

# **CSU ArcGIS Map Manual**

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For my honors thesis I decided to create an ArcGIS map of Colorado State University's campus to further my GIS skills and provide a data resource for others. This manual describes the files and information within the AlexHartshorn\_HonorThesis zip folder.

## **SubFolders**

### **ArcGIS\_Map**

An ArcGIS aprx and geodatabase is provided with the layers of data included. Symbology is minimized and layer ordered with polygons at the back and points at the front

### **Code**

Four files of code used to complete the thesis are included. The three python files were used to work with the point layer data after it was collected across CSU campus. Pseudocode is written within the files to describe the purpose of each file. A single rmd file was used to produce graphs and a resistance map of CSU which also included pseudocode within.

### **Layer\_CSV\_XLSX**

The csv files used for each layer are provided and match the attribute tables of each layer within the map. These files describe the point locations of points layers and the data associated with each, while the polygon layer csv files only include the data. Xlsx files used for organizing data at differing stages of the project were also included for reference.

### **Layer\_Shapefiles**

From the ArcGIS map, the Classes to Shapefile tool was used to export each layer as a shapefile into a separate folder so that shapefile are accessible outside of the map within the ArcGIS\_Map folder.

### **Thesis\_Documents**

The final thesis paper, manual for the map, and the final thesis presentation are included within this subfolder. These documents are required for the CSU Honors Program and describe the process of completing the project and potential use cases for the data.

## Information on Data Layers

(This information also available within the metadata of the map and shapefiles)

### Trees

Tree data across Colorado State University campus were collected in two periods. The first during the summer of 2024 involved collecting data on species scientific and common name, DBH in cm, circumference in cm, and height/lowest branch in meters using a rangefinder. About 300 hundred trees were recorded in this period. The second period occurred between January and March of 2025, and measured only height and lowest branch organized into categories. Height is split between general estimates of S (smaller below ~ 2 meters), M (medium between 2 and 6 meters tall), and T (Tall above 6 meters). Lowest Branch height is split between F (Floor or at ground level), L (Low below 1.5 meters), M (Medium between 1.5 and 3 meters), and H (High above 3 meters). These are general estimates compared to the first period which includes exact measurements for height and lowest branch. Fields X and Y represent xy-coordinates in WGS 84 Web Mercator Auxiliary Sphere. Trees in the CSU Arboretum were excluded.

### Roads

Streets bordering and within Colorado State University Campus. Roads designated for consistent car use including roads within parking lots were incorporated into this polyline layer. Larger sidewalks that can support cars but are primarily used for other purposes were not included.

### Trash Cans

Trash Can data across Colorado State University campus were collected between January and March 2025. The Type field categorizes trash centers by Simple, Dumpster, and Collection. Simple refers to smaller individual trash cans placed outdoors for students, faculty and visitors. When a trash and recycling bin are placed together, they are counted as one point. Dumpster represents large metal waste bins designed for garbage trucks and often placed out of view from sidewalks. Collection refers to groups of medium sized bins including designated bins for recycling, compost, and cardboard. Five fields include Y or N for presence/absence of Trash, Recycling, Compost, Cardboard, and whether the trash can was covered with a lid. Fields X and Y represent xy-coordinates in WGS 84 Web Mercator Auxiliary Sphere.

### Signs

Sign data across Colorado State University campus were collected between January and March 2025. The Type field is split into 9 categories. Building represents the CSU styled green building signs. The main text on these signs are included in the Building Name field. The Bus type represents signs indicating bus stops or directions to bus stops. The Colorado State University type refers to signs designated for CSU advertising or promotion such as banners. The Flag type designates flags situated across campus. Parking refers to signs used to indicate parking lots, handicap parking, motorcycle parking, and parking permits. The Rail type refers to signs marking train tracks and railway information. The Street type represents

traditional signs used for traffic, stops, and crosswalks which are seen across Fort Collins. The Tree type is used for signs placed on the ground in front of trees indicating the species or memorial planting. Lastly, the Other type is used for signs that don't fit in other categories. Fields X and Y represent xy-coordinates in WGS 84 Web Mercator Auxiliary Sphere.

