       | 21      | 20    | 24      | 24       | 24      | 24        | 23   | 24        | 24      | 24      | 24      | 23.27   |
| A       | 5       | 8     | 10      | 7        | 9       | 4         | 13   | 2         | 7       | 8       | 11      | 84      |
| %       | 45.45   | 28.57 | 55.56   | 24.14    | 50      | 50        | 46.43| 14.29     | 21.88   | 32      | 37.93   | 36.93   |
| Ar      | 3.63    | 4.84  | 6.92    | 4.8      | 5.55    | 2.6       | 7.13 | 1.89      | 4.19    | 5.79    | 6.76    | 4.92    |
| Ho      | 0.52    | 0.75  | 0.96    | 0.58     | 0.67    | 0.21      | 0.75 | 0.13      | 0.75    | 0.46    | 0.79    | 0.6     |
| He      | 0.67    | 0.7   | 0.85    | 0.7      | 0.78    | 0.32      | 0.85 | 0.31      | 0.67    | 0.84    | 0.83    | 0.69    |
| HWE     | 0.1996  | 1.00E-04 | 0.7156 | 0.2225  | 0       | 0.1513    | 4.00E-04 | 0.005    | 1.00E-04 | 0       | 0.4994  | 0       |

| QH-E-2  | QSO3797 | MSQ13 | QrZAG20 | QpZAG110 | QSO0314 | QSO01904 | MSQ4 | QSO00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|---------|---------|-------|---------|----------|---------|-----------|------|-----------|---------|---------|---------|---------|
| N       | 25      | 25    | 25      | 25       | 25      | 25        | 25   | 25        | 25      | 25      | 25      | 25      |
| A       | 3       | 3     | 5       | 8        | 3       | 13        | 2    | 3         | 6       | 7       | 56      |         |
| %       | 27.27   | 10.71 | 27.78   | 27.59    | 16.67   | 37.5      | 46.43| 14.29     | 9.38    | 24      | 24.14   | 24.16   |
| Ar      | 2.94    | 2.23  | 3.94    | 4.56     | 2.85    | 2.25      | 6    | 2         | 2.31    | 4.49    | 4.46    | 3.46    |
| Ho      | 0.44    | 0.24  | 0.6     | 0.72     | 0.56    | 0.24      | 0.56 | 0.32      | 0.52    | 0.56    | 0.56    | 0.49    |
| He      | 0.6     | 0.22  | 0.67    | 0.64     | 0.52    | 0.22      | 0.77 | 0.5       | 0.39    | 0.71    | 0.72    | 0.54    |
| HWE     | 0.1785  | 0.9276| 0.392   | 0.9949   | 0.334   | 0.9276    | 7.00E-04 | 0.0727   | 0.378   | 0.0056  | 0.9007  | 0.0183  |

| QH-E-3  | QSO3797 | MSQ13 | QrZAG20 | QpZAG110 | QSO0314 | QSO01904 | MSQ4 | QSO00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|---------|---------|-------|---------|----------|---------|-----------|------|-----------|---------|---------|---------|---------|
| N       | 27      | 27    | 27      | 27       | 27      | 27        | 27   | 27        | 27      | 27      | 27      | 27      |
| A       | 4       | 2     | 8       | 7        | 3       | 11        | 2    | 4         | 8       | 5       | 57      |         |
| %       | 36.36   | 7.14  | 44.44   | 24.14    | 16.67   | 37.5      | 39.29| 14.29     | 12.5    | 32      | 17.24   | 25.6    |
| Ar      | 3.37    | 1.76  | 4.99    | 3.83     | 2.23    | 1.74      | 6.39 | 1.93      | 2.51    | 4.14    | 3.45    | 3.3     |
| Ho      | 0.67    | 0.15  | 0.63    | 0.48     | 0.44    | 0.11      | 0.48 | 0.22      | 0.41    | 0.41    | 0.56    | 0.41    |
| He      | 0.59    | 0.14  | 0.65    | 0.66     | 0.52    | 0.11      | 0.85 | 0.3       | 0.36    | 0.58    | 0.65    | 0.49    |
| HWE     | 0.5323  | 0.6801| 7.00E-04| 0.0032   | 0.6708  | 0.993     | 1.00E-04| 0.1703   | 0.4494  | 0.047   | 1.00E-04| 0       |
Table S4. Continued.

