How can the connectivity of the greenway network in Southwest Montreal be improved?

Scenarios for enhancing the wellbeing of biodiversity and humans

Mémoire sur le projet de schéma d'aménagement et de développement de l'agglomération de Montréal

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Montreal, in November 2014

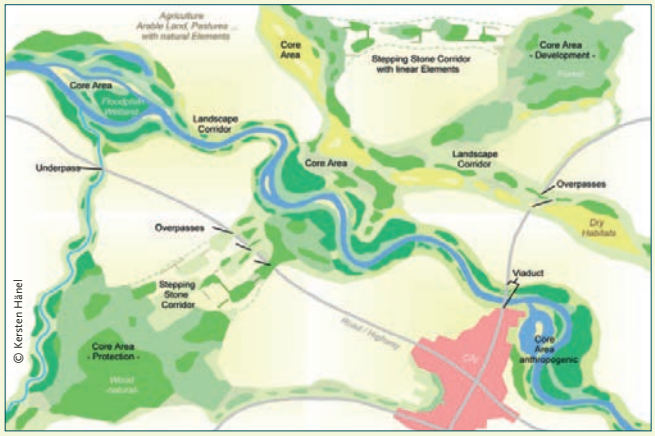
Connectivity

= "the degree to which the landscape facilitates or impedes movement among resource patches" (Taylor et al. 1993)

Important for:

Wildlife: Require movement between habitat patches

Humans: Prefer continuous green space for recreational activities



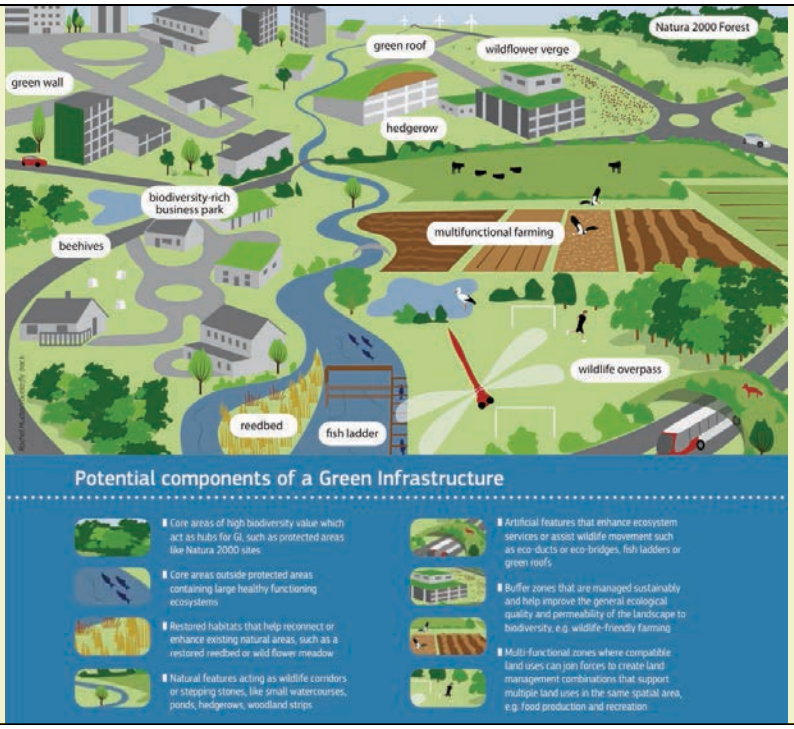
Böttcher et al. (2005)

Connectivity of natural areas

The Green Infrastructure Strategy of the European Union

- adopted in May 2013
- relates to the Biodiversity Strategy of the European Union
  - to halt biodiversity loss in Europe by 2020
  - adopted in May 2011

