



# Assessing Survival on MillionTreesNYC Reforestation Sites

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## Introduction

The City of New York Parks & Recreation's (Parks) Natural Resources Group (NRG) is leading a large scale, citywide reforestation effort as part of the MillionTreesNYC goal to plant 450,000 trees in parks across the city. The reforestation monitoring study was developed as one tool to test the success of the reforestation efforts. This study addresses the basic survivability and health of the trees since planting began in the fall of 2007. This study captured the container trees planted by In house staff, volunteer groups, and contractors.

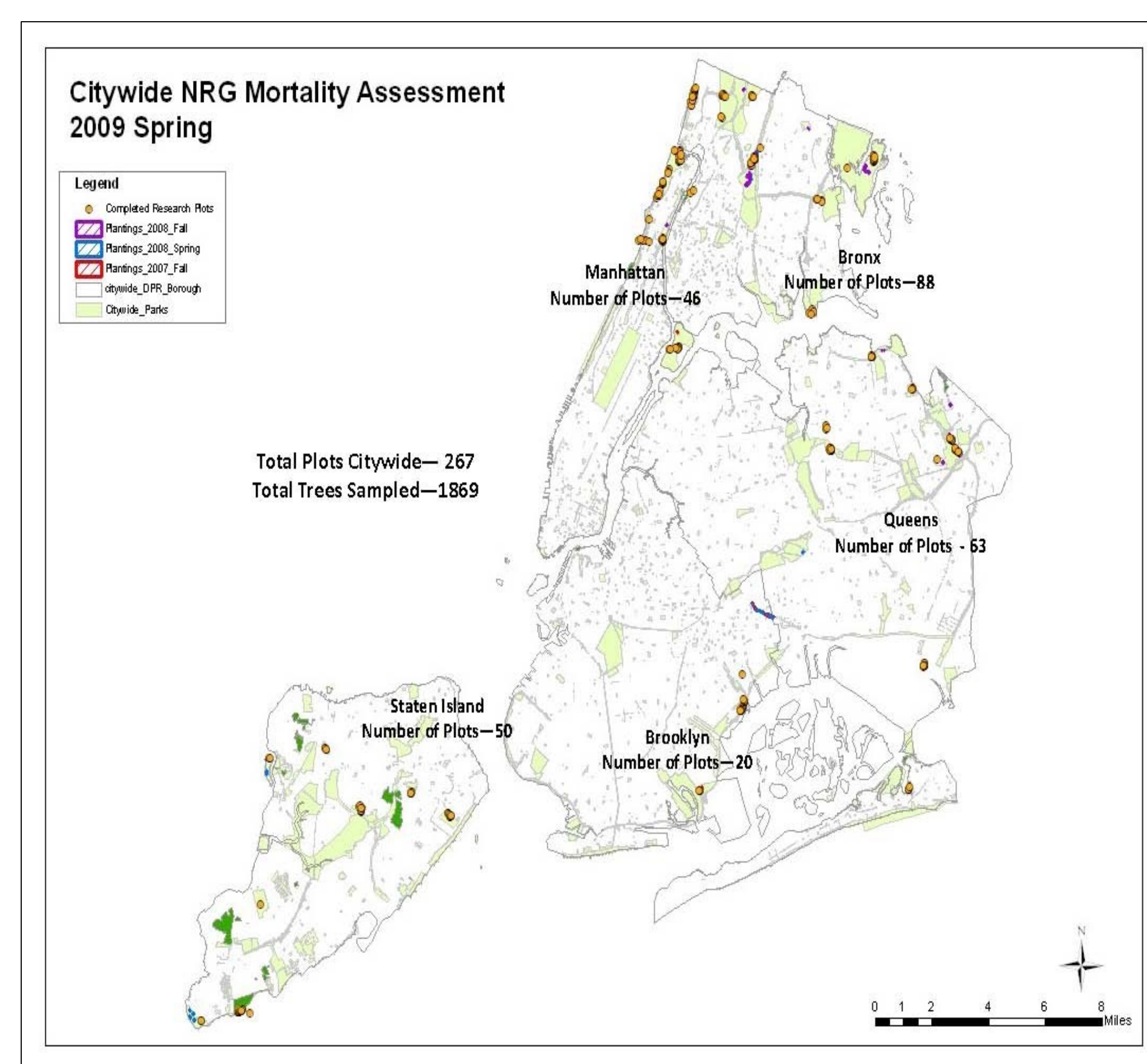


Figure 1. Citywide map of study area and research plots completed.

## Methods

Twenty seven parks were sampled throughout the five boroughs. The data was collected from June to August 2009. 222 permanent research plots were established; each plot is 25 sq. meters (Figure 1). Data related to species, survival and diameter was taken for each tree. Two variables for cause of death were added to test for vandalism in the planting areas; up rooted and broken stem. Data on the health of the live trees involved insect herbivory, leaf discoloration, dieback, or death of the main stem.

## Results

The citywide mortality rate for reforestation sites was 7% (Figure 2). The mortality rate varied by borough; with the highest in Staten Island at 12% and the lowest in the Bronx and Brooklyn at 3%. Seasonally, the trees experienced a higher mortality rate in the spring plantings (10%) compared to the fall plantings (5-7%) (Figure 3). The newly planted trees had different exposure to full sunlight. There was an increase in mortality for the trees that had full sun (9%) compared to trees that were shaded (4%) (Figure 4). Out of 23 genera surveyed, four experienced 100% survival citywide: birch (*Betula spp.*), hickory (*Carya spp.*), ash (*Fraxinus spp.*), and elm (*Ulmus spp.*). Pine (*Pinus spp.*) and Cherry (*Prunus spp.*) had the highest mortality out of all of the trees sampled. The Oak (*Quercus spp.*) had a 96% survival rate out of 843 oaks sampled (Figure 5). Leader stem survival was used as an indicator of tree health to further assess planting practices. Staten Island experienced the highest rate of leader stem die back (62%) compared to the lowest rate in the Bronx (11%) (Figure 6).

