

Forest structure but not tree diversity differ among urban woodlands with differing conservation

Authors: Erica Padvaiskas¹, Isabella C. Richmond^{1*}, Carly D. Ziter¹

1 Department of Biology, Concordia University, Montreal Canada, H4B 1R6

* isabella.richmond@mail.concordia.ca

Table S1. Table describing the park type, species, invasive status (according to the Eastern Temperate Forest region), and proportion of stems for each tree species (> 5.0 cm DBH) found in each park.

Park	Park Type	Scientific Name	Species Status	Percent of Stems
Angrignon	Non-Status	Fraxinus pennsylvanica	Native	23.67
Angrignon	Non-Status	Acer saccharinum	Native	17.39
Angrignon	Non-Status	Acer freemanii	Native	16.91
Angrignon	Non-Status	Populus deltoides	Native	9.18
Angrignon	Non-Status	Ulmus americana	Native	8.21
Angrignon	Non-Status	Rhamnus cathartica	Invasive	6.76
Angrignon	Non-Status	Acer saccharum	Native	4.83

Park	Park Type	Scientific Name	Species Status	Percent of Stems
Angrignon	Non-Status	Quercus rubra	Native	3.38
Angrignon	Non-Status	Salix sp.	Native	2.90
Angrignon	Non-Status	Quercus macrocarpa	Native	2.42
Angrignon	Non-Status	Rhamnus frangula	Invasive	1.45
Angrignon	Non-Status	Tilia americana	Native	1.45
Angrignon	Non-Status	Acer nigrum	Native	0.48
Angrignon	Non-Status	Fagus grandifolia	Native	0.48
Angrignon	Non-Status	Quercus bicolor	Native	0.48
Bois-de-Liesse	Nature	Rhamnus cathartica	Invasive	30.59
Bois-de-Liesse	Nature	Acer saccharum	Native	18.43
Bois-de-Liesse	Nature	Fagus grandifolia	Native	16.47
Bois-de-Liesse	Nature	Populus deltoides	Native	8.63
Bois-de-Liesse	Nature	Fraxinus pennsylvanica	Native	3.92
Bois-de-Liesse	Nature	Tilia americana	Native	3.92
Bois-de-Liesse	Nature	Ulmus americana	Native	3.14
Bois-de-Liesse	Nature	Acer freemanii	Native	2.35
Bois-de-Liesse	Nature	Lonicera periclymenum	Non-Native	2.35
Bois-de-Liesse	Nature	Ostrya virginiana	Native	1.18
Bois-de-Liesse	Nature	Quercus macrocarpa	Native	1.18
Bois-de-Liesse	Nature	Acer nigrum	Native	0.78
Bois-de-Liesse	Nature	Acer saccharinum	Native	0.78
Bois-de-Liesse	Nature	Prunus virginiana	Native	0.78
Bois-de-Liesse	Nature	Carya cordiformis	Native	0.39
Bois-de-Liesse	Nature	Cornus alternifolia	Native	0.39
Bois-de-Liesse	Nature	Fraxinus americana	Native	0.39
Bois-de-Liesse	Nature	Juglans cinerea	Native	0.39
Bois-de-Liesse	Nature	Pinus strobus	Native	0.39
Bois-de-Liesse	Nature	Populus tremuloides	Native	0.39
Bois-de-Saraguay	Nature	Acer saccharum	Native	42.98
Bois-de-Saraguay	Nature	Acer nigrum	Native	26.38

