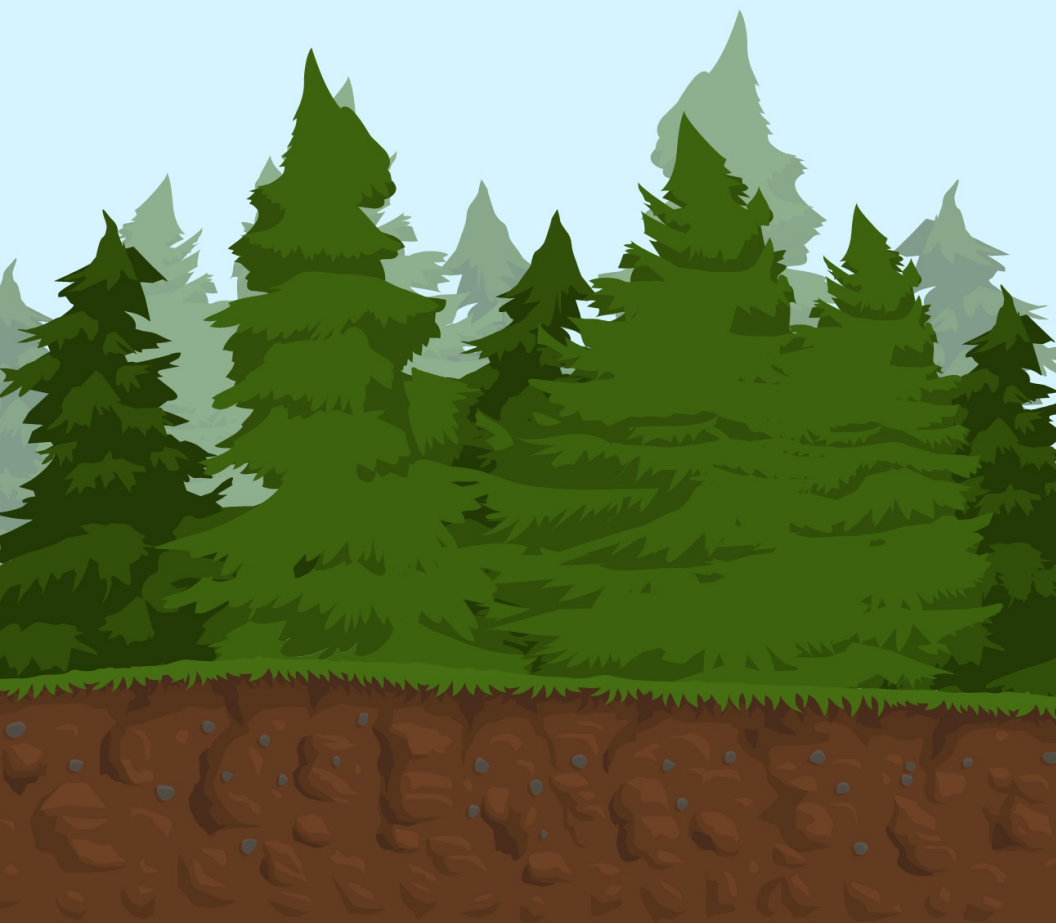




Center for Research Data
& Digital Scholarship

BUFFALIZATION DATA VISUALIZATION CHALLENGE



What is CRDDS?

Established in 2017, the Center for Research Data and Digital Scholarship is a partnership between Research Computing and the University Libraries. We are a collaborative team of data and information professionals, scholars, and educators with expertise in data-intensive scholarship and teaching. Our goal is to serve as an interdisciplinary hub and resource on campus that empowers everyone as they navigate the Research Lifecycle, through workshops and seminars, consultations, certificate programs, and collaborative opportunities.

Visit our website to find out more!

