

Quelle est la contribution d'une forêt mature à la
biodiversité d'une région périurbaine ?
Et comment la mesurer avant que celle-ci ne
pousse ?

*What is the biodiversity contribution of a mature
forest in an urban area ?
And how to measure it before its grows ?*

Michel Leboeuf, M. Sc. Biol. consultant

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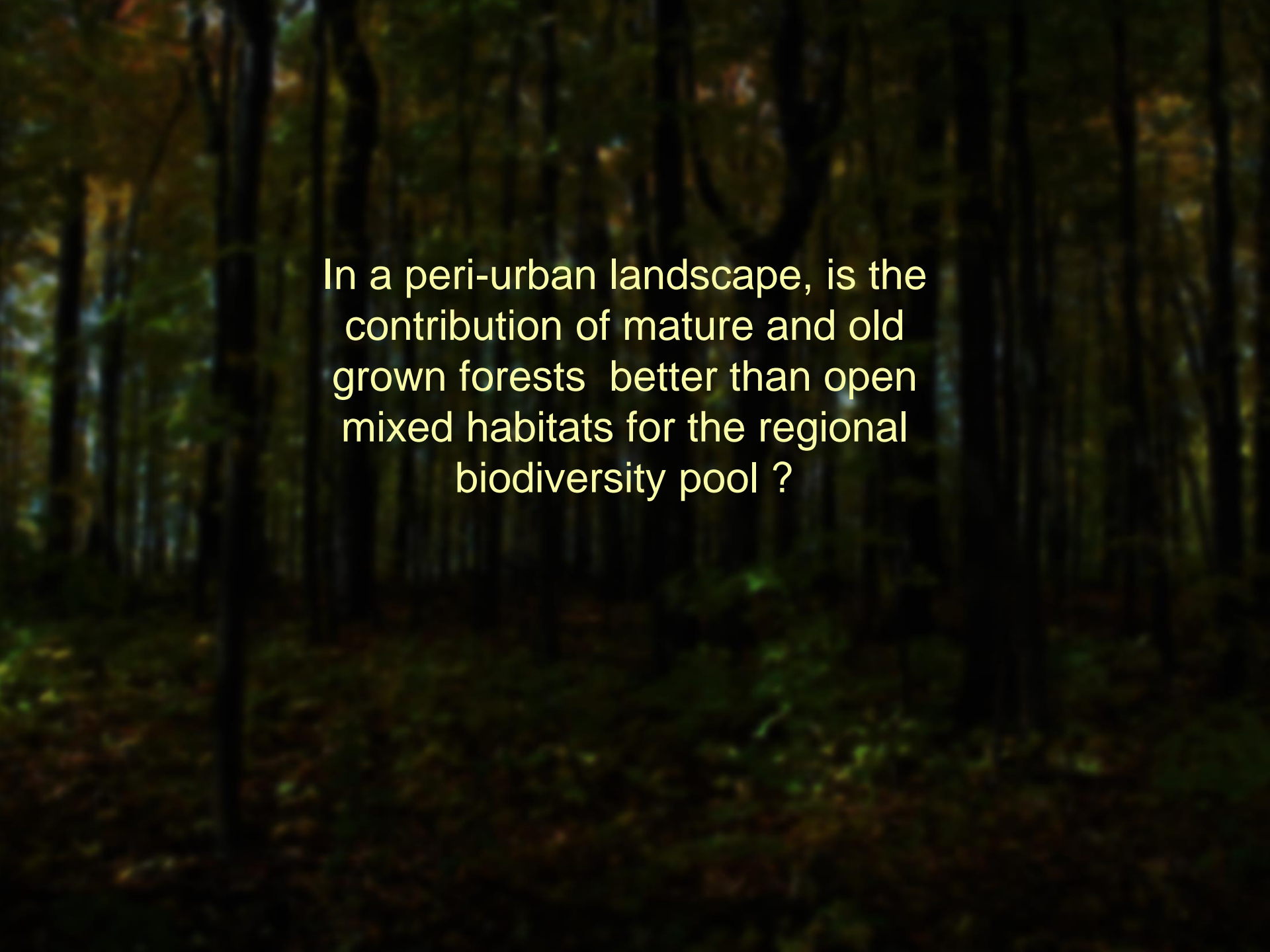
*Réjean Dumas, biol., ministère des Forêts, de la Faune et des
Parcs du Québec*

During a major restoration project in Terrebonne (north-east of the Montreal area), we studied the potential biodiversity of a mature forest VS a more open habitat using birds as indicators.