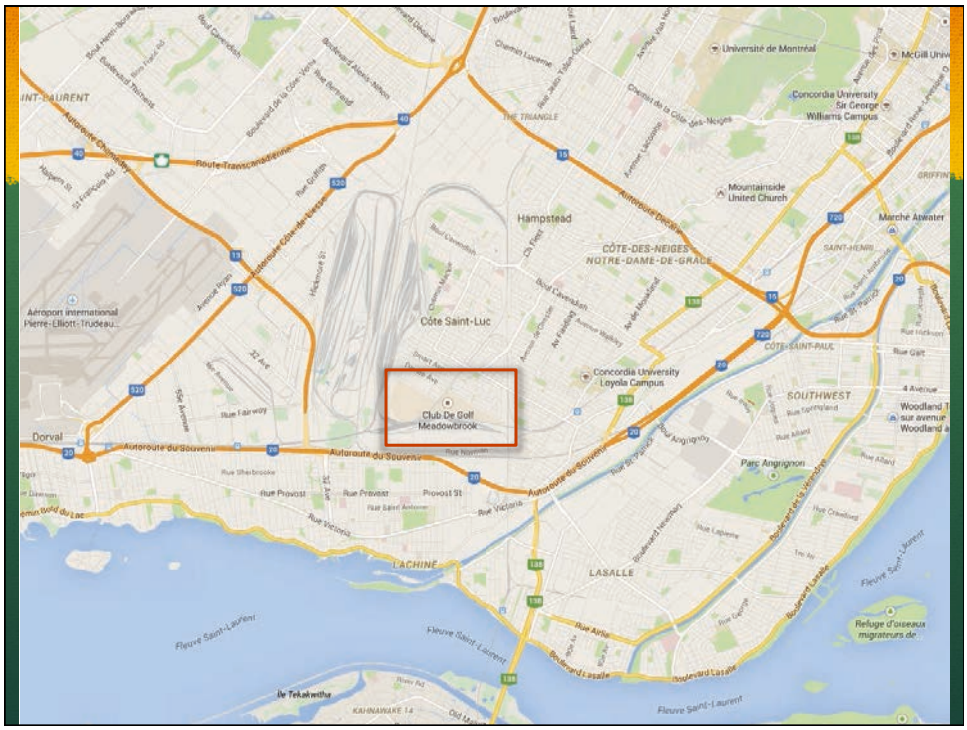
European Commission (2013)



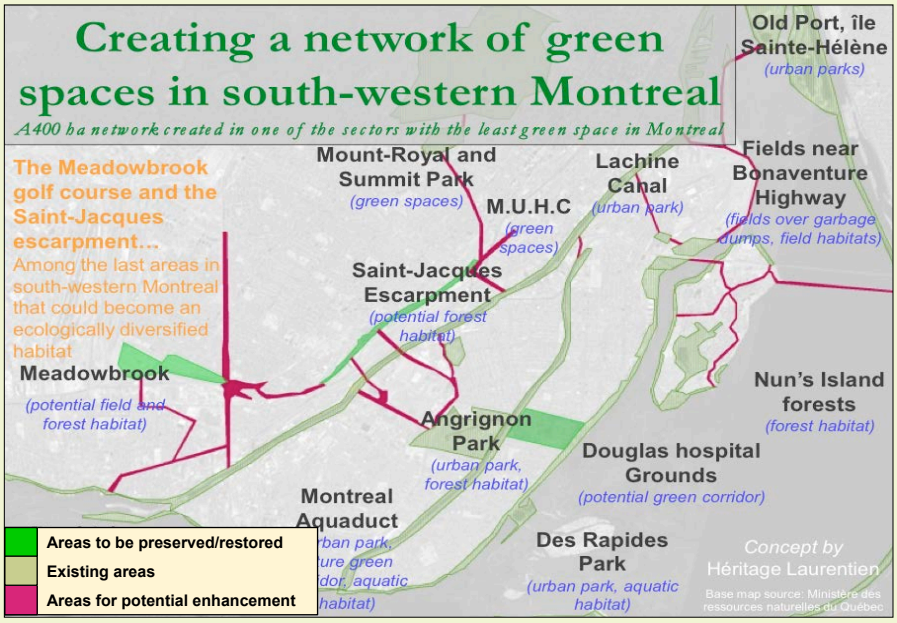
European Commission (2013)

Application

to Southwest Montreal (Meadowbrook)

