The University of Arizona Campus Arboretum and Plant Biodiversity

The health of an ecological system can often be judged by its biological diversity and balance. Biodiversity can be measured in terms of the number of species present and biological balance results from the subsequent dynamics occurring among the interconnected organisms in the larger ecological context. Both diversity and biological balance are necessary for ecosystems to function and maintain stability (1, 2). Scientific studies generally point to a loss of resilience (the ability to recover from stress) with decline in the number of species in an ecological system (3). As such, biological diversity among species within a population is not only necessary for that population's resilience, but also for all the ecosystem services needed for environmental regulation and human security - think of the oxygen, air filtration, and climate regulation plants provide for the earth as well as the food, fiber, medicines and other commodities they provide for humans! Because they take in sunlight and create sugar, they are considered the primary producers of ecosystems and the foundation of food webs (4).

Since trees are among the largest and longest-lived species on earth, their role in supporting ecological resilience and human health is magnified (5). Consider, for example, their enhanced capacity to take up and lock away atmospheric carbon in their large woody bodies, or how they moderate climate in cities with the shade they cast! It is the size but also the health of trees that dictates the extent to which they can support planetary and human needs.

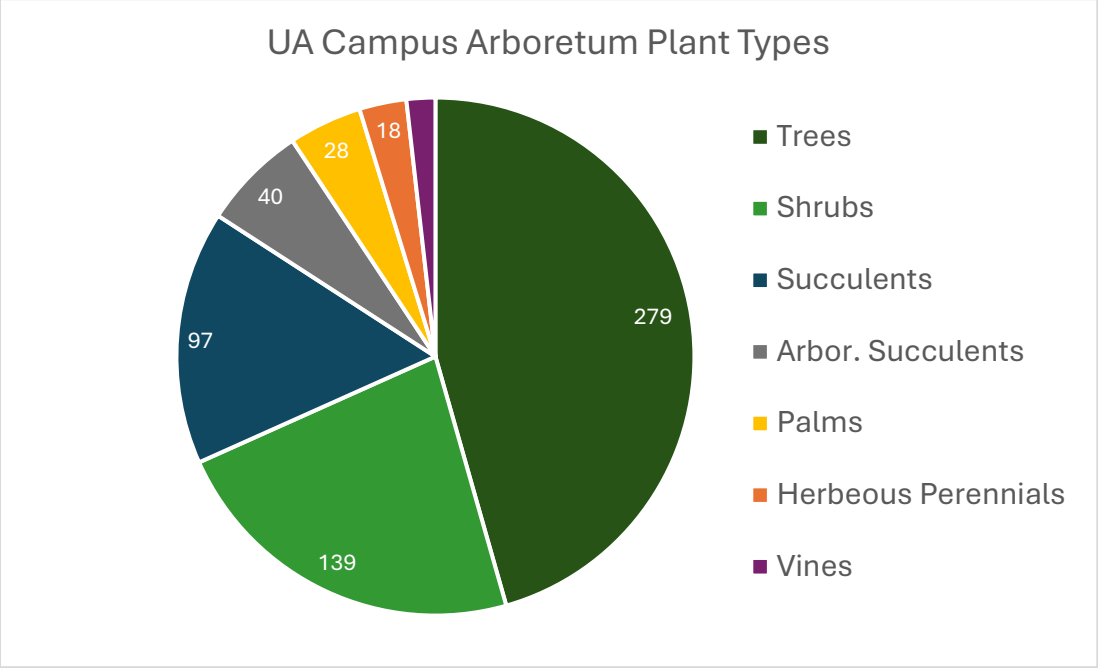
Unfortunately, both biological diversity and balance have decreased in the US as a result of changes in land use, land and water management, discharge of environmental pollutants, and through the introduction of invasive species (4). It is trees in cities, however, the urban forests of the world, which experience the greatest impacts of both human activity and environmental alteration. It is in cities that trees experience the greatest challenges but it is also in cities where healthy, diverse populations of trees have the greatest potential to counter both the human and environmental impacts of urbanization.

Arboreta, living tree collections, and other public gardens provide tremendous opportunities for building and protecting biodiversity through *in situ* conservation. By consciously collecting plants, public gardens serve as a sanctuary or a "library" of living specimens providing a reservoir of genetic diversity, stored safely away from any threats present in the species' natural habitats.

The University of Arizona Campus Arboretum is located in the American southwest, in Tucson, Arizona, which is one of the fastest warming US cities. Within the roughly 400 acres of its main campus hundreds of tree and shrub species from arid climates on every continent on earth have been collected over the University's more than 125-year history (6). Here, the campus itself was used as an ideal proving ground and living laboratory for evaluating plant species tolerant to the heat, drought, high light, poor soils, and freezing temperatures experienced here. While this living collection is an historical part of the University's land grant commitment, the Campus Arboretum remains committed and understands the relevance of urban trees in the modern era of climate changes, population growth and urbanization. Since the establishment of the University of Arizona Campus Arboretum in 2002, the collection has grown and increased in diversity and purpose around our goals of preserving historic specimens, curating and enhancing this extensive collection in support of research, education and outreach programs focused on the value of trees in urban deserts. Central to these goals lies a need to enhance the plant diversity within the UA tree collection. Here, diversity statistics are presented for the trees, shrubs, palms, arborescent succulents and herbaceous perennial plants included in the 2024 inventory.

