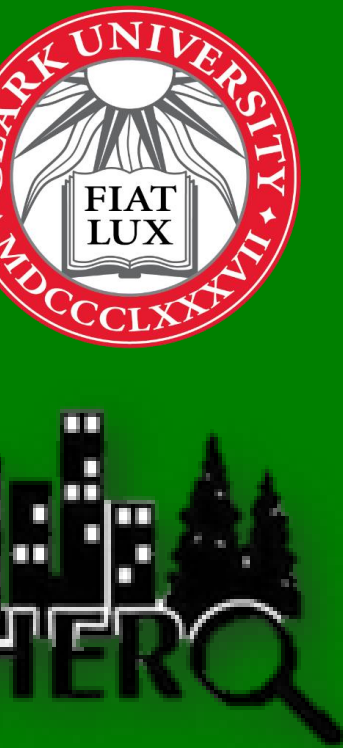




Assessing the Survivorship and Conditions of Planted Trees in Worcester, MA



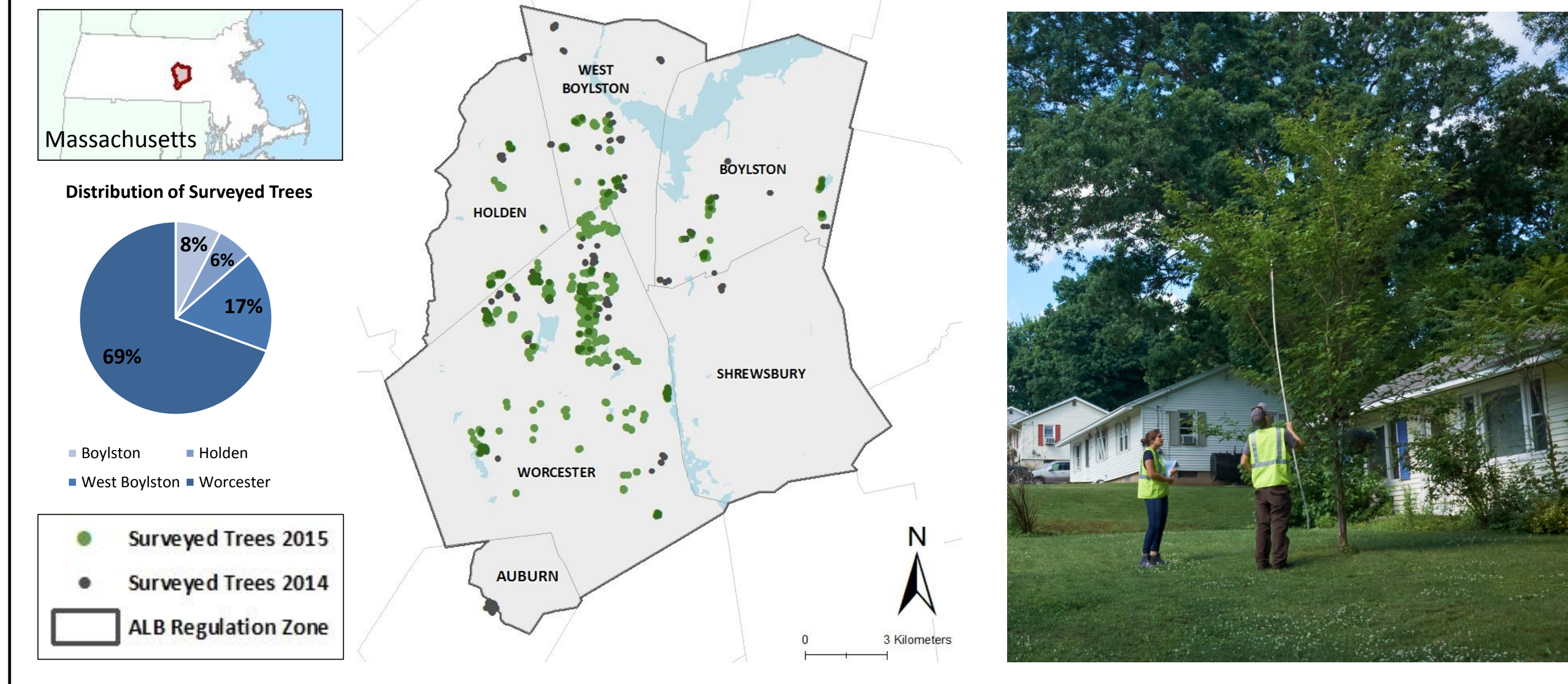
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Introduction

Since 2010, the Massachusetts Department of Conservation and Recreation (DCR) has been focusing on replanting efforts within the regulation zone as part of the Asian Longhorned Beetle eradication program. The goal of the efforts was to plant 30,000 new trees throughout 6 affected towns, including Worcester, Boylston, West Boylston, Shrewsbury, and a part of Holden and Auburn.

