The Conundrum of *Roadside Trees*: Joy for the People, but Plight for the Trees

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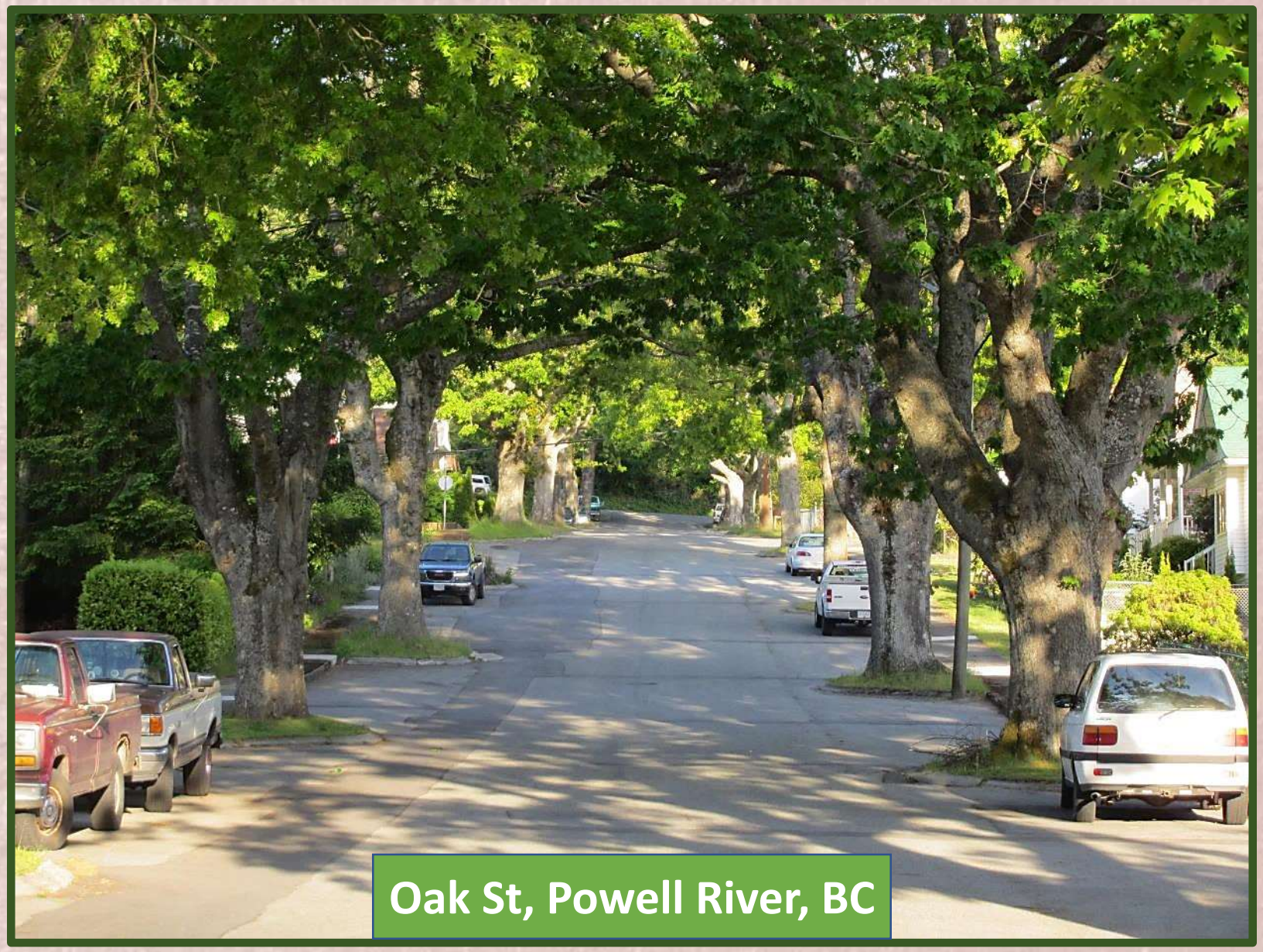
The Parts and Their Order

- **Overview of the Issue**
- **Our Research Findings**
  - **Tree Location Matters to Benefits Delivery**
  - **Street-Tree Species Diversity**
  - **Street-Tree Spacing**
  - **Grass Maintenance**
  - **Tree-Lawn Parameters**
- **Mgmt Considerations**
- **Conclusions**

Overview of the Issue




Poplar St, Powell River, BC

Research Findings:

Tree Location Matters to Benefits Delivery

- Four site types

Benefits and Disamenities

Benefits

Aesthetic beauty
Conserve fuel
Life of infrastructure
Community safety
Shade
Cool the city
Energy costs (direct)
Energy costs (indirect)
Business appeal
Enhance tourism
Diverse foods
Clean air
Health and healing
Road safety
Recreation opportunities
Learning opportunities
Enhances learning
Carbon capture
Employment
Property values
Stormwater flow
Water quality
Biodiversity
Sense of place
Sense of well-being

Disamenities

Powerlines
Underground infrastructure
Sidewalks & roads
Buildings
Health (allergies)
Shade
Taxes
Annual debris
Management costs
Undesirable wildlife
Perception of Danger