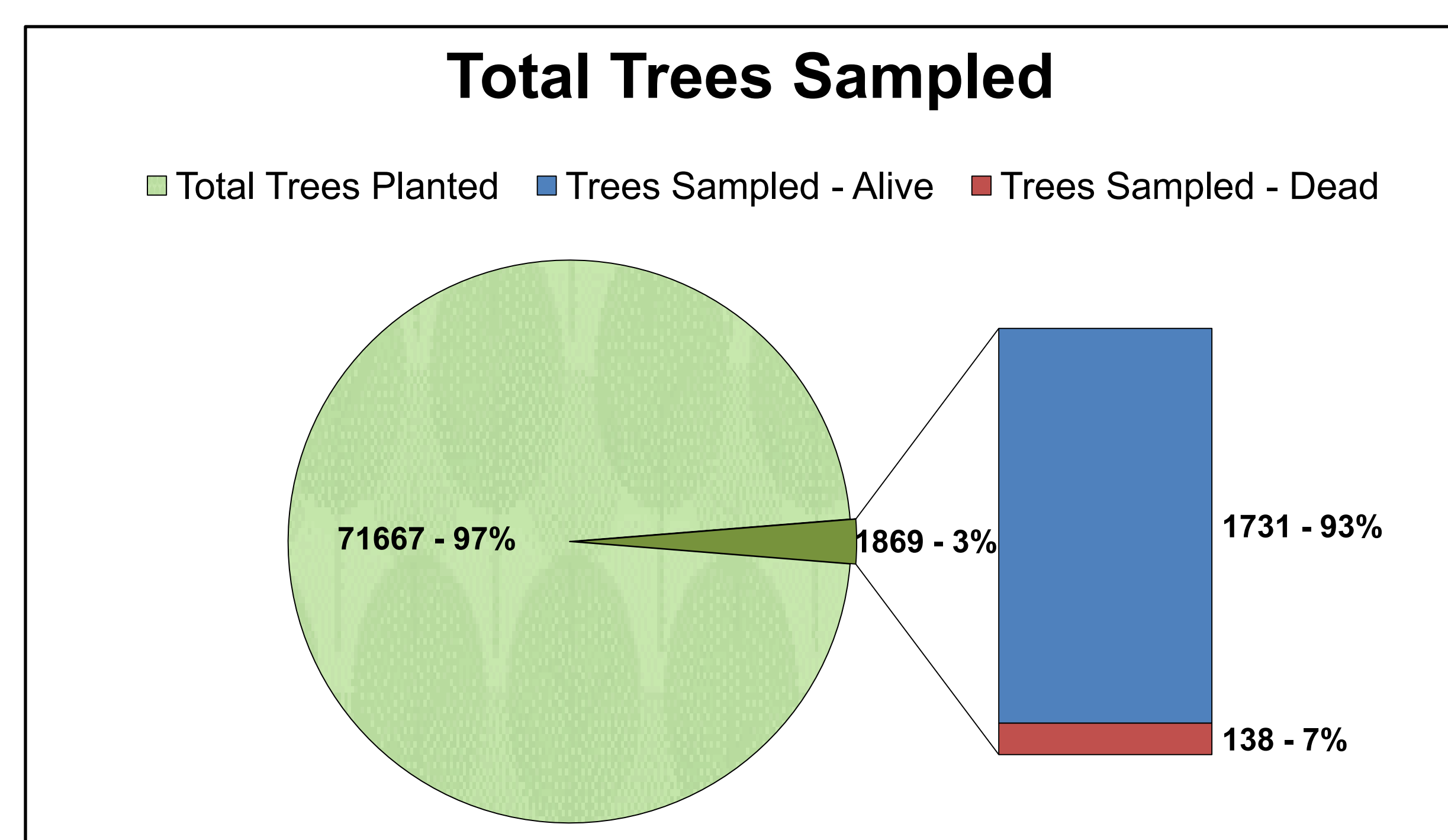


Figure 2. The percentage of trees sampled from total number planted. All three planting seasons are represented in trees planted and sampled.