| QH-E-4 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N      | 19      | 19    | 17      | 19       | 16      | 19      | 19   | 19      | 19      | 19      | 18      | 18.18   |
| A      | 3       | 3     | 10      | 4        | 3       | 2       | 6    | 2       | 4       | 6       | 6       | 49      |
| %      | 27.27   | 10.71 | 55.56   | 13.79    | 16.67   | 25      | 21.43| 14.29   | 12.5    | 24      | 20.69   | 21.99   |
| Ar     | 2.93    | 2.26  | 6.14    | 3.15     | 2.32    | 1.92    | 4.38 | 1.59    | 3.42    | 4.43    | 4.25    | 3.34    |
| Ho     | 0.47    | 0.32  | 0.76    | 0.63     | 0.44    | 0.26    | 0.5  | 0.05    | 0.63    | 0.37    | 0.78    | 0.47    |
| He     | 0.59    | 0.27  | 0.82    | 0.51     | 0.42    | 0.23    | 0.76 | 0.15    | 0.55    | 0.76    | 0.69    | 0.52    |
| HWE    | 0.2261  | 0.8802| 0.0416  | 0.7199   | 0.9402  | 0.5071  | 0.3189| 0.0054  | 0.4356  | 0       | 0.8817  | 0.0012  |

| QH-E-5 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N      | 32      | 31    | 32      | 32       | 32      | 31      | 32   | 32      | 32      | 32      | 30      | 31.91   |
| A      | 3       | 4     | 7       | 4        | 6       | 2       | 9    | 3       | 5       | 9       | 8       | 60      |
| %      | 27.27   | 14.29 | 38.89   | 13.79    | 33.33   | 25      | 32.14| 15.62   | 16.67   | 50      | 27.59   | 25.94   |
| Ar     | 2.39    | 2.96  | 4.41    | 3.25     | 2.91    | 2       | 4.93 | 1.73    | 2.91    | 4.56    | 4.59    | 3.33    |
| Ho     | 0.28    | 0.55  | 0.78    | 0.62     | 0.47    | 0.62    | 0.75 | 0.03    | 0.69    | 0.28    | 0.62    | 0.52    |
| He     | 0.25    | 0.46  | 0.67    | 0.6      | 0.43    | 0.7     | 0.2  | 0.54    | 0.66    | 0.58    | 0.5     | 0.5     |
| HWE    | 0.8351  | 0.3968| 0.9191  | 0.1906   | 0       | 0.0101  | 0.9771| 0       | 0.6978  | 0       | 0.8017  | 0       |

| QH-E-6 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N      | 14      | 14    | 14      | 14       | 14      | 14      | 14   | 14      | 14      | 14      | 14      | 14      |
| A      | 3       | 6     | 8       | 7        | 5       | 2       | 8    | 5       | 4       | 7       | 5       | 60      |
| %      | 27.27   | 21.43 | 44.44   | 24.14    | 27.78   | 25      | 28.57| 35.71   | 12.5    | 28      | 17.24   | 26.55   |
| Ar     | 2.82    | 4.3   | 6.38    | 5.22     | 4.14    | 1.72    | 5.79 | 3.61    | 3.16    | 5.68    | 3.64    | 4.22    |
| Ho     | 0.5     | 0.5   | 0.93    | 0.93     | 0.5     | 0.14    | 0.79 | 0.36    | 0.5     | 0.57    | 0.57    | 0.57    |
| He     | 0.48    | 0.61  | 0.82    | 0.74     | 0.68    | 0.13    | 0.79 | 0.68    | 0.49    | 0.82    | 0.62    | 0.63    |
| HWE    | 0.6846  | 0.4536| 0.4955  | 0.3629   | 0.2198  | 0.7773  | 0.0097| 3.00E-04| 0.2142  | 0.0718  | 0.7965  | 0.0026  |
Table S4 Continued.

| QH-E-7 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|--------|---------|
| N      | 56      | 51    | 56      | 55       | 56      | 56      | 56   | 56      | 56      | 56      | 56     | 56      |
| A      | 5       | 9     | 10      | 9        | 8       | 5       | 13   | 6       | 4       | 13      | 9      | 91      |
| %      | 45.45   | 32.14 | 55.56   | 31.03    | 44.44   | 62.5    | 46.43| 42.86   | 12.5    | 52      | 31.03  | 41.45   |
| Ar     | 3.9     | 3.12  | 5.41    | 4.32     | 3.6     | 2.4     | 7.21 | 2.65    | 3.14    | 6.12    | 4.03   | 4.17    |
| Ho     | 0.55    | 0.47  | 0.71    | 0.69     | 0.64    | 0.2     | 0.73 | 0.23    | 0.48    | 0.52    | 0.66   | 0.54    |
| He     | 0.69    | 0.48  | 0.69    | 0.69     | 0.58    | 0.21    | 0.86 | 0.36    | 0.5     | 0.83    | 0.7    | 0.6     |
| HWE    | 0.0249  | 0.0063| 0       | 1.00E-04 | 0       | 0.8622  | 0    | 0       | 2.00E-04| 0       | 0.0011 | 0       |

