PDX Tree Planting Analysis

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Questions

◆ Are the right type of trees being planted? (the best trees are large, evergreen and native).

◆ Are trees being planted equally across different income boundaries?

◆ Do planted trees persist? Which species last longer than others?

Data

Raw data:

- A database of tree plantings done by the City of Portland and Friends of trees. The data covers years 1989-2018 and contains information on the locations of the properties where these trees were planted.
- A recent survey of street trees conducted by Portland Parks & Recreation. It covers the years 2010-2016 and describes the condition of all the trees surveyed.
- A spatial dataset of Portland census tracts. We will be studying income on the census tract level, and we will use this data to make informative maps of the city.
- A list of median income levels by census tract.

Transformation:

First, we joined the planting data with the census tract data by location. This allowed us to figure out what tract, and therefore what income level, a tree belonged to.

Then, we built a "tree index" to more easily describe the overall quality of a tree. We are using the following index:

$$Q = S + N + E$$

where Q is the overall quality of a tree, S is the tree's size, N depends on whether a tree is native, and S depends on whether a tree is evergreen or deciduous. Large, native, and evergreen trees are considered to be the best types of trees.

This index is not perfect - some areas of the city do not have enough room for large trees. It is difficult to formulate one that would be accurate for the entire city.
After that, we created a new tree dataset by combining the planting and survey data. We joined these two datasets by address and by species, and noted whether or not each observation that existed in the planting dataset was also in the survey.

| Name	Year	Size	Native?	Type	FIPS	Income	Persist?
Norway maple	1999	M	FALSE	Decid.	4105…	Med-High	TRUE
Douglas fir	2005	L	TRUE	Ever.	4105…	Low	FALSE

The variables name, year, size, native and type describe the initial planting of the tree. FIPS is a geographic code that identifies the census tract where the tree was planted. Income describes the income level of that tract. Persist describes whether or not the tree that was originally in the planting dataset is recorded in the recent survey.

Analysis

Our main form of analysis was studying trends in planting over time to see the overall quality of planted trees has increased or decreased. We created times series plots of several different variables, such as size, index and type. The plots range from 1989 to 2017.

Planting Proportions by Size
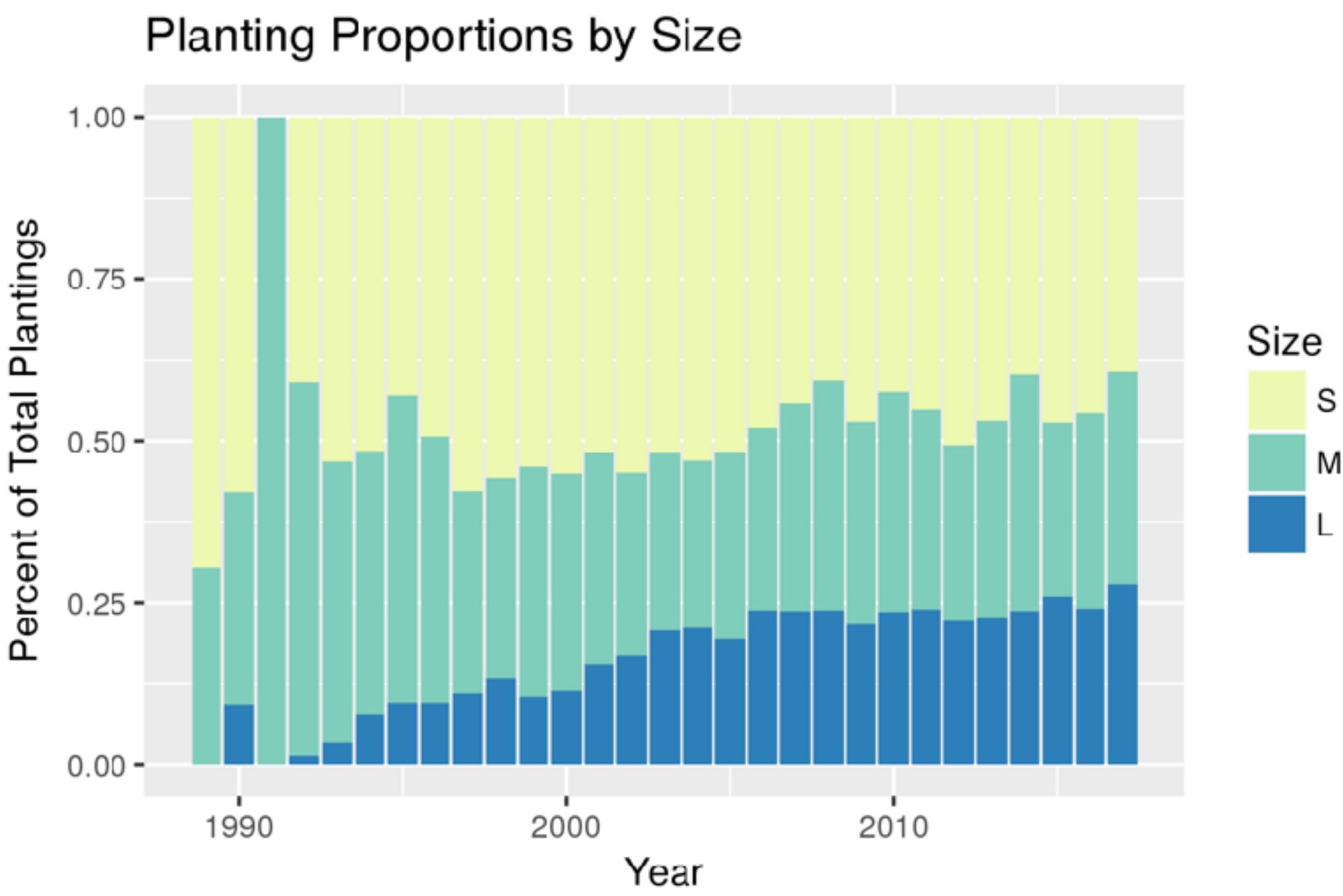
We created several maps of Portland that plot trees against median income by census tract. This allowed us to visually analyze the relationship between tree equality and income.