<https://www.colorado.edu/crdds/>



2025 Buffalization Data Visualization Challenge Winners

Undergraduate Students - Individual

Max Gong
Benjamin Herlinger
Annika Polavarapu

Graduate Students - Individual

Ben Emery
Clair Huffine

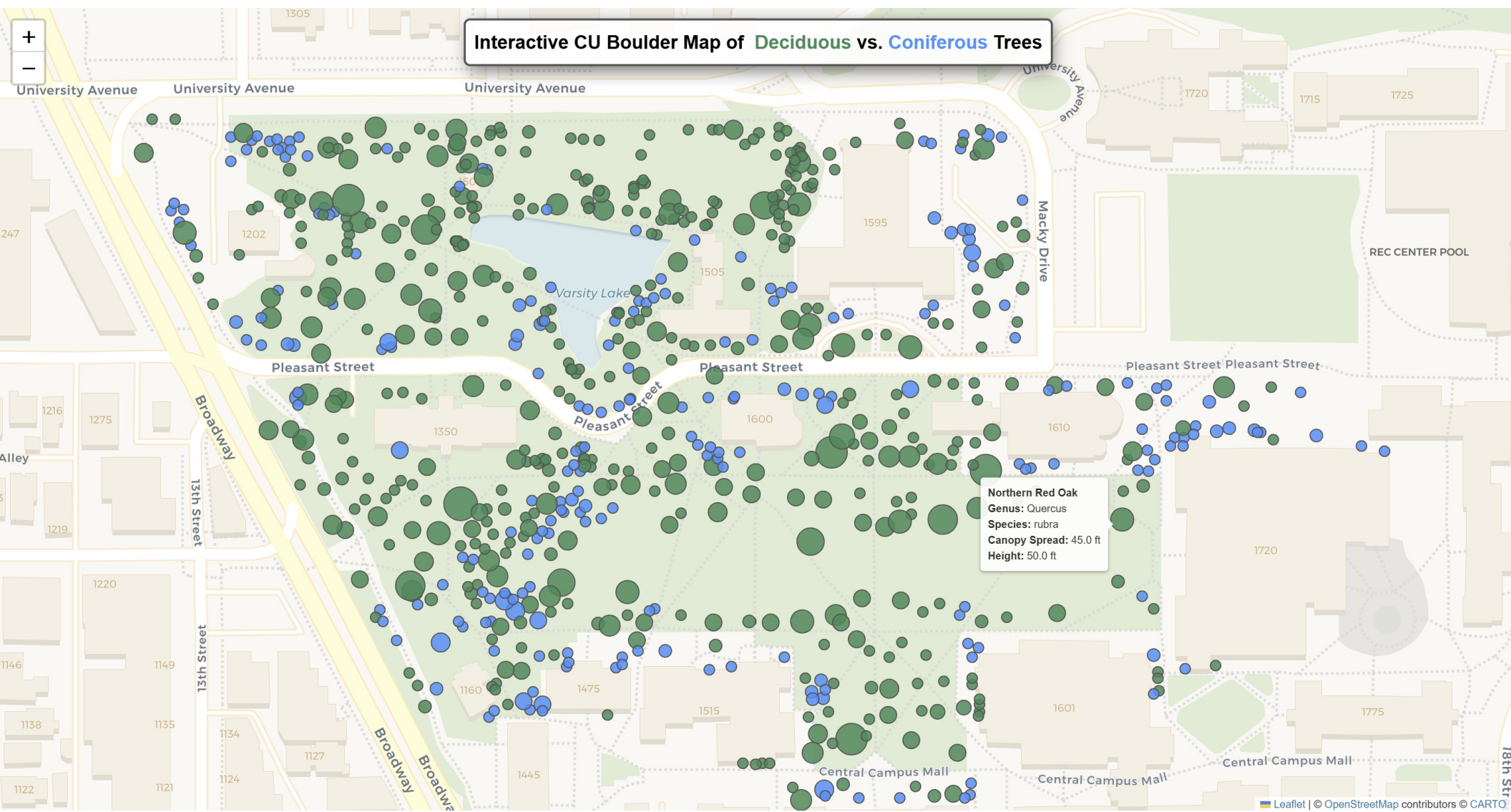
Data Science Students

*(Sponsored by the
Data Science Student Association)*

Trishala Thakur
Ishani Mody

Graduate Students - Team

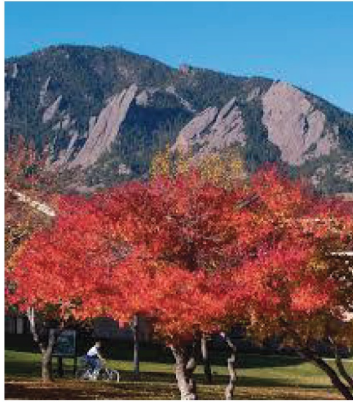
Kanishka Ghodke, Vedant Dixit,
and Ritvik Panwar



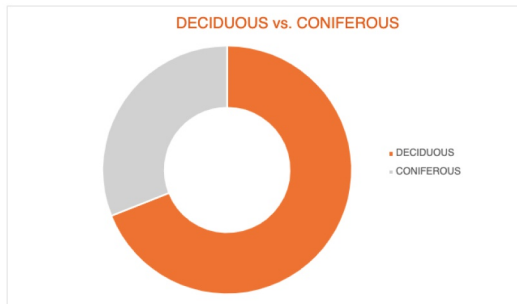
Undergraduate Students - Individual: Max Gong

CU Boulder's Trees

CU Boulder's Campus is 786 Acres, backdropped by the beautiful flations. One thing that is not noticed enough is the campus trees!

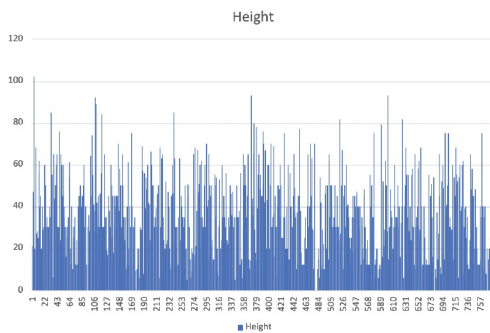


What's important to know is that the Campus trees are all different from each other.

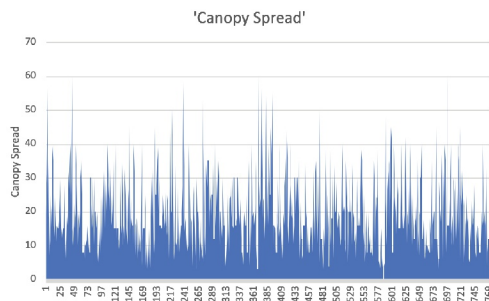


Looking at the chart to the right, most trees in camps are deciduous. This also means that CU Boulder's campus gets yellow and red in the fall, with leaves eventually falling to the ground!

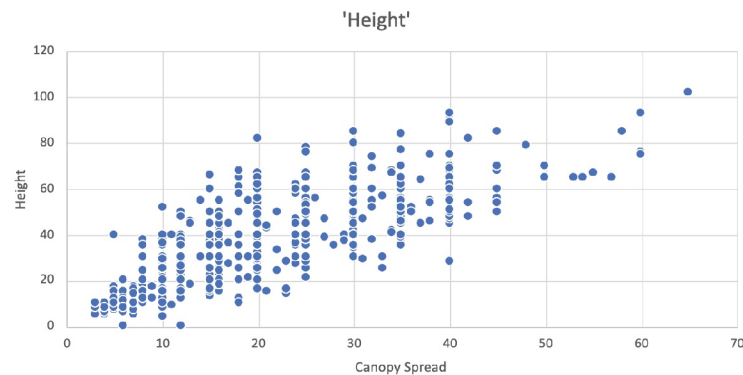
CU Boulder's trees all range in size, from the oldest and largest trees being over 100 to the youngest being planted even yesterday!



Looking at the charts to the right, Boulder's tree heights range, the Y-axis representing canopy spread, while the X-axis is the code number for different trees.



Looking at the scatterplot below, there seems to be a correlation that as tree height gets bigger, so does the canopy spread.



Forest of Knowledge: CU Boulder Campus Trees

Q Search genera...