Park	Park Type	Scientific Name	Species Status	Percent of Stems
Bois-de-Saraguay	Nature	Rhamnus cathartica	Invasive	5.11
Bois-de-Saraguay	Nature	Carya cordiformis	Native	4.68
Bois-de-Saraguay	Nature	Tilia americana	Native	4.68
Bois-de-Saraguay	Nature	Acer freemanii	Native	3.83
Bois-de-Saraguay	Nature	Ostrya virginiana	Native	3.40
Bois-de-Saraguay	Nature	Quercus macrocarpa	Native	2.98
Bois-de-Saraguay	Nature	Acer saccharinum	Native	2.13
Bois-de-Saraguay	Nature	Ulmus americana	Native	1.28
Bois-de-Saraguay	Nature	Quercus rubra	Native	0.85
Bois-de-Saraguay	Nature	Betula alleghaniensis	Native	0.43
Bois-de-Saraguay	Nature	Fraxinus americana	Native	0.43
Bois-de-Saraguay	Nature	Quercus alba	Native	0.43
Bois-de-Saraguay	Nature	Quercus bicolor	Native	0.43
Boisé-de-Saint-Sulpice	Non-Status	Ulmus americana	Native	34.23
Boisé-de-Saint-Sulpice	Non-Status	Populus tremuloides	Native	20.77
Boisé-de-Saint-Sulpice	Non-Status	Acer freemanii	Native	8.08
Boisé-de-Saint-Sulpice	Non-Status	Populus deltoides	Native	4.23
Boisé-de-Saint-Sulpice	Non-Status	Acer saccharum	Native	3.85
Boisé-de-Saint-Sulpice	Non-Status	Fraxinus americana	Native	3.46
Boisé-de-Saint-Sulpice	Non-Status	Acer negundo	Invasive	2.69
Boisé-de-Saint-Sulpice	Non-Status	Acer saccharinum	Native	2.69
Boisé-de-Saint-Sulpice	Non-Status	Acer plantanoides	Invasive	2.31
Boisé-de-Saint-Sulpice	Non-Status	Picea glauca	Native	2.31
Boisé-de-Saint-Sulpice	Non-Status	Sorbus aucuparia	Non-Native	2.31
Boisé-de-Saint-Sulpice	Non-Status	Pinus resinosa	Native	1.92
Boisé-de-Saint-Sulpice	Non-Status	Juglans nigra	Non-Native	1.54

Park	Park Type	Scientific Name	Species Status	Percent of Stems
Boisé-de-Saint-Sulpice	Non-Status	Fraxinus pennsylvanica	Native	1.15
Boisé-de-Saint-Sulpice	Non-Status	Celtis occidentalis	Native	0.77
Boisé-de-Saint-Sulpice	Non-Status	Juglans cinerea	Native	0.77
Boisé-de-Saint-Sulpice	Non-Status	Quercus rubra	Native	0.77
Boisé-de-Saint-Sulpice	Non-Status	Carya cordiformis	Native	0.38
Boisé-de-Saint-Sulpice	Non-Status	Morus alba	Non-Native	0.38
Boisé-de-Saint-Sulpice	Non-Status	Ostrya virginiana	Native	0.38
Boisé-de-Saint-Sulpice	Non-Status	Prunus serotina	Native	0.38
Boisé-de-Saint-Sulpice	Non-Status	Prunus virginiana	Native	0.38
Boisé-de-Saint-Sulpice	Non-Status	Quercus macrocarpa	Native	0.38
Boisé-de-Saint-Sulpice	Non-Status	Rhamnus cathartica	Invasive	0.38
Boisé-de-Saint-Sulpice	Non-Status	Robinia pseudoacacia	Non-Native	0.38
Boisé-de-Saint-Sulpice	Non-Status	Tilia americana	Native	0.38
Boisé-de-Saint-Sulpice	Non-Status	Ulmus hollandica	Non-Native	0.38
Boisé-de-Saint-Sulpice	Non-Status	Ulmus pumila	Invasive	0.38
Boisé-de-Saint-Sulpice	Non-Status	Ulmus thomasii	Native	0.38
Cap-Saint-Jacques	Nature	Rhamnus cathartica	Invasive	52.43
Cap-Saint-Jacques	Nature	Acer saccharum	Native	26.60
Cap-Saint-Jacques	Nature	Fraxinus pennsylvanica	Native	5.63
Cap-Saint-Jacques	Nature	Ulmus americana	Native	4.35
Cap-Saint-Jacques	Nature	Ostrya virginiana	Native	3.32
Cap-Saint-Jacques	Nature	Celtis occidentalis	Native	2.30
Cap-Saint-Jacques	Nature	Fraxinus americana	Native	1.53