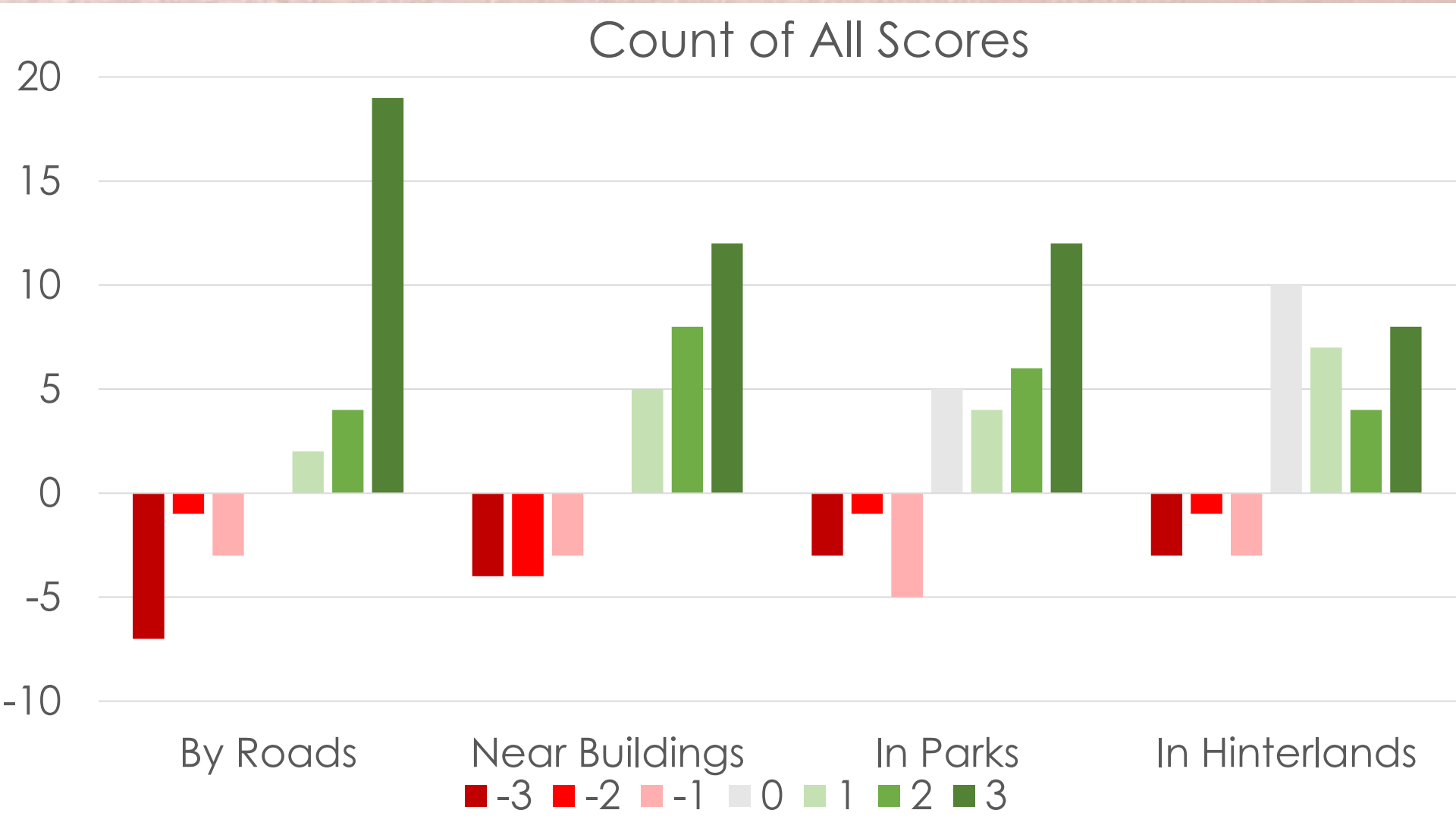
Res
Tree ivery

	By Roads	Near Buildings	In Parks	In Hinterlands
Aesthetic beauty	3	3	2	2
Conserve fuel	3	2	0	0
Life of infrastructure	3	1	0	0
Community safety	3	2	1	0
Shade	3	3	3	1
Cool the city	3	2	2	1
Energy costs (direct)	2	3	1	0
Energy costs (indirect)	3	3	2	1
Business appeal	3	3	3	0
Enhance tourism	1	1	2	3
Diverse foods	1	2	3	2
Clean air	3	3	3	1
Health and healing	3	3	3	3
Road safety	3	1	0	0
Recreation opportunities	2	2	3	3
Learning opportunities	3	3	3	3
Enhances learning	3	3	3	1
Carbon capture	3	3	3	3
Employment	2	1	1	3
Property values	3	2	3	1
Stormwater flow	3	2	2	1
Water quality	3	2	1	2
Biodiversity	2	1	2	3
Sense of place	3	3	3	2
Sense of well-being	3	3	3	3

Research Findings:
Tree Location Matters to Benefits Delivery

	By Roads	Near Buildings	In Parks	In Hinterlands
Powerlines	-3	-1	0	-1
Underground infrastructure	-3	-3	-1	0
Sidewalks & roads	-3	-1	-1	0
Buildings	-2	-3	0	-3
Health (allergies)	-3	-3	-3	-3
Shade	-1	-3	-1	0
Taxes	-3	-2	-3	-1
Annual debris	-3	-2	-1	0
Management costs	-3	-2	-1	-1
Undesirable wildlife	-1	-1	-2	-3
Perception of Danger	-1	-2	-3	-2

Research Findings:
Tree Location Matters to Benefits Delivery

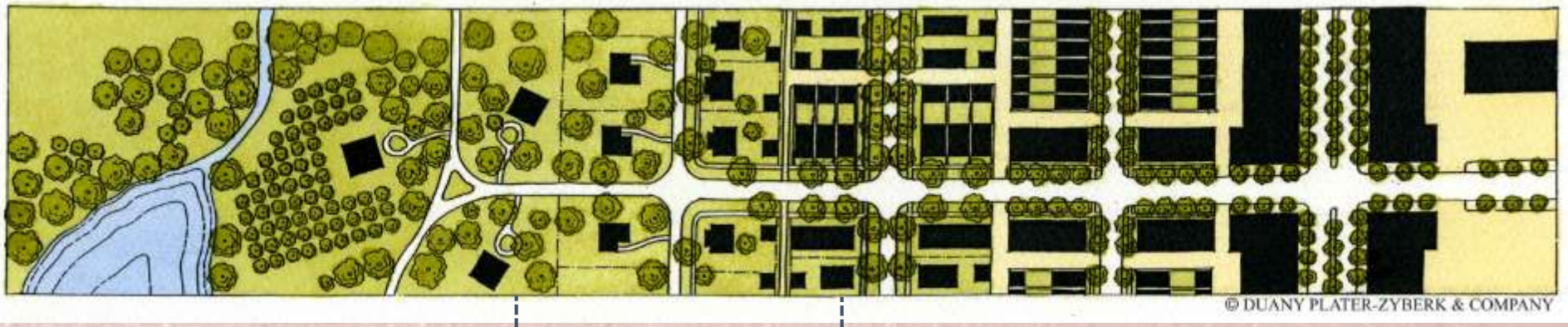


Research Findings:
Tree Location Matters to Benefits Delivery

- **Street Trees:**
  - **Highest delivery of benefits**
  - **Highest delivery of disamenities**
  - **Easiest for access to install and maintain**
  - **Most encountered by people**