Sort by Population

Juniperus

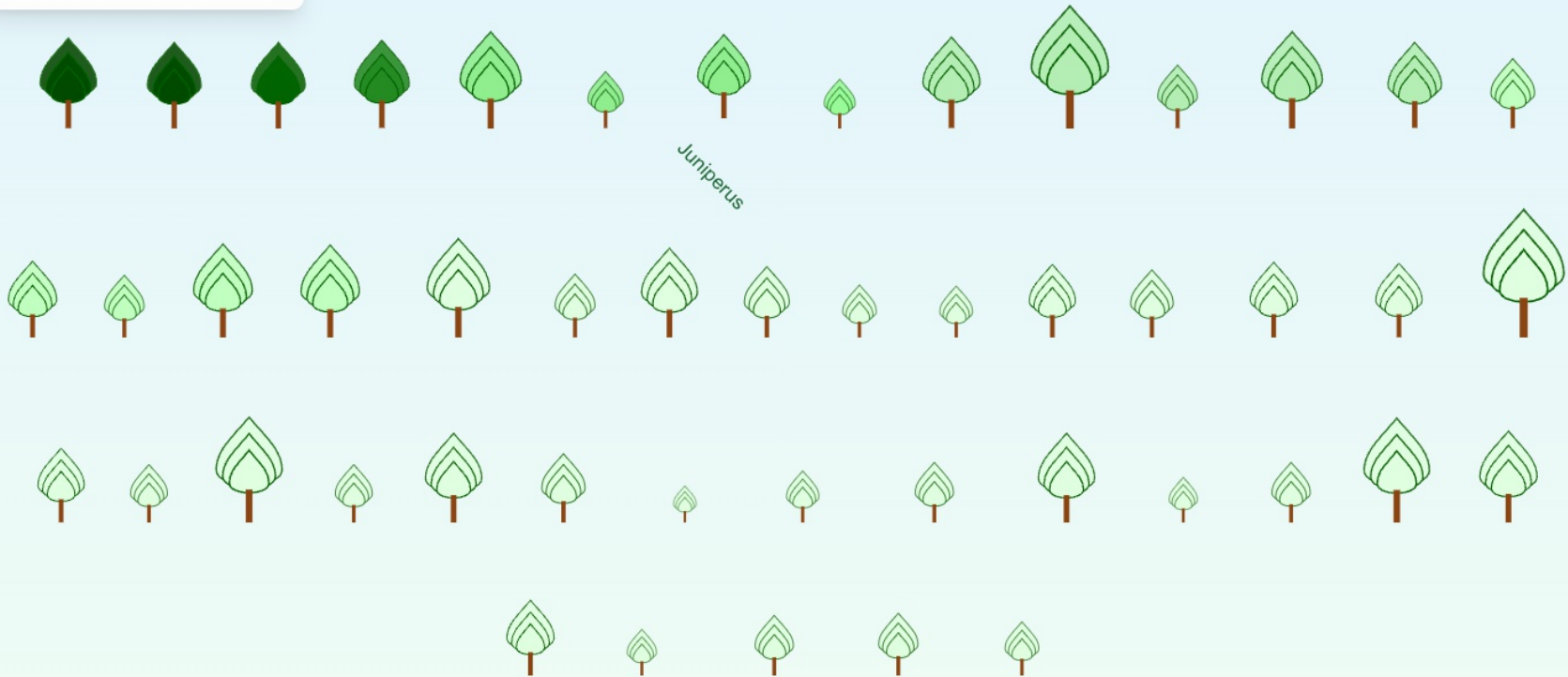
Common Name: Juniper

Population: 40 trees

Average Height: 30.4 ft

Species Diversity: 1 varieties

Average Spread: 14.7 ft



Undergraduate Students - Individual: Annika Polavarapu

A visualization of our campus canopy. Hover over trees to explore. Each tree represents a genus, with size reflecting average height and color intensity showing population.

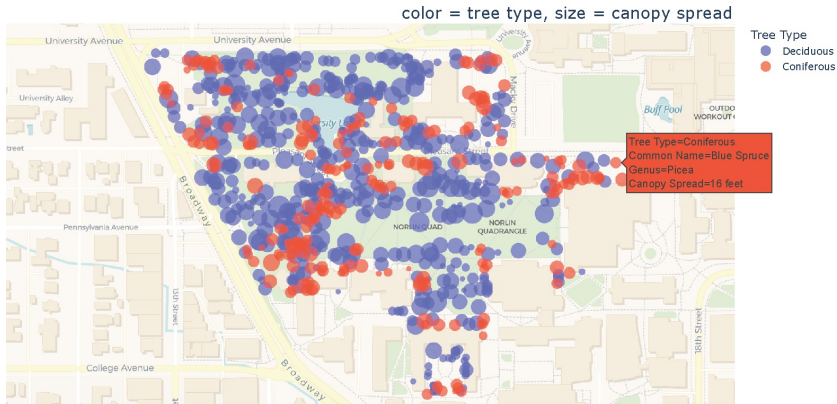
cu/Trees: a Campus Ecosystem in Data

by Benjamín Freixas Emery



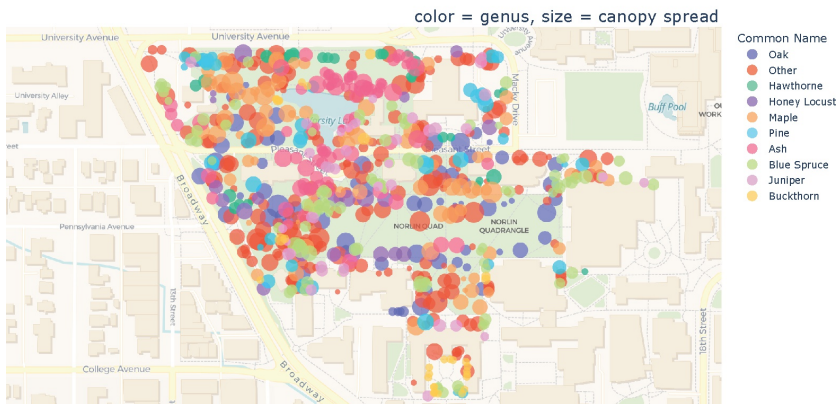
Trees. We sure got a lot of 'em at the University of Colorado. But what else do we know about them? And what does that mean for me, the student who just wants to lean on a trunk with a good book? We've got some visuals to help you out with that. Let's start with some maps!

Note: This is a static copy of an article that was originally interactive. To experience the interactive version, [click here](#) or navigate to www.sendfor.science/cu-trees.html in a web browser.



© CARTO, © OpenStreetMap contributors

Note that we've colored the dots by major tree type, and sized them according to canopy spread. Seems that it's mostly deciduous trees here, and in the instances where we find a prickly pine or friendly fir, it's usually in a cluster of other conifers. Let's see what we can learn by getting a little more detailed with it.



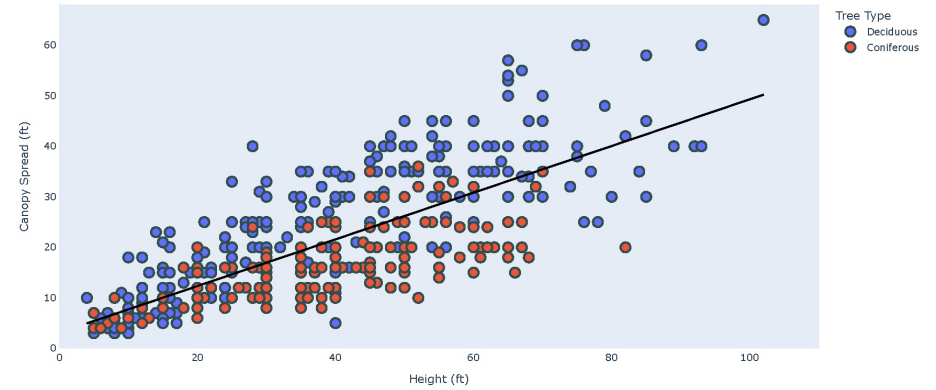
© CARTO, © OpenStreetMap contributors

For this one, all the colors indicate a unique genus except for red, which includes all the least frequent genera combined into one megacategory. While perusing, you may notice some geographical patterns, like the cluster of White Ash trees on the north side of Varsity Lake. A few paces west from there and you'll find yourself surrounded by Maples for that much needed glucose

replenishment. Similarly, whiskey enthusiasts can find Juniper at an exterior corner of pretty much any academic building. Neat!

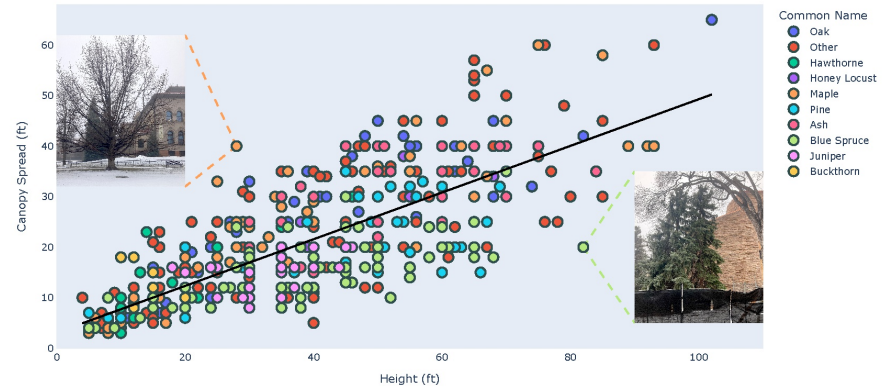
Okay, that's fun and all, but this is data viz, not cartography. Time to look at some geometric scaling? Perchance.