Park	Park Type	Scientific Name	Species Status	Percent of Stems
Cap-Saint-Jacques	Nature	<i>Carya cordiformis</i>	Native	1.28
Cap-Saint-Jacques	Nature	<i>Tilia americana</i>	Native	1.02
Cap-Saint-Jacques	Nature	<i>Carya ovata</i>	Native	0.51
Cap-Saint-Jacques	Nature	<i>Cornus alternifolia</i>	Native	0.26
Cap-Saint-Jacques	Nature	<i>Populus tremuloides</i>	Native	0.26
Cap-Saint-Jacques	Nature	<i>Quercus alba</i>	Native	0.26
Cap-Saint-Jacques	Nature	<i>Quercus rubra</i>	Native	0.26
Coulée-Grou	Non-Status	<i>Acer negundo</i>	Invasive	44.74
Coulée-Grou	Non-Status	<i>Fraxinus americana</i>	Native	11.28
Coulée-Grou	Non-Status	<i>Fraxinus pennsylvanica</i>	Native	10.90
Coulée-Grou	Non-Status	<i>Robinia pseudoacacia</i>	Non-Native	10.90
Coulée-Grou	Non-Status	<i>Gleditsia triacanthos</i>	Non-Native	4.89
Coulée-Grou	Non-Status	<i>Lonicera periclymenum</i>	Non-Native	3.01
Coulée-Grou	Non-Status	<i>Populus deltoides</i>	Native	2.63
Coulée-Grou	Non-Status	<i>Celtis occidentalis</i>	Native	0.75
Coulée-Grou	Non-Status	<i>Tilia americana</i>	Native	0.75
Coulée-Grou	Non-Status	<i>Ulmus americana</i>	Native	0.75
Coulée-Grou	Non-Status	<i>Acer tataricum</i>	Invasive	0.38
Coulée-Grou	Non-Status	<i>Amelanchier arborea</i>	Native	0.38
Coulée-Grou	Non-Status	<i>Malus domestica</i>	Non-Native	0.38
Coulée-Grou	Non-Status	<i>Prunus</i> sp.	Native	0.38
Coulée-Grou	Non-Status	<i>Prunus virginiana</i>	Native	0.38
Coulée-Grou	Non-Status	<i>Rhamnus cathartica</i>	Invasive	0.38

Park	Park Type	Scientific Name	Species Status	Percent of Stems
Coulée-Grou	Non-Status	Salix sp.	Native	0.38
Coulée-Grou	Non-Status	Ulmus pumila	Invasive	0.38
Jean-Drapeau	Non-Status	Celtis occidentalis	Native	28.35
Jean-Drapeau	Non-Status	Acer saccharum	Native	15.75
Jean-Drapeau	Non-Status	Tilia americana	Native	15.75
Jean-Drapeau	Non-Status	Ulmus americana	Native	8.66
Jean-Drapeau	Non-Status	Ostrya virginiana	Native	6.30
Jean-Drapeau	Non-Status	Pinus resinosa	Native	4.72
Jean-Drapeau	Non-Status	Acer saccharinum	Native	2.36
Jean-Drapeau	Non-Status	Crataegus succulenta	Native	2.36
Jean-Drapeau	Non-Status	Quercus macrocarpa	Native	2.36
Jean-Drapeau	Non-Status	Quercus rubra	Native	2.36
Jean-Drapeau	Non-Status	Acer plantanoides	Invasive	1.57
Jean-Drapeau	Non-Status	Fraxinus pennsylvanica	Native	1.57
Jean-Drapeau	Non-Status	Rhamnus cathartica	Invasive	1.57
Jean-Drapeau	Non-Status	Acer freemanii	Native	0.79
Jean-Drapeau	Non-Status	Aesculus glabra	Non-Native	0.79
Jean-Drapeau	Non-Status	Picea abies	Non-Native	0.79
Jean-Drapeau	Non-Status	Picea pungens	Non-Native	0.79
Jean-Drapeau	Non-Status	Prunus virginiana	Native	0.79