Research Findings:
Street-Tree Species Diversity

Studying tree diversity in suburban areas

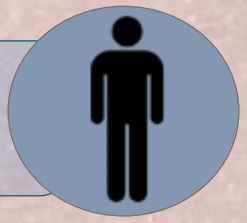


Greater species richness

Drivers of suburban tree diversity

Biophysical characteristics and natural features

Demographics and culture

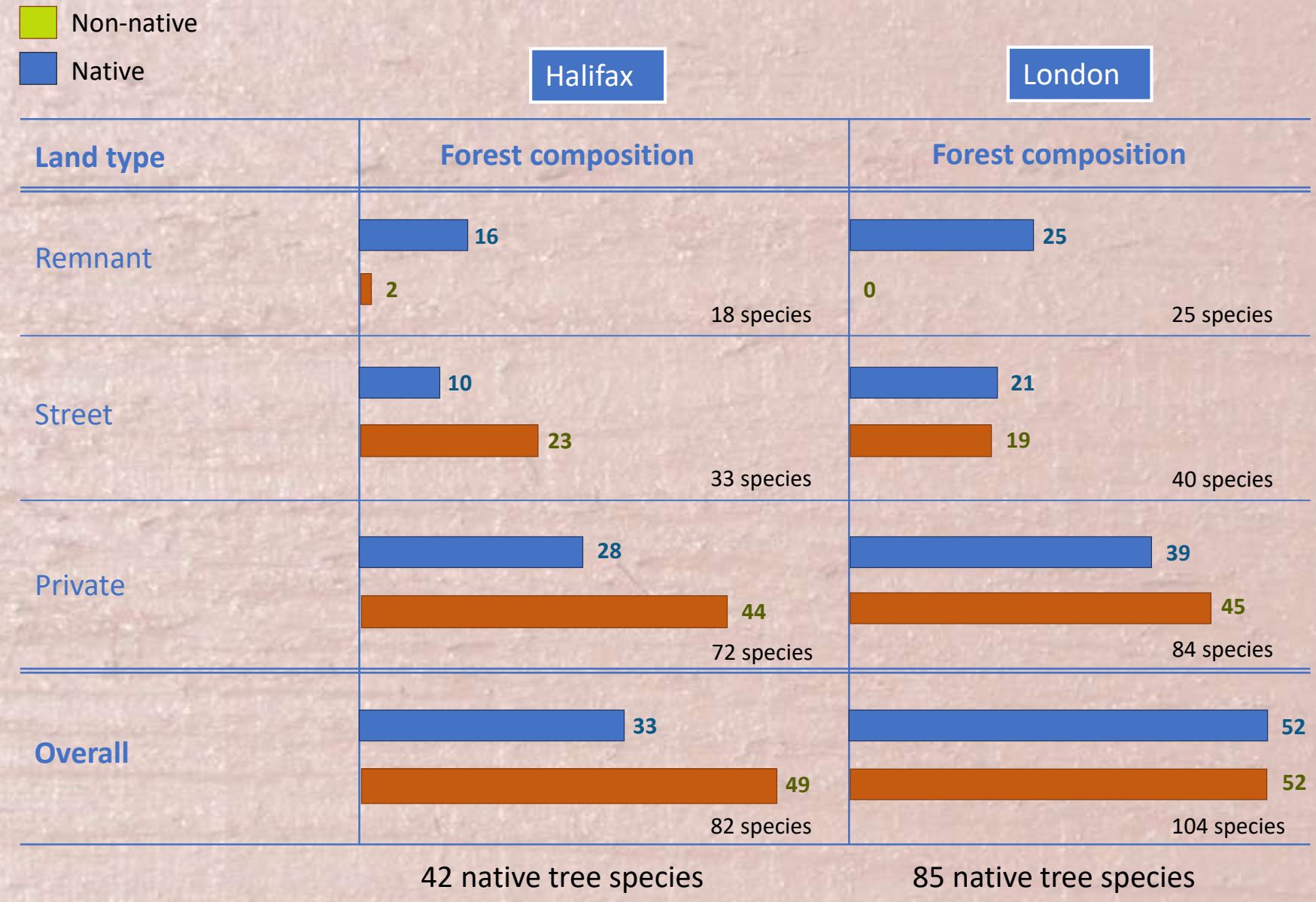


Administration and management

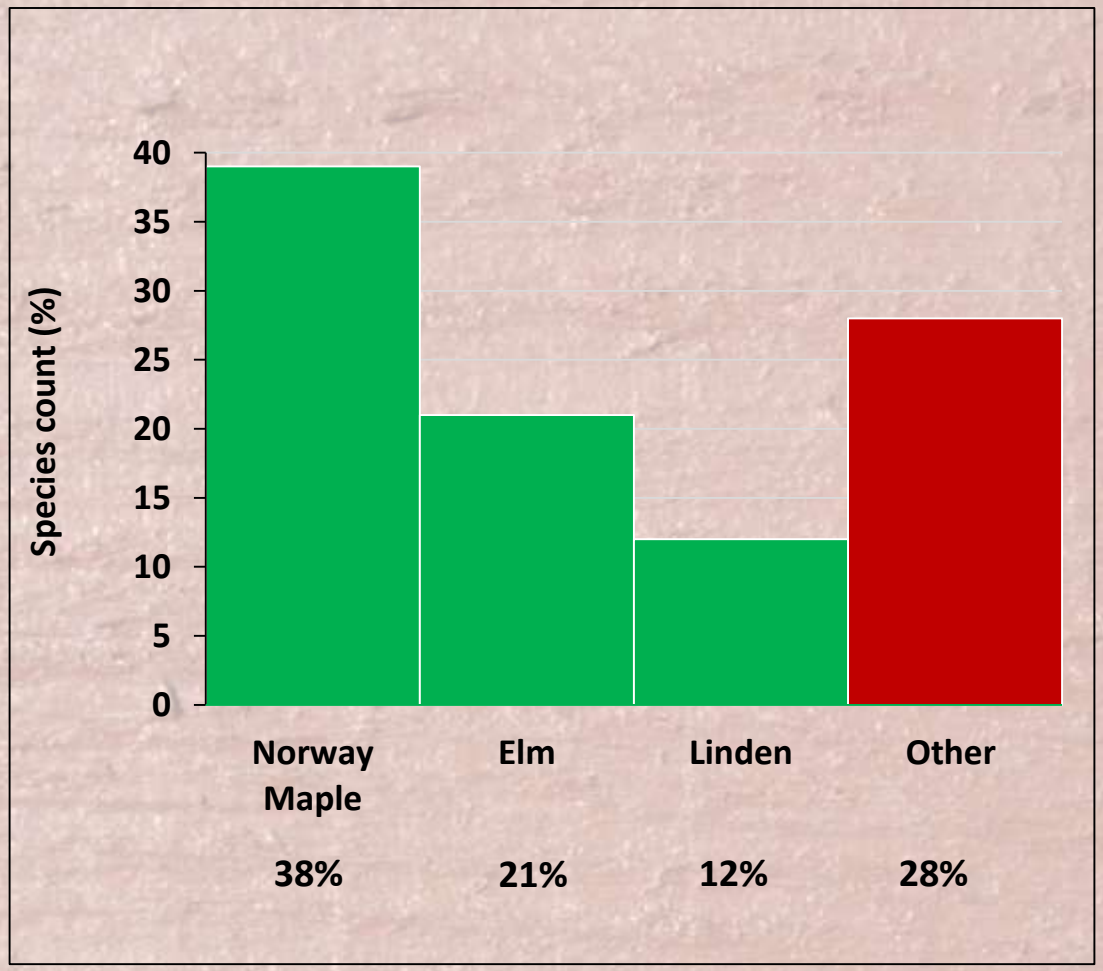
Professional cultures and paradigms

Community and neighbourhood design

General results for species composition



Results on Street-Tree Composition in Mature Neighbourhoods of Halifax



Research Findings:
Street-Tree Species Diversity

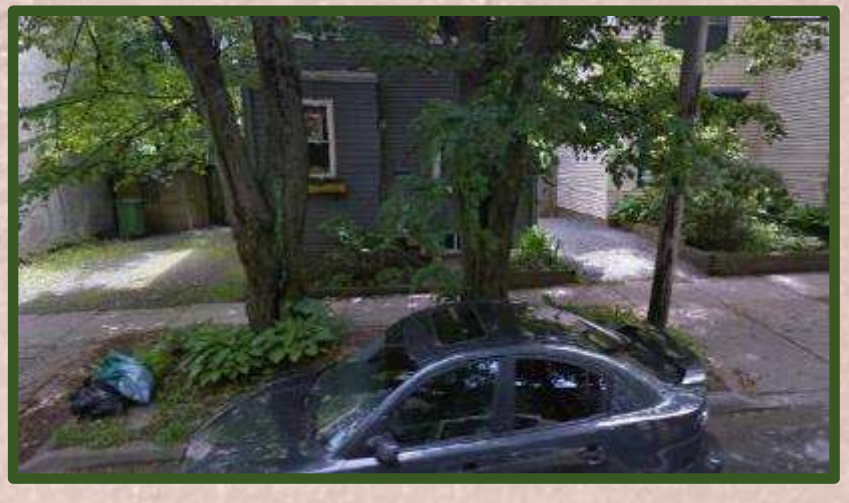
- **We have serious street-level and neighbourhood-level tree-species diversity issues in Halifax**

- **New plantings are trying to rectify this**

Research Findings:
Street-Tree Spacing

Range of Street-tree spacing in Halifax

Source: Google Earth



5-6 m

Street Trees

10-12 m

Source: Google Earth

Street Trees

Source: Google Earth

12-20 m

Over 20 m

Do we want street trees close together or far apart?