Surprise! Deciduous trees tend to be wider, and conifers are often skinnier, spread by height, colored by tree type



Always nice to see a linear regression line that almost perfectly partitions the two classifications in your data. But I bet we can do better. I'm gonna go investigate the two most extreme residuals in this plot, and get back to you.

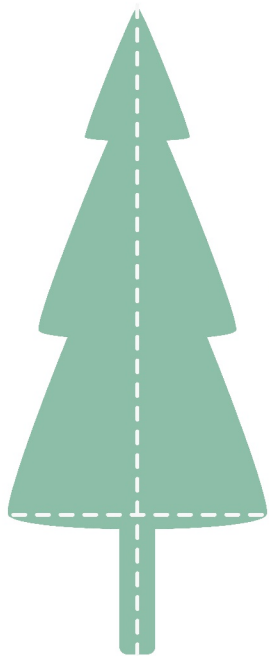
Separating by genus further explains variation. spread by height, colored by genus



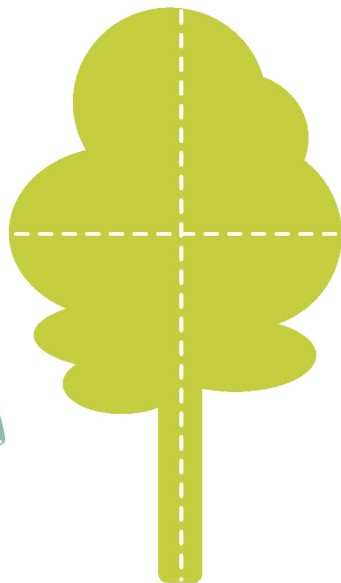
And there you have it - the Maples and Oaks sit on the opposite side of the fence from the Spruces, with the remaining categories sprinkling all over. And the most extreme trees in both directions both look nice (in each their own unique way). That's all I've got time for today. I hope you take some time soon to go outside and look up at some friendly giants. I'll leaf you to it! 🌳

How Evergreen is CU Boulder's Historic Campus?

A comparison of **coniferous** and **deciduous** trees on the University of Colorado Boulder's historic campus district

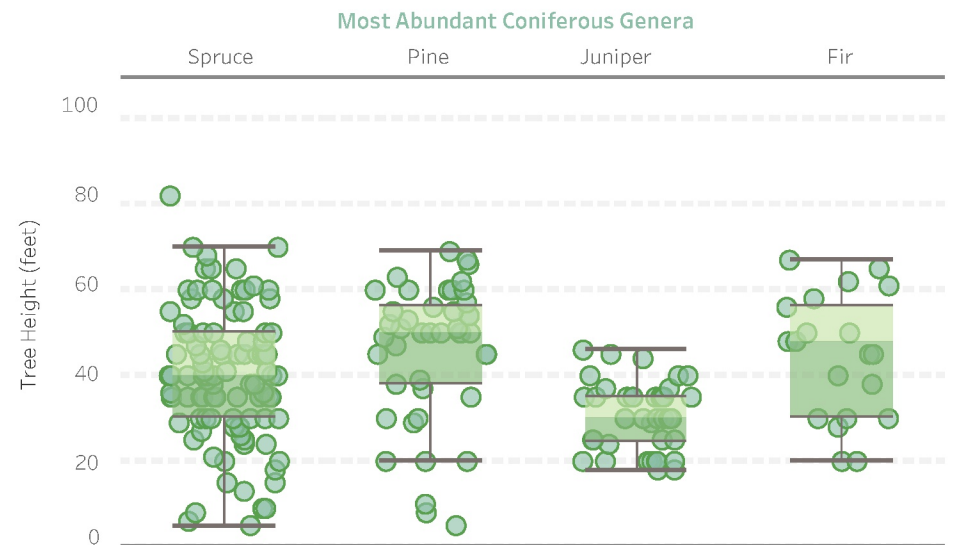
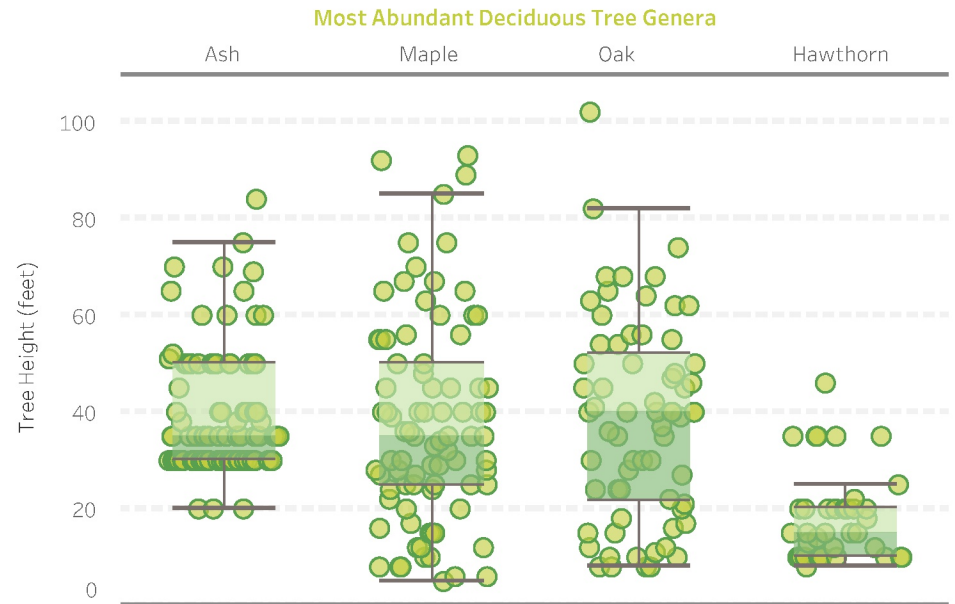


38 x 16ft



33 x 21ft

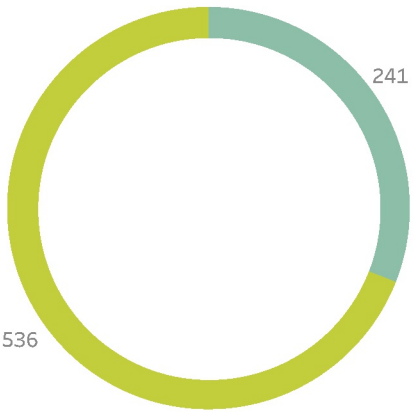
Graduate Students - Individual: Clair Huffine



To have equivalent **coniferous** and **deciduous** coverage on CU Boulder's historic campus, we need to plant **446 average sized coniferous trees**.