### **Sidewalks**

Sidewalks bordering and within Colorado State University Campus. Paved or gravel paths across CSU campus used often by students and faculty were included in this polyline layer. Dirt or unofficial paths are not included.

### **Seating**

Seating data across Colorado State University campus were collected between January and March 2025. The Type field is split between Bench, Circular and Picnic Table. Bench represents wooden or metal benches without a table. The Picnic Table type refers to larger picnic tables with seating on two sides. The Circular type represents seating situated with seats in a circular fashion or square tables with four chairs around. The capacity field represents the estimated number of people that can comfortably fit on the seating at one time. The Permanent Cover field includes Y or N for presence/absence of a permanent cover from rain such as a building overhead or umbrella. Fields X and Y represent xy-coordinates in WGS 84 Web Mercator Auxiliary Sphere.

### **Miscellaneous**

Miscellaneous data across Colorado State University campus were collected between January and March 2025. This point layer represents objects across CSU campus that don't fit into the other categories. The Object type names the object such as a grill, magazine boxes, or dog bag dispenser. Fields X and Y represent xy-coordinates in WGS 84 Web Mercator Auxiliary Sphere.

### **Monuments**

Monuments data across Colorado State University campus were collected between January and March 2025. Monuments include statues, fountains, pillars, plaques, designated rocks, and other special outdoor memorabilia across campus. The Type field states the object type. Fields X and Y represent xy-coordinates in WGS 84 Web Mercator Auxiliary Sphere.

### **Lampposts**

Lampposts data across Colorado State University campus were collected between January and March 2025. This layer detailed the locations of outdoor lampposts across campus and only includes standalone light fixtures and not lights hanging from buildings. The Sign field includes Y or N for presence/absence of a sign hanging from the post. Associated sign type is detailed in the Signs layer. Fields X and Y represent xy-coordinates in WGS 84 Web Mercator Auxiliary Sphere.

## **Facility**

Facility data across Colorado State University campus were collected between January and March 2025. This layer details three types of objects listed under the Object field: Facility, Drain, and Fire Hydrants. A facility object represents electrical or AC units associated with nearby buildings and is organized between under or over ground in the Type field. Drains represent large drainage areas next to buildings or in the middle of fields to collect large amounts of water. Smaller drains were not included. Fields X and Y represent xy-coordinates in WGS 84 Web Mercator Auxiliary Sphere.

## **Callboxes**

Callbox data across Colorado State University campus were collected between January and March 2025. 33 callboxes are spread across campus for emergency communication. Fields X and Y represent xy-coordinates in WGS 84 Web Mercator Auxiliary Sphere.

## **Bike Racks**

Bike rack data across Colorado State University campus were collected between January and March 2025. The Type field splits bike racks between \_ categories. Normal represents the most common type of bike rack that supports bikes from either direction and can hold up to 8 bikes. Small represents smaller bike racks that hold just 5 bikes from either direction. The protected type represents bicycle cages that are locked up. Repair stations are spots across campus with bicycle pumps and tools for bike maintenance. Alternating represents generally larger bike racks that only allow bikes to enter from specific alternating directions. Lastly, the skateboard type refers to racks for skateboards. The capacity of bikes or skateboards from the rack are listed under the Capacity field. Fields X and Y represent xy-coordinates in WGS 84 Web Mercator Auxiliary Sphere.

## **Buildings**

Data for building polygons were collected in April of 2025 from the CSU Building Floor Plan & Record Documentation Website. Fields are organized into the buildings' specific CSU number, name, address, year construction finished, gross square feet and number of floors. Along with whether a basement is present or absent as Y/N. The number of floors includes the basement. Polygon shapes for the buildings were manually created in ArcGIS. The layer is projected into WGS 84 Web Mercator Auxiliary Sphere.

## **Parking Lots**

Data for parking lots were collected in April of 2025 from the CSU 3D Interactive Map website. Fields represent the CSU specific lot number, the type of permit required to park, number of spaces, and presence/absence of motorcycle parking and electric vehicle chargers as Y or N. The layer is projected into WGS 84 Web Mercator Auxiliary Sphere.