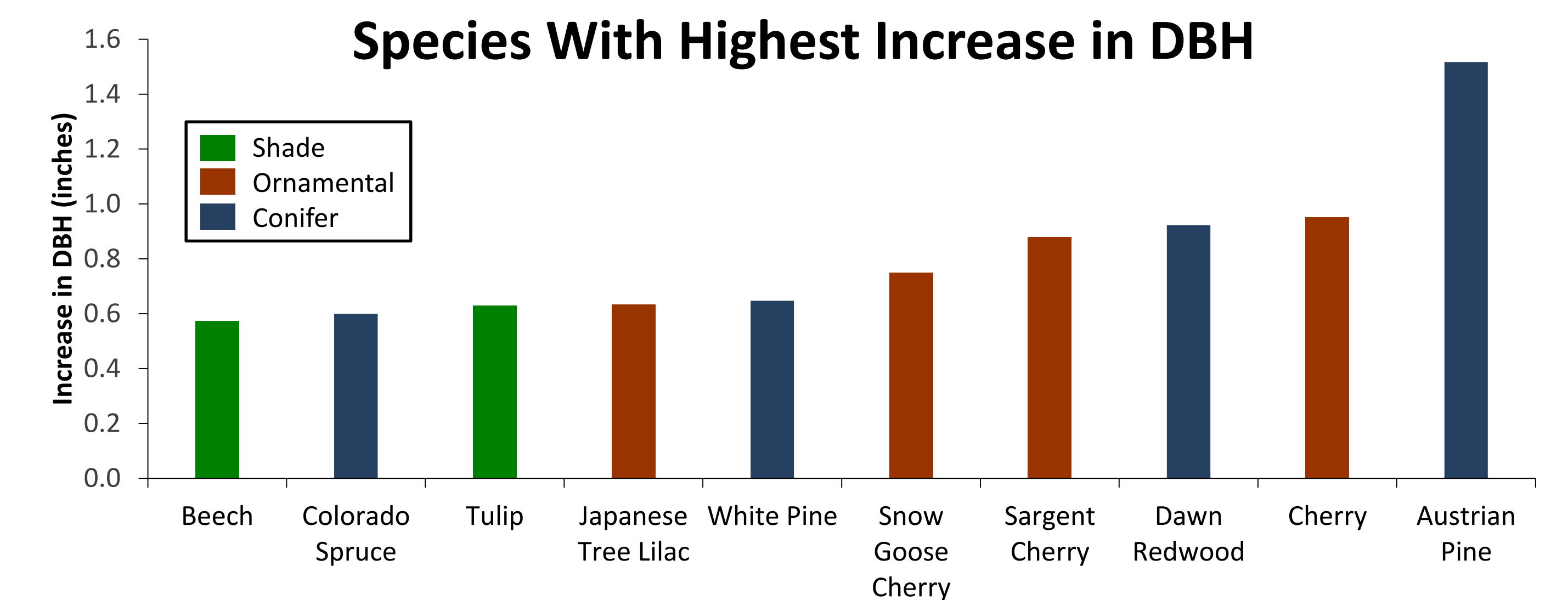
In 2014, the HERO program started to assess the survivorship and condition of the newly planted trees by surveying 1,054 trees. In 2015, the assessment continued with a larger sample of 1,516 with 342 trees resampled from the previous year. The survivorship, condition, and size metrics of the sample trees were recorded.