VS



A dark, blurred forest scene with sunlight filtering through the trees, creating a bokeh effect of light spots. The text is centered in the middle of the image.

In a peri-urban landscape, is the
contribution of mature and old
grown forests better than open
mixed habitats for the regional
biodiversity pool ?

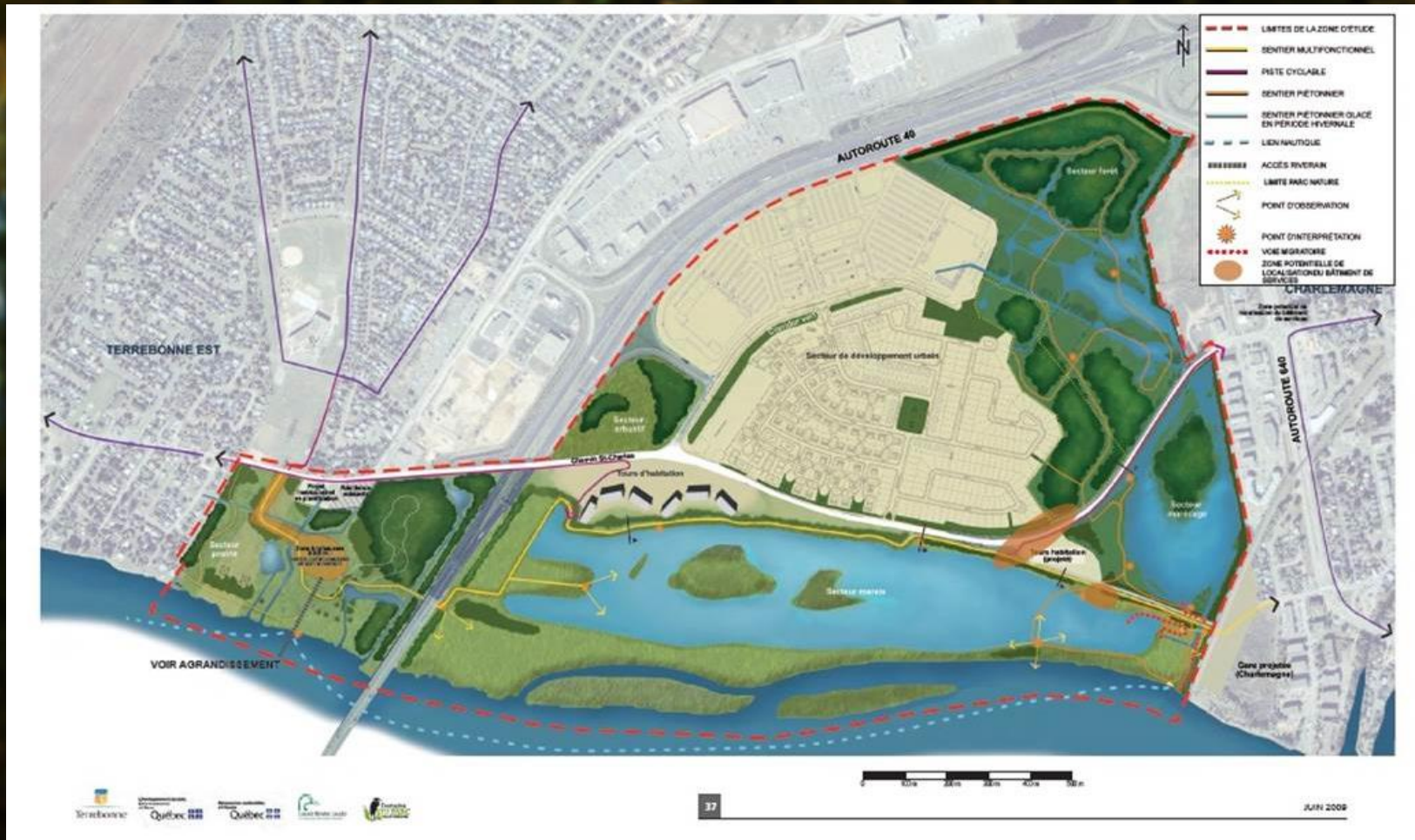


- 1000 ha *Ruisseau de feu* watershed
- 126 ha under intensive habitat restoration
- 34 ha of planned forest area