## **Bus Stop**

Bus Stop data across Colorado State University campus were collected between January and March 2025. The Seating and Cover fields show presence/absence of available seating or cover at the bus stop as either Y or N. The Stop field describes the bus lines that pass through the bus stop. Fields X and Y represent xy-coordinates in WGS 84 Web Mercator Auxiliary Sphere.

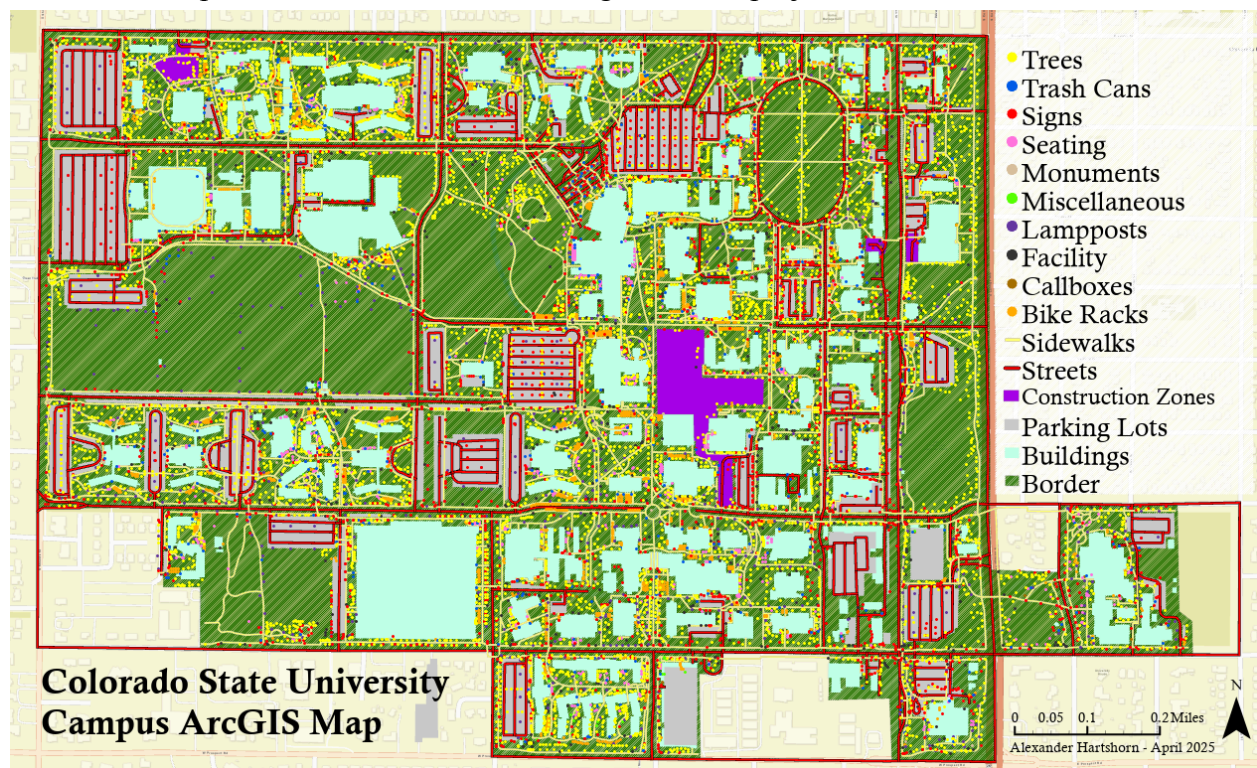
### Construction Zones

Polygon was created in April of 2025 to represent areas of Colorado State University blocked off for construction. The two main areas of construction include the Clark Building and Durward hall. Smaller outdoor areas on the eastern side of campus were also under construction during this period.