| QH-E-AUX5 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|-----------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|--------|---------|
| N         | 11      | 11    | 11      | 11       | 11      | 11      | 11   | 11      | 11      | 11      | 11     | 11      |
| A         | 3       | 3     | 2       | 2        | 2       | 1       | 6    | 2       | 3       | 5       | 5      | 34      |
| %         | 27.27   | 10.71 | 11.11   | 6.9      | 11.11   | 12.5    | 21.43| 14.29   | 9.38    | 20      | 17.24  | 14.72   |
| Ar        | 2.52    | 2.32  | 1.98    | 2        | 1.99    | 1       | 5.21 | 1.99    | 2.61    | 4.38    | 4.39   | 2.76    |
| Ho        | 0.64    | 0.09  | 0.36    | 0.36     | 0.45    | 0       | 0.45 | 0.27    | 0.18    | 0.36    | 1      | 0.38    |
| He        | 0.46    | 0.37  | 0.3     | 0.46     | 0.35    | 0       | 0.81 | 0.43    | 0.31    | 0.69    | 0.71   | 0.45    |
| HWE       | 0.4936  | 0.0115| 0.4624  | 0.4751   | 0.3297  | NA      | 1.00E-04 | 0.2176 | 1.00E-04 | 2.00E-04 | 0.1828 | 0       |

| QH-W-1 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|--------|---------|
| N      | 29      | 39    | 39      | 39       | 39      | 39      | 39   | 39      | 39      | 39      | 39     | 39      |
| A      | 3       | 7     | 5       | 10       | 3       | 2       | 8    | 4       | 5       | 7       | 4      | 58      |
| %      | 27.27   | 25    | 27.78   | 34.48    | 16.67   | 25      | 28.57| 28.57   | 15.62   | 28      | 13.79  | 24.61   |
| Ar     | 1.96    | 3.98  | 3.48    | 5.74     | 2.18    | 1.17    | 5.16 | 2.59    | 2.05    | 5.19    | 3.12   | 3.33    |
| Ho     | 0.03    | 0.72  | 0.72    | 0.85     | 0.38    | 0.03    | 0.67 | 0.15    | 0.13    | 0.79    | 0.64   | 0.46    |
| He     | 0.39    | 0.67  | 0.62    | 0.79     | 0.51    | 0.03    | 0.78 | 0.5     | 0.17    | 0.77    | 0.61   | 0.53    |
| HWE    | 0       | 0.1546| 1.00E-04| 7.00E-04| 0.2957  | 0.9203  | 0.1032| 0       | 0.5474  | 0.0027  | 0.7975 | 0       |
Table S4. Continued.

| QH-W-10 | Q03797 | MSQ13 | QrZAG20 | QpZAG110 | Q00314 | Q01904 | MSQ4 | Q00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|---------|--------|-------|---------|----------|--------|--------|------|--------|---------|---------|--------|---------|
| N       | 29     | 29    | 29      | 29       | 29     | 29     | 29   | 27     | 29      | 29      | 29     | 28.82   |
| A       | 3      | 8     | 11      | 7        | 5      | 12     | 6    | 11     | 13      | 10      | 90     |
| %       | 27.27  | 28.57 | 61.11   | 24.14    | 27.78  | 50     | 42.86| 42.86  | 34.38   | 52      | 34.48  | 38.68   |
| Ar      | 2.96   | 5.11  | 6.79    | 5.18     | 3.27   | 1.75   | 7.43 | 3.56   | 6.98    | 8.15    | 5.43   | 5.15    |
| Ho      | 0.38   | 0.69  | 0.9     | 0.69     | 0.41   | 0.1    | 0.76 | 0.1    | 0.96    | 0.79    | 0.72   | 0.59    |
| He      | 0.65   | 0.72  | 0.85    | 0.77     | 0.45   | 0.1    | 0.87 | 0.6    | 0.86    | 0.89    | 0.63   | 0.67    |
| HWE     | 0.0015 | 0.8699| 0.7098  | 0        | 6.00E-04| 1      | 0.001| 0      | 0.0489  | 0.127   | 0.5407 | 0       |