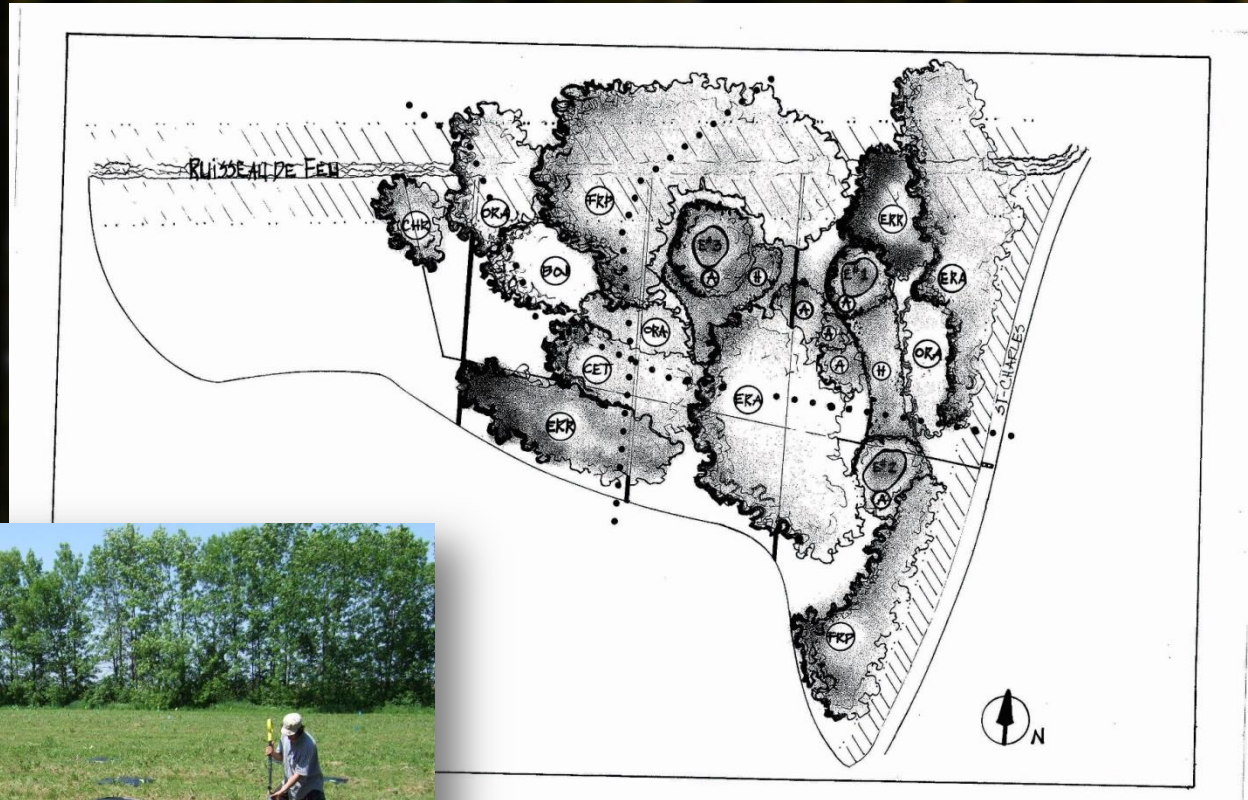
Area before habitat
restoration
(looking south)



