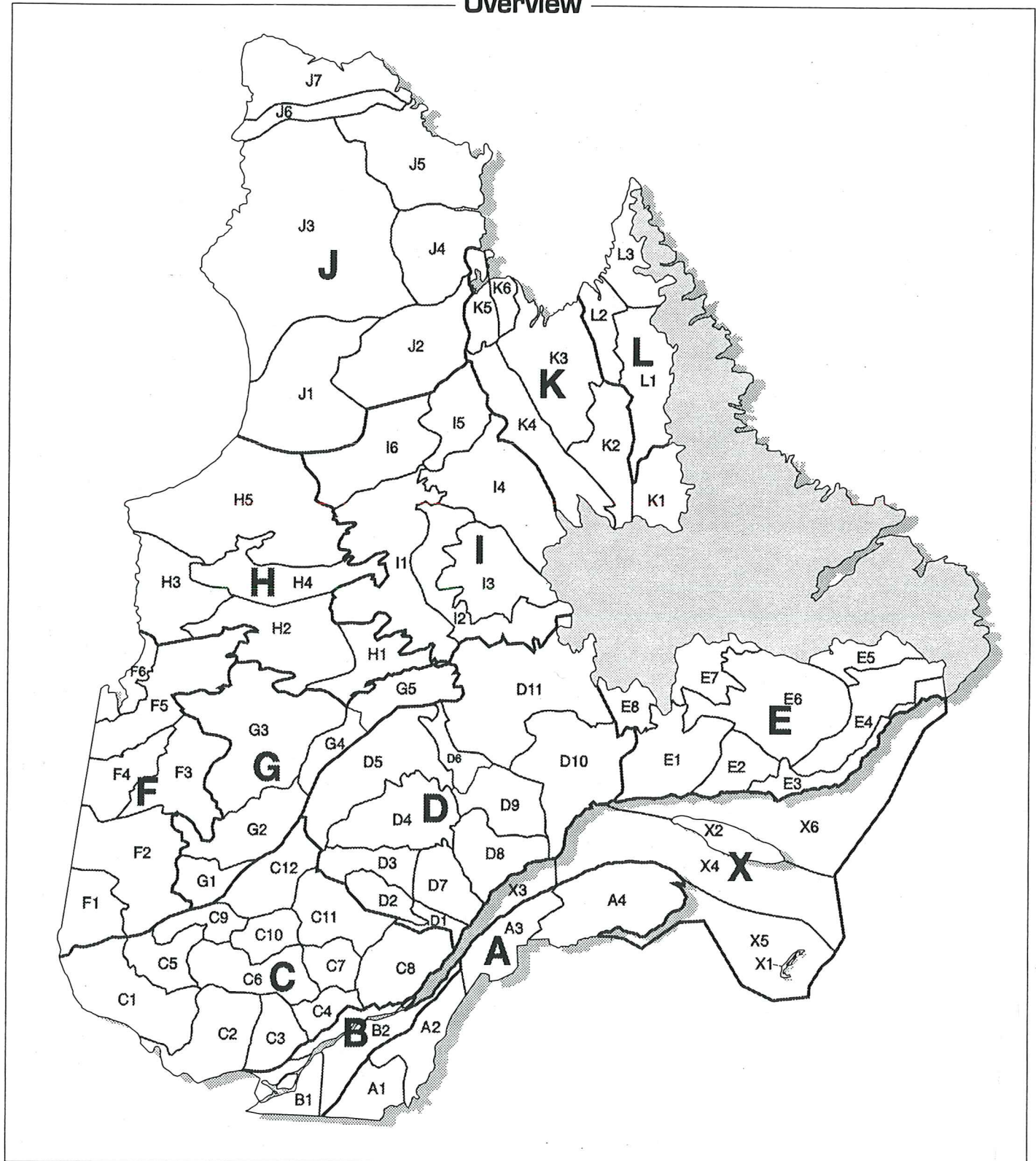


THE ECOLOGICAL REFERENCE FRAMEWORK FOR QUÉBEC: NATURAL REGIONS

Overview



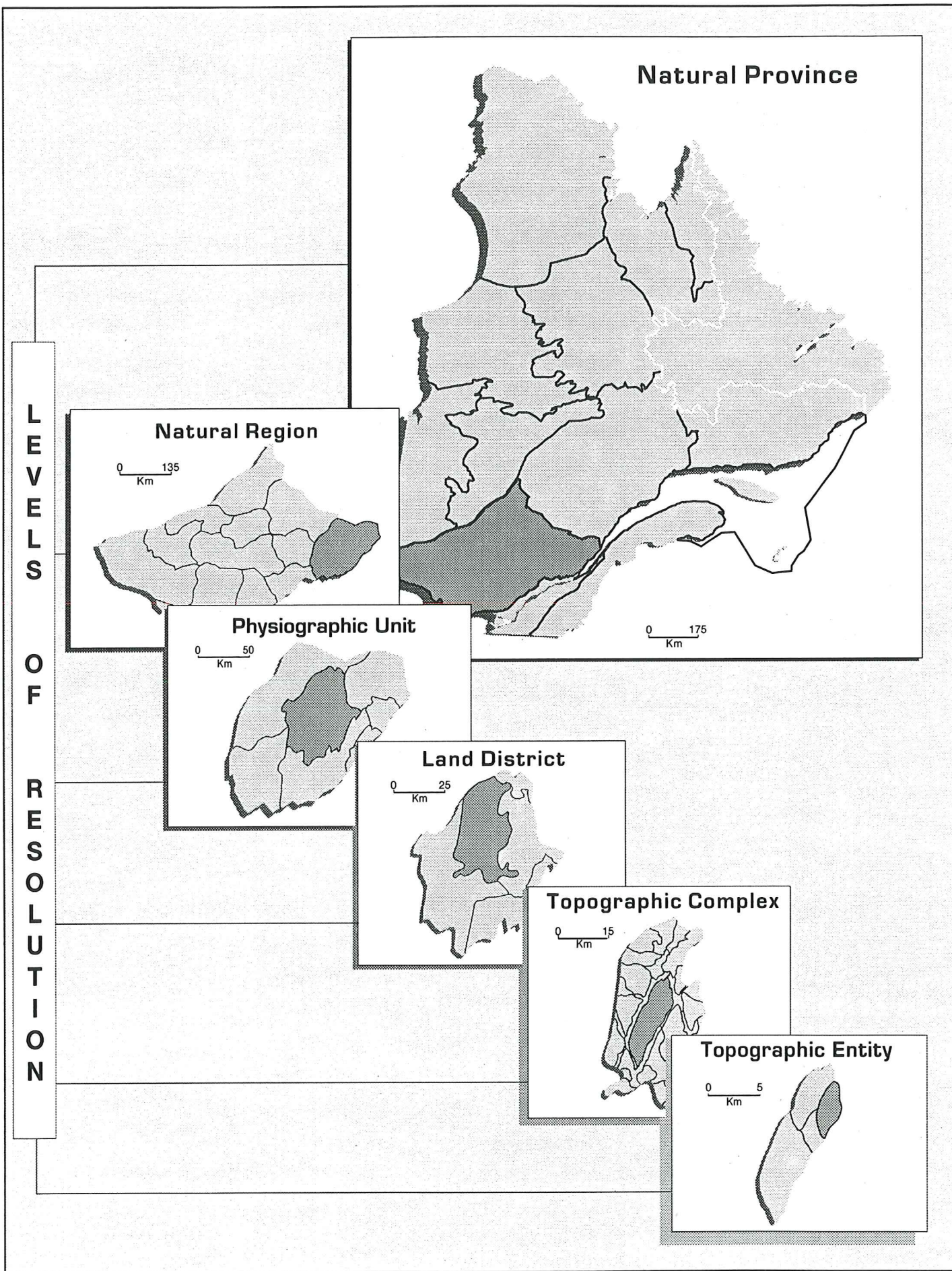
THE NATURAL REGIONS OF QUÉBEC

In recent years, the Québec government has frequently expressed the will to manage the territory of Québec with greater ecological knowledge (ecosystem-based management), to use the land according to its capability (sustainable land and resource use, environmental assessments, state of the environment reporting) and to develop a coherent conservation policy (parks, ecological reserves, biodiversity). In order to carry this out, Québec will have to develop an ecological planning and management tool for the province.

