Collaborative Urban Forestry in the GTA

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Outline

- Background
  - Collaboration
  - Role of the TRCA
  - Benefits and costs
- Methodology
  - UFORE Model
  - Aerial Land Cover Analysis
  - Study Design
  - Data Collection
- Results
- Next Steps

Background

- “Programs that restore and enhance the urban forest represent a cost-effective and sustainable ‘biotechnological’ means to meet multiple standards, as trees provide multiple benefits for a singular cost (Nowak, 2006)”.

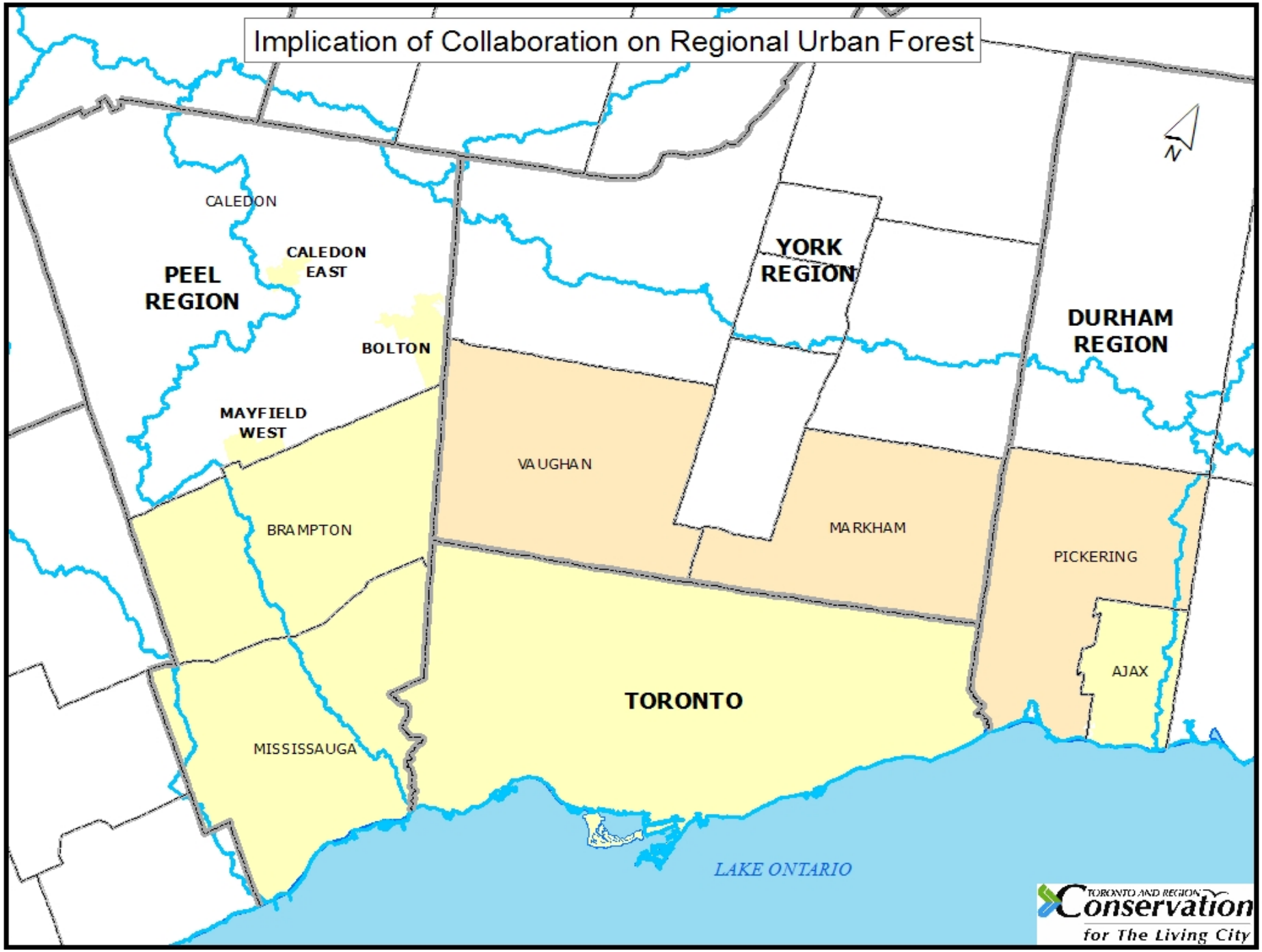
Background

- Recognized need for collaboration
- Urban Forest Studies Design Forum – April 2008
- Objectives:
  - To develop a standardized methodology that would facilitate comparative and complimentary research across the GTA
  - To strengthen the collective capacity to maintain and enhance the urban forest resource
- Partners:
  - Conservation Authorities
  - Municipalities (Local and Regional)
  - Technical advisors
  - Community and academia

"…comparative ecological research would lay a foundation for distinguishing common urban effects and responses from those specific to a particular city or group of cities due to variation in factors such as geography, climate, soil, urban morphology, cultural values, and political and economic systems" (Carreiro and Zipperer, 2008).