## Example Maps and Smaller Projects

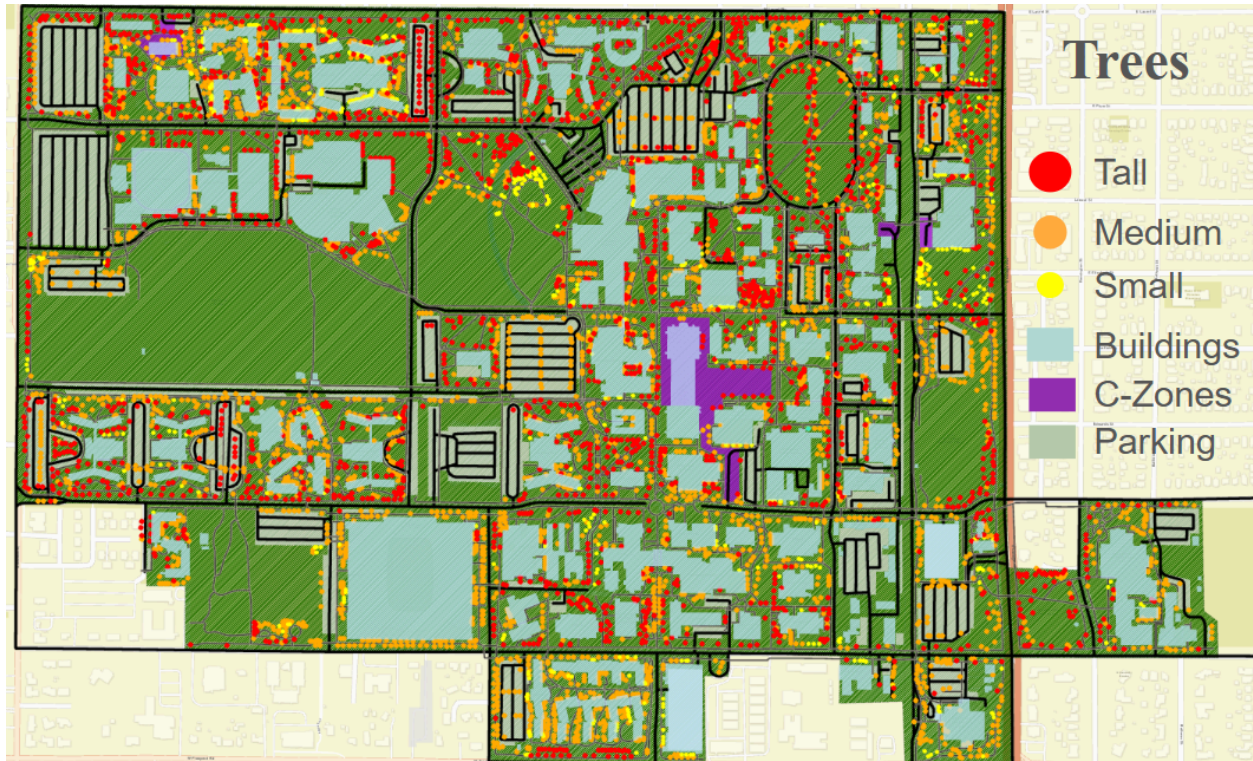
Several maps were created and symbolized using ArcGIS to display the data collected during the project. Images of these maps are provided below.