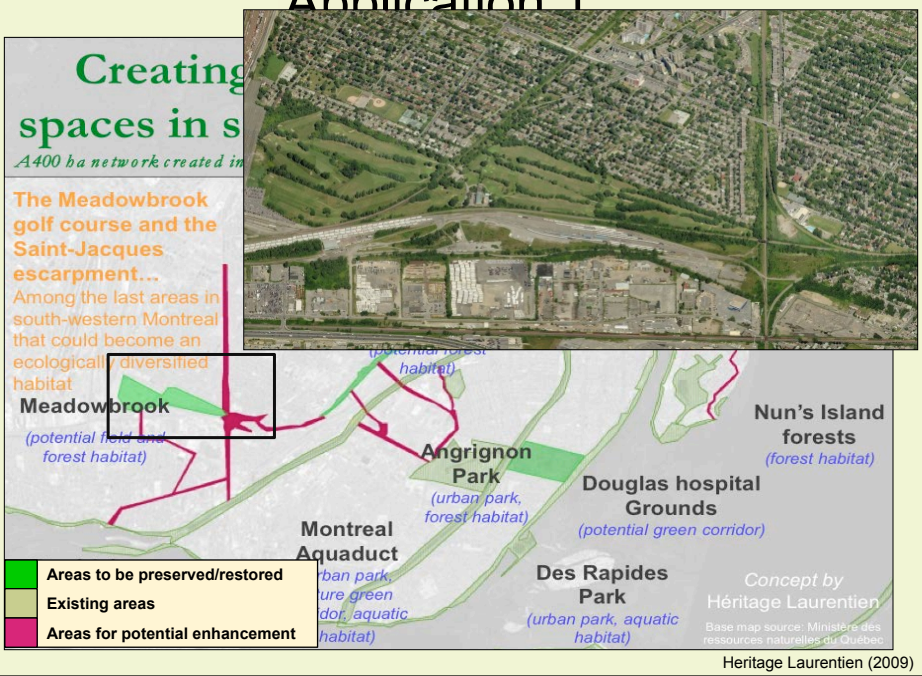


Application 1



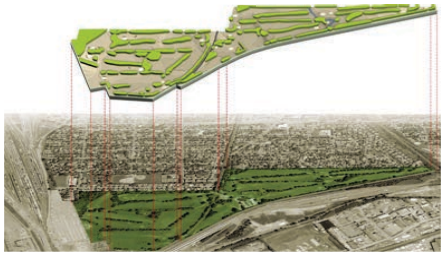
Heritage Laurentien (2009)

Application 1



Heritage Laurentien (2009)

Meadowbrook



Site:
- Private golf course
- Serves as habitat for wildlife and as recreational space

- Threatened by housing development
- Project opponents propose that site be preserved and enhanced as urban nature park
- Potential to be integrated in greenway network of Southwest Montreal for benefit of wildlife and residents

Research Questions

1. What is the current level connectivity in the network?
   for a) wildlife, b) humans

2. What is the potential future level of connectivity in the network?
   for a) wildlife, b) humans

3. What is Meadowbrook's contribution to connectivity?
   a) preserved, b) developed

Hypothesis

If Meadowbrook is developed, this loss in connectivity in the greenway network could not be compensated for by creating new spaces for wildlife and people to use

SOS Meadowbrook (2011)

Methods: Data Collection

Collaboration with Patrick Asch (Heritage Laurentien)

- Distinguished between spaces suitable for:

Wildlife	Humans
Natural areas • Wooded areas **Semi-natural areas** • Railways • Parks • Golf Courses • Cemeteries	**Green spaces** • Wooded areas • Parks • Golf Courses • Cemeteries • Bike/pedestrian paths along waterways and railways

Methods: Impediments to movement

Barriers considered	Wildlife	Humans
Major roads and highways	✔	✔
Building footprints	✔	✔
Railroads	- (semi-natural)	✔
Canals	- (semi-natural)	✔