Newly planted trees

15 m

5-6 m

(Trees over 50 years)

Street-tree Spacing in Diverse Cities

Cities	Street-tree spacing		
	Large (m)	Medium (m)	Small (m)
Hamilton	10	N/A	6
North Vancouver	15-18	8-13	5-9
Vancouver	9-11	8-10	6-10
Regina	10	N/A	8
Visalia (USA)	9-14	7-10	6-7
Toronto	5-10		
Boston	9-13	7	6
Portland	7		
Richmond	6-12		
Milpitas	5-15		
Buffalo	Minimum 9 m		
Parramatta (Australia)	10	7	5
Sydney (Australia)	10-15	7-10	7
Kansas	10-20		

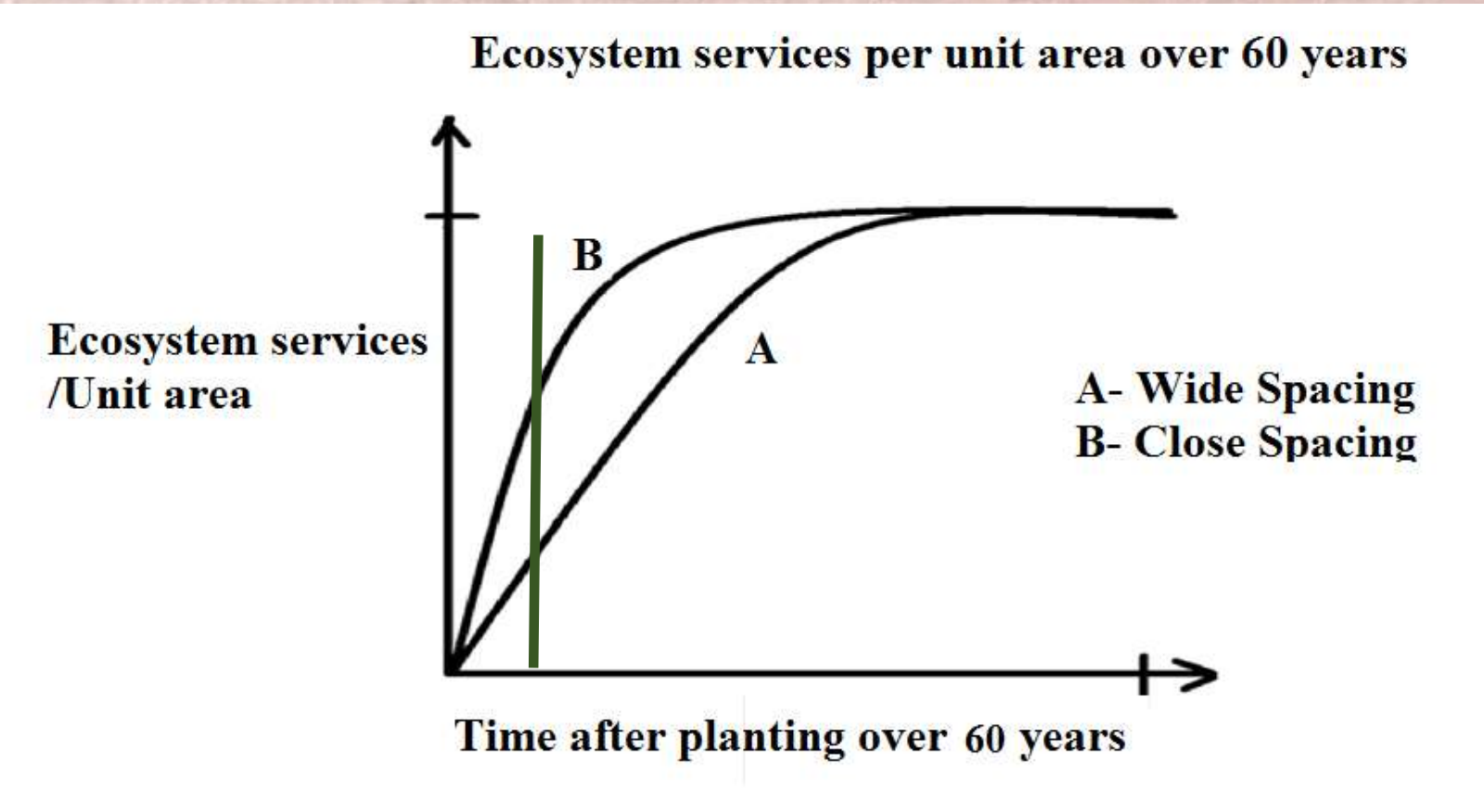
Street Trees as Providers of Ecosystem Services

1. **Improved air quality**
2. **Absorption of pollutants**
3. **Slowing storm water flow**
4. **Shading of asphalt, cars and buildings**
5. **Energy savings**

Source: Google Earth

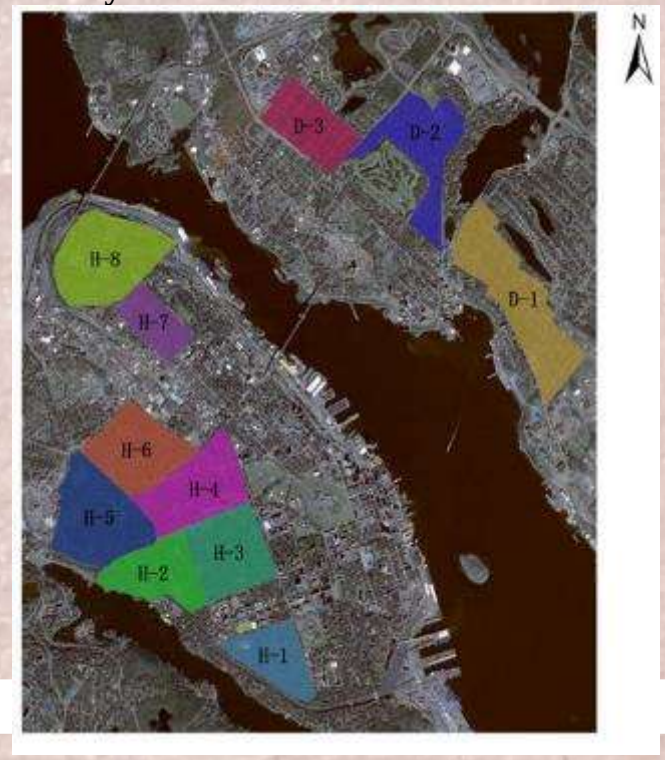
Amount of tree foliage per unit land area, not per tree