| QH-W-11 | Q03797 | MSQ13 | QrZAG20 | QpZAG110 | Q00314 | Q01904 | MSQ4 | Q00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|---------|--------|-------|---------|----------|--------|--------|------|--------|---------|---------|--------|---------|
| N       | 20     | 20    | 20      | 20       | 20     | 20     | 20   | 20     | 20      | 20      | 20     | 20      |
| A       | 6      | 11    | 8       | 7        | 6      | 1      | 15   | 6      | 7       | 9       | 8      | 84      |
| %       | 54.55  | 39.29 | 44.44   | 24.14    | 33.33  | 12.5   | 53.57| 42.86  | 21.88   | 36      | 27.59  | 35.47   |
| Ar      | 3.8    | 7.55  | 5.84    | 4.32     | 5.26   | 1      | 8.75 | 3.75   | 3.49    | 5.4     | 5.49   | 4.97    |
| Ho      | 0.25   | 0.98  | 0.8     | 0.85     | 0.75   | 0      | 0.8  | 0.35   | 0.35    | 0.6     | 0.85   | 0.59    |
| He      | 0.63   | 0.88  | 0.77    | 0.69     | 0.8    | 0      | 0.89 | 0.46   | 0.35    | 0.66    | 0.78   | 0.63    |
| HWE     | 0.0019 | 0.1637| 0.1406  | 0.7965   | 0.232  | NA     | 0.0219| 0      | 0.9015  | 0.0569  | 0.5014 | 0       |

| QH-W-12 | Q03797 | MSQ13 | QrZAG20 | QpZAG110 | Q00314 | Q01904 | MSQ4 | Q00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|---------|--------|-------|---------|----------|--------|--------|------|--------|---------|---------|--------|---------|
| N       | 18     | 18    | 18      | 18       | 18     | 18     | 18   | 17     | 18      | 18      | 18     | 17.91   |
| A       | 2      | 12    | 8       | 7        | 6      | 1      | 12   | 2      | 6       | 9       | 4      | 69      |
| %       | 18.18  | 42.86 | 44.44   | 24.14    | 33.33  | 12.5   | 42.86| 14.29  | 18.75   | 36      | 13.79  | 27.38   |
| Ar      | 1.97   | 7.7   | 5.65    | 4.73     | 4.61   | 1      | 7.33 | 1.37   | 4.12    | 5.23    | 3.15   | 4.26    |
| Ho      | 0      | 0.94  | 0.61    | 0.61     | 0.56   | 0      | 0.72 | 0      | 0.44    | 0.71    | 0.39   | 0.45    |
| He      | 0.44   | 0.88  | 0.82    | 0.62     | 0.78   | 0      | 0.86 | 0.1    | 0.5     | 0.73    | 0.57   | 0.57    |
| HWE     | 0      | 0.1153| 0.0083  | 0.1715   | 0      | NA     | 1.00E-04| 0      | 0.0018  | 0.0012  | 0.0159 | 0       |
Table S4. Continued.

| QH-W-2 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N      | 11      | 11    | 11      | 11       | 11      | 11      | 11   | 11      | 11      | 11      | 11      | 11      |
| A      | 3       | 6     | 6       | 4        | 5       | 1       | 5    | 2       | 9       | 7       | 5       | 53      |
| %      | 27.27   | 21.43 | 33.33   | 13.79    | 27.78   | 12.5    | 17.86| 14.29   | 28.12   | 28      | 17.24   | 21.96   |
| Ar     | 2.93    | 5.28  | 4.82    | 3.57     | 3.69    | 1       | 3.78 | 2       | 7.26    | 5.41    | 4.25    | 4       |
| Ho     | 0.27    | 0.73  | 0.55    | 0.73     | 0.45    | 0       | 0    | 0.64    | 0.91    | 0.82    | 0.36    | 0.5     |
| He     | 0.66    | 0.79  | 0.74    | 0.55     | 0.51    | 0       | 0.74 | 0.5     | 0.87    | 0.8     | 0.75    | 0.63    |
| HWE    | 0.0315  | 0.0508| 0.0019  | 0.732    | 0.2706  | NA      | 0    | 0.3652  | 0.007   | 0.0023  | 0.0347  | 0       |