Benefits of Collaboration

- Benefits:
  - Data collected uniformly across the GTA – facilitate future partnerships
  - Shared terminology
  - Shared experience of design/management – trouble shooting
  - Mutual support – political
  - Wise use of experts
- Costs:
  - More communication – time and effort
  - More complex relationships – timing, outcome, resources
  - More dependence – higher risk


Implication of Collaboration on Regional Urban Forest
CALEDON
CALEDON EAST
PEEL REGION
BOLTON
MAYFIELD WEST
BRAMPTON
MISSISSAUGA
YORK REGION
VAUGHAN
MARKHAM
DURHAM REGION
PICKERING
AJAX
TORONTO
LAKE ONTARIO
TORONTO AND REGION Conservation
for The Living City

Methodology

- Urban Forest Effects (UFORE) model
  - i-Tree Software Suite
  - Created by the USDA Forest Service, Northern Research Centre
- Quantify structure and function of urban forest
- Rational for model selection:
  - Level of structural detail
  - Values specific to study area
  - Regional, national, international use

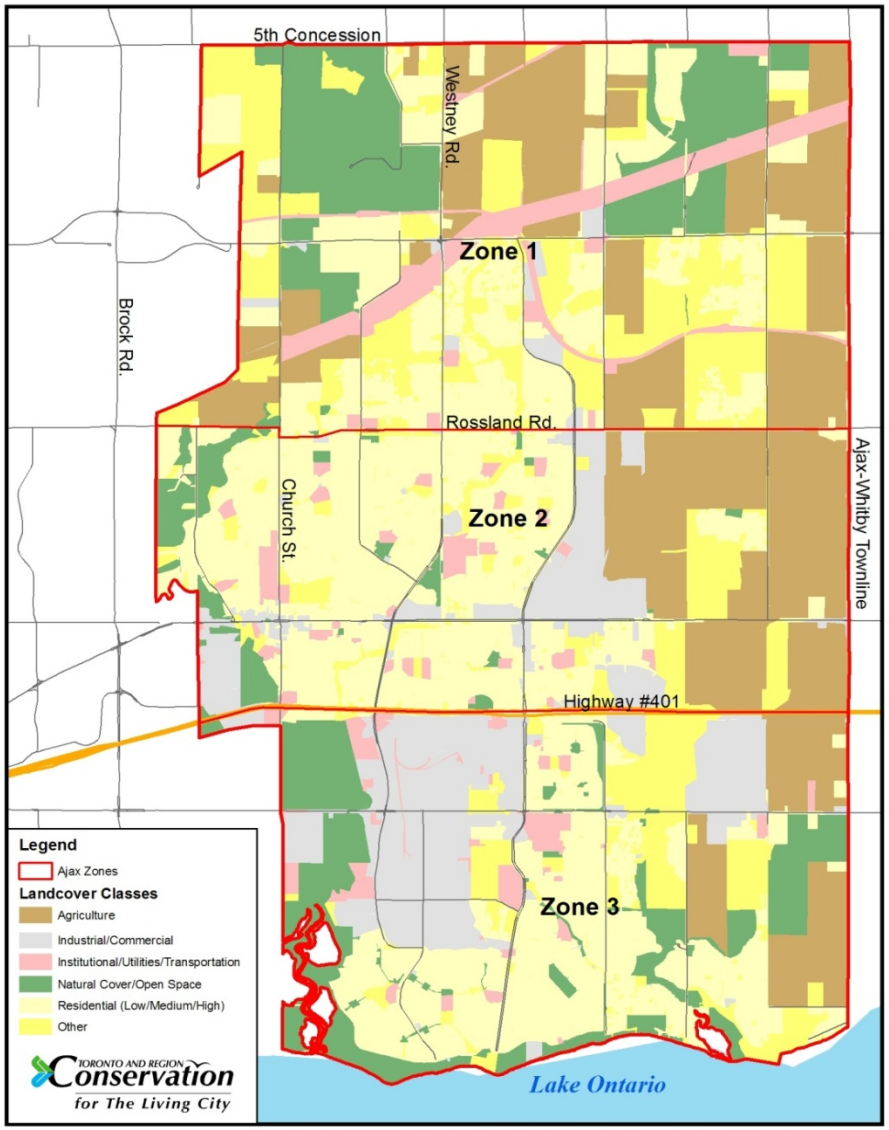
Methodology

Aerial Land Cover Analyses:

1. Aerial photo interpretation
   - Percent cover by land use or community
   - Ajax and Pickering
2. Digital cover maps using satellite imagery
   - Determine actual and potential location of trees
   - Peel Region, York Region, Toronto

UFORE Study Design

- Define study area
- Land use categories
- Post-stratification



UFORE Study Design

- 200 plots
- Randomized grid
- 0.1 hectare


LCBO
FUTURE SHOP

Data Collection

- Field Data
  - Ground cover
  - Tree and shrub species
  - DBH and height
  - Crown attributes
  - Distance and direction to buildings
- Pollution Data
  - Hourly measurements
  - SO_2, NO_2, CO, O_3, PM2.5, PM10

Results: Surface Cover

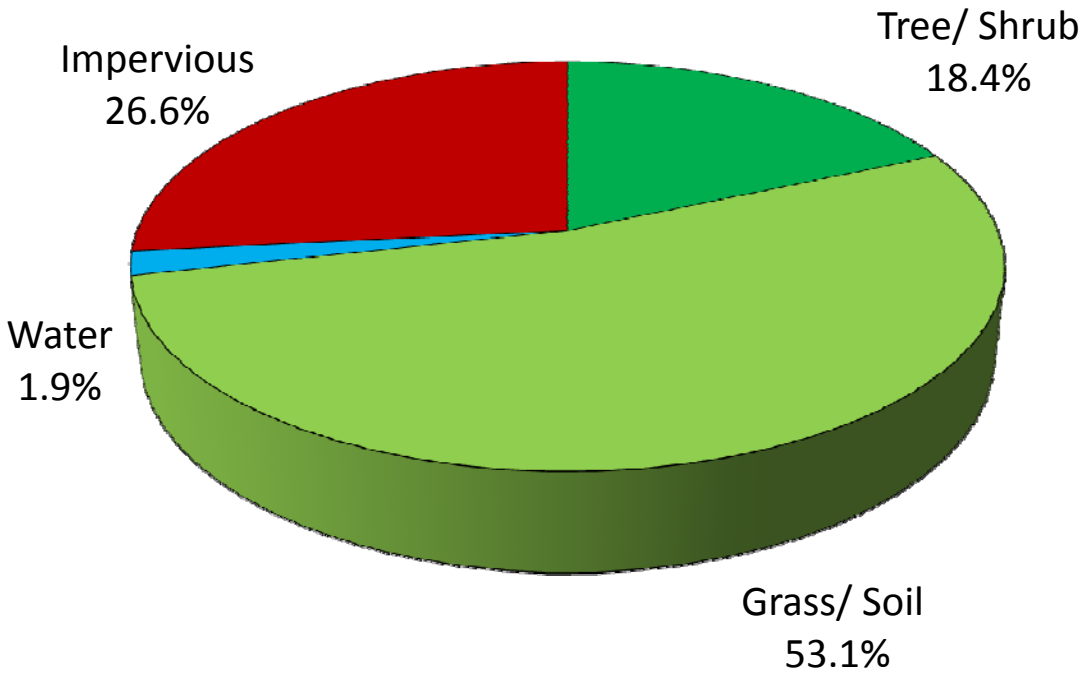


Figure 1: Surface cover composition in Ajax

Results: Species Composition

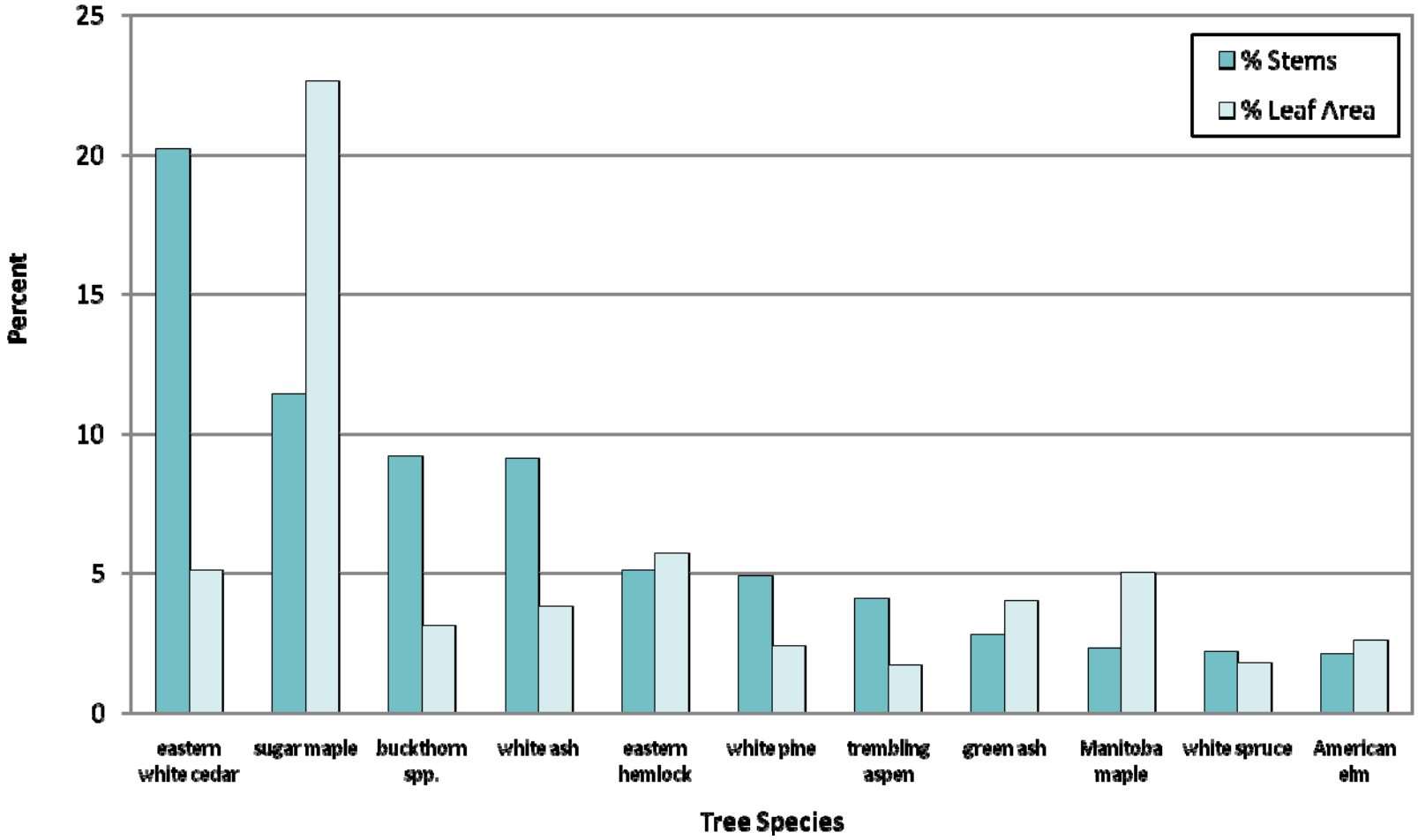


Figure 2: Species Composition in Ajax by Percent Total Stems and Percent Leaf Area