Planned restoration work in four zones

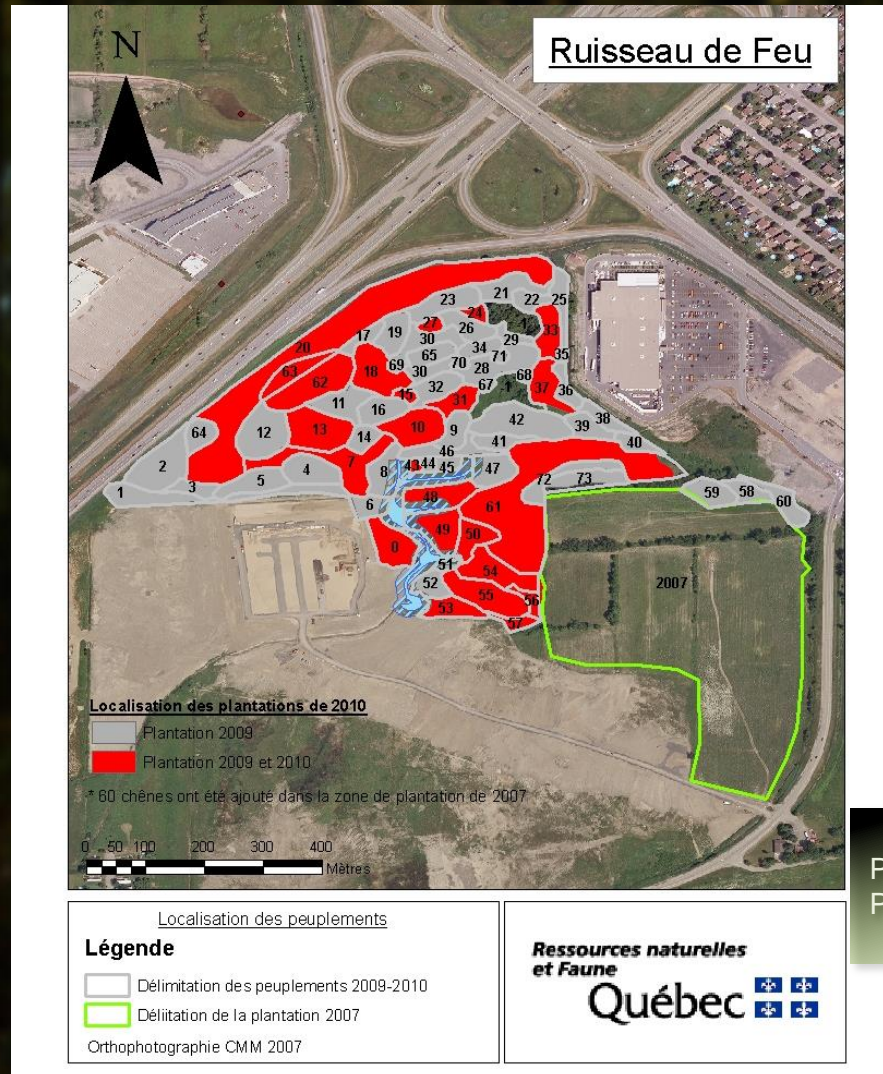


Planned restoration work in forest area



Phase 1 = 2007 © MFFP

Planned restoration work in forest area



Phase 1 = 2007 (green)
Phase 2 = 2009/2010 (red and gray)



May 2007 © MFFP



September 2016 © MFFP

Deciduous forest :

Acer saccharium (silver maple)

Acer rubrum (red maple)

Prunus serotina (black cherry)

Populus deltoides (eastern cottonwood)

Quercus rubra (red oak)

Quercus macrocarpa (bur oak)

Fraxinus pennsylvanica (red ash)

Salix sp.

Alnus sp.