| QH-W-3 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N      | 28      | 33    | 33      | 33       | 32      | 33      | 33   | 33      | 33      | 33      | 33      | 32.45   |
| A      | 5       | 12    | 8       | 9        | 6       | 3       | 13   | 4       | 10      | 12      | 6       | 88      |
| %      | 45.45   | 42.86 | 44.44   | 31.03    | 33.33   | 37.5    | 46.43| 28.57   | 31.25   | 48      | 20.69   | 37.23   |
| Ar     | 2.83    | 7.1   | 5.42    | 4.61     | 3.42    | 1.59    | 7.53 | 1.82    | 6.45    | 6.99    | 3.64    | 4.67    |
| Ho     | 0.25    | 0.91  | 0.7     | 0.42     | 0.47    | 0.09    | 0.52 | 0.03    | 0.79    | 0.67    | 0.52    | 0.49    |
| He     | 0.39    | 0.86  | 0.74    | 0.59     | 0.49    | 0.09    | 0.9  | 0.17    | 0.78    | 0.85    | 0.45    | 0.57    |
| HWE    | 0.1034  | 0.3008| 0.2481  | 0.0013   | 0.5876  | 0.9952  | 0    | 0       | 0.3696  | 0.48    | 0.999   | 0       |
| Fis    | 0.3595  | -0.0622| 0.0641  | 0.2804   | 0.0457  | -0.0366| 0.4273| 0.8221  | -0.0041| 0.2181  | -0.1461| 0.1521  |

| QH-W-4 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N      | 24      | 33    | 33      | 33       | 33      | 33      | 32   | 25      | 33      | 33      | 31.36   | 31.36   |
| A      | 4       | 12    | 9       | 5        | 8       | 2       | 10   | 6       | 8       | 7       | 8       | 79      |
| %      | 36.36   | 42.86 | 50      | 17.24    | 44.44   | 25      | 35.71| 42.86   | 25      | 28      | 27.59   | 34.1    |
| Ar     | 3.01    | 6.66  | 6.3     | 3.29     | 4.85    | 1.9     | 6.58 | 3.33    | 4.51    | 4.82    | 4.65    | 4.54    |
| Ho     | 0.38    | 1     | 0.94    | 0.52     | 0.79    | 0.27    | 0.82 | 0.09    | 0.6     | 0.79    | 0.73    | 0.63    |
| He     | 0.47    | 0.82  | 0.83    | 0.59     | 0.75    | 0.24    | 0.84 | 0.61    | 0.71    | 0.66    | 0.64    | 0.65    |
| HWE    | 0.1338  | 0.3066| 0.0182  | 0.8885   | 0.0095  | 0.3652  | 0    | 0       | 0.2966  | 0.9036  | 0.8498  | 0       |
Table S4. Continued.

| QH-W-5 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N      | 30      | 30    | 30      | 30       | 30      | 30      | 29   | 30      | 29      | 30      | 30      | 29.82   |
| A      | 4       | 13    | 12      | 10       | 7       | 3       | 15   | 3       | 11      | 16      | 9       | 103     |
| %      | 36.36   | 46.43 | 66.67   | 34.48    | 38.89   | 37.5    | 53.57| 21.43   | 34.38   | 64      | 31.03   | 42.25   |
| Ar     | 3.65    | 6.42  | 7.02    | 4.87     | 4.23    | 1.96    | 7.85 | 1.82    | 5.94    | 8.64    | 6.33    | 5.34    |
| Ho     | 0.63    | 0.73  | 0.83    | 0.63     | 0.7     | 0.17    | 0.73 | 0.03    | 0.73    | 0.86    | 0.9     | 0.63    |
| He     | 0.7     | 0.76  | 0.86    | 0.6      | 0.68    | 0.16    | 0.87 | 0.22    | 0.7     | 0.9     | 0.82    | 0.66    |
| HWE    | 0.0028  | 0.7443| 0.4796  | 0.9196   | 0       | 0.9691  | 0    | 0       | 0.9592  | 0.0175  | 0.1769  | 0       |