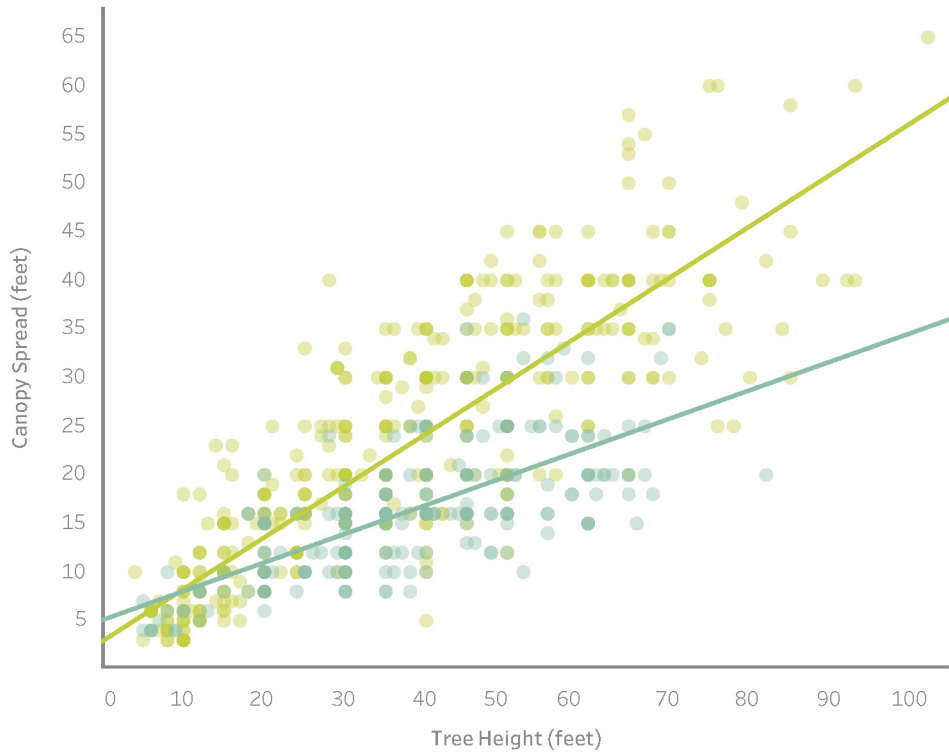
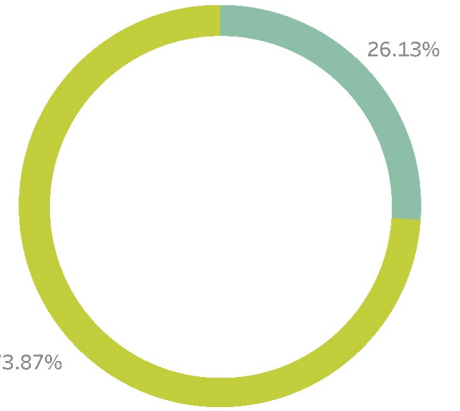
Where would YOU plant them?