1. Full map of all the data collected during the thesis project



2. Map of trees across CSU's main campus excluding the arboretum



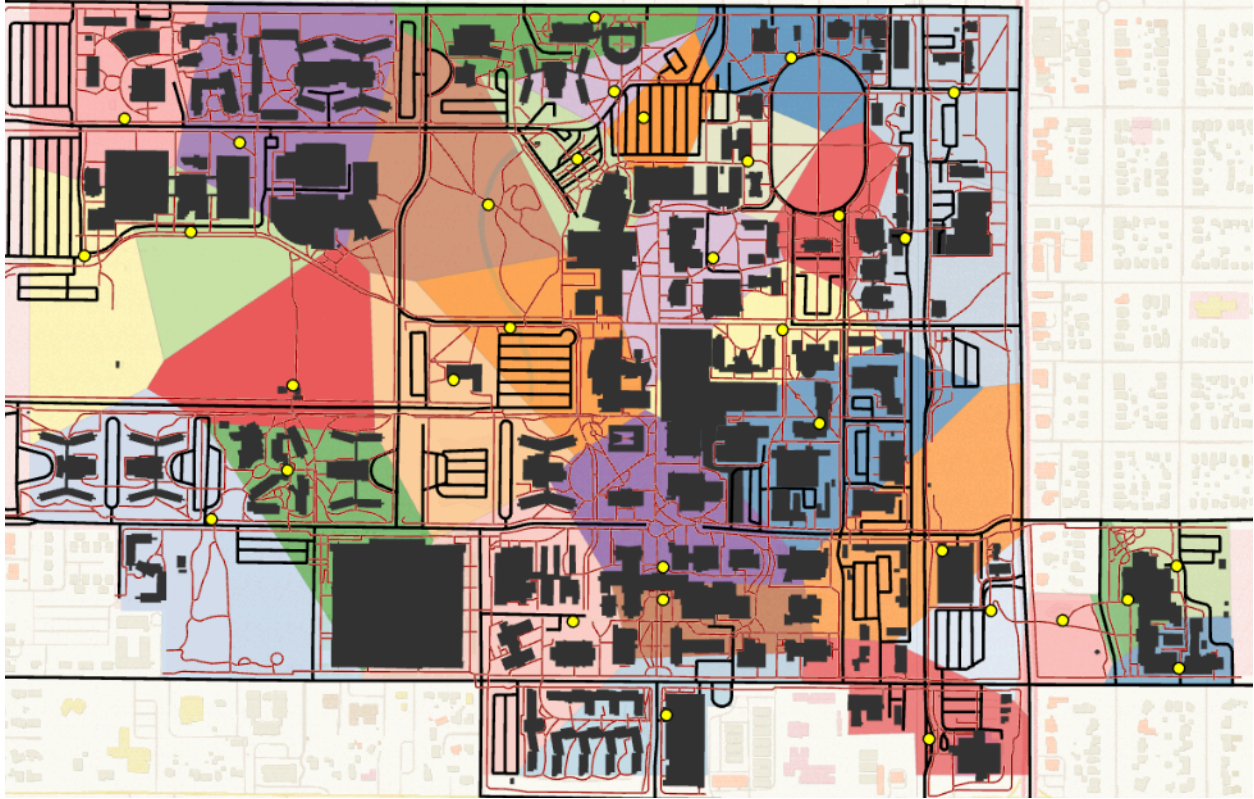


3. Heatmap of Bike racks across CSU's main campus

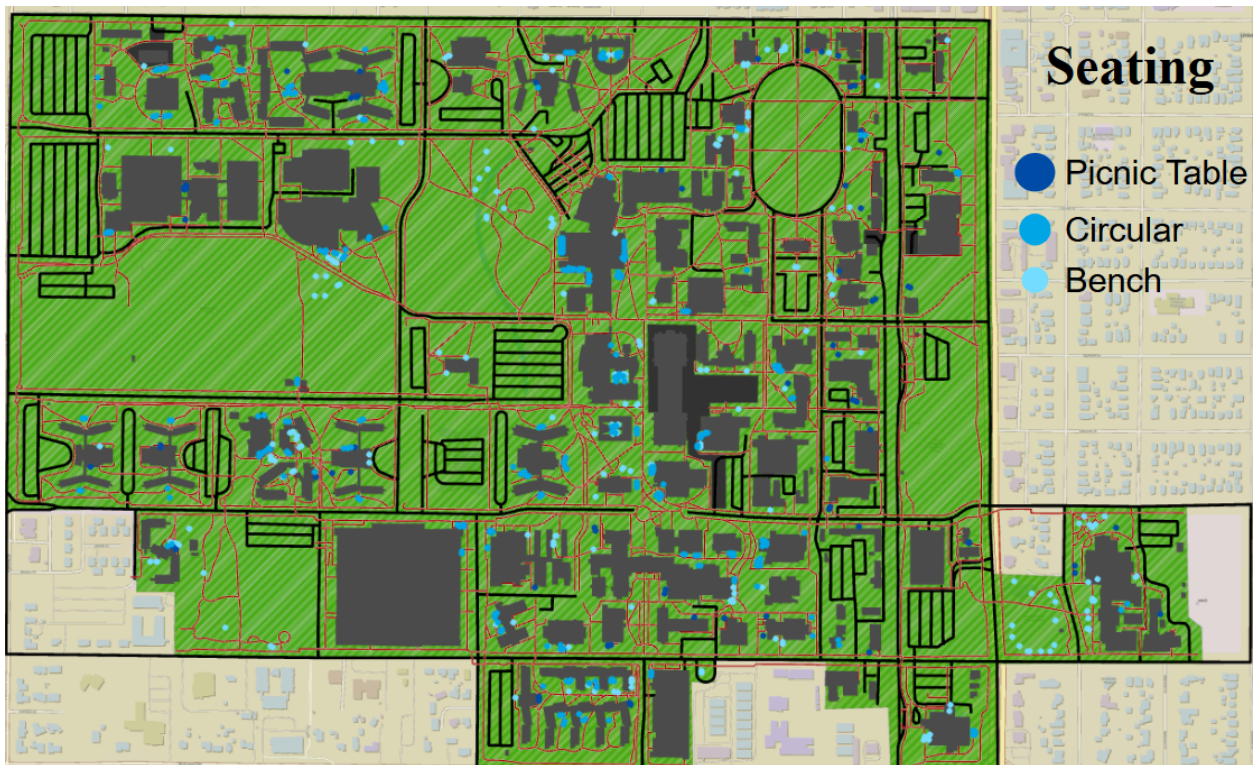