Study Area



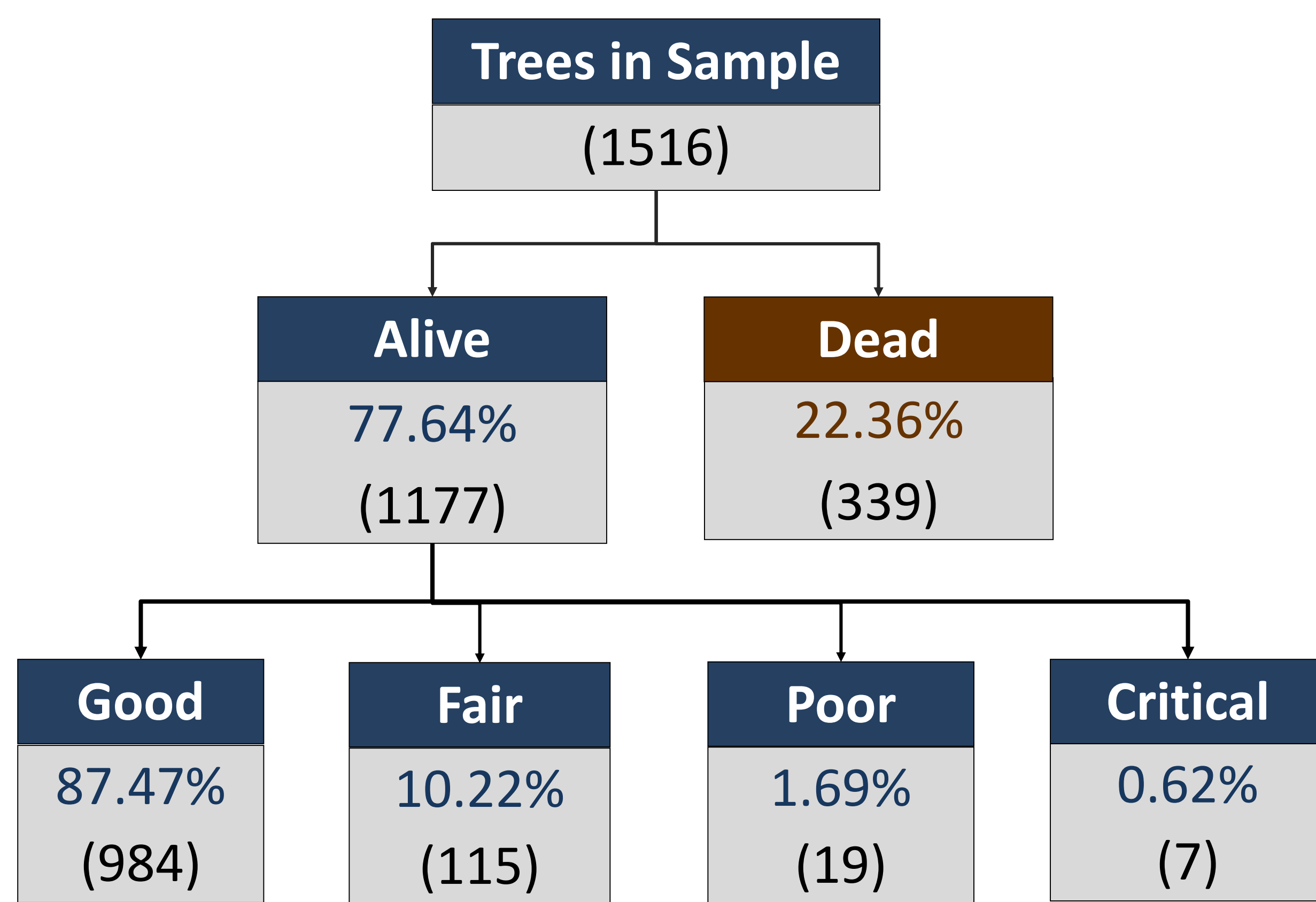
Impact of Size Metrics on Survivorship

Species that had the highest overall survivorship also showed the highest annual increases in diameter at breast height (DBH) and height. Several species that showed high increase in both size metrics includes White Pine and Snow Goose Cherry.