Find more at clairhuffine.com

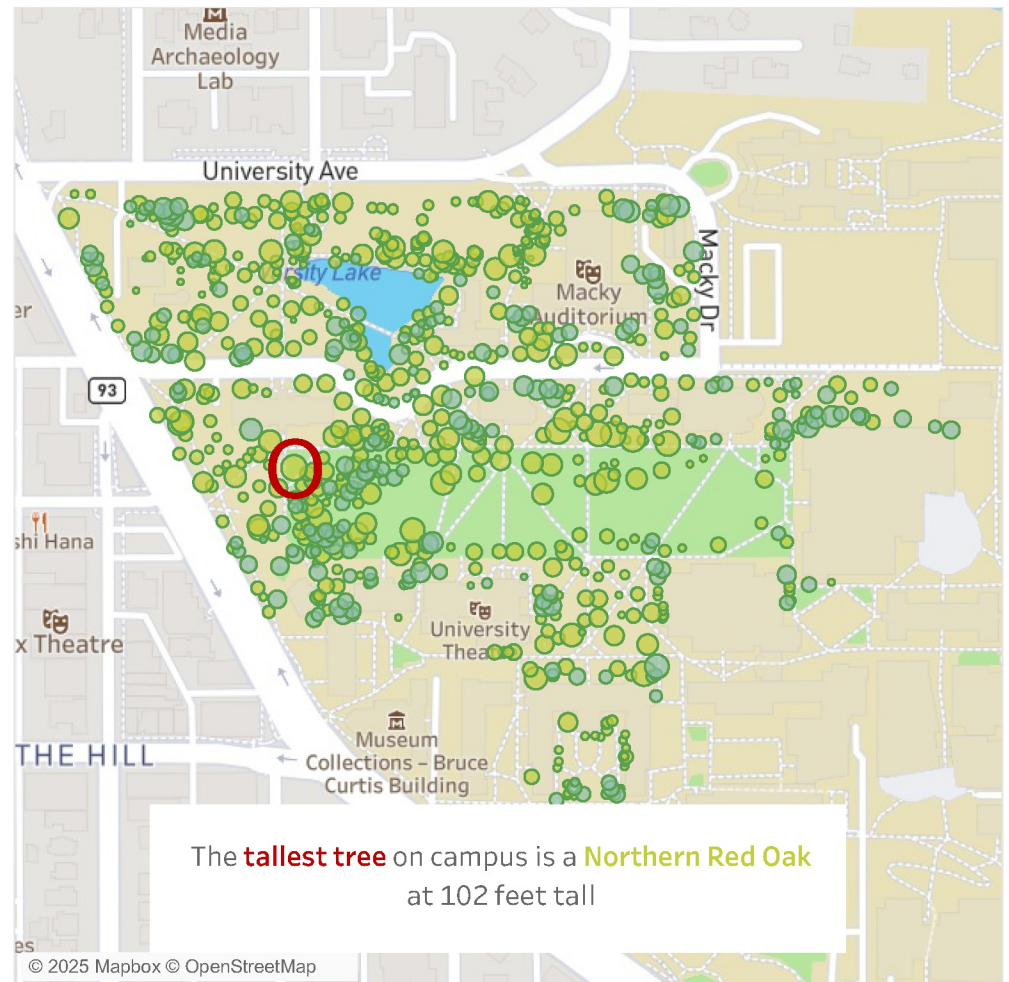


Coniferous trees make up **31%** of the **777 trees** on campus

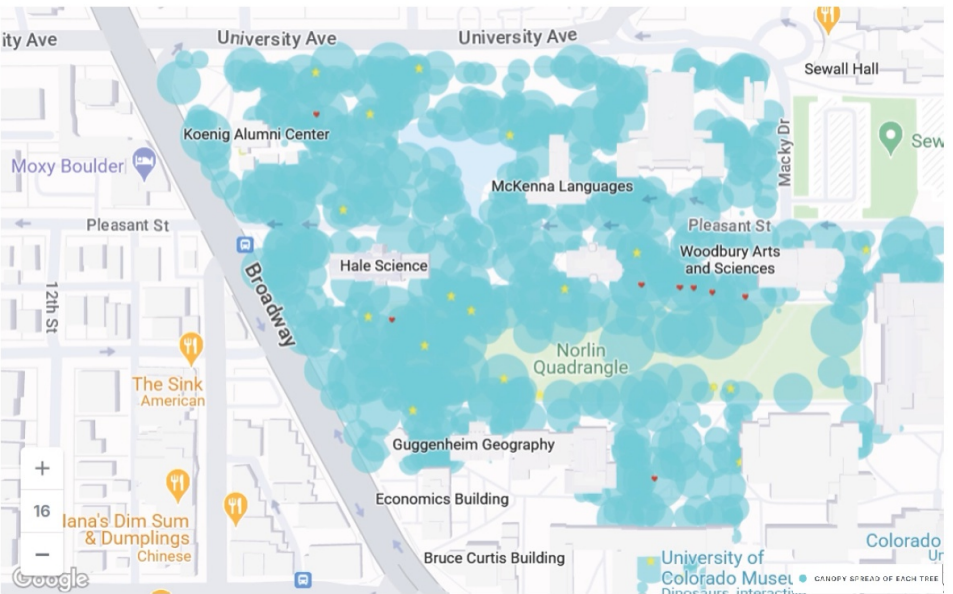
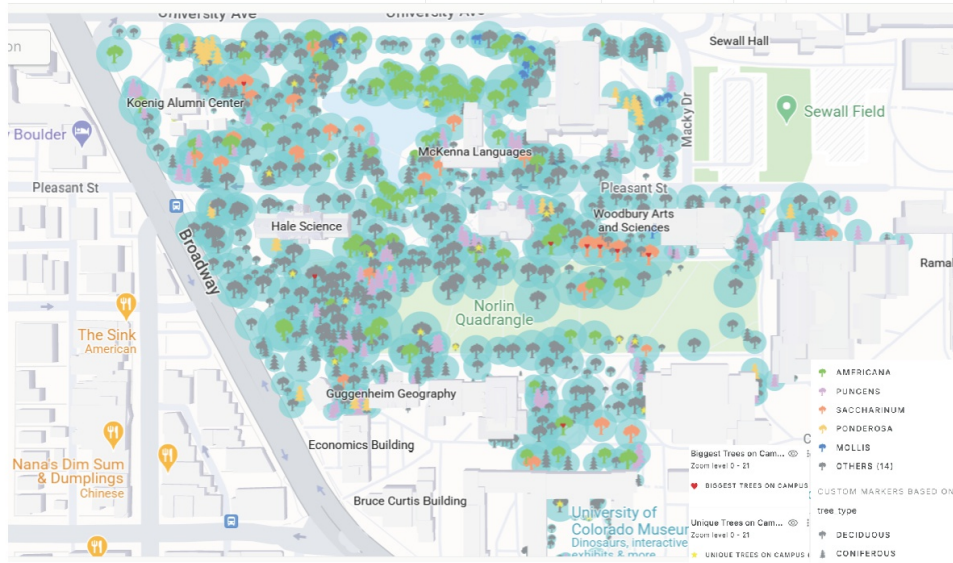
Coniferous Trees contribute only **26%** of the **total canopy cover**



For every foot of height:
Coniferous trees have **one third foot** of canopy spread
Deciduous trees have **half a foot** of canopy spread



CU BOULDER TREES



Total Trees: 777

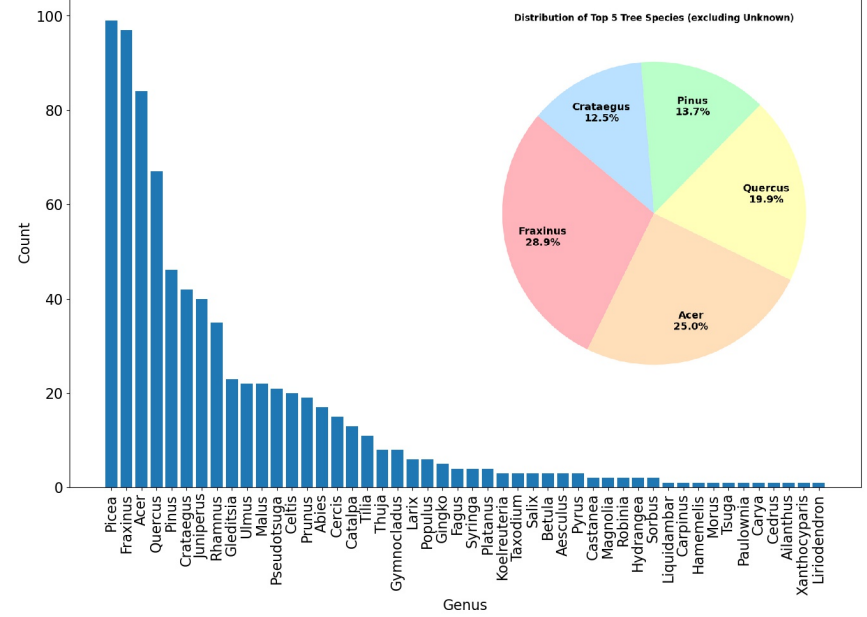
- (Deciduous Tree, 536)
- (canopy size: large circle = large canopy)
- (Marks trees with only one occurrence)
- (Coniferous Tree, 241)
- (Icon Size (taller tree = larger icon))
- (Marks exceptionally tall trees)

Tallest Tree 102 unit **Largest Canopy Cover** 65 unit **Total Canopy Cover:** 300,000 (sq units)

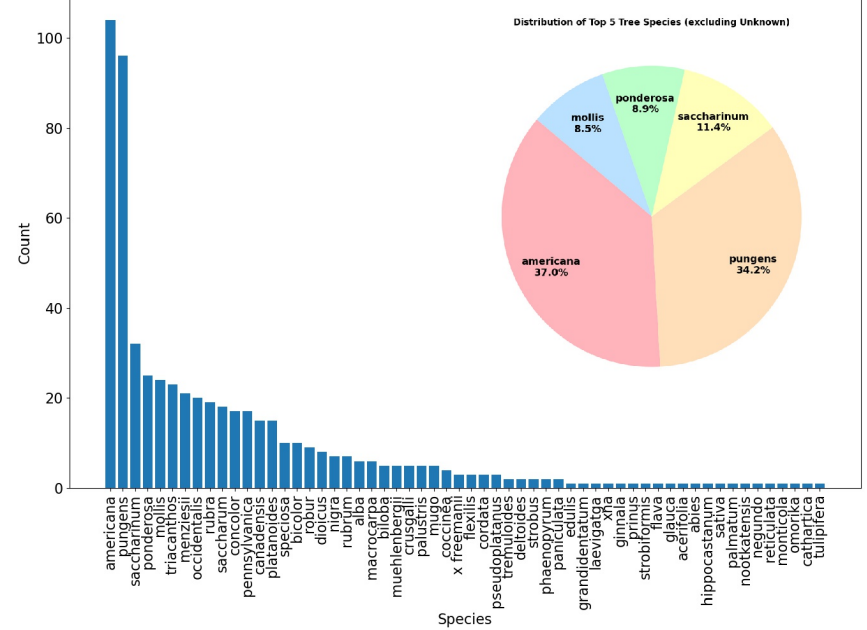
Colors (Represent top 5 common species)