| QH-W-6 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N      | 33      | 33    | 33      | 33       | 33      | 33      | 33   | 33      | 33      | 33      | 33      | 33      |
| A      | 4       | 12    | 14      | 8        | 5       | 3       | 18   | 4       | 14      | 14      | 10      | 106     |
| %      | 36.36   | 42.86 | 77.78   | 27.59    | 27.78   | 37.5    | 64.29| 28.57   | 43.75   | 56      | 34.48   | 43.36   |
| Ar     | 3.49    | 6.12  | 7.47    | 4.08     | 3.25    | 1.93    | 8.4  | 2.91    | 6.93    | 7.41    | 4.72    | 5.16    |
| Ho     | 0.36    | 0.79  | 0.82    | 0.55     | 0.52    | 0.15    | 0.67 | 0.12    | 0.7     | 0.73    | 0.58    | 0.54    |
| He     | 0.71    | 0.73  | 0.85    | 0.57     | 0.52    | 0.14    | 0.89 | 0.51    | 0.79    | 0.84    | 0.58    | 0.65    |
| HWE    | 0       | 0.9763| 0.7893  | 0.9986   | 0.777   | 0.9743  | 0.012| 0       | 0.1228  | 3.00E-04| 0       | 0       |

| QH-W-7 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N      | 32      | 32    | 32      | 32       | 32      | 32      | 32   | 32      | 32      | 32      | 32      | 32      |
| A      | 4       | 9     | 14      | 10       | 9       | 1       | 14   | 5       | 11      | 7       | 9       | 93      |
| %      | 36.36   | 32.14 | 77.78   | 34.48    | 50      | 12.5    | 35.71| 34.38   | 28      | 31.03   | 38.4    | 38.4    |
| Ar     | 3.64    | 5.81  | 7.63    | 5.17     | 5.42    | 1       | 6.67 | 2.84    | 6.58    | 5.16    | 4.93    | 4.99    |
| Ho     | 0.44    | 0.62  | 0.91    | 0.78     | 0.75    | 0       | 0.53 | 0.09    | 0.75    | 0.72    | 0.66    | 0.57    |
| He     | 0.66    | 0.71  | 0.87    | 0.7      | 0.75    | 0       | 0.83 | 0.47    | 0.83    | 0.75    | 0.6     | 0.65    |
| HWE    | 0.0121  | 0.649 | 0.3672  | 0.2292   | 0.2839  | NA      | 0    | 0       | 0.8163  | 0.5922  | 0.0832  | 0       |

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Table S4. Continued.

| QH-W-8 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N      | 39      | 39    | 39      | 39       | 39      | 39      | 39   | 39      | 37      | 38      | 39      | 39      | 38.73  |
| A      | 4       | 9     | 10      | 8        | 6       | 4       | 17   | 6       | 12      | 15      | 10      | 101     |
| %      | 36.36   | 32.14 | 55.56   | 27.59    | 33.33   | 50      | 60.71| 42.86   | 37.5    | 60      | 34.48   | 42.78   |
| Ar     | 3.15    | 6.31  | 6.35    | 4.18     | 3.36    | 2.55    | 8.3  | 3.62    | 6.13    | 7.39    | 5.28    | 5.15    |
| Ho     | 0.51    | 0.9   | 0.85    | 0.51     | 0.69    | 0.26    | 0.74 | 0.16    | 0.71    | 0.74    | 0.74    | 0.62    |
| He     | 0.66    | 0.83  | 0.83    | 0.58     | 0.63    | 0.31    | 0.9  | 0.62    | 0.78    | 0.86    | 0.69    | 0.7     |
| HWE    | 0.004   | 0     | 0.6219  | 4.00E-04 | 0       | 0.4288  | 0    | 0.7631  | 0.0701  | 0.8293  | 0       |

| QH-W-9 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|--------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N      | 30      | 30    | 30      | 30       | 30      | 30      | 29   | 30      | 30      | 30      | 30      | 29.91   |
| A      | 3       | 13    | 13      | 10       | 7       | 3       | 13   | 5       | 13      | 15      | 11      | 106     |
| %      | 27.27   | 46.43 | 72.22   | 34.48    | 38.89   | 37.5    | 46.43| 35.71   | 40.62   | 60      | 37.93   | 43.41   |
| Ar     | 2.97    | 6.56  | 7.97    | 4.82     | 4.13    | 1.49    | 7.46 | 3.19    | 7.9     | 7       | 6.05    | 5.41    |
| Ho     | 0.43    | 0.77  | 0.87    | 0.5      | 0.5     | 0.03    | 0.67 | 0.07    | 0.87    | 0.77    | 0.67    | 0.56    |
| He     | 0.65    | 0.77  | 0.88    | 0.63     | 0.6     | 0.1     | 0.88 | 0.57    | 0.88    | 0.84    | 0.74    | 0.68    |
| HWE    | 0.001   | 6.00E-04 | 0.0057 | 0.0481  | 0.1084 | 0       | 0    | 0       | 0.3774  | 0.5325  | 0.0474  | 0       |