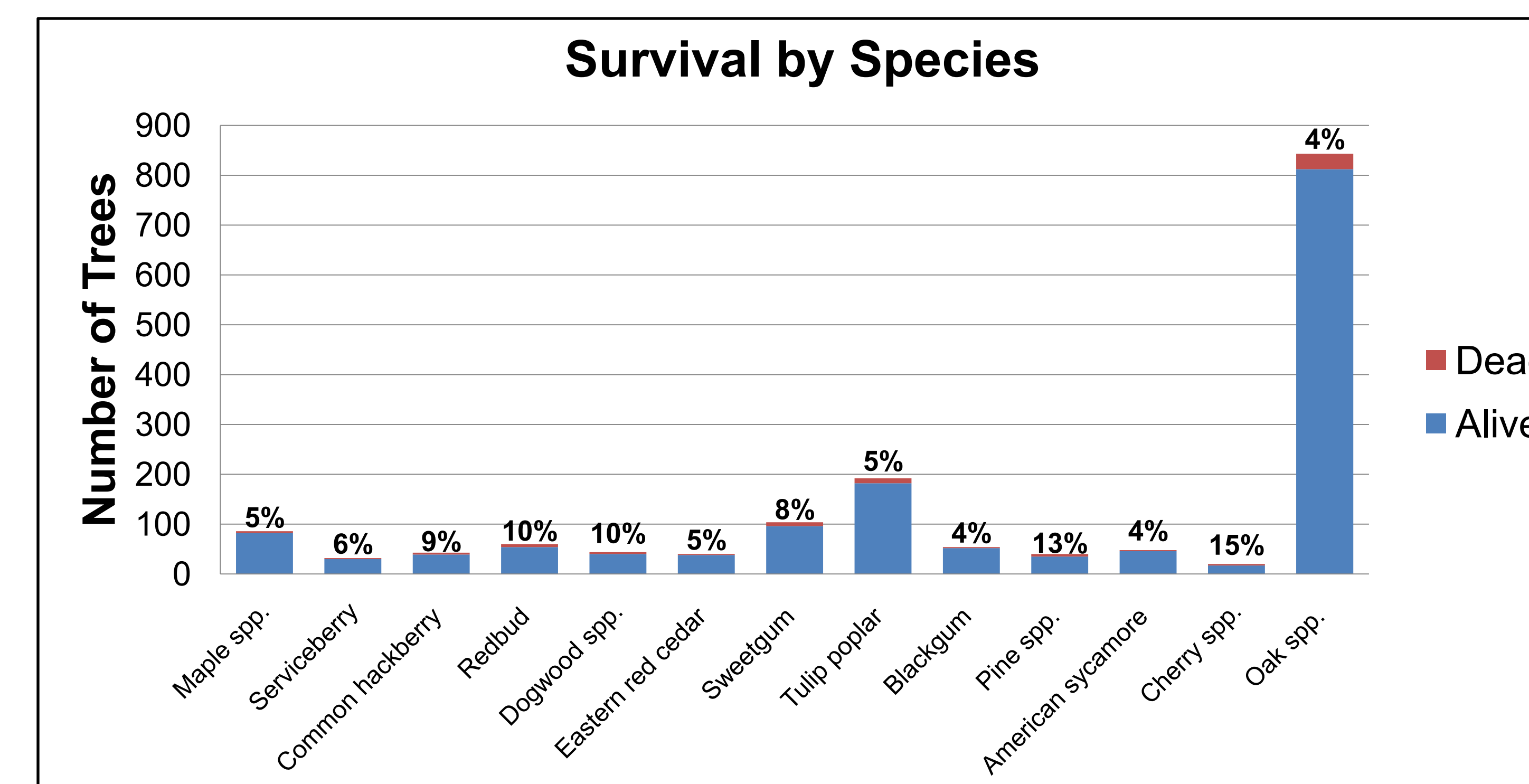


Figure 5. Basic mortality of species planted. The percentages shown represent the mortality of each genus. Percent alive category is not labeled.