CU BOULDER TREES

Count of Trees by Genus



Count of Trees by Species



The Living Canopy of Norlin Quad

Exploring the biodiversity of CU Boulder's 777 Trees

Ishani Mody
MS in Data Science Department, CU
Boulder

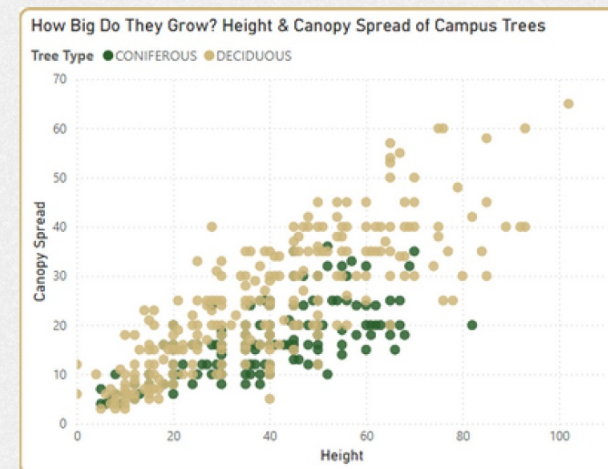
Data Science Students - Individual: Ishani Mody

Telling a Story Through Trees

This project was created for the CU Boulder Buffalization Data Visualization Challenge, using a dataset of 777 trees located in Norlin Quad. The dataset included detailed attributes like tree type, species, height, canopy spread, and exact location – all sourced from a larger public tree inventory maintained by CU's CAD/GIS Office, which catalogs over 5,000 trees on campus.

I chose this project as a way to explore how data can tell compelling stories about our environment – and to grow my skills in Power BI. As I dug deeper into the data, patterns began to emerge: the Blue Spruce is the most common tree, while the Northern Red Oak not only stands tallest at 102 ft, but also has the widest canopy at 65 ft.

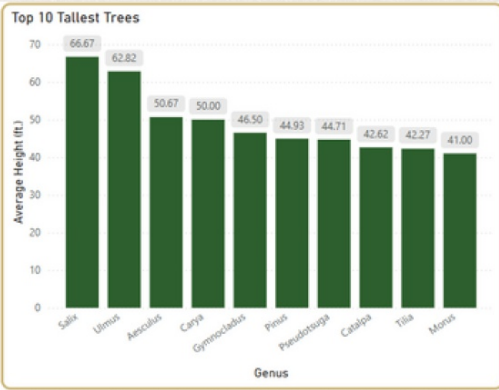
One key insight came from visualizing the relationship between height and canopy – a clear positive correlation that reflects how tree structure scales with age and species.



Taller trees tend to have wider canopies, as seen in the trend across both coniferous and deciduous species.

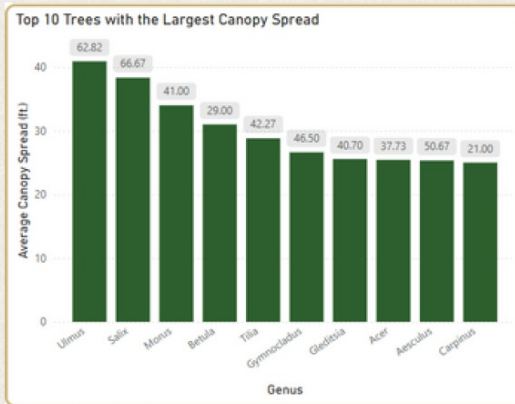


Biodiversity at a Glance



Salix (Willow) and Ulmus (Elm) trees soar above the rest, with average heights over 60 ft. The Northern Red Oak is among the tallest individual specimens on campus.

Ulmus and Salix trees also lead in canopy spread, reinforcing their dominance in both height and width. Wider canopies often indicate older, well-established trees.



Looking Up: Reflections from the Canopy

Through this project, I gained more than just technical experience – I developed a deeper appreciation for the living systems around us. What began as a data visualization exercise became a reminder that even ordinary spaces like Norlin Quad hold extraordinary stories.

Creating this dashboard in Power BI helped me refine my data storytelling skills while connecting with the environment in a new way. It also reminded me that data can make the invisible visible – surfacing patterns, celebrating diversity, and encouraging mindful stewardship of our surroundings.

I hope this visualization inspires others to pause, look up, and take notice of the quiet giants that surround them.

In every walk with nature one receives far more than he seeks. – John Muir



The Blue Spruce stands out as the most common tree on CU Boulder's campus, followed by White Ash and Silver Maple. Diversity spans dozens of species.



Scan this to access the entire Dashboard



The Green Legacy of CU Boulder: Mapping, Diversity & Rare Trees

CU Boulder's campus is home to 777 trees of diverse species.

This dashboard visualizes tree locations, their height, rarity, and biodiversity. Explore the map and filters to gain insights into the campus greenery!

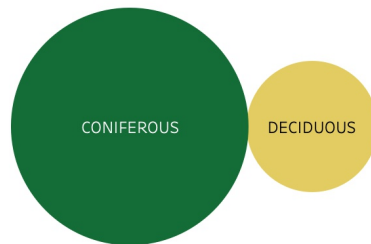
Trees Distribution



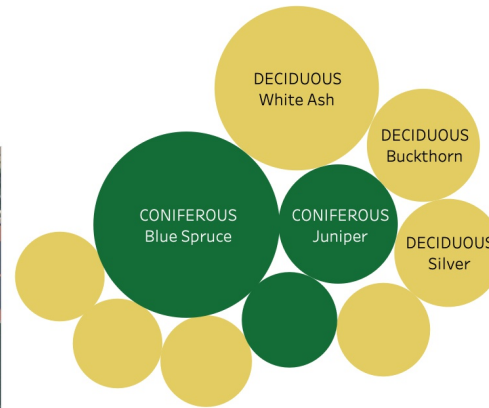
Rarest Trees

Common Name	Count
American Chestnut	1
American Sycamore	1
Amur Maple	1
Big Tooth Maple	1
Black Willow	1
Boxelder Maple	1
Buckeye	1
Cedar	1
Chestnut Oak	1
Colorado Blue Spruce	1
Colorado Pinyon Pine	1
Douglas fir	1
Empress Tree	1

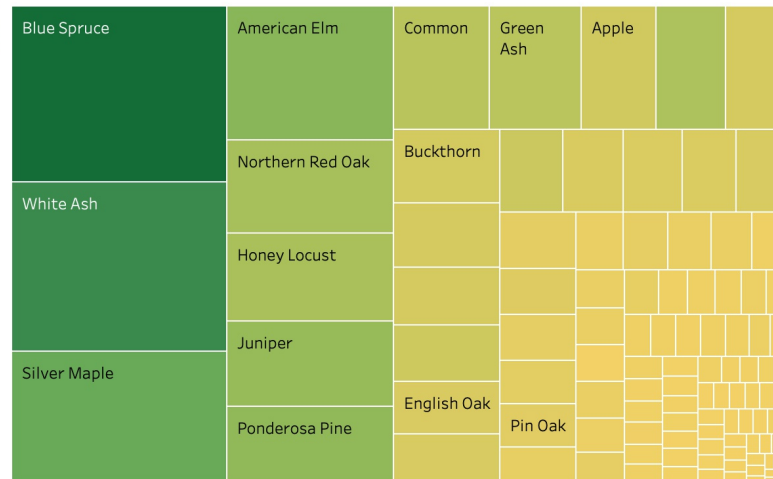
Regional Diversity



Most Common Trees on Campus



Tree Height & Canopy Analysis



Tree Type
 CONIFEROUS
 DECIDUOUS

Common Name
 American Chestnut
 American Elm
 American Linden
 American plane tree
 American Sycamore
 Amur Maple
 Apple
 Arborvitae
 Ash
 Aspen
 Austrian Pine
 Bald Cypress
 Beech
 Big Tooth Maple
 Birch
 Black Willow
 Blue Spruce