| QH-W-AUX3 | QS03797 | MSQ13 | QrZAG20 | QpZAG110 | QS00314 | QS01904 | MSQ4 | QS00562 | QrZAG87 | QpZAG15 | QM692M | Overall |
|-----------|---------|-------|---------|----------|---------|---------|------|---------|---------|---------|---------|---------|
| N         | 16      | 15    | 16      | 16       | 16      | 16      | 16   | 9       | 16      | 16      | 16      | 15.18   |
| A         | 3       | 7     | 12      | 7        | 6       | 2       | 9    | 6       | 5       | 9       | 7       | 73      |
| %         | 27.27   | 25    | 66.67   | 24.14    | 33.33   | 25      | 32.14| 42.86   | 15.62   | 36      | 24.14   | 32.02   |
| Ar        | 2.98    | 5.73  | 8.08    | 4.53     | 4.1     | 1.43    | 6.38 | 3.85    | 3.82    | 6.02    | 4.91    | 4.71    |
| Ho        | 0.62    | 0.93  | 1       | 0.67     | 0.62    | 0.06    | 0.62 | 0.12    | 0.89    | 0.81    | 0.75    | 0.65    |
| He        | 0.64    | 0.8   | 0.88    | 0.68     | 0.64    | 0.06    | 0.84 | 0.7     | 0.69    | 0.77    | 0.62    | 0.66    |
| HWE       | 0.0087  | 0.649 | 0.6092  | 0.7409   | 0.7252  | 0.8875  | 9.00E-04 | 0       | 0.8059  | 0.1004  | 0.9987  | 0.013   |
**Table S5.** Results from the full dataset. Percent alleles captured by each garden for each allele category, and the number of plants (num ind ex situ), number of maternal accessions sampled (num mat plants) and number of populations sampled (num pops), and number of populations from East and West regions.

| garden | global | Global common | Glob low frequency | Global rare | num ind ex situ | num mat plants | num pops | East pops | West pops |
|--------|--------|---------------|-------------------|------------|----------------|----------------|---------|-----------|-----------|
| A      | 8      | 35            | 5                 | 0          | 1              | 1              | 1       | 1         | 1         |
| B      | 11     | 41            | 15                | 0          | 2              | 2              | 2       | 2         | 2         |
| C      | 16     | 53            | 21                | 2          | 6              | 2              | 6       | 2         | 0         |
| D      | 21     | 69            | 30                | 4          | 9              | 3              | 3       | 3         | 0         |
| E      | 36     | 94            | 57                | 10         | 22             | 10             | 12      | 6         | 4         |
| F      | 37     | 92            | 61                | 9          | 43             | 8              | 14      | 7         | 1         |
| G      | 43     | 96            | 70                | 14         | 56             | 18             | 19      | 15        | 3         |
| H      | 65     | 100           | 89                | 42         | 151            | 20             | 45      | 15        | 5         |
| all    | 70     | 100           | 94                | 48         | 290            | 26             | 87      | 18        | 8         |

**Table S6.** Results from the reduced dataset. Percent alleles captured by each garden for each allele category, and the number of plants (num ind ex situ), number of maternal accessions sampled (num mat plants) and number of populations sampled (num pops), and number of populations from East and West regions.

| garden | global | Global common | Glob low frequency | Global rare | num ind ex situ | num mat plants | num pops | East pops | West pops |
|--------|--------|---------------|-------------------|------------|----------------|----------------|---------|-----------|-----------|
| A      | 10     | 35            | 5                 | 0          | 1              | 1              | 1       | 1         | 0         |
| B      | 14     | 41            | 15                | 0          | 2              | 2              | 2       | 2         | 0         |
| C      | 20     | 53            | 21                | 1          | 6              | 2              | 6       | 2         | 0         |
| D      | 26     | 69            | 30                | 3          | 9              | 3              | 3       | 3         | 0         |
| E      | 46     | 94            | 57                | 13         | 22             | 10             | 12      | 6         | 4         |
| F      | 47     | 92            | 61                | 13         | 43             | 8              | 14      | 7         | 1         |
| G      | 52     | 96            | 70                | 14         | 56             | 18             | 19      | 15        | 3         |
| H      | 76     | 100           | 89                | 51         | 151            | 20             | 45      | 15        | 5         |
| all    | 79     | 100           | 94                | 55         | 290            | 26             | 87      | 18        | 8         |
Methods S1. Modified DNA extraction protocol using the E.Z.N.A. Plant DNA DS kits (Omega Bio-tek, Inc., Norcross, GA, USA).