Evergreen PDX Trees
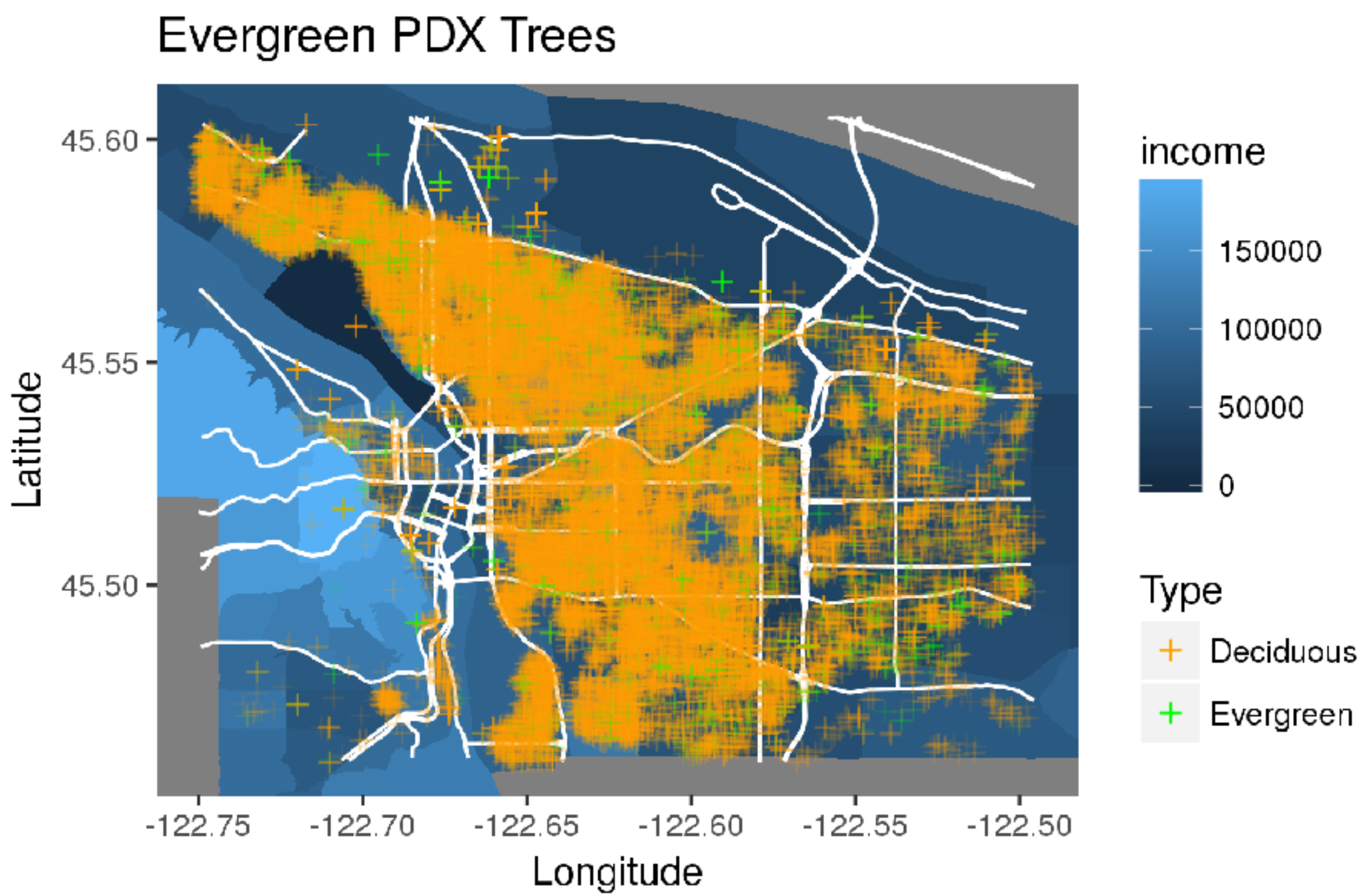
Finally, we created a model to predict whether or not a tree would persist based on several variables: size, income, native and evergreen.