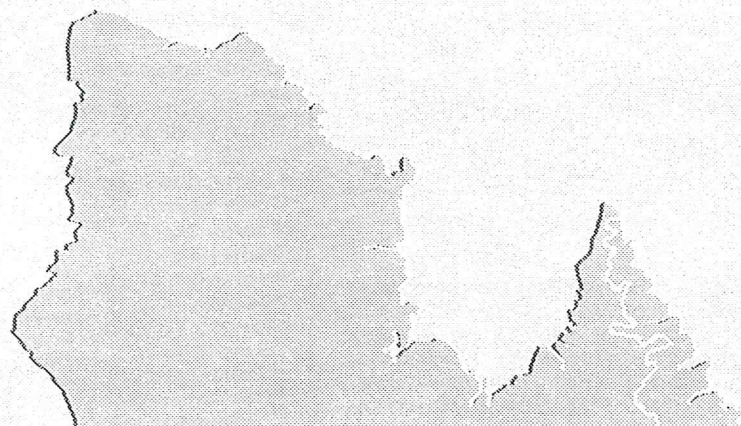
Apart from the map of natural regions produced by the former recreation, fish and game department, the Ministère du Loisir, de la Chasse et de la Pêche (MLCP, 1983), for use in parks planning, no small-scale ecological map of Québec exists.

Using its vast experience in ecological mapping and rigorous methodology, and benefiting from greater access to satellite images, geomatic tools and geological data, the environment and wildlife department, the Ministère de l'Environnement et de la Faune (MEF), is proposing a new division of Québec's natural regions for use in general land, environmental and resource management.

With the help of satellite images in particular, this document illustrates the basic mapping method, content of and possible uses for this very first ecological reference framework for the territory of Québec.



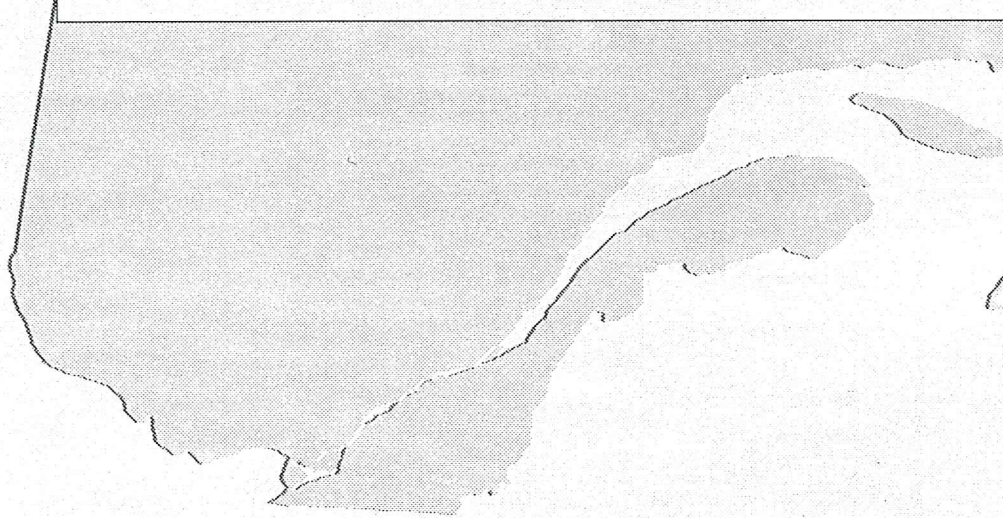
THE NATURAL REGIONS OF QUÉBEC



THE ROLE OF CLIMATE IN THE NATURAL REGIONS

Climate is a key factor in the function of ecosystems, although it has no bearing on the supporting environment's spatial organization. In other words, it does not influence the distribution of the physiographic factors that structure the landscape. Furthermore, the effects of climate are gradual and continual; climatic boundaries therefore change and cannot be precisely defined.