4. Callbox Thiessen Polygon map displaying the nearest emergency callbox

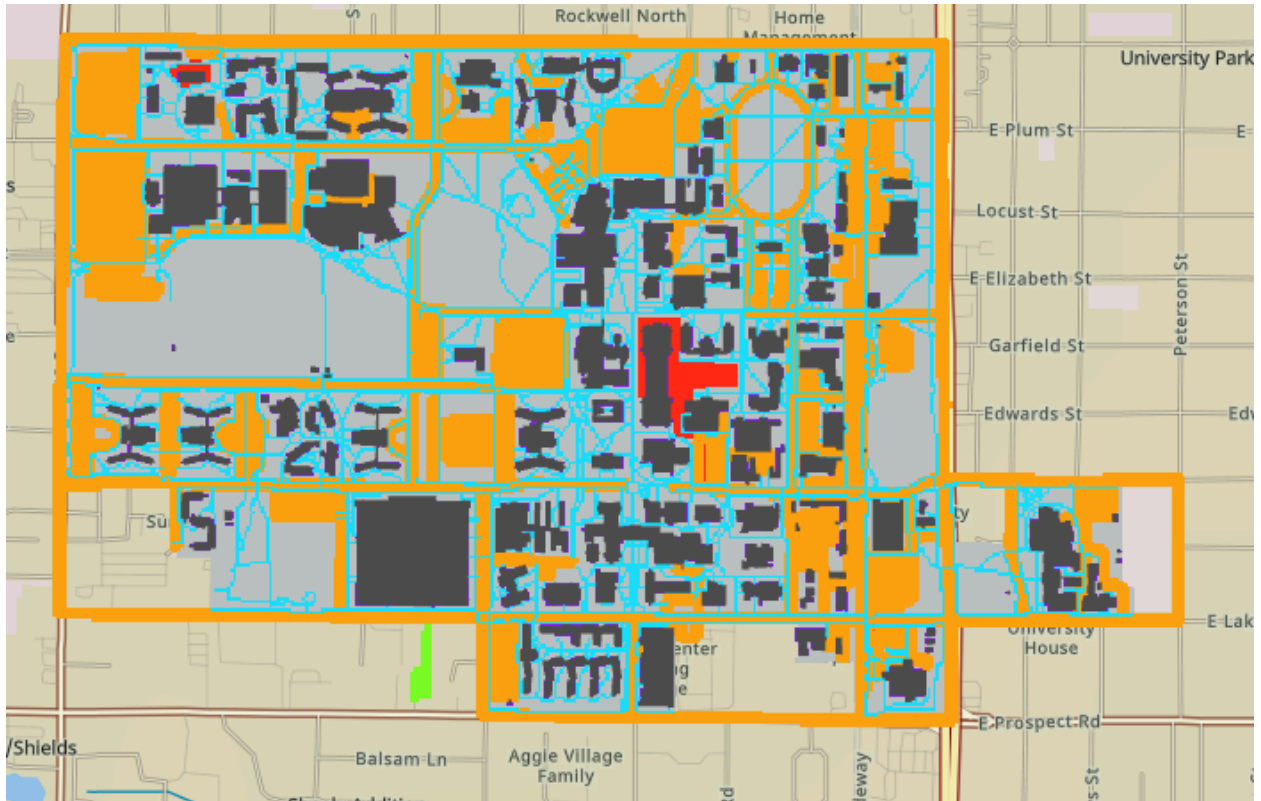




5. Map of outdoor available seating symbolized by type of seating and number of seats

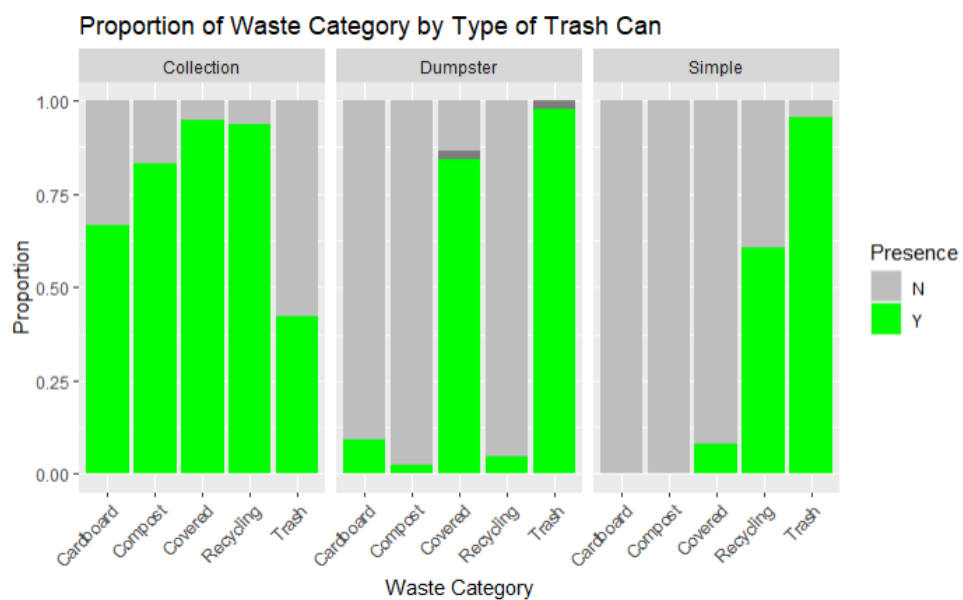


6. Land Cover raster of CSU created in ArcGIS