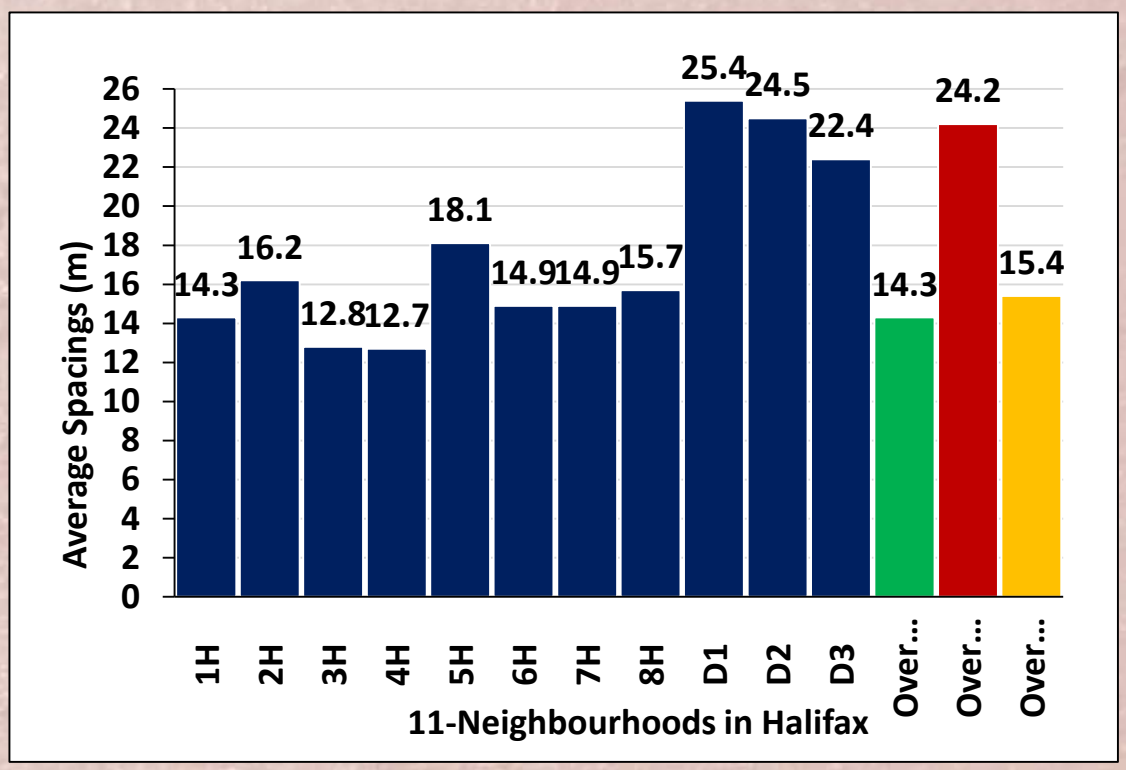
Ecosystem Services



Average Spacing of Street trees in Halifax

Study Area

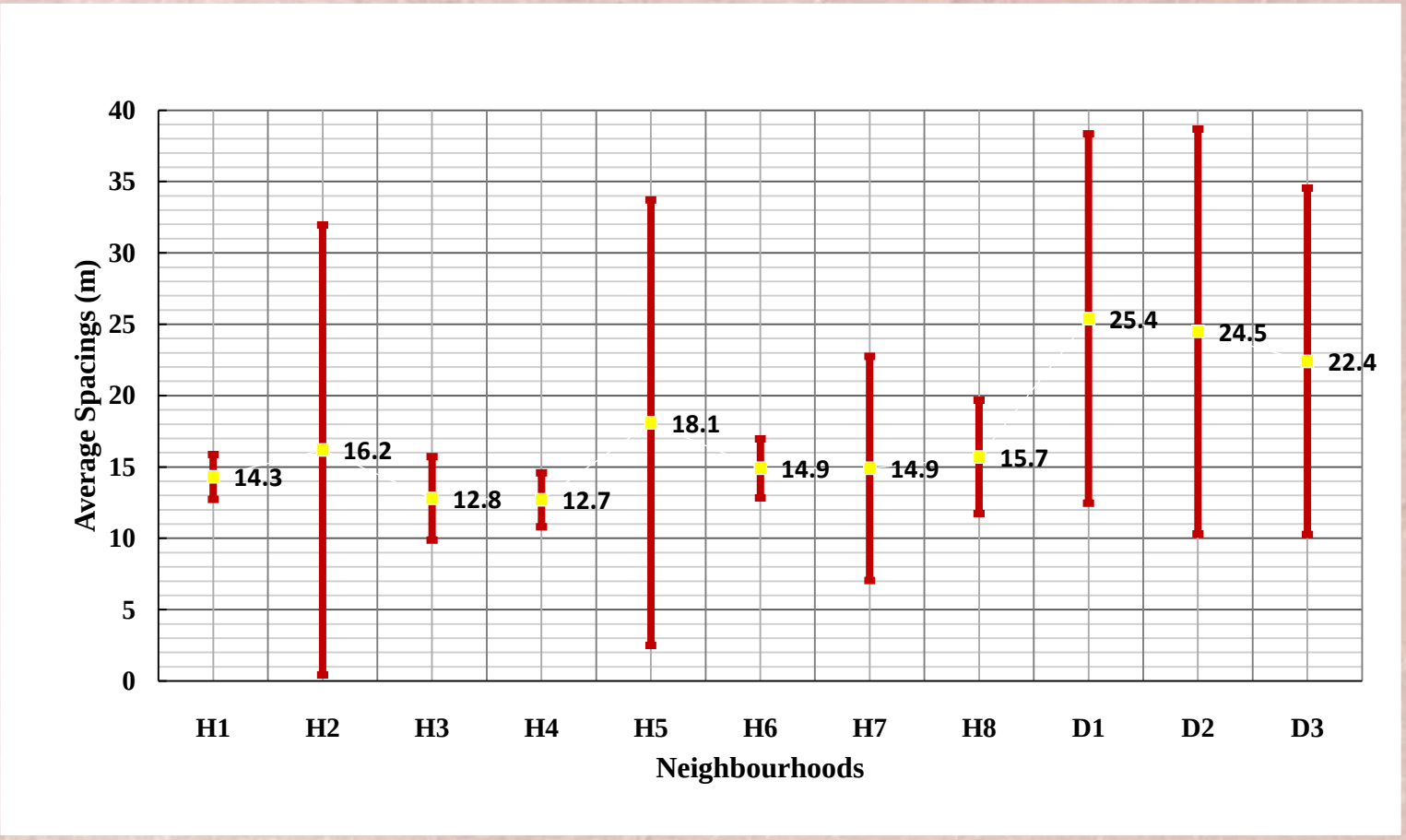




DALHOUSIE UNIVERSITY

School for Resource and Environmental Studies

Comparing Average Spacing between Neighbourhoods



Research Findings:
Street-Tree Spacing

Years taken to reach 50% crown cover by three species using different growth models						
Spacings	Elm		Norway Maple		Linden	
	PD_GM	iTreeGM	PD_GM	iTreeGM	PD_GM	iTreeGM
5	21	25	18	21	19	22
6	25	30	22	27	24	29
7	28	35	26	33	29	36
8	31	39	30	37	33	42
9	34	44	33	42	37	48
10	37	48	36	47	41	54
11	40	52	40	52	45	60
12	42	55	42	55	48	64
13	45	60	46	60	53	70
14	47	62	48	63	56	73
15	51	67	52	68	61	79
16	53	70	55	72	65	83
17	56	73	58	75	70	80
18	58	75	60	77	72	90
19	61	79	64	82	79	96
20	63	81	66	84	83	99

Research Findings:
Grass Maintenance

Threats to urban trees

- Urbanization/loss of woodlots
- Air pollution
- Water pollution
- Invasive pests and diseases
- Vandalism
- **Mechanical damage**

Mechanical Damage

Any damage that a tree incurs from mechanical grass maintenance equipment

http://www.better-lawn-care.com/

www.stihlusa.com

Mechanical Damage

- **Affects health and ability to grow**
- **When damage reaches cambium layer, damage is more severe**
- **Functional priorities shift at expense of future tree growth**
- **Very few formal studies exploring this issue**

HRM Case Study

- **Four rounds of surveying: mid June, early July, late July, and mid September**
- **Routes chosen by HRM staff**
  - **Caliper trees planted through HRM contracts, and presence of HRM-maintained grass**

