Supplementary Materials for

# Exploring the Concept of Lineage Diversity across North American Forests

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**This file includes:**

**Table S1.** Species added to the molecular phylogeny in this study, because they were present in the FIA dataset, but absent in the study of Ma *et al*. 2016. The position is represented in relation to the two most closely related species according to the cited reference.

| | Species | Position | Reference |
|---|---|---|---|
| 1 | ***Crataegus crus-galli*** | (*C. saligna*(***C. crus-galli*** , *C. mollis*)) | Potter et al. 2007 |
| 2 | ***Crataegus mollis*** | (*C. saligna*(*C. crus-galli* , ***C. mollis***)) | Potter et al. 2007 |
| 3 | ***Pinus arizonica*** | (***P. arizonica***, *P. ponderosa*)) | Gernandt et. al 2009 |
| 4 | ***Pinus remota*** | (*P.cembroides*, ***P. remota***)) | Gernandt et al. 2005 |
| 5 | ***Prosopis glandulosa*** | (*P. juliflora*(***P. glandulosa***, *P. velutina*)) | Bessega et al. 2006 |
| 6 | ***Prosopis velutina*** | (***P. juliflora***(***P.glandulosa***, ***P. velutina***)) | Bessega et al. 2006 |
| 7 | ***Quercus buckleyi*** | (*Q. rubra*, ***Q. buckleyii*** ) | Hipp et al. 2018 |
| 8 | ***Quercus margarettae*** | (***Q. margarettae***,*Q. similis*,*Q. stellata*) | Hipp et al. 2018 |
| 9 | ***Quercus minima*** | (***Q. minima***, *Q. virginiana*)) | Hipp et al. 2018 |
| 10 | ***Quercus pagoda*** | (*Q. falcata*, ***Q. pagoda***) | Hipp et al. 2018 |
| 11 | ***Quercus prinoides*** | (***Q. prinoides***, *Q. muehlenbergii*) | Hipp et al. 2018 |
| 12 | ***Quercus similis*** | (*Q. margarettae*,***Q. similis***,*Q. stellata*) | Hipp et al. 2018 |
| 13 | ***Salix xsepulcralis*** | (***S. xsepulcralis***(Section Longfoliaea)) | Lauron-Moreau et al. 2015 |

**Table S2.** Descriptions of the major evolutionary groups in the tree flora of the contiguous United States as determined by k-means clustering of over 13,000 tree assemblages based on their shared evolutionary history.

| Group | Geography | Climate | Top 5 Indicator species and other notable indicators | Comments |
|---|---|---|---|---|
| Wet West | Along the west coast and the west flank of the Sierra Nevada, scattered across Rockies | Broad distribution across rainfall regime, occurring at cooler temperatures | 1. *Pseudotsuga menziesii*, 2. *Thuja plicata*, 3. *Tsuga heterophylla*, 4. *Alnus rubra*, 5. *Acer macrophyllum*; *Abies* spp., *Arbutus menziesii* | The only group in west to occur above 1000 mm MAP, but also occurs in dry areas. Includes temperate rainforests of northwest, but also throughout Rockies. |
| High West | At northern latitudes, scattered through Rockies and east side of Cascade range | Cold and dry conditions | 1. *Pinus contorta*, 2. *Abies lasiocarpa*, 3. *Picea engelmannii*, 4. *Pinus flexilis*, 5. *Larix occidentalis* | Occurs under coldest conditions of any group. Found at lower elevations as latitude increases. Very few angiosperms. |
| Dry West | Scattered throughout the Rockies and on the east flank of the Sierra Nevada mountains. | From warm to cool conditions, occurring under drier conditions on average than Wet West group. | 1. *Pinus ponderosa*, 2. *Juniperus scopularum*, 3. *Juniperus occidentalis*, 4. *Juniperus deppeana*, 5. *Juniperus osteopsperma*; Many *Quercus* and *Pinus* spp., | *Quercus* spp. are the only non-gymnosperm species to regularly occur across this group. Predominantly species of open habitat. |
| Northern Plains | Found across the Great Plains, but more predominant further north, also extending into Midwest | Found under cooler conditions on average than Southern Plains group, and uniformly | 1. *Quercus macrocarpa*, 2. *Sapindus saponaria*, 3. *Gymnocladus dioica*, 4. *Ehretia anacua*, 5. *Crataegus crus-* | Least ‘cohesive’ group in terms of silhouette analysis and low indicator values for indicator species. Many of the indicators |

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| | states from Illinois to Ohio. | occurs at low elevations. | *galli* | favour calcareous soils, but also include floodplain spp. |
| Southern Plains | Texas and scattered areas of Arizona, New Mexico and more northern states | Occurs under the hottest and driest conditions of any group. | 1. *Prosopis glandulosa*, 2. *Juniperus ashei*, 3. *Juniperus pinchotii*, 4. *Juniperus coahuilensis*, 5. *Quercus buckleyi*; *Condalia hookeri*, *Vachellia farnesiana* | Notable presence of tree species that also occur in tropical arid regions. Many drought tolerant indicator species. |
| Northeast | Main evolutionary group in the Great Lakes region and the northeast from New York and upwards. | Occurs under coldest conditions of any of the eastern groups. Also drier on average than other eastern groups. | 1. *Betula papyrifera* 2. *Abies balsamea* 3. *Betula alleghaniensis* 4. *Pinus strobus* 5. *Fraxinus nigra*; *Thuja occidentalis*, *Picea* spp., *Populus* spp., *Tsuga canadensis* | A diverse mix of gymnosperm and angiosperm lineages. |
| Appalachian | Southern Appalachian mountains of North Carolina north to include much of Pennsylvania and scattered across the Midwest | Intermediate in rainfall and temperature between the Southeast and Northeast groups | 1. *Sassafras albidum*, 2. *Robinia psuedoacacia*, 3. *Quercus rubra*, 4. *Fraxinus Americana*, 5. *Carya ovata*; *Liriodendron tulipifera*, *Prunus serotina*, *Acer saccharinum*, *Castanea dentata* | Restricted to high elevations at more southern latitudes. Across elevations further north and interdigitated with other groups in Midwest. |
| Southeast | Found across the southeastern states inland of the Coastal Plain, but also extending westwards into Arkansas, Missouri and eastern Texas | This group is intermediate in precipitation and temperature between the Coastal Plain and Appalachian groups | 1. *Ulmus alata*, 2. *Juniperus virginiana*, 3. *Pinus echinata*, 4. *Quercus stellata*, 5. *Carya alba*; *Cornus florida*, *Cercis canadensis*, *Platanus occidentalis*, many *Quercus*, *Carya* and | The most geographically widespread of the eastern groups and representing more grid cells than any other group in the database. |

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| | | | *Celtis* spp. | |
| Coastal Plain | Along the Gulf Coast, including most of Florida and up the Atlantic Coast to New Jersey and Massachussetts | Uniformly at low elevations, occurs under warm and wet conditions | 1. *Pinus elliottii*, 2. *Persea borbonia*, 3. *Quercus laurifolia*, 4. *Taxodium distichum*, 5. *Quercus virginiana*; *Gordonia lasianthus*, *Sabal palmetto*, *Nyssa aquatica*, Many *Quercus* spp. | Warmest conditions of eastern groups. Including many species from tropical and early diverging angiosperm lineages. Many of the indicators like swampy conditions. |

**Figure S1.** Elbow plot showing the total sum of within group sum of squares versus the number of groups. Lower values mean more variation explained by groups.