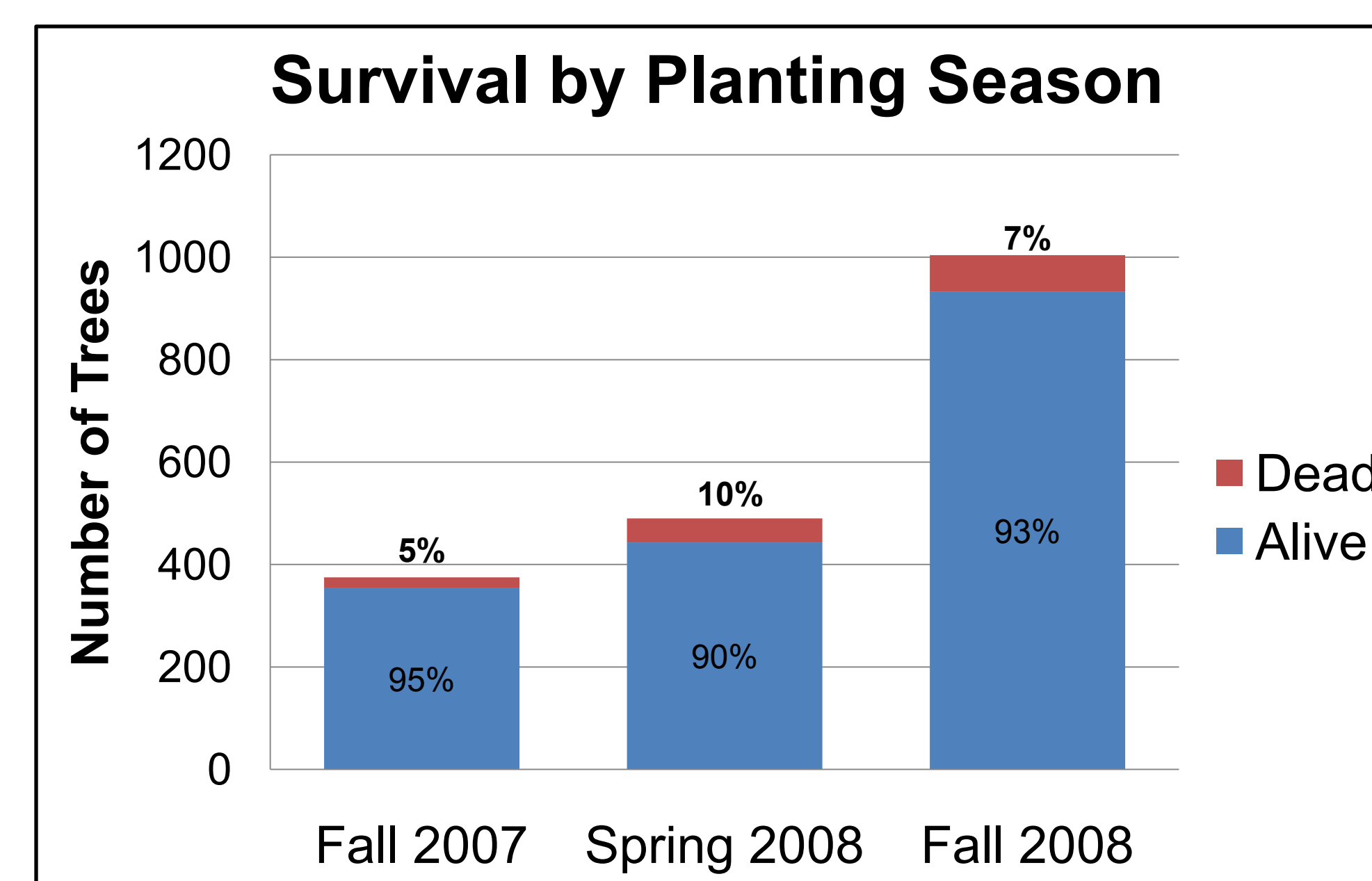


Figure 3. Survival and mortality of trees planted in the fall versus the spring.