Graphs in R-Studio were created to describe the data collected across CSU

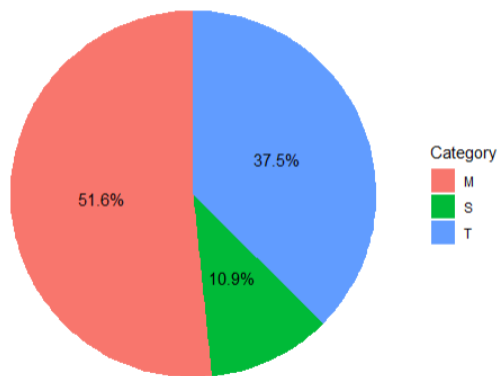
1. Proportion of available disposal options at each trash can type



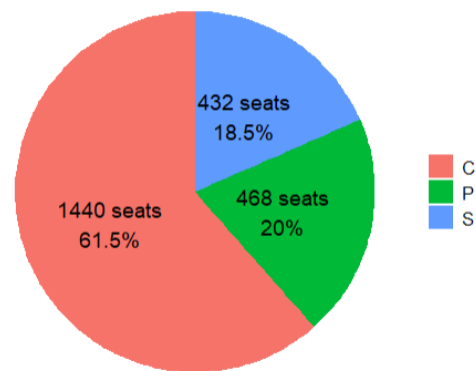
2. Pie charts for the proportion of trees and seating types across CSU