19,123 : Total Accessions
90: Diversity of Botanical Families
304: Diversity of Botanical Genera
611: Diversity of Plant Species
807: Diversity of Plant Species including documented cultivars

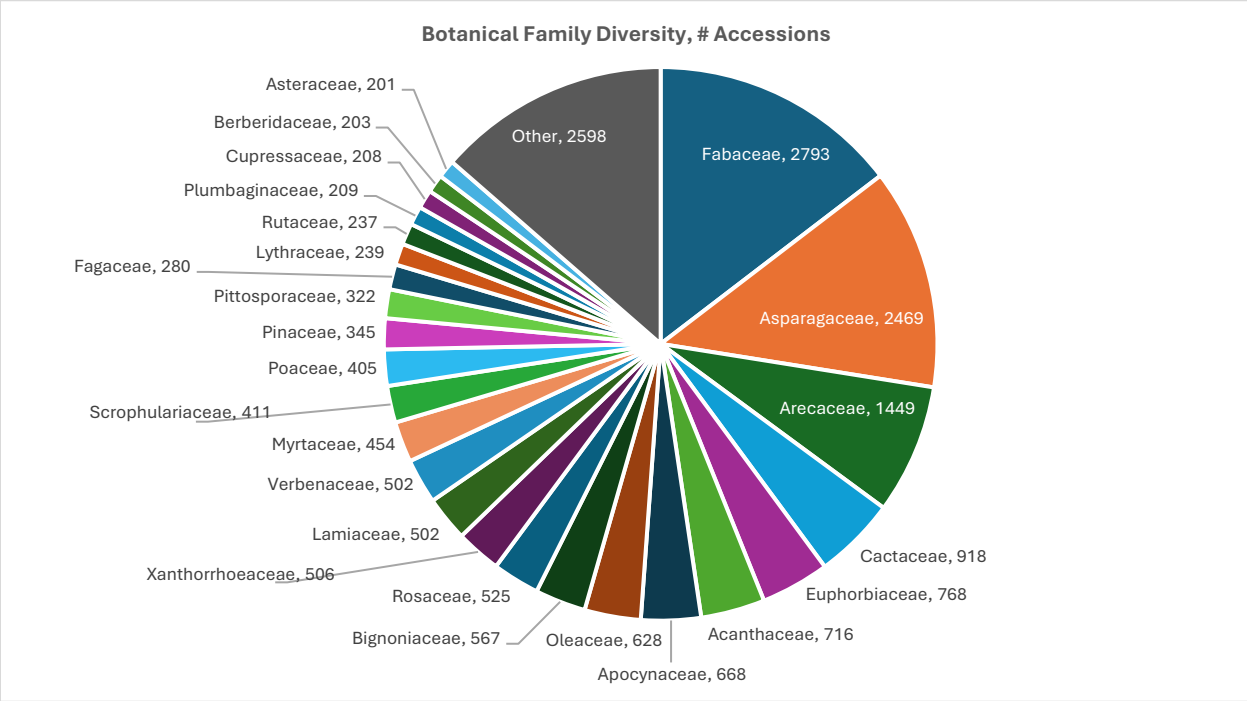
Plant Type	Species, #	Taxa, % of Total
Trees	279	45.59
Shrubs	139	22.71
Succulents	97	15.85
Arb succ	40	6.54
Palms	28	4.58
Herbs/Others	18	2.94
Vines	11	1.80



Top 25 Most Abundant Families in 2024:

Family	Accessions Within Family, #	Accessions Within Family, % of Total
Fabaceae	2793	14.61
Asparagaceae	2469	12.91
Arecaceae	1449	7.58
Cactaceae	918	4.80
Euphorbiaceae	768	4.02
Acanthaceae	716	3.74
Apocynaceae	668	3.49
Oleaceae	628	3.28
Bignoniaceae	567	2.97
Rosaceae	525	2.75
Xanthorrhoeaceae	506	2.65
Lamiaceae	502	2.63
Verbenaceae	502	2.63
Myrtaceae	454	2.37

Scrophulariaceae	411	2.15
Poaceae	405	2.12
Pinaceae	345	1.80
Pittosporaceae	322	1.68
Fagaceae	280	1.46
Lythraceae	239	1.25
Rutaceae	237	1.24
Plumbaginaceae	209	1.09
Cupressaceae	208	1.09
Berberidaceae	203	1.06
Asteraceae	201	1.05



Top 25 Most Abundant Genera in 2024:

Family	*Genus*	Accessions/Genus, #	Genus Accessions, % of Total
Asparagaceae	*Hesperaloe*	808	4.225
Euphorbiaceae	*Euphorbia*	760	3.974
Fabaceae	*Prosopis*	758	3.964
Arecaceae	*Washingtonia*	757	3.959
Asparagaceae	*Agave*	668	3.493
Asphodelaceae	*Aloe*	623	3.258
Verbenaceae	*Lantana*	502	2.625
Apocynaceae	*Nerium*	486	2.541
Fabaceae	*Acacia*	411	2.149
Acanthaceae	*Justicia*	374	1.956
Fabaceae	*Parkinsonia*	362	1.893
Pinaceae	*Pinus*	342	1.788

Fabaceae	*Calliandra*	335	1.752
Poaceae	*Muhlenbergia*	334	1.747
Scrophulariaceae	*Leucophyllum*	321	1.679
Pittosporaceae	*Pittosporum*	321	1.679
Cactaceae	*Echinocactus*	281	1.469
Fagaceae	*Quercus*	280	1.464
Asparagaceae	*Yucca*	279	1.459
Bignoniaceae	*Tecoma*	277	1.449
Arecaceae	*Phoenix*	275	1.438
Arecaceae	*Chamaerops*	264	1.381
Oleaceae	*Fraxinus*	264	1.381
Asparagaceae	*Dasylirion*	262	1.370
Oleaceae	*Olea*	255	1.333

Top 25 Most Abundant Species in 2024:

Genus	*SpecificEpithet*	Accessions/Species, #	Species, % of Total Accessions	Plant Type
Hesperaloe	*parviflora*	682	3.5664	Succulent
Washingtonia	*robusta*	531	2.7768	Palm
Aloe	*vera*	493	2.5780	Succulent
Nerium	*oleander*	486	2.5414	Shrub
Euphorbia	*lomelii*	441	2.3061	Succulent
Muhlenbergia	*rigens*	331	1.7309	Shrub
Pittosporum	*tobira*	317	1.6577	Shrub
Justicia	*spicigera*	307	1.6054	Shrub
Prosopis	*velutina*	281	1.4694	Tree
Chamaerops	*humilis*	264	1.3805	Palm
Olea	*europaea*	255	1.3335	Tree
Chilopsis	*linearis*	254	1.3282	Tree
Lantana	*montevidensis*	250	1.3073	Shrub
Echinocactus	*grusonii*	240	1.2550	Succulent
Fraxinus	*velutina*	238	1.2446	Tree
Dasylirion	*wheeleri*	228	1.1923	Arborescent Succulent
Washingtonia	*filifera*	226	1.1818	Palm
Calliandra	*californica*	225	1.1766	Shrub
Rhaphiolepis	*indica*	215	1.1243	Shrub
Rosmarinus	*officinalis*	212	1.1086	Shrub
Pinus	*halepensis*	209	1.0929	Tree
Lantana	*camara*	201	1.0511	Shrub
Pachystachys	*spicata*	201	1.0511	Shrub
Nandina	*domestica*	195	1.0197	Shrub
Plumbago	*zeylanica*	190	0.9936	Shrub

Top 25 Most Abundant Tree Species in 2024:

Genus	*SpecificEpithet*	# Accessions	Species % of Total Accessions
Prosopis	*velutina*	281	1.4694
Olea	*europaea*	255	1.3335
Chilopsis	*linearis*	254	1.3282
Fraxinus	*velutina*	238	1.2446
Pinus	*halepensis*	209	1.0929
Lagerstroemia	*indica*	188	0.9831
Quercus	*virginiana*	188	0.9831
Acacia	*farnesiana*	186	0.9727
Parkinsonia	*X hybrids*	170	0.8890
Citrus	*x aurantium*	157	0.8210
Xylosma	*longifolia*	149	0.7792
Parkinsonia	*florida*	140	0.7321
Prosopis	*alba*	118	0.6171
Dermatophyllum	*secundiflorum*	113	0.5909
Prosopis	*glandulosa*	103	0.5386
Cupressus	*sempervirens*	99	0.5177
Pistacia	*chinensis*	86	0.4497
Prosopis	*chilensis*	81	0.4236
Eucalyptus	*microtheca*	78	0.4079
Celtis	*laevigata*	71	0.3713
Pinus	*brutia*	71	0.3713

References

1. Chapin III, F.S., B.H. Walker, R.J. Hobbs, D.U. Hooper, J.H. Lawton, O.E. Sala, and D. Tilman. 1997. Biotic control over the functioning of ecosystems. Science 277(5325):500-504.
2. Wilson, E.O. 1992. The diversity of life. Cambridge, MA: Belknap Press.
3. McCann, K.S. 2000. The diversity-stability debate. Nature 405(11):228-233.
4. Diversity and Biological Balance EPA Report https://www.epa.gov/report-environment/diversity-and-biological-balance Retrieved Aug. 4, 2024.
5. Gilhen-Baker, M., Roviello, V., Beresford-Kroeger, D. *et al.* Old growth forests and large old trees as critical organisms connecting ecosystems and human health. A review. *Environ Chem Lett* **20**, 1529–1538 (2022). https://doi.org/10.1007/s10311-021-01372-y
6. The University of Arizona Campus Arboretum Mission https://arboretum.arizona.edu/mission