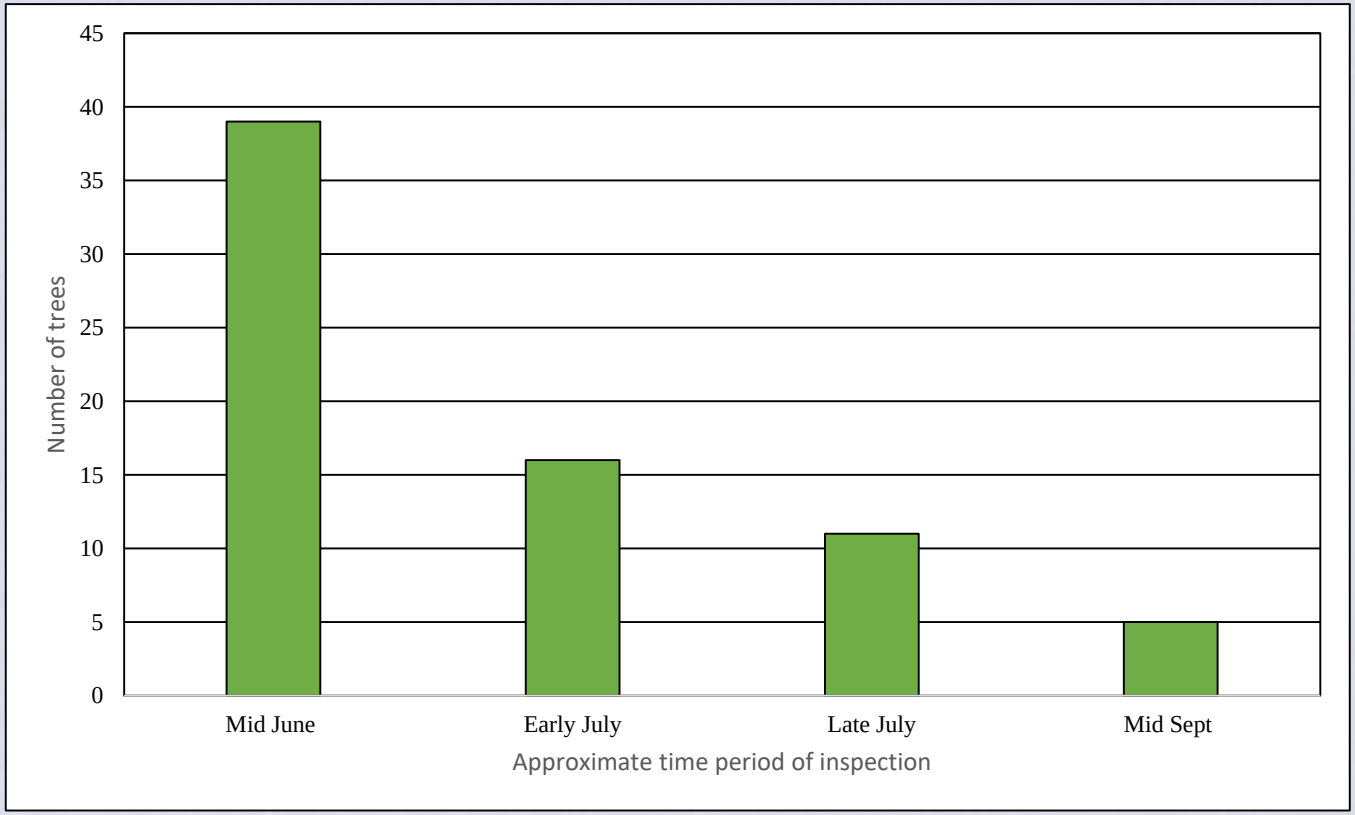
Route	Number of trees	Length of route (km)
North End/Peninsula	369	5.03
Crichton Park/Mic Mac Blvd	15	0.83
Colby Village	102	1.50
Clayton Park	310	5.25
Eastern Passage	48	0.90
Total	844	13.51

HRM Case Study

- **Each tree inspected for presence/absence of recent mechanical damage**
- **Lowest 50 cm of trunk**
- **If there was recent damage:**
  - **Location of tree**
  - **Type of damage**
  - **Size of damage**
  - **Picture of damage**

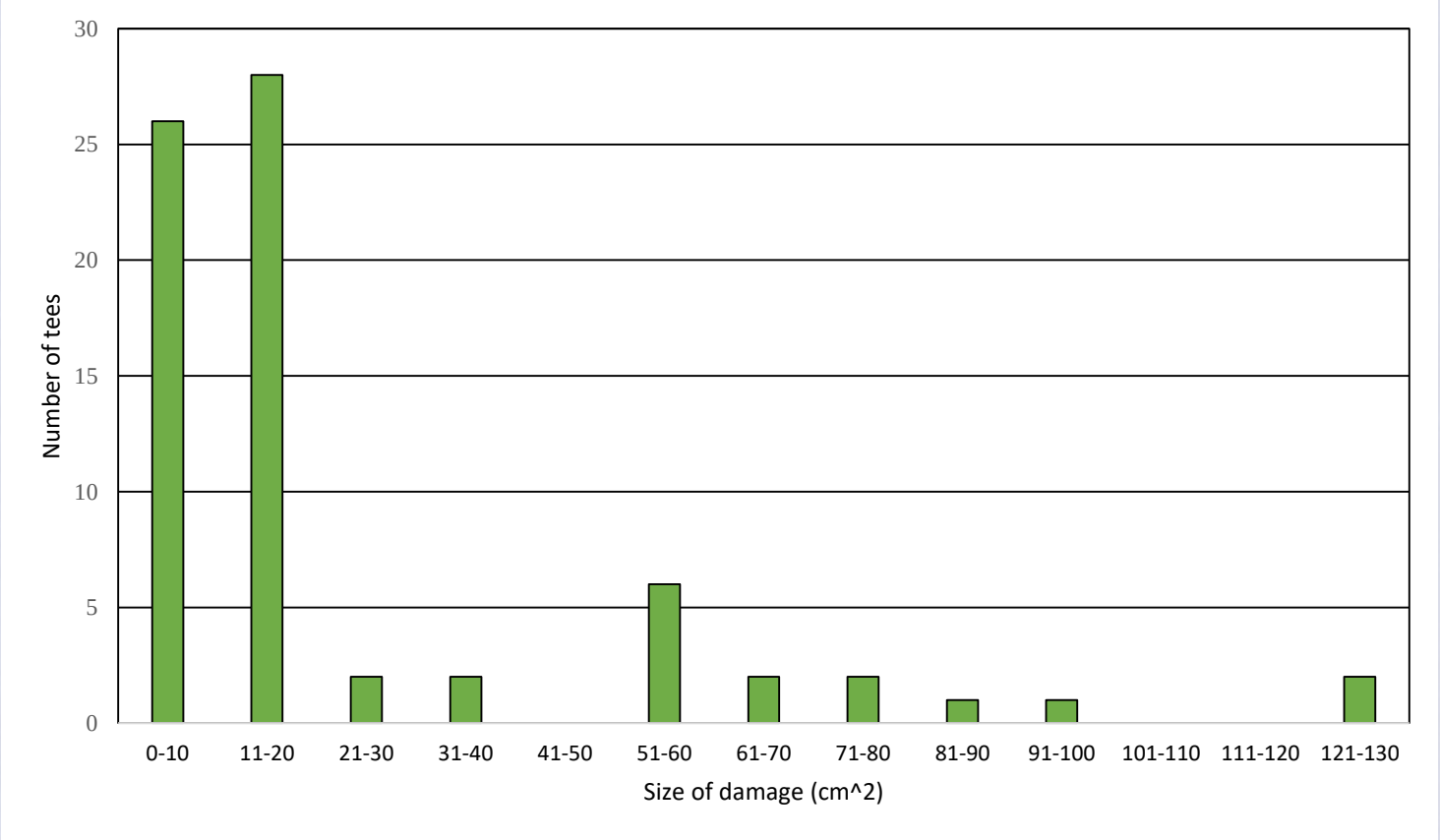
HRM Case Study

HRM Case Study



Number of recently-damaged trees by inspection date

HRM Case Study



Number of newly-damaged trees by size of damage

HRM Case Study

- **In total: 71 trees had recent mechanical damage**
  - **8.41%**
- **Current fine: $100 per 7.5 cm^2**
- **Average size of damage: 25 cm^2**
- **Approximately equal instances of scuffing and bark removal**
- **Total cost of damages if HRM fined to the fullest extent: almost $24K**