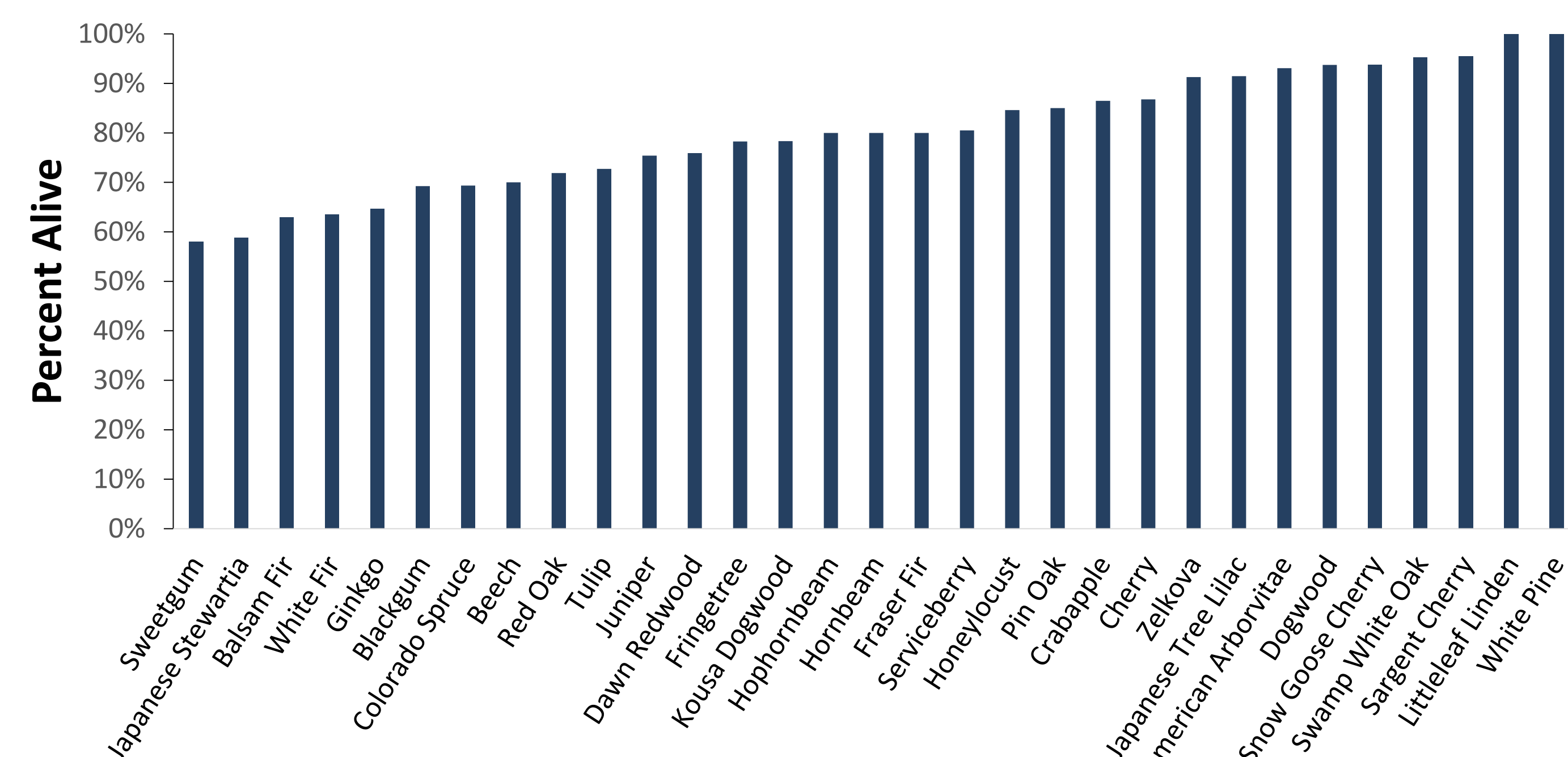
For the top ten species of annual DBH increase, there were 2 shade, 4 ornamental, and 4 conifer species. Ornamental trees are known to grow faster during their establishment period, which explains for their higher frequency in this chart.

Tree Survivorship Summary



We observe a 2% increase in tree survivorship from 2014 (75.6%) to 2015 (77.6%). In addition, 97.69% of the alive trees in 2015 are in good or fair condition, compared to 94.9% of 2014. The survivorship rate is also above the average rate (75%) of other studies on tree planting across the United States. We determine that these statistics indicate a successful performance of the program in Worcester.