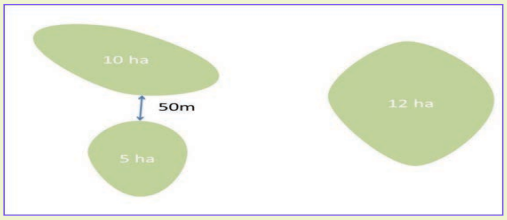
Methods: Measuring Connectivity

Method implemented in CBI: Effective mesh size m_{eff}

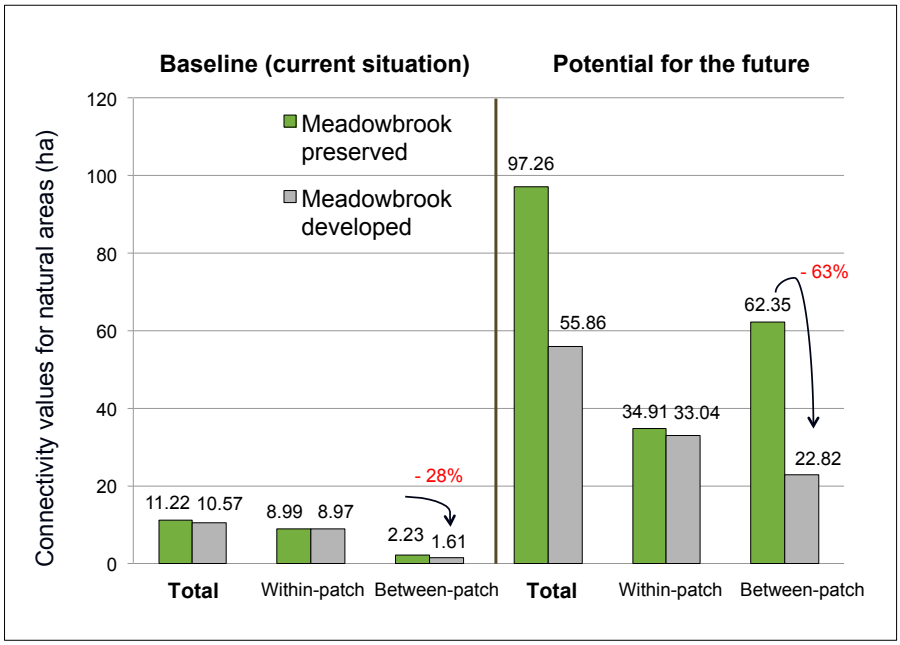
- Represents the average size of an area that an individual is connected to when placed randomly in the greenway network
- Considers within- and between-patch connectivity

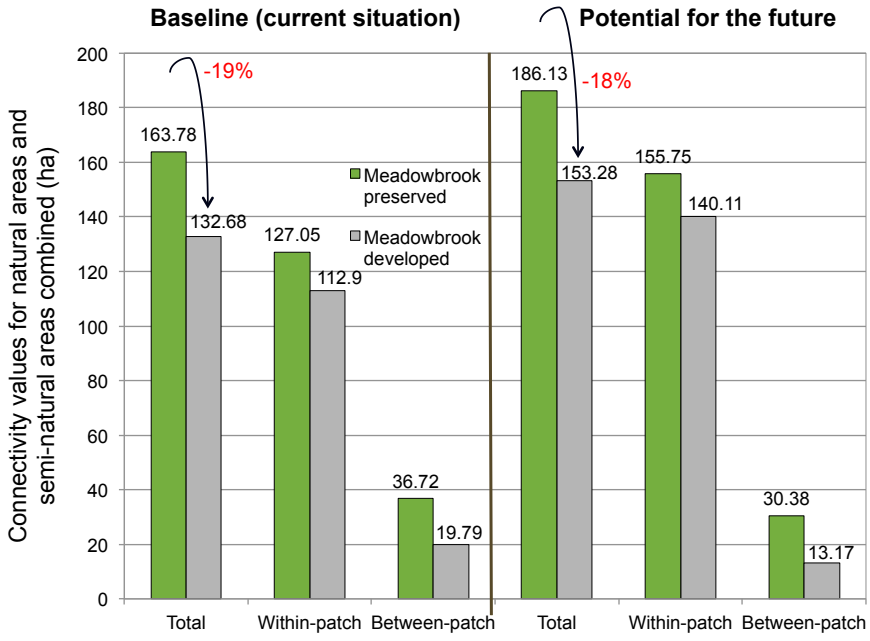
Factors necessary for patches to be considered connected:

- Max. 100 m apart
- No major barriers (i.e.: roads)