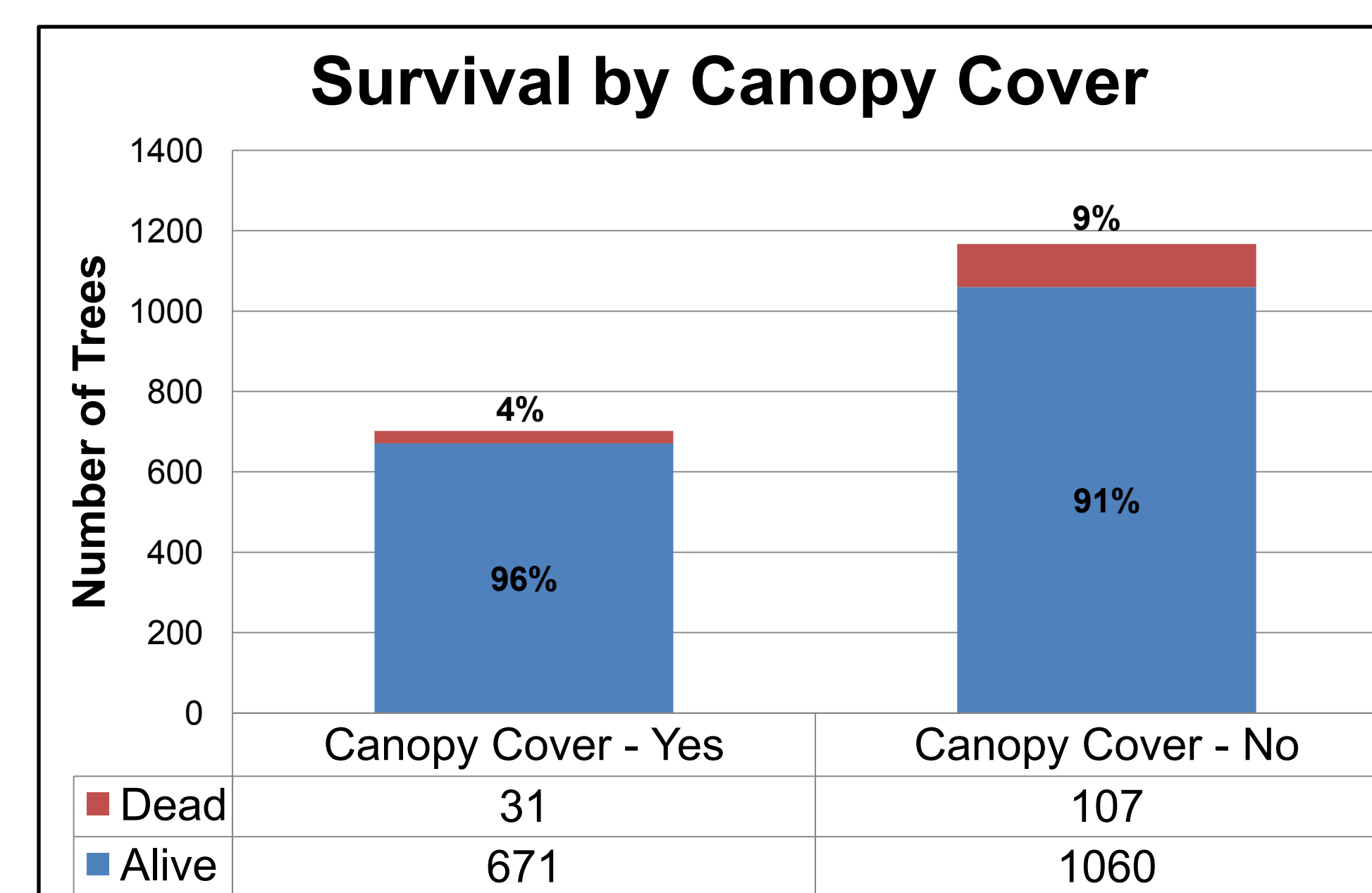


Figure 4. Trees planted under canopy cover are shown on the left and full sun plantings are shown on the right.