Results: Tree Size

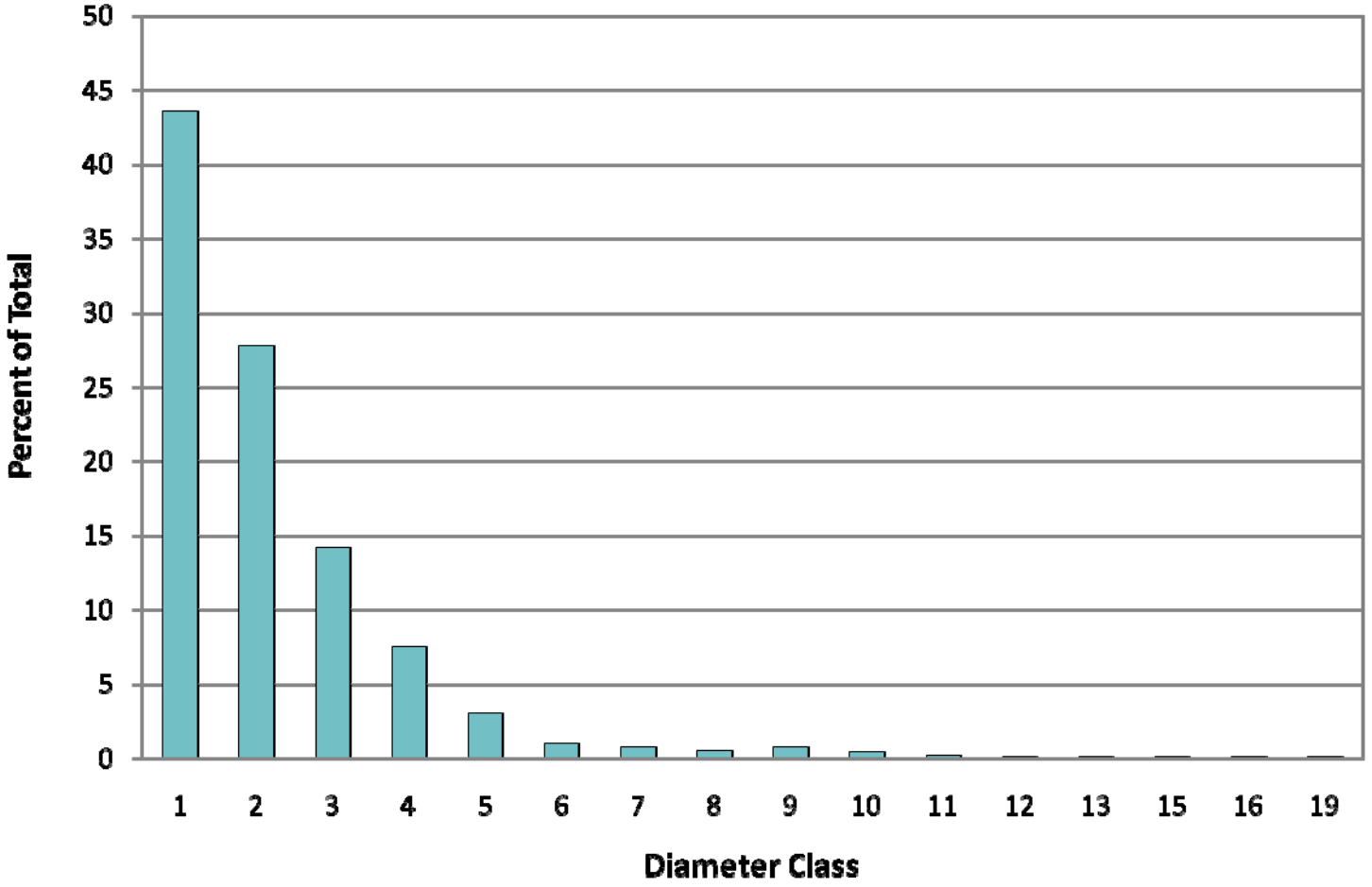


Figure 3: Percent of Tree Population in Ajax by Diameter Class

Results: Carbon Storage

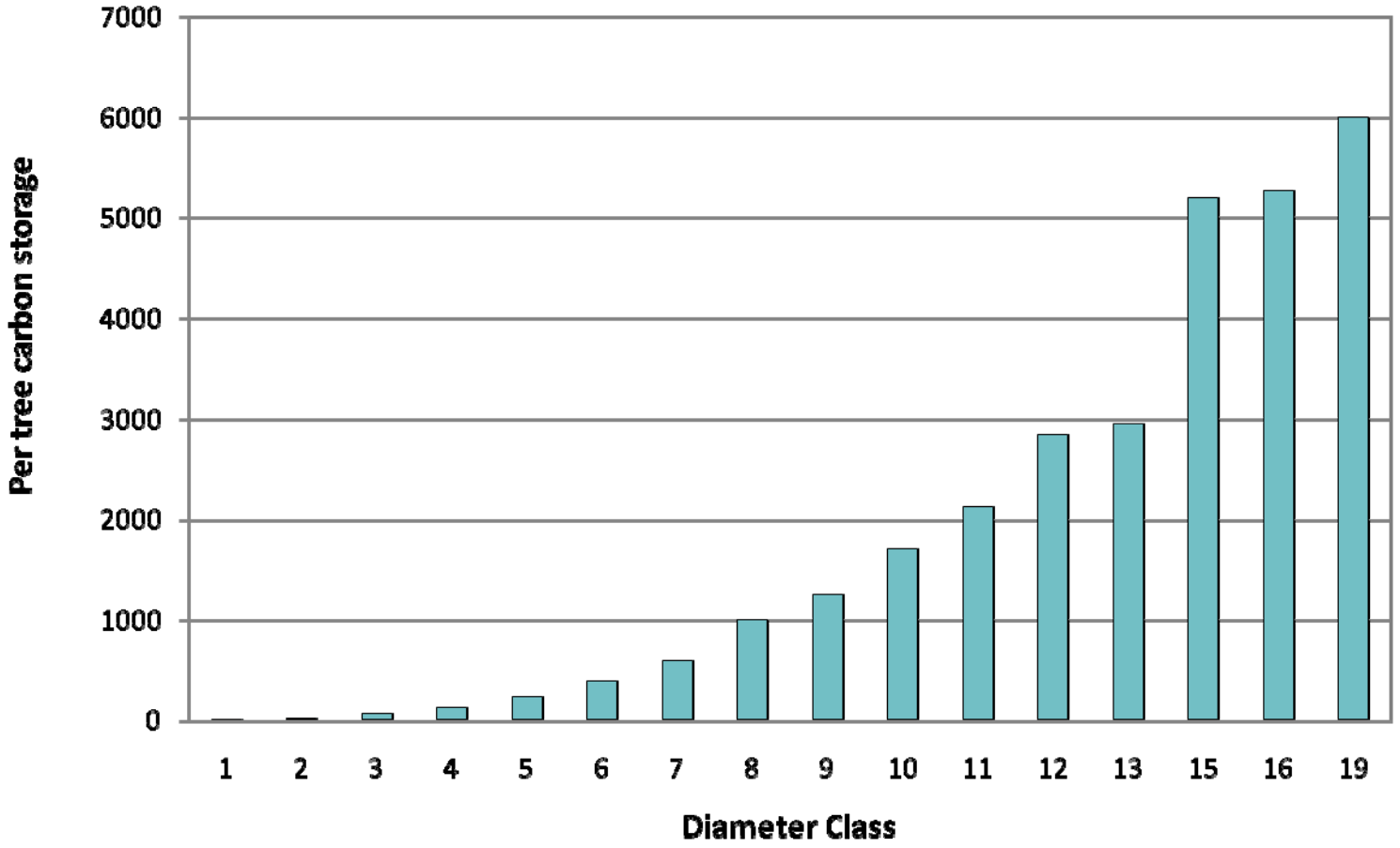


Figure 4: Per Tree Carbon Storage by Diameter Class for Trees in Ajax

Results: Pollution Removal

- Total annual pollution removed = 860 tonnes
- Total value = $ 3.9 million

Table 1: Annual pollution removal (dry deposition) and associated removal value for trees and shrubs, and removal rate for trees and shrubs

Pollutant	Pollution Removed (tonnes)	Removal Value (US $)	Removal Rate (g/m^2)	
			Trees	Shrubs
NO2	262	$ 2,598,140	26.2	10.4
O3	124	$ 1,225,065	12.4	7.1
SO2	43	$ 103,615	4.3	2.9
PM10	430	$ 32,981	0.5	0.3
CO	0.54	$ 755	0.05	0.05
Total	**859**	**$ 3,960,556**		

Results: Residential Energy Savings

- Total carbon avoided = 711 tonnes

Table 2: Household energy savings provided by trees

Energy Units	Heating		Cooling		Total (CAN $)
	Energy Savings	Financial Savings	Energy Savings	Financial Savings	
MBTU	35,570	$ 308,400	n/a	n/a	$ 308,400
MWH	304	$ 23,700	916	$ 71,400	$ 95,000

Additional Results

- Emissions of volatile organic compounds by trees
- Species diversity
- Pest impacts
- Compensatory value of trees
- Carbon sequestration
- Tree health

Recommendations

- Increase proportion of large, mature trees
  - Action: Protect and care for existing trees
  - Action: Improve growing conditions
  - Action: The right tree in the right place

- Increase species diversity
  - Action: through planting and removal ensure that no single species represents more than 5 percent and no single genus represents more than 10 percent of the entire tree population city-wide or at the neighbourhood / street segment level

Next Steps

- UFORE Studies 2010
- Strategy development
- On-going monitoring program
- GTA-wide reporting
- Academic partnerships

Thank you!

1. Digital Cover Map