“Research” Findings:
Tree-Lawn Parameters

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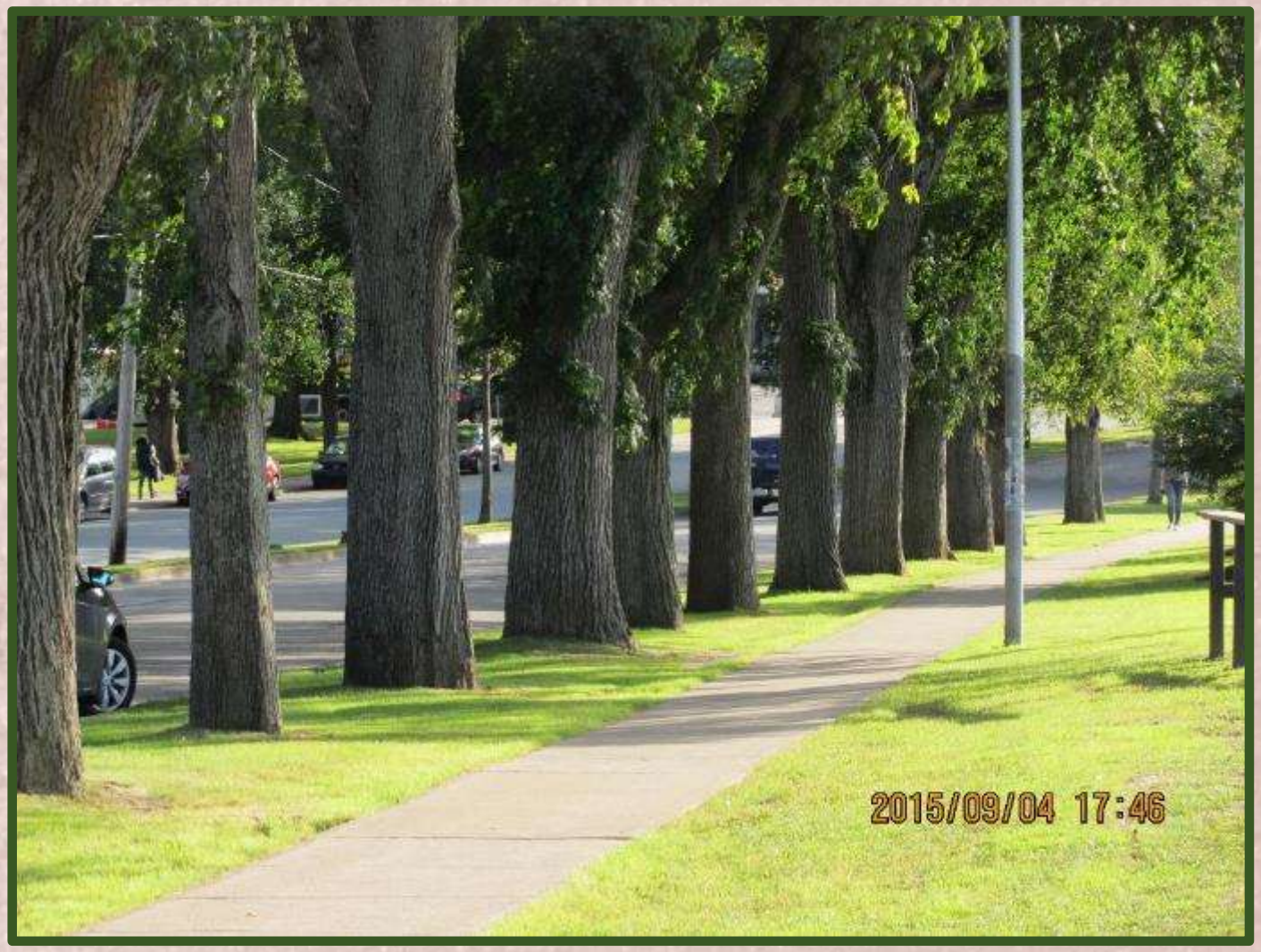
Management Considerations: Creating the Tree Lawn



Management Considerations: Creating the Tree Lawn

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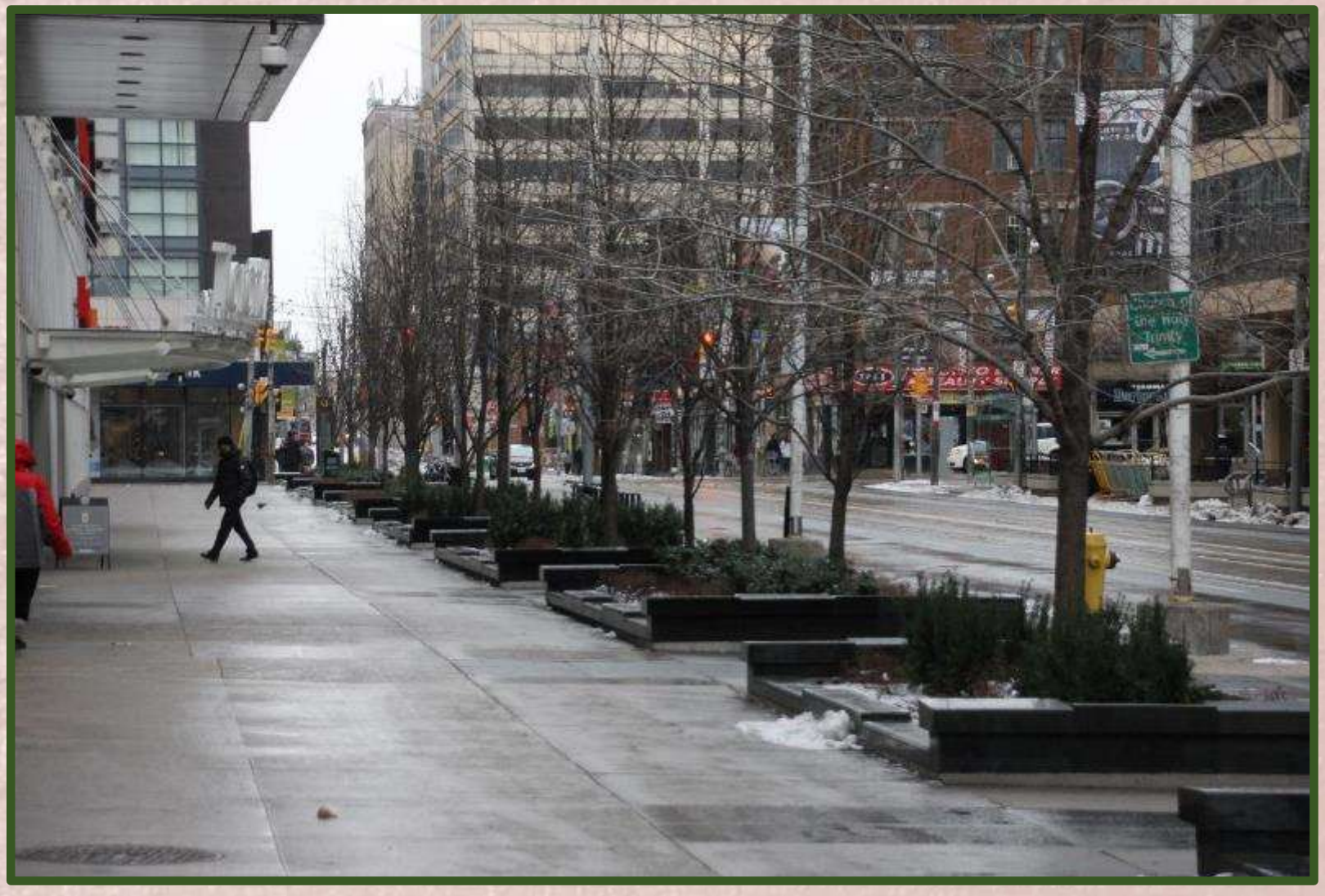

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Management Considerations: Street-Tree Species Diversity

- **Diverse species list, predominantly of native species (or cultivars thereof), long-lived, tough, appropriate in a changing climate**
- **Street-level and neighbourhood-level diversity**

Management Considerations: Street-Tree Spacing

- **Closer together!**
- **Develop specifications for linear density, not distance apart (e.g., 13 trees/100 metres streetside, max and min separation distances)**

Management Considerations: Tree Protection

- Prevention
  - Education
- Protection
  - Physical barriers
- Accountability
  - Fines and penalties

