DEPARTMENT:
Computer Information Systems (CISB)

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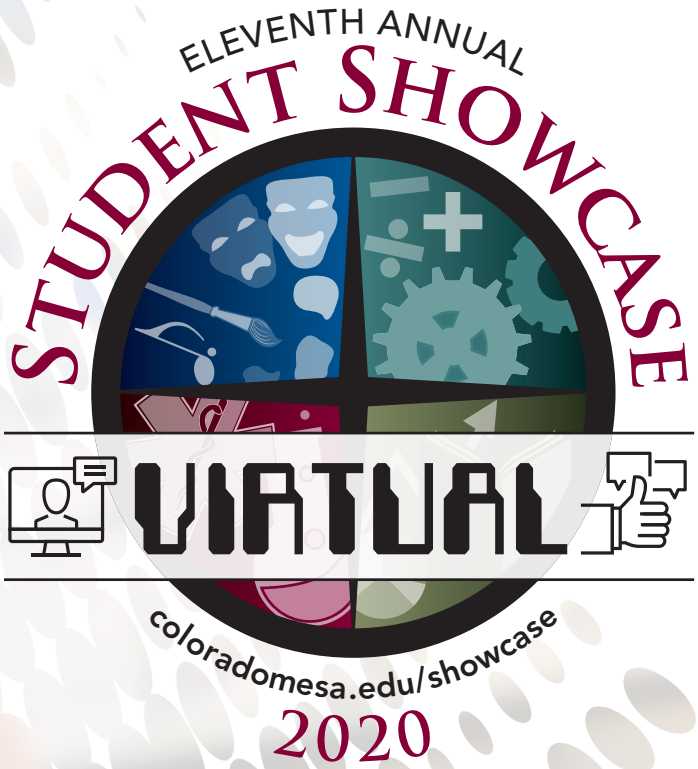
PROJECT TITLE:
Tree Inventory of Denver



The data set we have chosen is a sample of trees within the Denver Metro Area with a few outliers to the west in areas such as Morrison and Conifer. The data set contains roughly 280,000 entries, with each entry containing the geo location (Latitude and Longitude), scientific name, common name, weather the tree is publicly or privately maintained, and which county of Denver the tree resides in. We were interested in the types of trees and their ability to produce oxygen, a vital resource that is threatened by growing metropolitan areas like Denver.

Finding the data on which trees produce the most oxygen proved to be a challenging task. Preferably a study would have been located that contains a list of trees and their theoretical oxygen production. While this study did not surface, we located two articles that discuss the distinguishing factors that increase or decrease a particular type of tree's capacity to produce oxygen. The primary factor used to determine if a tree will produce more or less oxygen is the species Leaf Area Index. Trees that have small leaves, such as pine trees, will produce less oxygen than a tree with large leaves, such as maple. (Lab, n.d.)

The data was cleansed and formatted for use to create a visual to display which trees have the potential to produce more oxygen. The data was formatted for use to create a Tableau visualization, displaying the trees classified as Good, Medium, and Poor oxygen production. Figure 1 displays the trees sorted by each neighborhood and color coded by oxygen production.

Tree project Data filtering and organizing

1. First step was to create a calculated field to determine which trees produce low, medium, or high amounts of oxygen. Using excel this is the calculated field I created. =IF(OR(ISNUMBER(SEARCH("fir", C10)), ISNUMBER(SEARCH("spruce",C10)), ISNUMBER(SEARCH("beech",C10)), ISNUMBER(SEARCH("maple",C10)), ISNUMBER(SEARCH("ash",C10)), ISNUMBER(SEARCH("poplar",C10)), ISNUMBER(SEARCH("willow",C10))), "High", IF(OR(ISNUMBER(SEARCH("oak",C10)), ISNUMBER(SEARCH("aspen",C10))), "Medium", "Low"))

NOTE: unfortunately, this is the very long version of the formula that we found out how to create in order to determine which tree was considered low, medium or high on the output.

2. Second step was to determine how many trees are needed in order to counteract the amount of oxygen that humans take in. luckily this is calculated easily based on the article in the link: (Villazon, n.d.)

NOTE: this way of estimating how many trees are needed to counteract how much is being taken in, may be considered a good way to determine how much a medium trees level of oxygen output can be measured as

Based off this we can take the population of trees in the area, from the database, and divide it by 7.5 (Average between the numbers given in the article as to how many trees are needed for one person). The math comes out to 284,740 / 7.5 = 37,965.33. So, the number of trees in the area only produce enough oxygen to balance out with 37,965 humans. Which is a shame since the current Denver population is around three million.