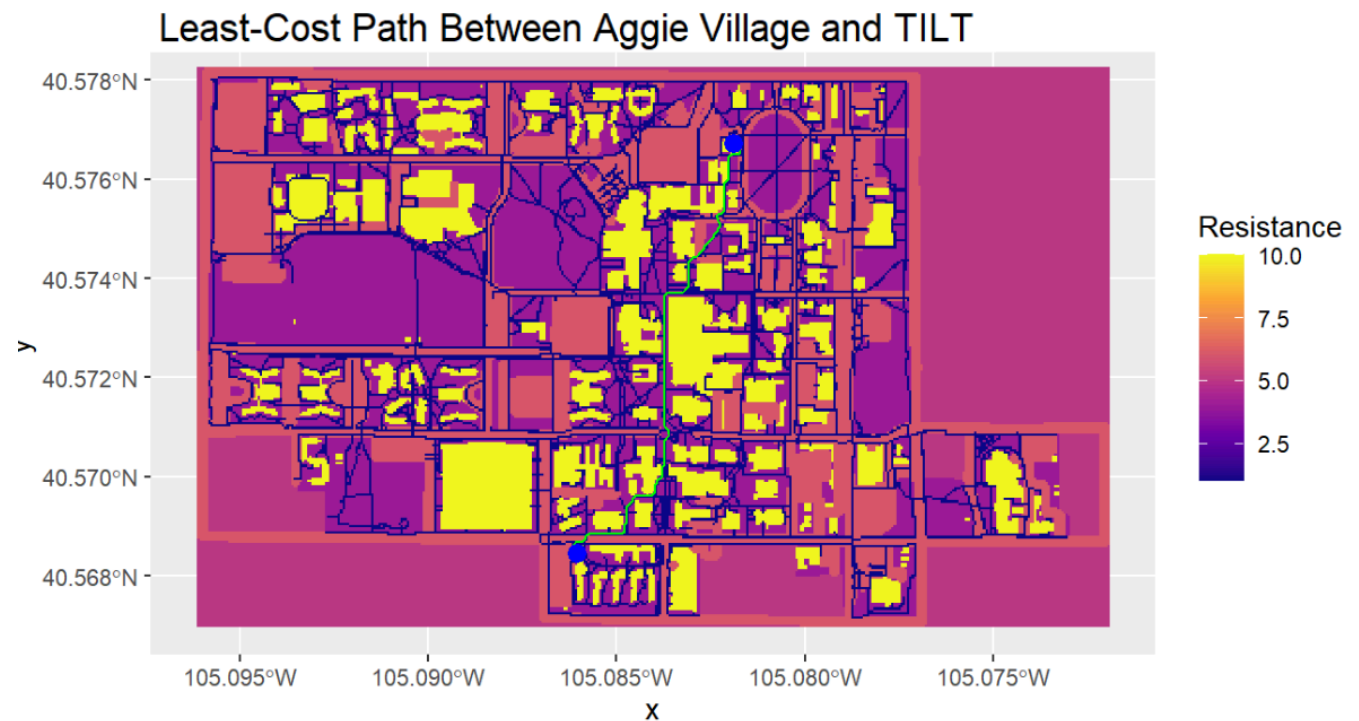
Distribution of Small, Medium and Tall Trees Across CSU



Distribution of Circular, Picnic, and Simple Seating Options



A least cost resistance map across CSU was created in R which shows the easiest path between two points on campus. For this map, the easiest path following sidewalks was drawn between Aggie Village Lodgepole and the TILT building.



A map displaying the best hammock spots across CSU was created using ranking based off of data within the tree, building, and road layers. Pairs of trees within 3 and 6 meters were sectioned out and ranked based on height, lowest branch height, and distance to building and roads. A zoomed in image is also provided to show an example of specific hammock sites.