Height
 • 0
 • 1,000
 • 2,000
 • 3,000
 • 3,864

Tree Type
 CONIFEROUS
 DECIDUOUS

Canopy Spread (ft)
 All values

Height
 0 3,864

Tree ID
 1 95

Graduate Students - Team: Kanishka Ghodke, Vedant Dixit, and Ritvik Panwar

OBJECTID	Tree ID	Tree Type	Genus	Species	Cultivar or Varietal	Common Name	Canopy Spread	Height	Latitude	Longitude
1	10146	DECIDUOUS	Quercus	bicolor		Swamp White Oak	19	21	40.00910444	-105.2725292
2	10150	DECIDUOUS	Gymnocladus	dioicus		Kentucky Coffeetree	31	47	40.00913593	-105.2727975
3	10041	DECIDUOUS	Quercus	rubra		Northern Red Oak	65	102	40.00888767	-105.2748857
4	10042	DECIDUOUS	Quercus	rubra		Northern Red Oak	42	54	40.00877507	-105.2749996
5	10051	DECIDUOUS	Crataegus			Hawthorne	18	20	40.00887024	-105.2754284
6	10052	DECIDUOUS	Gleditsia	triacanthos		Honey Locust	34	68	40.0088399	-105.2753071
7	10055	DECIDUOUS	Sorbus			Mountain-ash	7	17	40.00894038	-105.2752206
8	10118	DECIDUOUS	Quercus	palustris		Pin Oak	25	27	40.00895672	-105.2713972
9	10456	CONIFEROUS	Pseudotsuga	menziesii		Douglas Fir	10	28	40.01003153	-105.275527
10	10285	DECIDUOUS	Acer	saccharinum		Silver Maple	18	25	40.00961808	-105.2750125
11	10319	CONIFEROUS	Pseudotsuga	menziesii		Douglas Fir	24	62	40.00959138	-105.2744772
12	10328	DECIDUOUS	Quercus	rubra		Northern Red Oak	40	56	40.00969183	-105.275427
13	10329	DECIDUOUS	Tilia	americana		American Linden	35	40	40.00979183	-105.275269
14	10345	DECIDUOUS	Gleditsia	triacanthos		Honey Locust	40	45	40.01035936	-105.2753222
15	10348	DECIDUOUS	Prunus			Flowering fruit trees	16	30	40.0103547	-105.2750968
16	10458	CONIFEROUS	Pseudotsuga	menziesii		Douglas Fir	10	20	40.01004684	-105.2755822
17	10464	CONIFEROUS	Pseudotsuga	menziesii		Douglas Fir	25	40	40.00950967	-105.2757369
18	10467	CONIFEROUS	Pinus	nigra		Austrian Pine	16	29	40.01032476	-105.2760597
19	10468	CONIFEROUS	Pinus	mugo		Mugo Pine	7	5	40.0102291	-105.2760614
20	10472	CONIFEROUS	Pinus	ponderosa		Ponderosa Pine	16	30	40.0103109	-105.2759547
21	10479	CONIFEROUS	Pinus	ponderosa		Ponderosa Pine	15	60	40.01030592	-105.2757596
22	10480	CONIFEROUS	Pinus	ponderosa		Ponderosa Pine	15	50	40.01032389	-105.275713
23	10750	DECIDUOUS	Fraxinus	americana		White Ash	15	30	40.009399	-105.2742956
24	10762	DECIDUOUS	Fraxinus	pennsylvanica		Green Ash	20	30	40.00977326	-105.2762282
25	10763	DECIDUOUS	Fraxinus	pennsylvanica		Green Ash	20	30	40.00966799	-105.2761499
26	10771	DECIDUOUS	Fraxinus	pennsylvanica		Green Ash	30	35	40.00835502	-105.2739823
27	10776	DECIDUOUS	Fraxinus	americana		White Ash	15	30	40.01017593	-105.2742952
28	10777	DECIDUOUS	Fraxinus	americana		White Ash	15	30	40.0101509	-105.2742503
29	10787	DECIDUOUS	Fraxinus	americana		White Ash	12	35	40.01003371	-105.2740349
30	10796	DECIDUOUS	Fraxinus	americana		White Ash	15	40	40.00999893	-105.2738593
31	10799	DECIDUOUS	Fraxinus	americana		White Ash	15	35	40.0100355	-105.2737477
32	10802	DECIDUOUS	Fraxinus	americana		White Ash	15	35	40.01002627	-105.2735994
33	11185	DECIDUOUS	Ulmus	americana		American Elm	30	85	40.00775512	-105.2723714
34	11679	CONIFEROUS	Picea	pungens		Blue Spruce	16	55	40.00915054	-105.2737074
35	14154	DECIDUOUS	Syringa	reticulata		Japanese tree lilac	6	6	40.00986233	-105.2760194
36	14155	DECIDUOUS	Cercis	canadensis		Redbud	6	6	40.00984074	-105.2755459
37	12342	CONIFEROUS	Pseudotsuga	menziesii		Douglas Fir	20	65	40.01030714	-105.2725214
38	12415	CONIFEROUS	Juniperus			Juniper	16	44	40.00963388	-105.2725169

An example of the 777 trees in the dataset used for the challenge.

Special Thanks

Elizabeth Goetz, Office of Space Optimization

Vince Aquino, CU Outdoor Services

Data Science Student Association (DaSSA)

The over two dozen students who submitted their data visualizations to the challenge!

Love Data Week Committee

Melissa Cantrell, CRDDS

Nickoal Eichmann-Kalwara, CRDDS

Brandi Hart, University Libraries

Matthew Murray, CRDDS

Liz Novosel, University Libraries

Kim Popetz, CRDDS

Katie Randall, University Libraries

Katie Sparks, University Libraries

Find the full dataset of campus trees (featuring over 5000 trees and many additional categories of data) at

the CU ArcGIS Online site

<https://ucboulder.maps.arcgis.com/>

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2025-04-09



For Love Data Week, the Center for Research Data & Digital Scholarship (CRDDS) held our annual **Buffalization Data Visualization Challenge!**

We invited students to show off their data visualization and storytelling skills using a dataset of 777 trees in the campus historic district (Norlin Quad and adjacent areas).

Visualizations were judged on creativity, clarity, data accuracy, visual appeal, and storytelling. Students could use any software or tools they wanted.

You can find more information about the challenge at <https://buff.link/2> and links to interactive versions of the submissions at <https://www.colorado.edu/crdds/buffalization-data-visualization-challenge-winners>