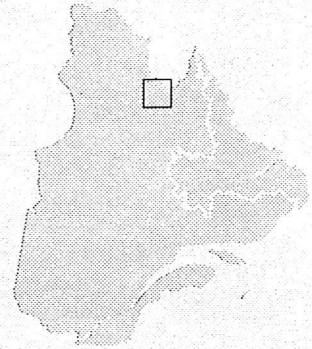
For this reason, neither climate nor the biological components that depend on it can be used in the delineation of natural regions. However, these factors are totally inseparable from the ecosystem and play a predominant role in the characterization of natural regions.



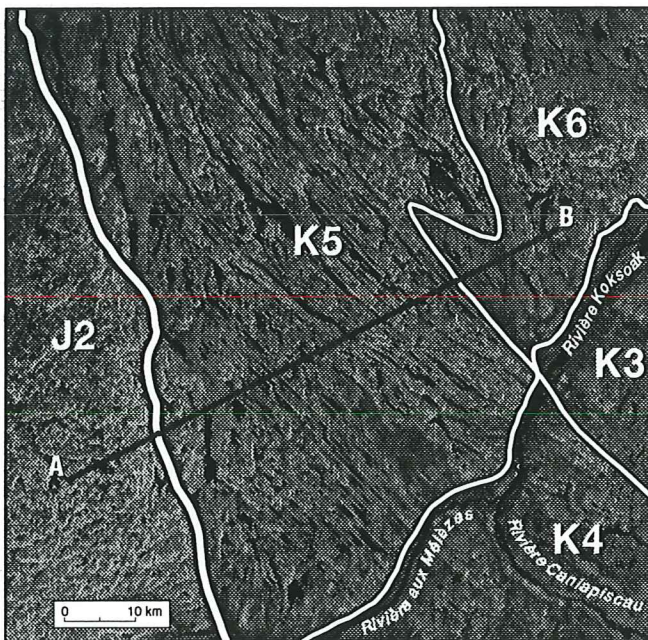
THE NATURAL REGIONS OF QUÉBEC

Through simple visual observation

we can distinguish the Lac Nedlouc plateau (J2) and Lac aux Feuilles hills (K5) natural regions.



In a satellite image

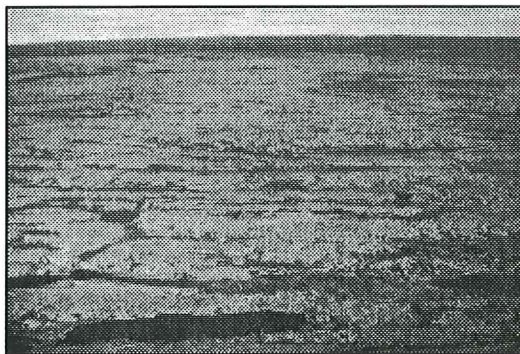


► two dominant structure types can be seen:

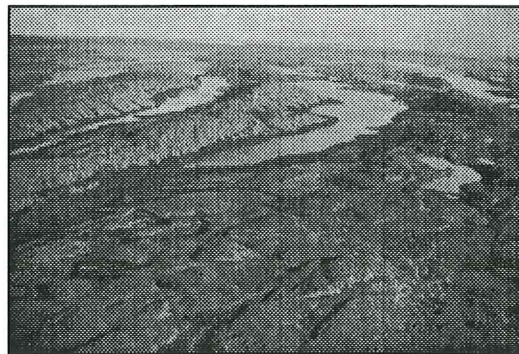
J2 - lack of a well-defined spatial organization, many small lakes of all shapes and sizes; lesser orthogonal drainage pattern;

K5 - marked parallel structure highlighted by long, narrow lakes.