Marsh area

Mesic forest area

Lowland forest area

PONT CHARLES DE GAULLE

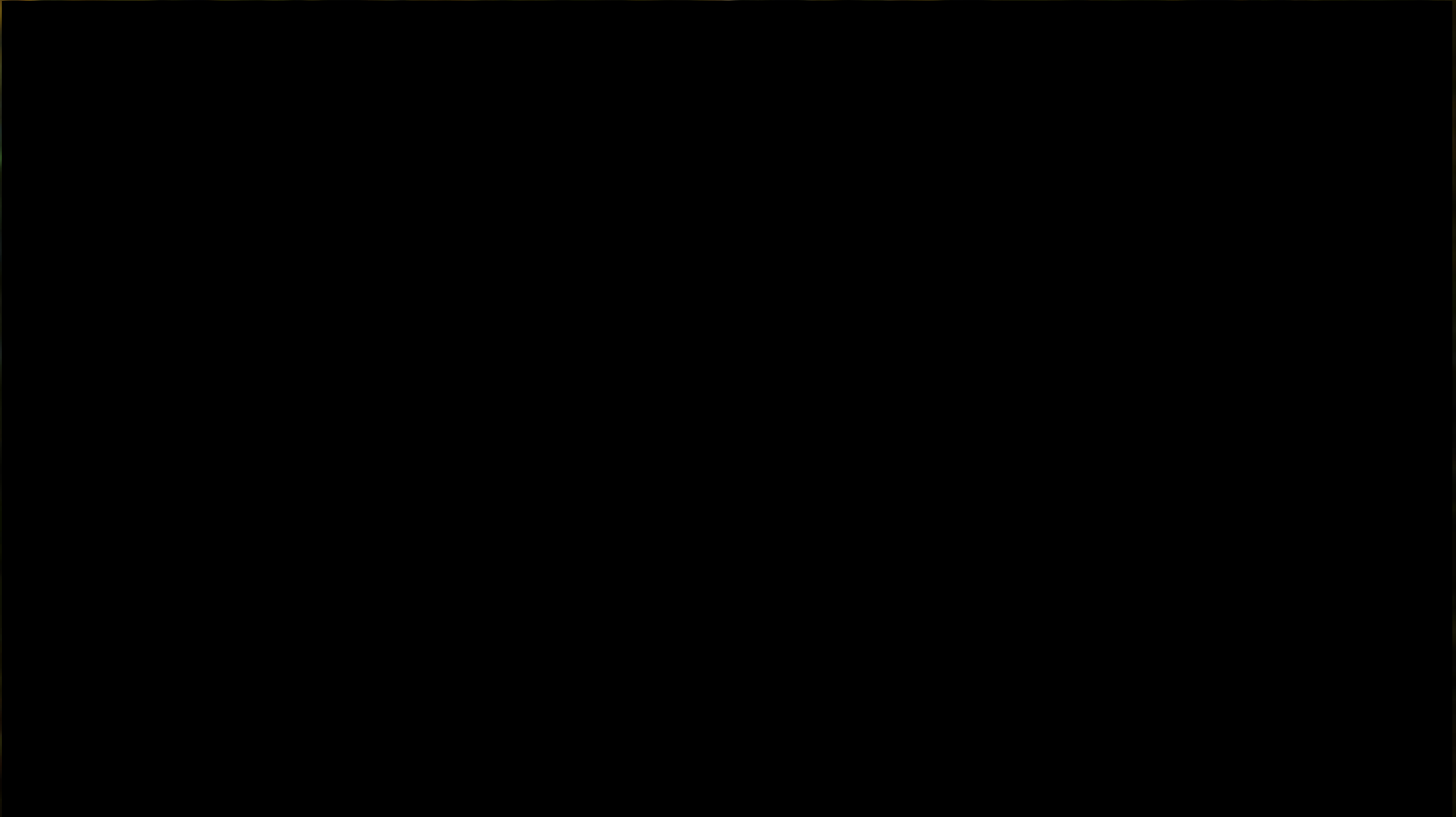
AUTOROUTE 40

AUTOROUTE 40

BOULEVARD SAINT-CHARLES

CHEMIN DE FER

**From the air :
some drone images (sept 2016)**



Three steps :

- 1) Selecting an effective guild of indicator species (birds)*
- 2) Studying regional forest cover in a 14 km radius around the site (under 30% of forest habitats in the fragmented landscape)*
- 3) Predicting bird communities according to local successional forest stages for the site on three temporal scales (21-40 years ; 41-60 years ; 81-100 years)*

Step 1. Indicators species

Birds are excellent indicators of wildlife diversity in a peri-urban regional context.

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Birds are excellent indicators of wildlife diversity in a peri-urban regional context.

They are ubiquitous, easy to count (low time consuming), and are charismatic species that capture public attention.

Step 1. *Indicator species*

Birds are excellent indicators of wildlife diversity in a peri-urban regional context.



Some are highly sensitive to fragmentation.

Piranga olivacea © Wikimedia commons

Step 1. *Indicator species*

Birds are excellent indicators of wildlife diversity in a peri-urban regional context.



Others need structural features for nidification (ex : cavity nesters like owls, ducks, woodpeckers, nuthatches).

Megascops asio © Wikimedia commons

Step 2. Regional forest cover

We studied regional forest cover in a 14 km radius.

Step 2. *Regional forest cover*

We studied regional forest cover in a 14 km radius.