Park	Park Type	Scientific Name	Species Status	Percent of Stems
Jean-Drapeau	Non-Status	<i>Thuja occidentalis</i>	Native	0.79
L'Anse-à-l'Orme	Nature	<i>Ostrya virginiana</i>	Native	39.77
L'Anse-à-l'Orme	Nature	<i>Acer saccharum</i>	Native	24.43
L'Anse-à-l'Orme	Nature	<i>Rhamnus cathartica</i>	Invasive	13.07
L'Anse-à-l'Orme	Nature	<i>Populus deltoides</i>	Native	3.12
L'Anse-à-l'Orme	Nature	<i>Tilia americana</i>	Native	3.12
L'Anse-à-l'Orme	Nature	<i>Ulmus americana</i>	Native	2.84
L'Anse-à-l'Orme	Nature	<i>Acer freemanii</i>	Native	2.56
L'Anse-à-l'Orme	Nature	<i>Carya cordiformis</i>	Native	2.56
L'Anse-à-l'Orme	Nature	<i>Fraxinus pennsylvanica</i>	Native	1.70
L'Anse-à-l'Orme	Nature	<i>Acer negundo</i>	Invasive	1.14
L'Anse-à-l'Orme	Nature	<i>Populus tremuloides</i>	Native	1.14
L'Anse-à-l'Orme	Nature	<i>Acer rubrum</i>	Native	0.85
L'Anse-à-l'Orme	Nature	<i>Acer saccharinum</i>	Native	0.85
L'Anse-à-l'Orme	Nature	<i>Carya ovata</i>	Native	0.85
L'Anse-à-l'Orme	Nature	<i>Fraxinus americana</i>	Native	0.85
L'Anse-à-l'Orme	Nature	<i>Betula papyrifera</i>	Native	0.57
L'Anse-à-l'Orme	Nature	<i>Quercus rubra</i>	Native	0.57
Pointe-aux-Prairies	Nature	<i>Acer rubrum</i>	Native	40.58
Pointe-aux-Prairies	Nature	<i>Quercus rubra</i>	Native	14.01
Pointe-aux-Prairies	Nature	<i>Acer freemanii</i>	Native	11.11
Pointe-aux-Prairies	Nature	<i>Carya ovata</i>	Native	4.83
Pointe-aux-Prairies	Nature	<i>Ulmus americana</i>	Native	4.83
Pointe-aux-Prairies	Nature	<i>Fraxinus pennsylvanica</i>	Native	3.86
Pointe-aux-Prairies	Nature	<i>Prunus serotina</i>	Native	3.86
Pointe-aux-Prairies	Nature	<i>Prunus virginiana</i>	Native	3.86
Pointe-aux-Prairies	Nature	<i>Acer saccharum</i>	Native	2.90
Pointe-aux-Prairies	Nature	<i>Fagus grandifolia</i>	Native	1.93
Pointe-aux-Prairies	Nature	<i>Populus deltoides</i>	Native	1.45
Pointe-aux-Prairies	Nature	<i>Betula alleghaniensis</i>	Native	0.97
Pointe-aux-Prairies	Nature	<i>Fraxinus americana</i>	Native	0.97
Pointe-aux-Prairies	Nature	<i>Quercus bicolor</i>	Native	0.97
Pointe-aux-Prairies	Nature	<i>Rhamnus cathartica</i>	Invasive	0.97
Pointe-aux-Prairies	Nature	<i>Robinia pseudoacacia</i>	Non-Native	0.97
Pointe-aux-Prairies	Nature	<i>Tilia americana</i>	Native	0.97
Pointe-aux-Prairies	Nature	<i>Acer plantanoides</i>	Invasive	0.48

Park	Park Type	Scientific Name	Species Status	Percent of Stems
Thomas-Chapais	Non-Status	<i>Ostrya virginiana</i>	Native	40.97
Thomas-Chapais	Non-Status	<i>Acer saccharum</i>	Native	16.45
Thomas-Chapais	Non-Status	<i>Carya cordiformis</i>	Native	14.19
Thomas-Chapais	Non-Status	<i>Tilia americana</i>	Native	10.00
Thomas-Chapais	Non-Status	<i>Crataegus pruinosa</i>	Native	4.84
Thomas-Chapais	Non-Status	<i>Fraxinus americana</i>	Native	2.90
Thomas-Chapais	Non-Status	<i>Ulmus americana</i>	Native	1.94
Thomas-Chapais	Non-Status	<i>Celtis occidentalis</i>	Native	1.29
Thomas-Chapais	Non-Status	<i>Populus deltoides</i>	Native	1.29
Thomas-Chapais	Non-Status	<i>Fraxinus pennsylvanica</i>	Native	0.97
Thomas-Chapais	Non-Status	<i>Quercus rubra</i>	Native	0.97
Thomas-Chapais	Non-Status	<i>Rhamnus cathartica</i>	Invasive	0.97
Thomas-Chapais	Non-Status	<i>Acer rubrum</i>	Native	0.65
Thomas-Chapais	Non-Status	<i>Acer freemanii</i>	Native	0.32
Thomas-Chapais	Non-Status	<i>Crataegus monogyna</i>	Non-Native	0.32
Thomas-Chapais	Non-Status	<i>Lonicera periclymenum</i>	Non-Native	0.32
Thomas-Chapais	Non-Status	<i>Pinus strobus</i>	Native	0.32
Thomas-Chapais	Non-Status	<i>Prunus serotina</i>	Native	0.32
Thomas-Chapais	Non-Status	<i>Quercus macrocarpa</i>	Native	0.32
Thomas-Chapais	Non-Status	<i>Tilia cordata</i>	Non-Native	0.32