Results

To conclude, we find that although the quality of planted trees has been steadily increasing, there is still room for improvement. There is a healthy mix of different sizes of trees, but very small numbers of evergreen and native trees.

After plotting the trees against income, we discovered that planting efforts by the city and Friends of Trees have been fairly equitable in general. However, there are a few notable areas with low median income and poor tree quality, which seem to have been caused by a disparity in tree size.

PDX Trees by Index
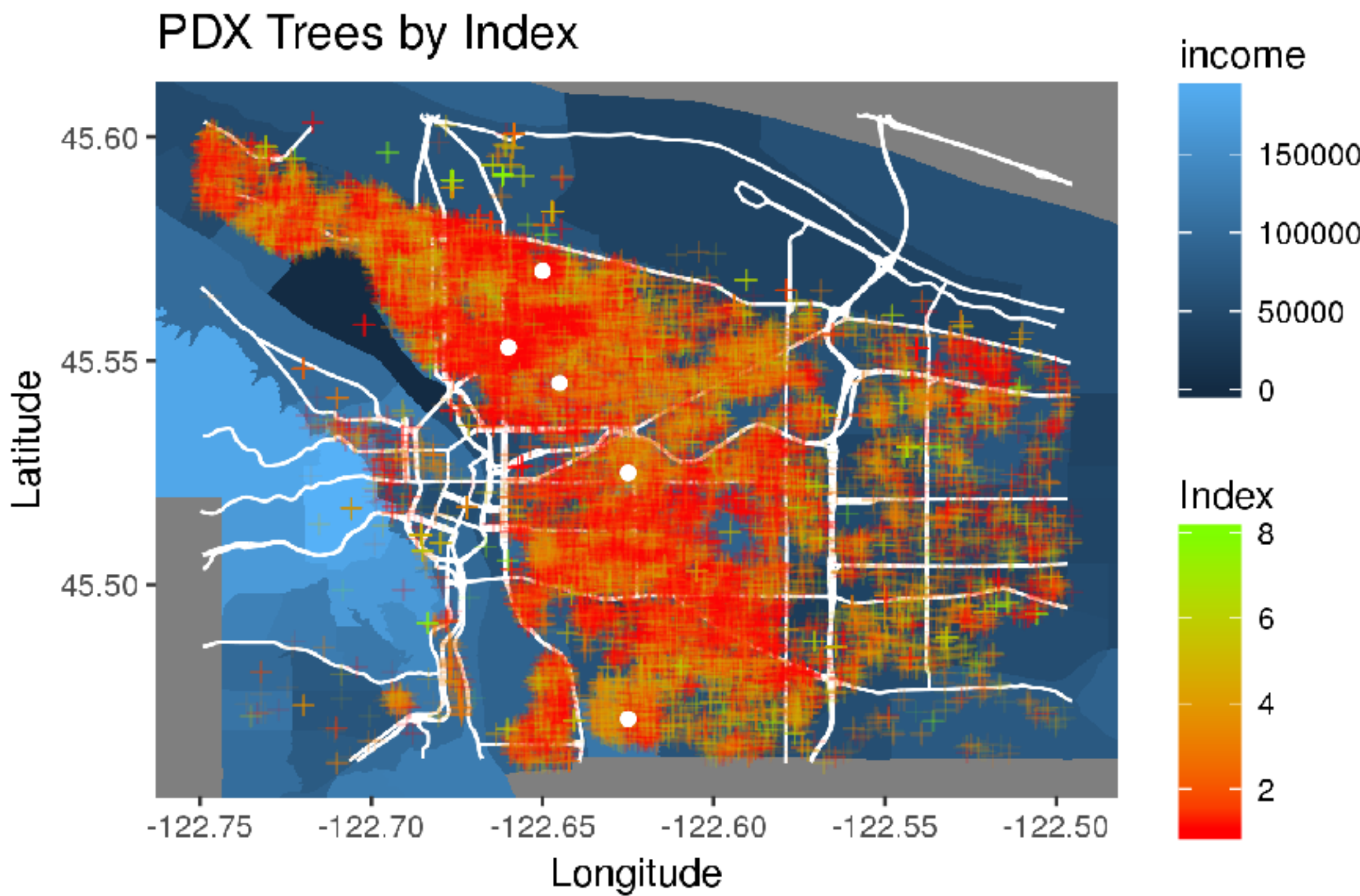
Lastly, large, deciduous trees have the best persistence rate, while small evergreen trees have the worst.

Persistence of Evergreen Trees