

BIOLOGICAL THREATS TO BIODIVERSITY

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INTRODUCTION

The pressures of urban development impact small remaining areas of the Carolinian Forest in Southern Ontario. The Carolinian Forest contains some of the highest biodiversity in Canada and losses in green areas and the diversity of species can be identified from the local or municipal level to a global scale. Changes in climate and disease patterns put additional pressure on these areas.

WHITE PINE



Background

The Association for Canadian Educational Resources (ACER), Humber Arboretum, Arborvitae (non-profit) and Atmospheric Science and Technology Directorate, Adaptation and Impacts Division (government) developed a climate change experimental site at the Toronto Humber Arboretum in northwest Toronto, in the heart of the Carolinian forest, to monitor the impacts of biological threats on urban forest biodiversity. The goal was to investigate the benefits of forest planting design and the selection of species to optimize greater species biodiversity and ensure increased climatic resilience of species under current and changed climate conditions, particularly for urban forests.

Description

Approximately 2,157 trees and shrubs were planted in 2002-03 in a standard one-hectare biodiversity site with 25 quadrats, each 20 metres by 20 metres in size. There are 76 different species of trees and shrubs planted, an unprecedented number of species for a community planting project. As well as planting for biodiversity and climatic warming, the site was also designed to bolster disease resistance: no more than 5-10% of any one species; no more than 20% of species in the same genus; and no more than 30% in the same family.

Urban Heat Island Effect

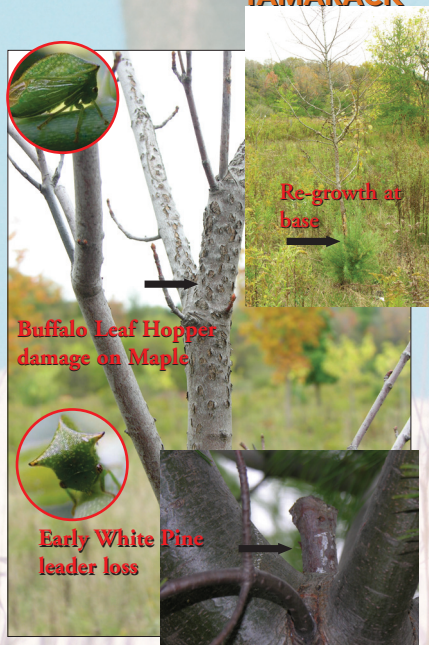
The Toronto urban location proved particularly beneficial for this study. The Toronto core, home to 2.5 million people has a well-documented warming bias relative to surrounding rural sites. This "Toronto warming effect" of nearly 4.0°C in minimum temperatures relative to rural sites includes thermal influences from the city's location on the shoreline of the Great Lakes, as well as urban heat island effects.

The degree of warming in the Toronto core relative to nearby rural areas is consistent and within the range of anticipated future warming. It is hypothesized that this degree of temperature change in the city presents itself as a possible "learning laboratory." The current observed differences in minimum temperatures serve as an important indicator to better assess the responses of vegetation to the warming by a comparison to rural sites outside of the city.

BLACK CHERRY



TAMARACK



REFERENCES AND ACKNOWLEDGEMENTS

Environment Canada. 2008. Poster prepared for Climate Change and Biodiversity in the Americas Symposium, Panama City, Panama, Feb. 25-29, 2008. Adaptation and Impacts Division, Environment Canada. Thanks are extended Joanne Healy for the tree photographs.

Conclusion

Climate warming in urban habitats is associated with increased frequency and outbreaks of pests, as well as the expansion of populations of deer and rabbits, whose growth is benefited by the warmer springs. Despite protecting the trees with tree collars, browsing damage in the Humber Arboretum site was considerable, with 20-80% mortality of the newly planted seedlings in the sampled quadrats after five years. All of the trees still living, with the exception of white spruce, showed signs of heavy or severe browsing that may affect future growth, survival, reproductive success and competitive ability. The take-home message for managers is to plant larger-sized trees and trees more resilient to deer browsing in the urban landscape.