In an aerial view



J2



K5

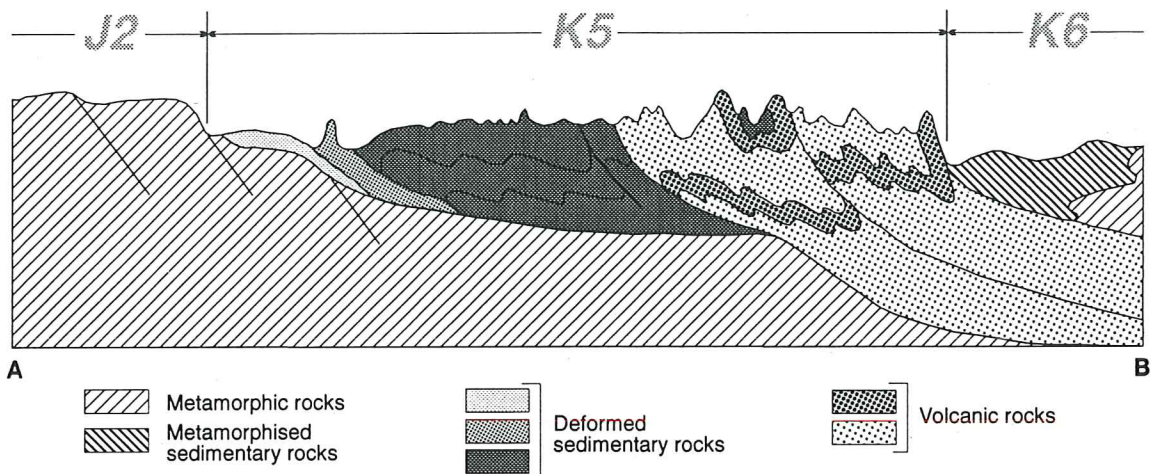
Where do these structures come from?

THE NATURAL REGIONS OF QUÉBEC

Territorial structures

To understand these structures, we must return to the dawn of time, as far back as the creation of the North American continent.

A geologic cross-section will help us :



Natural region J2 is part of Québec's initial continental block, which dates back 2.7 billion years. Since that time, it has been constantly eroded, bringing severely metamorphosed rocks to the surface; these rocks have often been subject to the Earth's internal forces, which have caused numerous fractures and faults in the basement rocks. During the Quaternary period, unhindered glacier movement polished the territory without substantially changing its original configuration.

Today, this natural region forms a relatively smooth plateau, criss-crossed by an orthogonal drainage pattern which underlines the basement tectonics and is partially covered by thin soils.

Natural region K5 was created approximately 1.6 billion years ago during the New Québec orogeny. Only a chain of elongated, narrow hills remains of these once towering mountains. During the Quaternary, glaciers likely contributed to this particular topography by overdeepening the valleys and polishing the summits.

Today, the terrain is rough and extremely structured: a tight succession of long, narrow hills with steep slopes and equally long, narrow depressions, many of which contain lakes. The parallel drainage pattern consists primarily of long, narrow lakes that do not connect transversally. The soil is thin or absent at the summit, becoming thicker in the depressions; resulting from the erosion of sedimentary rocks, it is fine-textured and slightly acidic, creating a richer, more fertile environment.

THE NATURAL REGIONS OF QUÉBEC

Territorial structures and climate

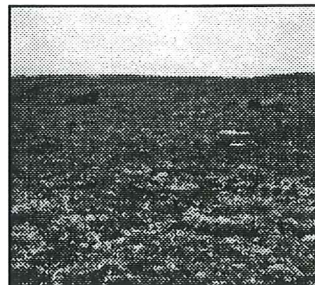
Natural regions J2 and K5 are subject to a regional arctic climate.