Step 2. *Regional forest cover*

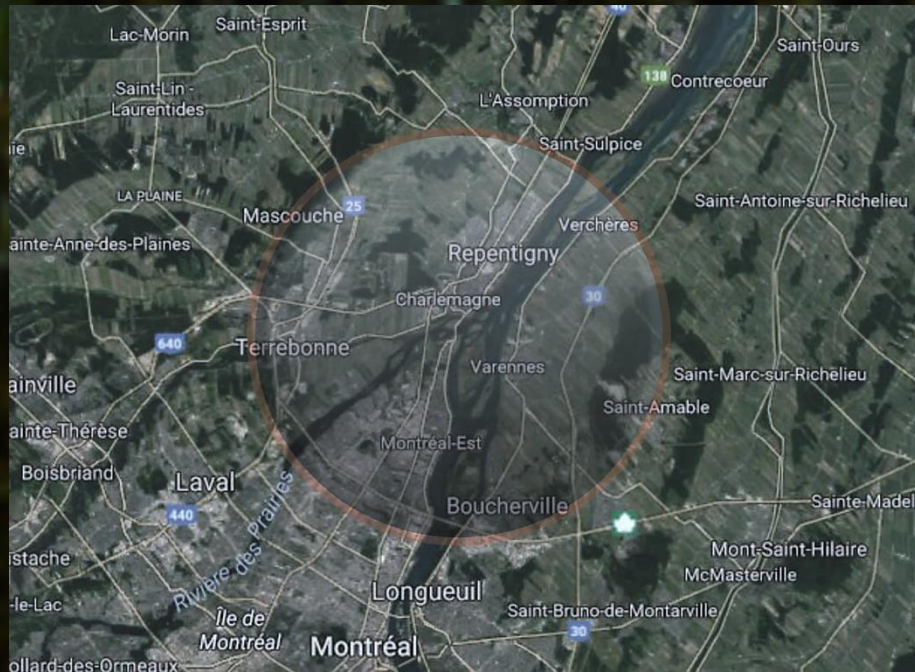
We studied regional forest cover in a 14 km radius.



- Less than 30% forest cover in a 616 km² area

Step 2. *Regional forest cover*

We studied regional forest cover in a 14 km radius.



- Less than 30% forest cover in a 616 km² area
- Only 3 mature forest patches (90 years and over):
 - 1) 12 ha
 - 2) 10 ha
 - 3) 5 ha

Step 2. *Regional forest cover*

We studied regional forest cover in a 14 km radius.



- Less than 30% forest cover in a 616 km² area
- Only 3 mature forest patches (90 years and over) :
 - 1) 12 ha
 - 2) 10 ha
 - 3) 5 ha
- Low connectivity between patches



*Step 3. Predicting bird communities
according to local successional
forest stages*

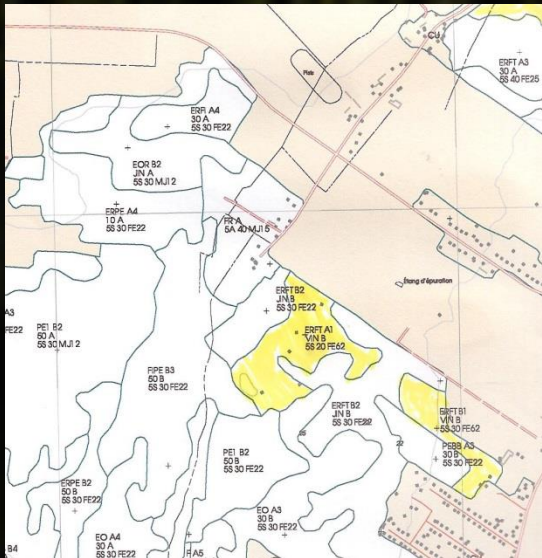
Step 3.

*Predicting bird communities
according to local successional
forest stages*

We studied 10 local mature forest stands
to extrapolate potential succession at
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Step 3. *Predicting bird communities according to local successional forest stages*

We studied 10 local mature forest stands to extrapolate potential succession at future forest sites



Quebec's ecoforestry maps from *ministère des Forêts, de la Faune et des Parcs* (1:20 000) giving multiple stands information (geology, drainage, soils, composition and height of stands, etc.)

*Red maple stand, 21-40 y/o, RF-1 station
© Michel Leboeuf*



Red maple stand, 21-40 y/o, RF-1 station
© Michel Leboeuf




Red maple stand, 41-60 y/o, RF-4 station
© Michel Leboeuf



*Sugar maple and basswood stand,
81-100 y/o, RF-10 station
© Michel Leboeuf*





Prospective stand revolution in time shows that mature and old growth sugar maple and basswood forests (80 y/o and over) offered higher regional bird diversity despite intense fragmentation.