Something else to consider is that this is based off the number of trees if they were all medium outputting trees, but that's not the case. So, we proposed a formula to calculate the amount of trees we have based off the amount of oxygen they produce.

Amount of trees = 0.5*(Low oxygen) + 1*(Medium Oxygen) + 1.5*(High Oxygen)

With this new formula we come out with this calculation.

Amount of trees = 0.5*(167,885) + 1*(25,720) + 1.5*(91,134) = 246,363.5 trees.

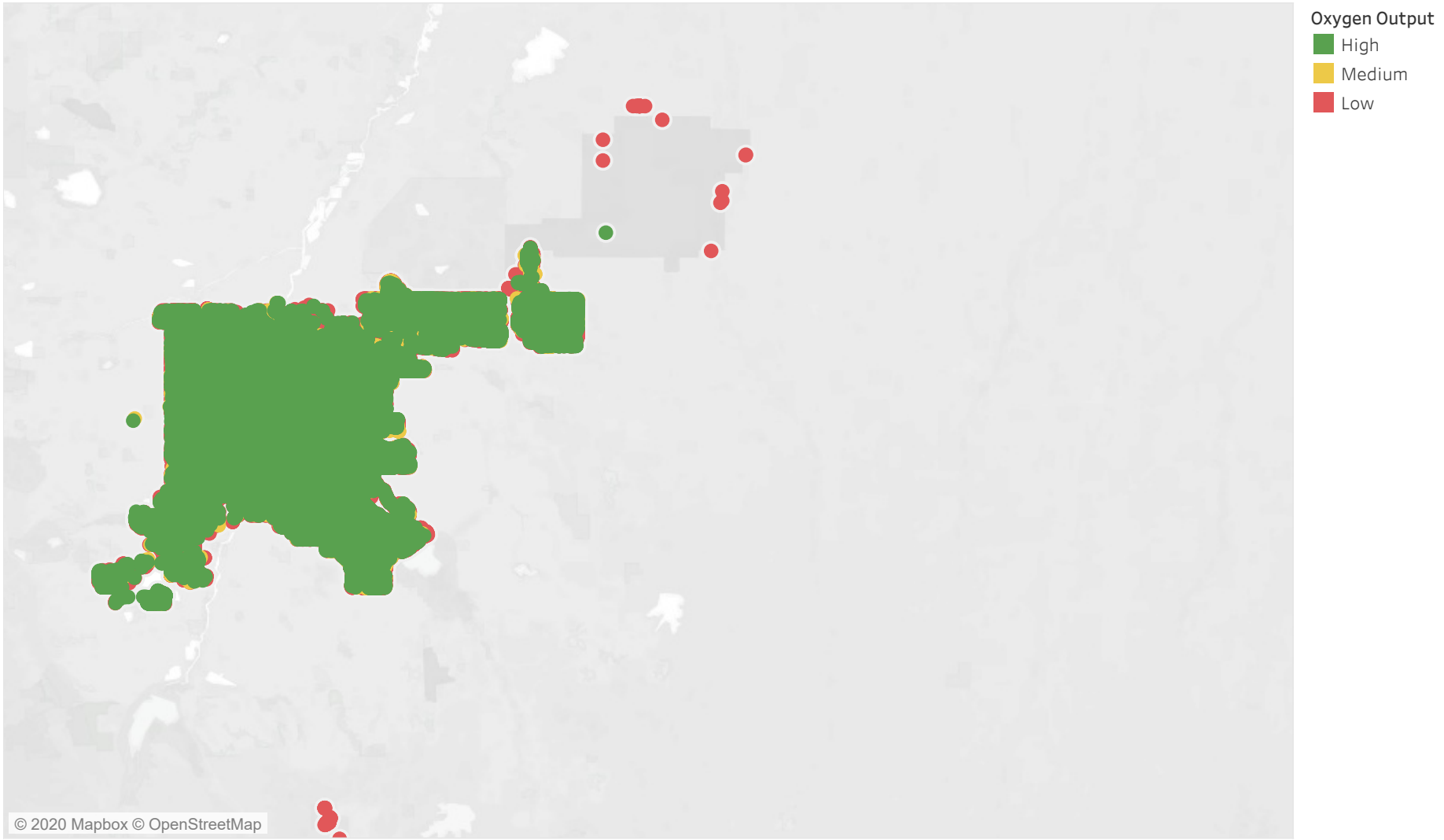
With this calculation we can more accurately depict how much oxygen is being created to be calculated.