Survivorship By Species

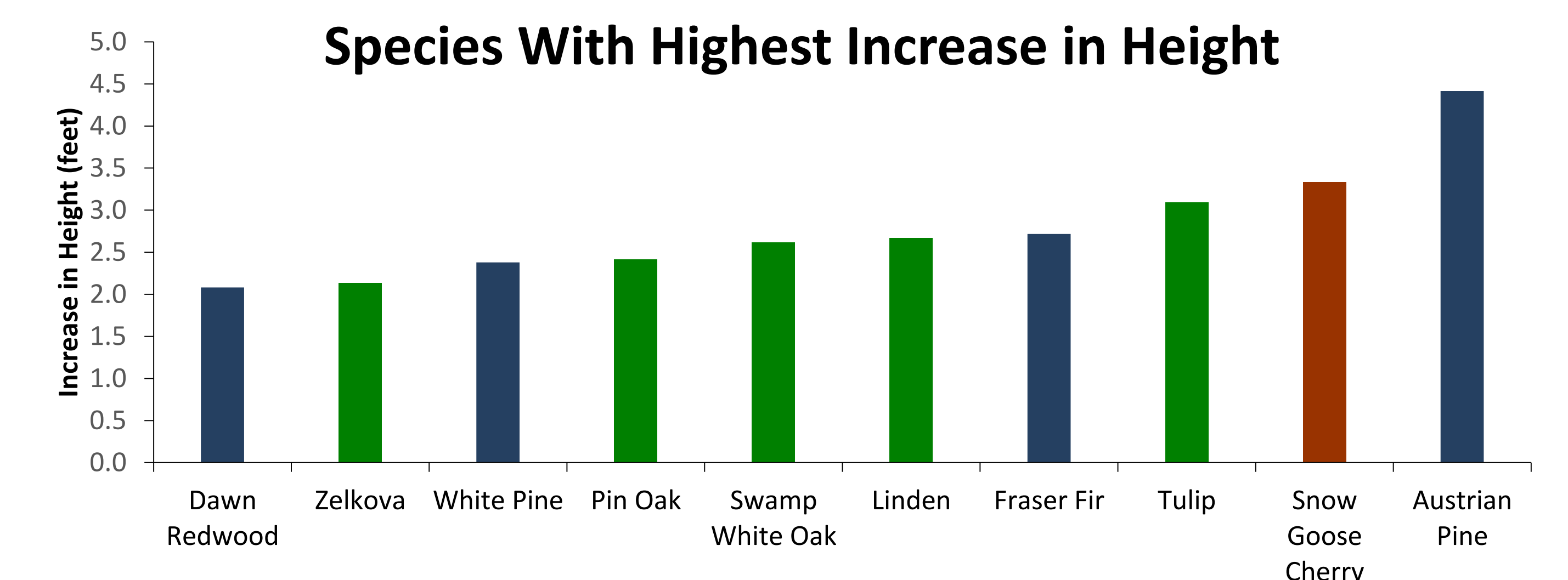


Species with Lowest survivorship	
Sweetgum:	58%
Japanese Stewartia:	59%
Balsam Fir:	63%
White Fir:	64%
Ginkgo:	65%

Species with highest survivorship	
Snow Goose Cherry:	94%
Swamp White Oak:	95%
Sargent Cherry:	96%
Littleleaf Linden:	100%
White Pine:	100%

Survivorship was calculated only for species that had fifteen or more trees surveyed in our sample. The White Pine and the Little Leaf Linden both had a survivorship of 100% while the Sweet Gum and Japanese Stewartia had the lowest at 60%. Another species that should be noted for low survivorship is the White Fir (64%). The White Fir had one of the lowest survivorships while also being the most frequently sampled species due to a higher number of trees planted. This had a significant effect on the survivorship percentage of the total cohort.

Species With Highest Increase in Height



For the top ten species of annual height increase, there were 5 shade, 1 ornamental, and 4 conifer species. The majority of shade trees could be due to the fact that they tend to grow to a taller height when reaching maturity.

Summary

In overall, the 2015 sample of 1516 trees had a high survivorship rate of 77.6%. Given the high percentage of trees in good and fair conditions, we predict that the survivorship rate will continue to increase as the trees grow out of their establishment period. In addition, all of the species with at least 15 trees sampled had a survivorship rate above 50%. Most species that had the highest growth in size metrics were also among the ones that had the highest survivorship. Understanding the relationship between size metrics and survivorship will be helpful for further research in urban tree assessment.

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