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Mature forest scenario
Alpha diversity = 60

Aiglon des palombes
Bruant à couronne blanche
Bruant à gorge blanche
Bruant de Lincoln
Bruant fauve
Buse à épaulettes
Buse à queue rousse
Canard branchu
Cardinal à poitrine rose
Chouette rayée
Colibri à gorge rubis
Cornelle d'Amérique
Épervier brun
Épervier de Cooper
Geai bleu
Gélinotte huppée
Grand pic
Grand-duc d'Amérique
Grimpereau brun
Grive à dos olive
Grive à joues grises
Grive des bois
Junco ardoisé
Mésange à tête noire
Moucherolle à côtés olive
Moucherolle à ventre jaune
Moucherolle phébi
Moucherolle tchébec
Paruline à calotte noire
Paruline à collier
Paruline à croupion jaune
Paruline à flancs marron
Paruline à gorge noire
Paruline à gorge orangée
Paruline à joues grises
Paruline à poitrine baie
Paruline à tête cendrée
Paruline bleue
Paruline couronnée
Paruline du Canada
Paruline obscure
Paruline tigrée
Paruline triste
Paruline verdâtre
Petit-duc maculé
Pic chevelu
Pic flamboyant
Pic maculé
Pic mineur
Pioui de l'Est
Piranga écarlate
Roi-lelet à couronne dorée
Roi-lelet à couronne rubis
Sittelle à poitrine blanche
Troglodyte mignon
Tyrann huppé
Viréo à gorge jaune
Viréo à tête bleue
Viréo aux yeux rouges
Viréo de Philadelphie

Autour des palombes
Bruant à couronne blanche
Bruant à gorge blanche
Bruant de Lincoln
Bruant fauve
Buse à épaulettes
Buse à queue rousse
Canard branchu
Cardinal à poitrine rose
Chouette rayée
Colibri à gorge rubis
Cornellie d'Amérique
Épervier brun
Épervier de Cooper
Geai bleu
Gélinotte huppée
Grand pic
Grand-duc d'Amérique
Grimpereau brun
Grive à dos olive
Grive à joues grises
Grive des bois
Junco ardoisé
Mésange à tête noire
Mouche-à-cul à côtés olive
Mouche-à-cul à ventre jaune
Mouche-à-cul phébé
Mouche-à-cul tchèque
Paruline à calotte noire
Paruline à collier
Paruline à croupion jaune
Paruline à flancs marron
Paruline à gorge noire
Paruline à gorge orangée
Paruline à joues grises
Paruline à poitrine baie
Paruline à tête cendrée
Paruline bleue
Paruline couronnée
Paruline du Canada
Paruline obscure
Paruline tigrée
Paruline triste
Paruline verdâtre
Petit-duc maculé
Pic chevelu
Pic flamboyant
Pic maculé
Pic mineur
Piou de l'Est
Piranga écarlate
Roi-lest à couronne dorée
Roi-lest à couronne rubis
Sittelle à poitrine blanche
Troglodyte mignon
Tyrann huppé
Viréo à gorge jaune
Viréo à tête bleue
Viréo aux yeux rouges
Viréo de Philadelphie

Mature forest scenario
Alpha diversity = 60

Mixed open habitats scenario
Alpha diversity = 50

A photograph of a mature forest. The scene is filled with tall, slender tree trunks that rise vertically, creating a sense of depth and height. The ground is covered in a dense layer of green and brown leaves, suggesting an autumn setting. The lighting is soft and filtered, with some brighter patches where sunlight hits the foliage. The overall atmosphere is quiet and natural.

Mature forests are essential...



Mature forests are essential...

... especially for neotropical migrants,
interior species specialists...



Cardellina canadensis © Wikimedia commons



Contopus cooperi © Wikimedia commons

Threatened (COSEWIC)

... and cavity nesters (owls, ducks, woodpeckers and allies).




Aix sponsa © Wikimedia commons



All forests are not equal.

Some contribute more regionally than others in terms of biodiversity, especially in a intense fragmentation context.



In urban landscapes,
careful planning can highly
contribute to the regional
biodiversity pool.

Litteral et Wu, 2012

Long-term measurements
(annual survey) with a local
birding association



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