Park	Park Type	Scientific Name	Species Status	Percent of Stems
Île-Bizard	Nature	Acer saccharum	Native	46.52
Île-Bizard	Nature	Rhamnus cathartica	Invasive	20.00
Île-Bizard	Nature	Ulmus americana	Native	10.00
Île-Bizard	Nature	Tilia americana	Native	6.96
Île-Bizard	Nature	Robinia pseudoacacia	Non-Native	4.35
Île-Bizard	Nature	Fraxinus pennsylvanica	Native	3.48
Île-Bizard	Nature	Ostrya virginiana	Native	3.04
Île-Bizard	Nature	Fraxinus americana	Native	1.74
Île-Bizard	Nature	Lonicera periclymenum	Non-Native	0.87
Île-Bizard	Nature	Acer negundo	Invasive	0.43
Île-Bizard	Nature	Crataegus pruinosa	Native	0.43
Île-Bizard	Nature	Fagus grandifolia	Native	0.43
Île-Bizard	Nature	Thuja occidentalis	Native	0.43

Table S2. Model summary table for the general linear model describing the relationship between tree species richness (dependent) and conservation status, park size, and proportion of invasive stems (independents).

Term	Estimate	Standard Error	t-statistic	p-value
Intercept	17.19	2.95	5.84	0.00
Nature Park	1.53	4.16	0.37	0.72
Park Size	0.02	2.14	0.01	0.99
Proportion Invasive	-0.12	2.03	-0.06	0.96

Table S3. Model summary table for the general linear model describing the relationship between tree Shannon diversity (dependent) and conservation status, park size, and proportion of invasive stems (independents).

Term	Estimate	Standard Error	t-statistic	p-value
Intercept	14.81	2.32	6.38	0.00
Nature Park	0.92	3.27	0.28	0.79
Park Size	-0.47	1.68	-0.28	0.79
Proportion Invasive	0.00	1.60	0.00	1.00

Table S4. Model summary table for the beta regression model describing the relationship between percent canopy cover (dependent) and conservation status, park size, and proportion of invasive stems (independents).

Component	Term	Estimate	Standard Error	t-statistic	p-value
mean	Intercept	0.80	0.24	3.33	0.00
mean	Nature Park	1.69	0.43	3.97	0.00
mean	Park Size	-0.30	0.19	-1.55	0.12
mean	Proportion Invasive	-0.53	0.18	-2.96	0.00
precision	phi	19.13	8.23	2.33	0.02

Table S5. Model summary table for the general linear model describing the relationship between mean vegetative complexity (dependent) and conservation status, park size, and proportion of invasive stems (independents).

Term	Estimate	Standard Error	t-statistic	p-value
Intercept	2.22	0.16	13.73	0.00
Nature Park	0.54	0.23	2.36	0.05
Park Size	-0.03	0.12	-0.23	0.82
Proportion Invasive	0.04	0.11	0.37	0.72

Table S6. Model summary table for the beta regression model describing the relationship between the percent invasive species (dependent) and conservation status and park size (independents)

Component	Term	Estimate	Standard Error	t-statistic	p-value
mean	Intercept	-1.95	0.19	-10.28	0.00
mean	Nature Park	-0.13	0.27	-0.49	0.63
mean	Park Size	0.00	0.00	-1.10	0.27
precision	phi	58.05	24.82	2.34	0.02

Table S7. Model summary table for the beta regression model describing the relationship between the percent invasive stems (dependent) and conservation status and park size (independents)

Component	Term	Estimate	Standard Error	t-statistic	p-value
mean	Intercept	-1.95	0.49	-3.94	0.00
mean	Nature Park	0.34	0.61	0.55	0.58

Component	Term	Estimate	Standard Error	t-statistic	p-value
mean	Park Size	0.00	0.01	0.69	0.49
precision	phi	4.89	2.12	2.31	0.02