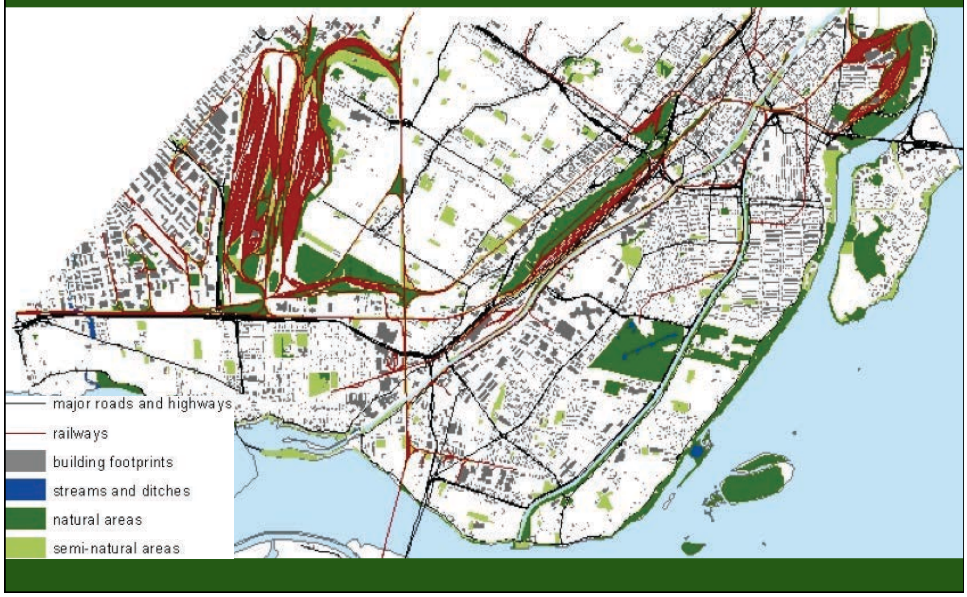
$$m_{eff} = \frac{1}{A_{total}}\left(A_1^2 + A_2^2\right) = \frac{1}{27\ \text{ha}}\left(15*15\ \text{ha}^2 + 12*12\ \text{ha}^2\right) = \frac{369}{27}\text{ha} = 13.67\ \text{ha}$$


Baseline (current situation)
Potential for the future
Connectivity values for natural areas (ha)
Meadowbrook preserved
Meadowbrook developed
120
100
80
60
40
20
0
11.22
10.57
8.99
8.97
2.23
1.61
- 28%
97.26
55.86
34.91
33.04
62.35
22.82
- 63%
Total
Within-patch
Between-patch
Total
Within-patch
Between-patch

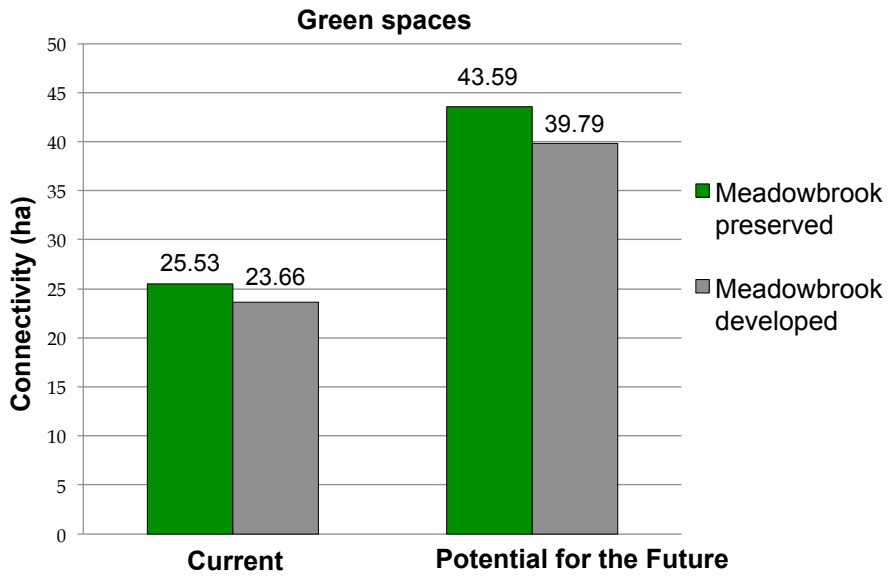

Baseline (current situation)
Potential for the future
Connectivity values for natural areas and semi-natural areas combined (ha)
Meadowbrook preserved
Meadowbrook developed
200
180
160
140
120
100
80
60
40
20
0
-19%
163.78
132.68
127.05
112.9
36.72
19.79
186.13
-18%
153.28
155.75
140.11
30.38
13.17
Total
Within-patch
Between-patch
Total
Within-patch
Between-patch