NOTE: There are many different variables we are not accounting for. Such as how we cannot accurately depict for every species of tree how much oxygen is being output, the quality of life each tree is in, how the diameter and height of the tree can factor into effect of oxygen output, and more form pure lack of information. Much more intensive research is required for such results.

Using the cleansed data set, we created two different visualizations. Figure 1 is a visualization using geocoding of each individual tree to display its location within the Denver Metro area. Unsurprisingly, the trees tend to line streets and pathways, while other clusters appear at known parks and recreation areas. Each tree is classified as green, yellow, and red, signifying good, average, and poor oxygen production. Figure 2 is a second view of this same visualization but zoomed in to show the detail. Due to the sheer number of datapoints within a small geographic space, the overall view of Denver is hard to distinguish.

Figure 3 is a graph that displays trees per neighborhood within the data set. Each neighborhood is represented by three graphs, again colored green, yellow, and red to represent the count of trees within each category of oxygen production. Note that there is a neighborhood called “Unassigned.” These trees are located in areas that are not included within a neighborhood.

Figure 1: Tree Inventory of Denver Map

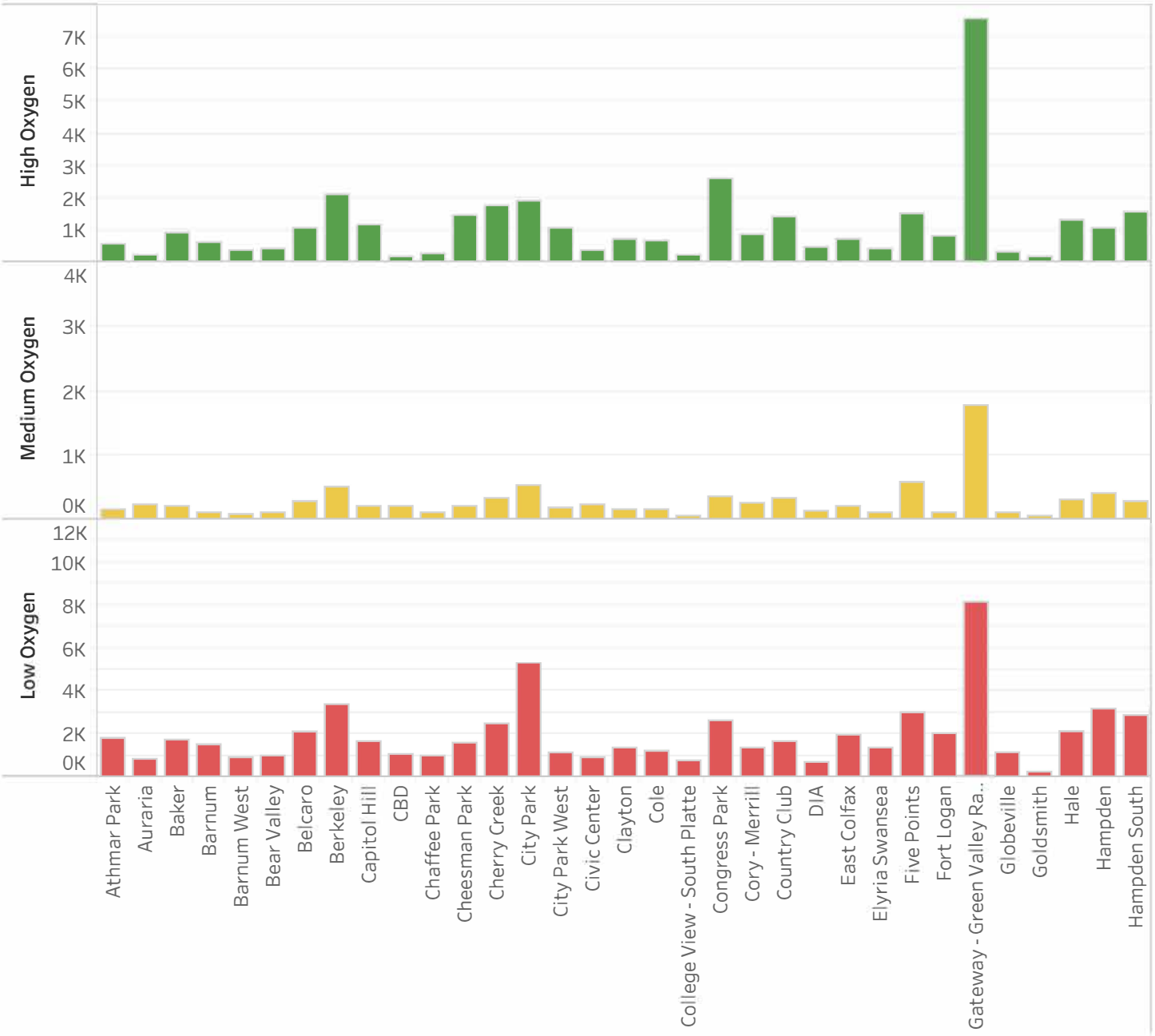


Map based on X Long and Y Lat. Color shows details about Oxygen Output. Details are shown for Species Co. The view is filtered on X Long and Oxygen Output. The X Long filter keeps non-Null values only. The Oxygen Output filter keeps Null, High, Low and Medium.

Figure 2: Tree Inventory of Denver Map

Map based on X Long and Y Lat. Color shows details about Oxygen Output. Details are shown for Species Co. The view is filtered on X Long and Oxygen Output. The X Long filter keeps non-Null values only. The Oxygen Output filter keeps Null, High, Low and Medium.

Figure 3: Tree Inventory of Denver Graph



Sum of High Oxygen, sum of Medium Oxygen and sum of Low Oxygen for each Neighborhood. Details are shown for Neighborhood. Each color represents oxygen production by tree type, green = good oxygen production, yellow = average oxygen production, red = poor oxygen production.

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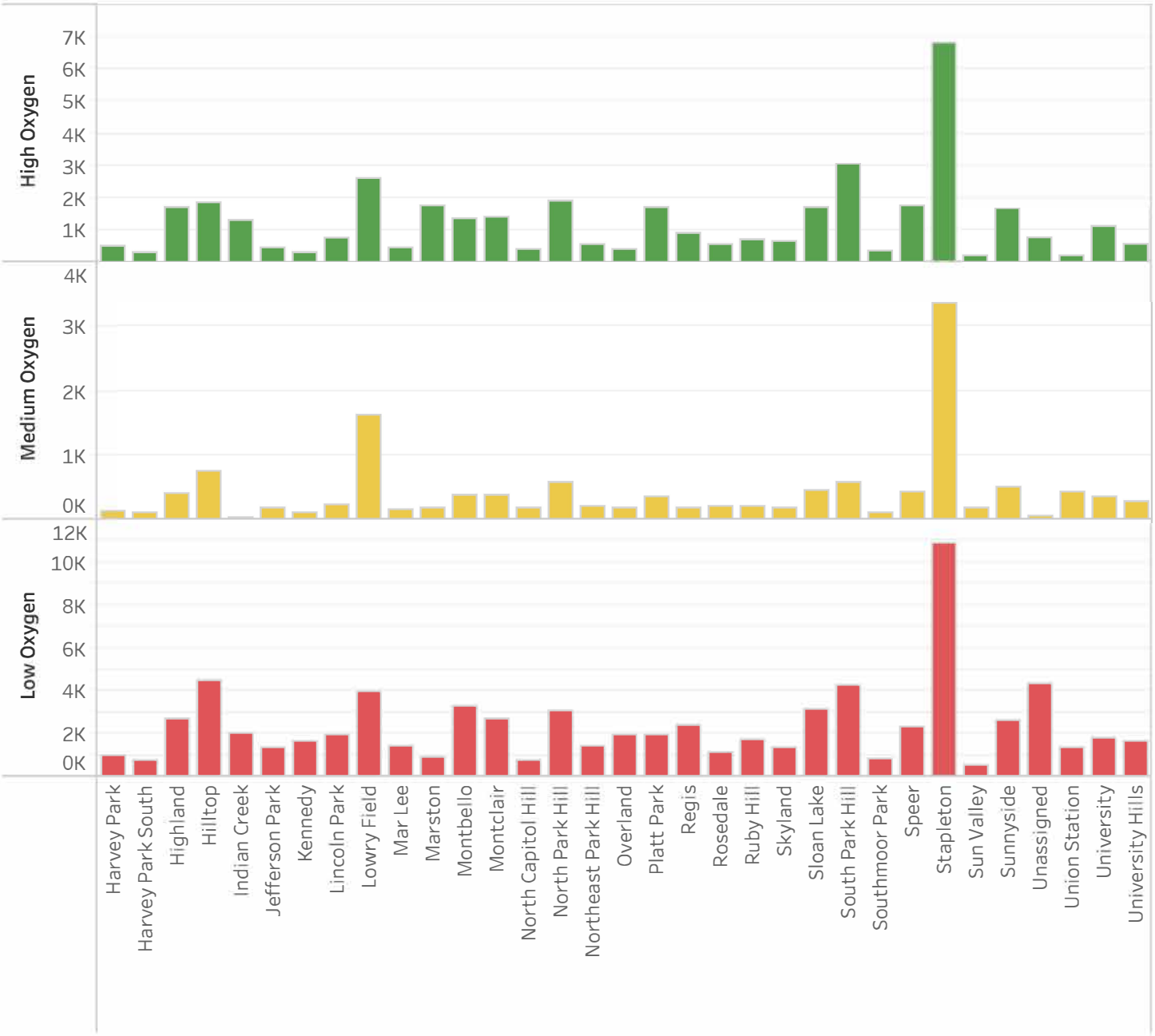

