VEGETATION MAPPING OF NORTHERN QUÉBEC

CONFERENCE ON THE VULNERABILITIES OF QUÉBEC’S ARCTIC TERRITORY IN THE CONTEXT OF CLIMATE CHANGE

April 19, 2018, Kuujjuaq, Nunavik

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TEAM AND COLLABORATORS

- Project leaders: Antoine Leboeuf, Claude Morneau
- Mapping:
  - MFFP-DIF: Isabelle Baril, Louise Bourque, Élisabeth Dufour, Marie-Pierre Samson, Éric Vaillancourt
  - Poly-Géo
  - WSP
- Collaborators:
  - MDDELCC: Line Couillard, Frédéric Poisson, Benoît Tremblay
  - MFFP: Pierre Grondin, André Robitaille
There was no detailed map of vegetation covering all of Nunavik and northern Québec

Project started in 2010 as pilot project (22,000 km²)

Following a vegetation mapping between 51 and 53°N (2005-2009)

Financial support: Plan Nord project (2011-2013)
MAPPING AREA

- North of 53° N
- 680 000 km²
- Climate:
  - Mean annual temperature: -1 to -10°C
  - Annual precipitation: 450 to 1000 mm
- Vegetation: 4 bioclimatic domains
- Altitude: 0 to > 1000 m
METHODS

Mapping from satellite imagery

Landsat summer mosaic
Spatial resolution: 30 m

90 images
Acquired mid-July to end of August between 2003 and 2010
Portions of Landsat summer mosaic
METHODS

Overflights and aerial photographs
> 100,000

Ground plots
> 1000
METHODS

Automated classification

Unsupervised classification

Integration of raster in polygons

Landsat mosaic

Image segmentation

Classification of polygons

Preliminary map
Surficial deposits: RapidEye-3D (5 m)

Main tree species:
- Black spruce
- White spruce
- Larch
- Jack Pine
- White birch
- Poplar

Treed or treeless non-forest classes:
Landsat winter

Wetlands:
Perimeters (NTDB) and classification (Landsat and RapidEye)

Fire history:
Landsat images 1973-2013

Water bodies (NTDB)

Preliminary map

Final map

Minimum mapping area
- 16 ha
- 3 ha for wetlands and water bodies
# LAND COVER CLASSES

## 71 classes

### Groups of land cover classes

<table>
<thead>
<tr>
<th>Group</th>
<th>Criteria</th>
<th>N classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forests</td>
<td>&gt; 10 % tree cover</td>
<td>23</td>
</tr>
<tr>
<td>Shrublands</td>
<td>&gt; 70 % deciduous shrubs and &lt; 10 % tree cover</td>
<td>3</td>
</tr>
<tr>
<td>Burned area</td>
<td>Recently burned area (0-30 years)</td>
<td>1</td>
</tr>
<tr>
<td>Boreal lichen-heaths</td>
<td>&lt; 10 % tree cover without tundra vegetation</td>
<td>3</td>
</tr>
<tr>
<td>Subarctic lichen-heaths</td>
<td>&gt; 0 to 10 % tree cover with tundra vegetation</td>
<td>6</td>
</tr>
<tr>
<td>Erect-shrub tundras</td>
<td>Treeless with erect-shrubs (&gt; 30 cm)</td>
<td>11</td>
</tr>
<tr>
<td>Prostrate-shrub tundras</td>
<td>Treeless without erect-shrubs</td>
<td>4</td>
</tr>
<tr>
<td>Wetlands</td>
<td>&lt; 10 % tree cover and saturated by water</td>
<td>12</td>
</tr>
<tr>
<td>Without vegetation</td>
<td>&lt; 20 % vegetation cover (bedrock/stones, bare ground, snow, water, human infrastructures)</td>
<td>8</td>
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</tbody>
</table>
## Cover type

<table>
<thead>
<tr>
<th>Cover type</th>
<th>Understory type</th>
<th>Crown cover</th>
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</thead>
<tbody>
<tr>
<td>Deciduous (F)</td>
<td>-</td>
<td>A, B, C, D, L</td>
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<tr>
<td>Mixed (M)</td>
<td>-</td>
<td>A, B, C, D, L</td>
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<tr>
<td>Coniferous (R)</td>
<td>Shrub (a)</td>
<td>C, D, L</td>
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<tr>
<td></td>
<td>Lichen (c)</td>
<td>C, D, L</td>
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<tr>
<td></td>
<td>Lichen and moss (cm)</td>
<td>B, C, D, L</td>
</tr>
<tr>
<td></td>
<td>Moss (m)</td>
<td>A, B, C, D, L</td>
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</tbody>
</table>

### Crown cover classes
- A : > 80 %
- B : 61-80 %
- C : 41-60 %
- D : 26-40 %
- L : 10-25 %
Criteria used for classes in lichen-heath and tundra groups

- Shrub cover (30-70%, 70-100%)
- Bedrock/stones cover (10-50%, 50-80%)
- Herb cover (>10%)
- Frost-boils (numerous or not)
- Themokarst ponds (numerous or not)
NON FOREST CLASSES

<table>
<thead>
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<th>Group</th>
<th>N classes</th>
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<tr>
<td>Shrublands</td>
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<tr>
<td>Burned area</td>
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<td>Boreal lichen-heaths</td>
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<td>Subarctic lichen-heaths</td>
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<td>Prostrate-shrub tundras</td>
<td>4</td>
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<tr>
<td><strong>Wetlands</strong></td>
<td><strong>12</strong></td>
</tr>
<tr>
<td>Whitout vegetation</td>
<td>8</td>
</tr>
</tbody>
</table>

Criteria used for classes in wetlands

- Marsh/bog/fen
- Structure (patterned or not)
- Pools
- Palsas
- Geographic location

Salt marsh

Patterned bog without pools

Patterned bog with pools

Arctic fen

String fen
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<tr>
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<th>CL_DENS</th>
<th>CO TER</th>
<th>CL_CARTO</th>
<th>ESS_DOM</th>
<th>ORIGINE</th>
<th>AN_ORIGINE</th>
<th>STADE_DEV</th>
<th>PERTURB</th>
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<td>AN_ORIGINE</td>
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<td>AN_ORIGINE</td>
<td>STADE_DEV</td>
<td>PERTURB</td>
<td>AN_PERTURB</td>
<td>DEP_SUR</td>
</tr>
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</table>

| ID_SEQ   | 1827405 | SUPERFICIE | 388.7 | TYPE_COUV | VEG_SBOIS | CL_DENS | CO TER | CL_CARTO | ESS_DOM | ORIGINE | AN_ORIGINE | STADE_DEV | PERTURB | AN_PERTURB | DEP_SUR |
| ID_SEQ   | 1841529 | SUPERFICIE | 109.7 | TYPE_COUV | VEG_SBOIS | CL_DENS | CO TER | CL_CARTO | ESS_DOM | ORIGINE | AN_ORIGINE | STADE_DEV | PERTURB | AN_PERTURB | DEP_SUR |

PORTION OF THE MAP AND DATABASE
CONCLUSION

- The map is launched today
- Available to everyone for free
- Also available:
  - Landsat summer mosaic
  - Aerial photographs online
- A document presents pertinent information to understand and use the map product (mapping standard)

- In preparation: a document describing methods and map classes (structure, composition, habitat, distribution)
Thank you for your attention!

Merci pour votre attention!