1) **Prep Work:**
   - ☐ Wipe down area/gloves with 10% bleach and 70% ethanol in between samples to avoid cross contamination
   - ☐ Turn on 65°C hot water bath & add bottle of elution buffer
   - ☐ Wash work area, wipe down centrifuges, FastPrep, as well as tweezers and spatulas with ETOH or 10% bleach
   - ☐ Label 2 tubes (1 x 1.5mL tube (For final storage), 1 x 2mL tube) and green spin column for each sample
   - ☐ Label 1 FastPrep tube for each sample. Add 6 stainless steel beads to each FastPrep tube
   - ☐ Get cooler of ice from basement

2) ☐ For every sample, measure **0.035 - 0.060 g** of leaf tissue and Transfer into FastPrep tube. Put FastPrep tube on ice. Tubes may also be placed in -20C freezer as they are filled to reduce thawing of leaves. Repeat for all samples. **Use forceps/scissors to hold leaf to avoid defrosting leaf with heat of hand. Make sure to clean forceps with 10% bleach between each sample.**

3) ☐ Place all tubes in the -80 °C freezer for at least 30 minutes. Usually 60 minutes is optimal. The tubes can remain in the freezer for longer than 30 minutes, even overnight if necessary.
   
   **In Time:**__________ **Out Time:**__________

4) ☐ After freezer incubation period, add 700µL **CSPL buffer** and 20µL **Proteinase K Solution**

5) ☐ Place the tubes in the FastPrep rotor, twist the rotor so the spokes cover the tubes, place the rotor back in the FastPrep machine, spin the rotor clockwise until it clicks into place, secure the rotor with the securing knob, ratchet the securing knob to ensure rotor is stable, and close the dome lid, run the auto-program “quickprep 2x30” which is two cycles of 6.0m/s for 30 seconds.

6) ☐ Incubate entire batch for 30 - 60 min. at 65°C, inverting tubes 2-3 times.
   
   **In Time:**__________ **Out Time:**__________

7) ☐ Spin for **3 minutes at 12,000 x g.**

8) ☐ Apply 550µL lysate to Homogenizer spin column (green) sitting in a 2ml collection tube
   - ☐ Centrifuge homogenizer columns for 1 min. at 12,000 x g

9) ☐ Throw away top green portion of tube, **keep lower portion.**
   - ☐ Transfer flow-through fraction (lower portion!) to labeled 2ml tube without disturbing the cell debris pellet

10) ☐ Add **5uL RNase A** and gently invert or lightly vortex. Let sit at room temperature for 5 minutes **In Time:**__________ **Out Time:**__________
11) □ Add 525uL RBB buffer and 525uL XP2 buffer. Vortex to mix thoroughly

12) ☐ ☐ Apply 750µl of this mixture, including any precipitate, onto HiBind mini spin column (blue) sitting in a 2ml collection tube (Can dump into spin column second time)
☐ ☐ Centrifuge for 1 min. at 12,000 x g
☐ ☐ Pour out lower portion, keep blue column
**Repeat step 12 **

13) □ Add 500uL HBC buffer

14) □ Centrifuge at 12,000 x g for 1 minute

15) □ Pour out lower portion, keep blue column

16) ☐ ☐ Add 700uL DNA Wash buffer
☐ ☐ Centrifuge for 1 min. at 12,000 x g
☐ ☐ Pour out lower portion, keep blue column
**Repeat step 16 **

17) □ Centrifuge column for 2 minutes at 12,000 x g

18) □ Transfer column into 1.5ml tube with caps ripped off

19) ☐ ☐ Pipet 55uL of preheated elution buffer onto column membrane.  
In Time:________ Out Time:________
☐ ☐ Incubate for 10 min. at room temperature In Time:________ Out Time:________
☐ ☐ Centrifuge for 1 min. @ 12,000 x g to elute (lower portion contains DNA!) Make sure to use “clean” centrifuge at end of lab bench
**Repeat step 19 **

20) □ Transfer flow through to a labeled 1.5mL tube for long term storage

Clean-Up:

21) □ Add DNA specimen information to DNA Database/Put paperwork in extractions binder
☐ Store DNA in -20 °C freezer temporarily or -80 °C freezer for long term
☐ Turn off hot water bath and clean all equipment (centrifuges, FastPrep, pipettes, etc.) with 10% bleach followed by water
☐ Clean beads in 10% bleach solution and rinse with distilled H2O.
☐ Quantify DNA & add this information to our DNA database
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