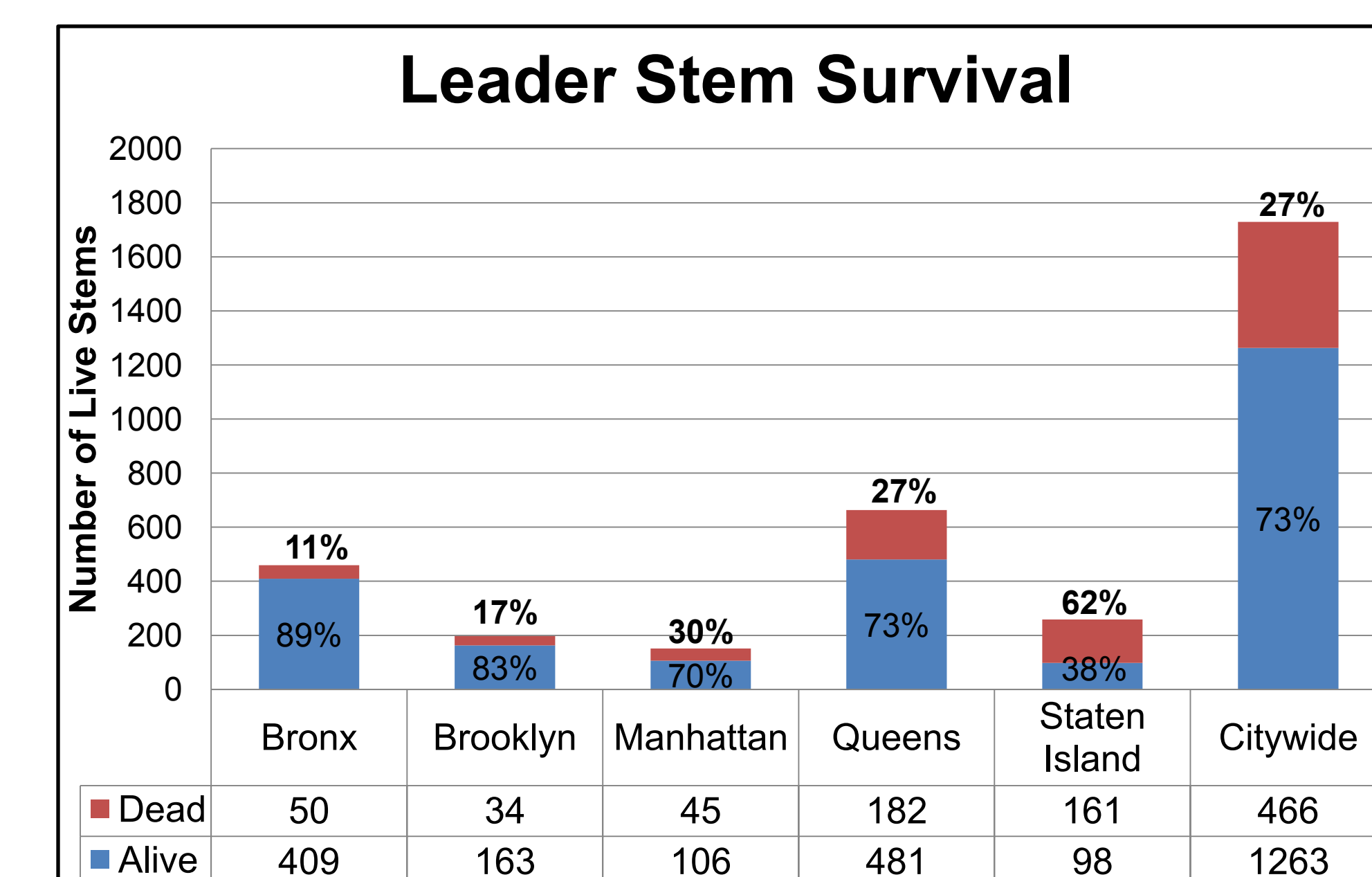


Figure 6. Analysis of leader stem mortality by borough.

## Discussion

Seven percent mortality is relatively low in comparison to available research. Reforestation efforts in the Mediterranean showed 10% mortality for intense management of planted trees and as high as 95% mortality for plots that were in full sun without mowing (Benayas et al. 2005). A study in the Coweeta Basin, NC showed oak seedling mortality as high as 20% (1-10cm diameter) (Elliot and Swank 1994). In summer 2010, sites planted in fall 2009 will have plots installed, and sites planted in fall 2007 and spring 2008 will be revisited. NRG will continue to establish new plots each summer and visit past plots on a two year cycle.

## References

Elliott, K. J. and W. T. Swank. 1994. Impacts of Drought on Tree Mortality and Growth in a Mixed Hardwood Forest. *Journal of Vegetation Science*. Vol. 5, No. 2. pp. 229-236.

Rey Benayas, Jose´ M., Javier Navarro, Ti´scar Espigares, Jose´ M. Nicolau, and Miguel A. Zavala. 2005. Effects of artificial shading and weed mowing in reforestation of Mediterranean abandoned cropland with contrasting *Quercus* species. *Forest Ecology and Management*. Vol. 212. pp.302-314.

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