Natural and semi-natural areas
current situation

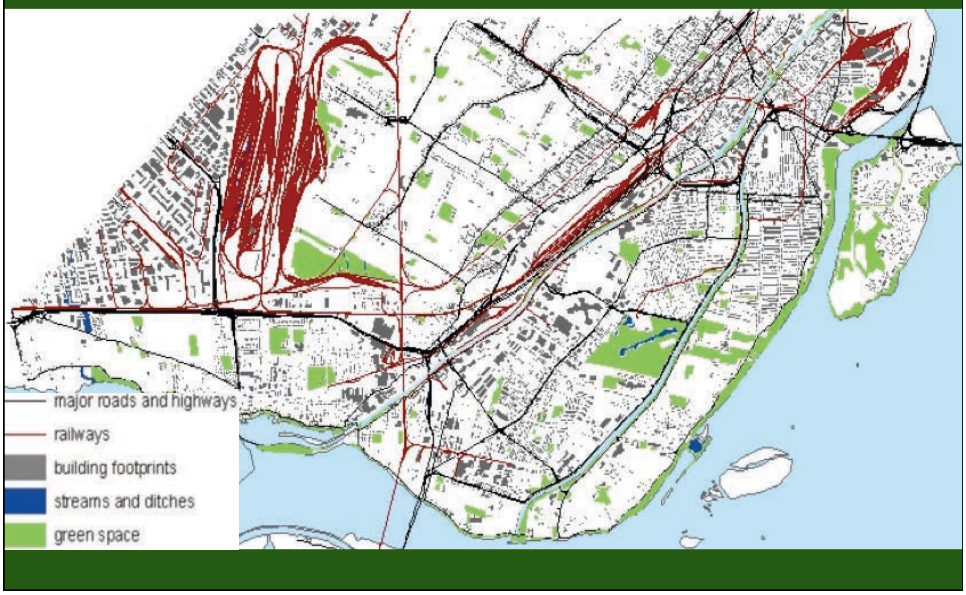
Natural and semi-natural areas
future scenario



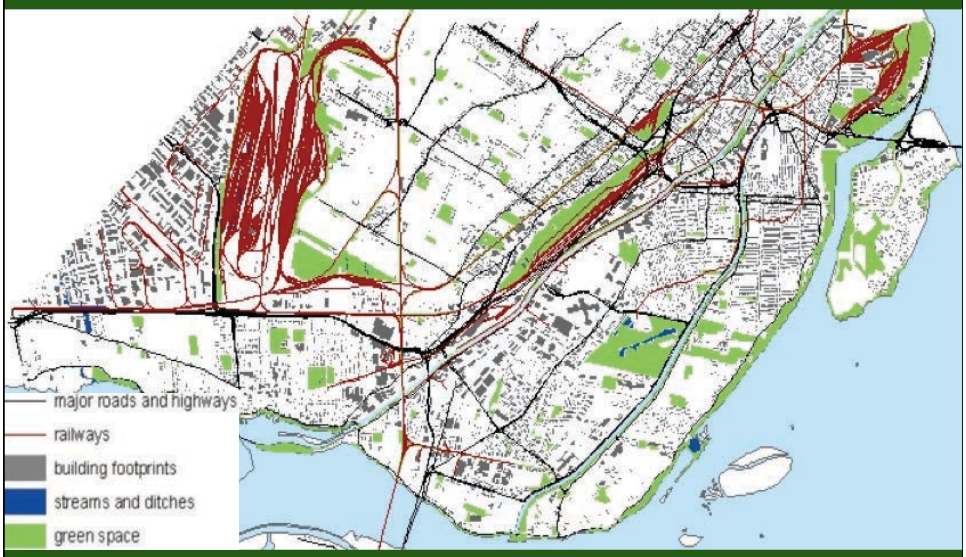
Results for Humans



Green spaces
current situation



Green spaces
future scenario



Conclusions

With Meadowbrook developed, we would loose Meadowbrook's significant contribution to current connectivity for wildlife (and people)

This reduction in connectivity could be compensated for by creating additional natural areas and green spaces.

- **However:** We would **loose** Meadowbrook's much larger **potential** for increased connectivity for wildlife (and people) in the area in the future!
  - and this loss could **not** be compensated for by creating additional natural areas and green spaces.

Thank you!

--> to **Patrick Asch** from Heritage Laurentien, Montreal for his help with data acquisition