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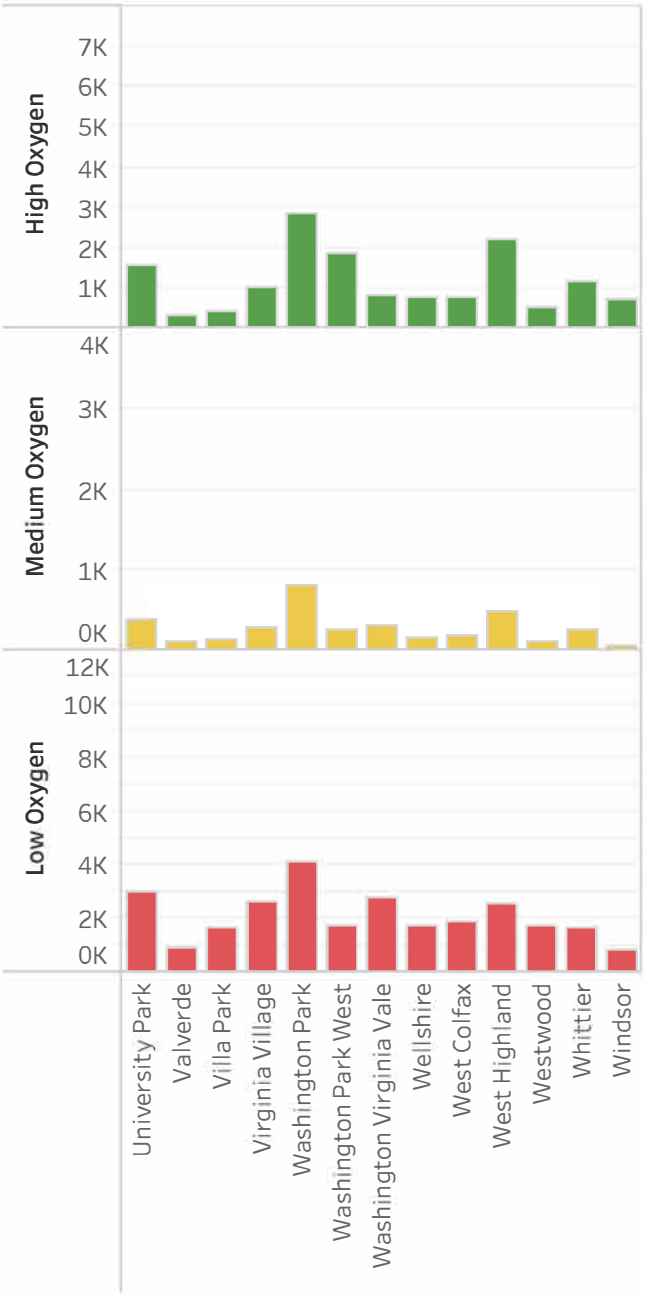

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The visualizations and the data set both show that Denver has done a decent job balancing the need for trees that produce higher amounts of oxygen, and the need for a variety of trees. More research would need to be completed to further solidify this conclusion. Data concerning the water consumption, maintenance needs, and lifespan of certain trees would help determine which trees to plant, and more specifically which trees to avoid planting. Many trees that are considered native to the area, such as pines, are on the lower spectrum of oxygen production. This reality would inevitably create complications for a plan that calls for maximum oxygen production, as the balance of native and non-native species is always an important piece of the puzzle when considering the environment.

References

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Lab, U. B. (n.d.). *Which trees give off the most oxygen?* Retrieved from UC Berkely: https://nature.berkeley.edu/garbelottowp/?qa_faqs=which-trees-give-off-the-most-oxygen

Villazon, L. (n.d.). *How many trees does it take to produce oxygen for one person?* Retrieved from Science Focus: https://www.sciencefocus.com/planet-earth/how-many-trees-does-it-take-to-produce-oxygen-for-one-person/