City of St. Louis Parks Dept, 2016

http://www.wikihow.com/Protect-Young-Tree-Trunks-from-Lawn-Care-Damage

http://gibneyce.com/8-read-about-follow-up-care.html

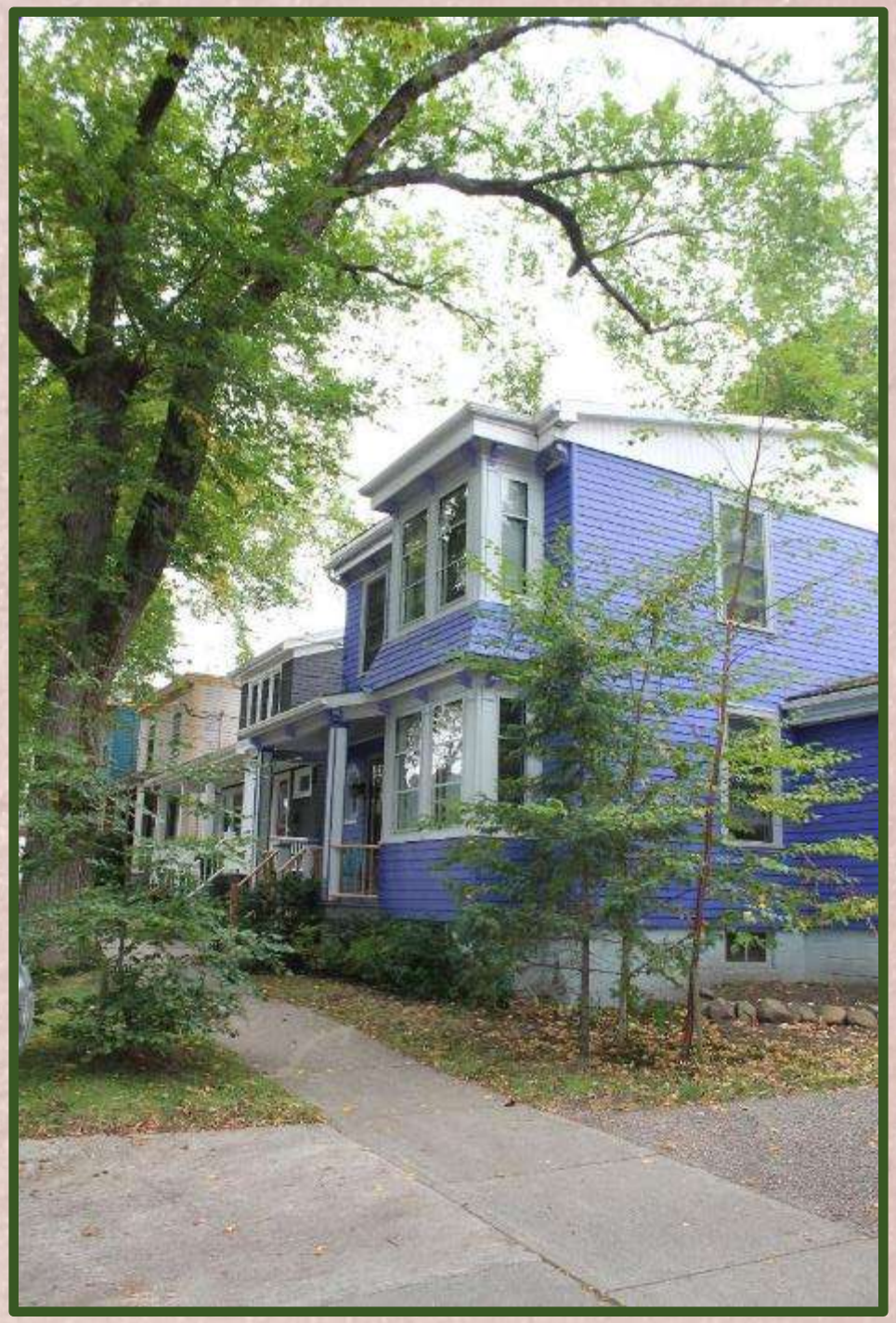
"A penalty of $100.00 per 7.5 square centimetre of damaged tissue shall be levied when the Contractor is found to be responsible for causing the damage"

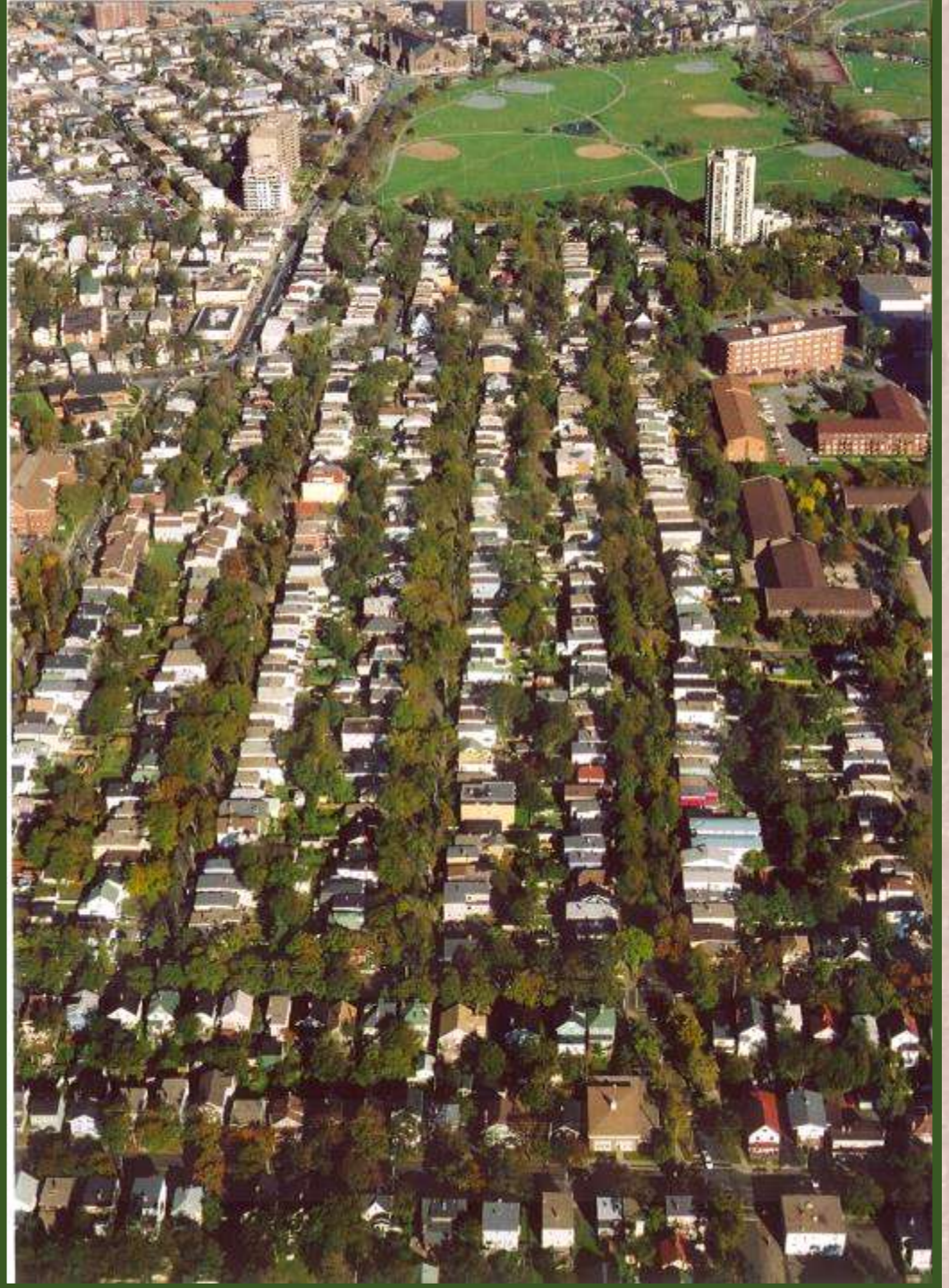
Management Considerations: Tree Protection

Conclusions

- **Municipalities should focus most resources onto street trees – they own them, they're in the best and the worst place!**

p.s. what role for property owners?





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