However, due to their vastly different spatial organizations, climate does not affect them in the same way:

J2

Tundra as far as the eye can see

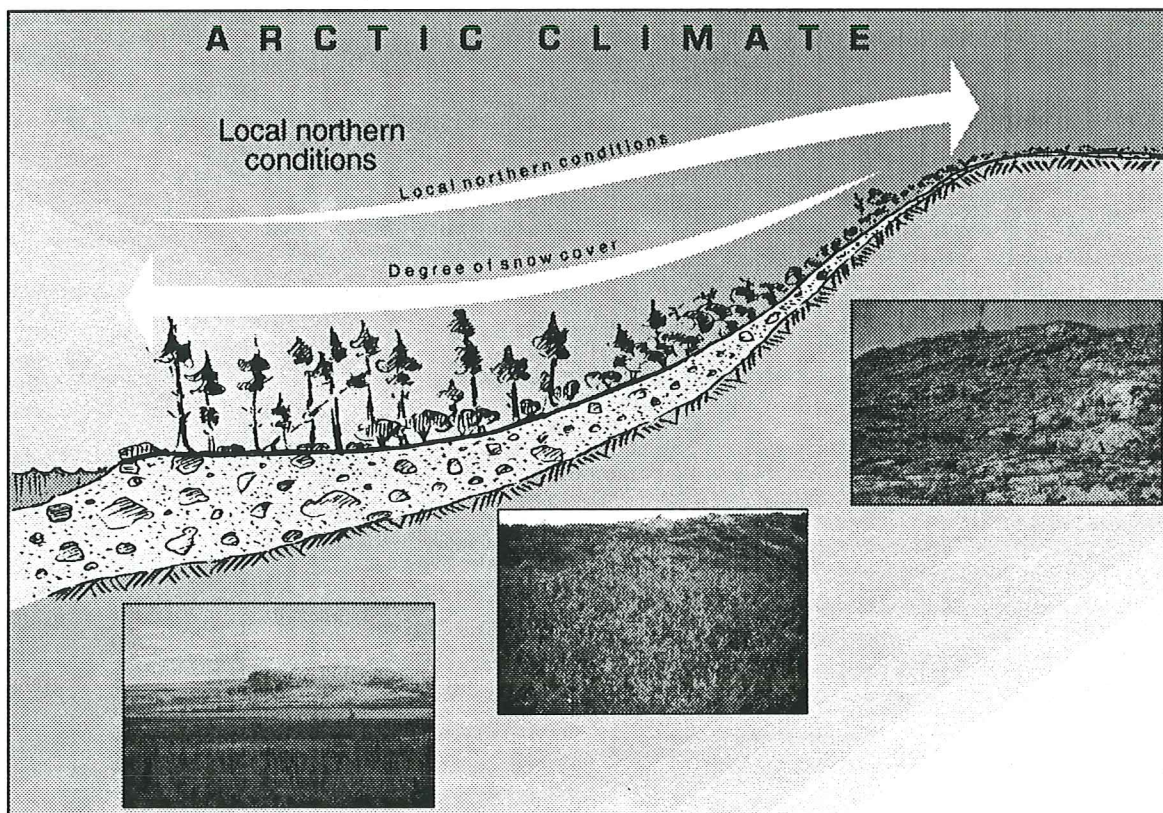
On the plateau of natural region J2, the climate is the same throughout the territory, which is characterized by tundra as far as the eye can see.



K5

From tundra to forest

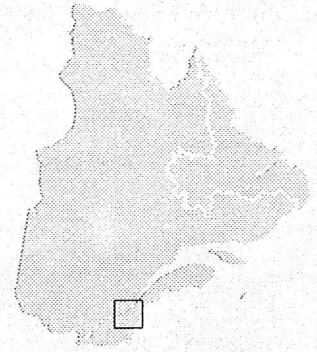
In the low hills of natural region K5, influenced by wind exposure and the topography, the climate creates a repetitive microclimatic zonation characterized by vegetation zoning coupled with a unique soil distribution.



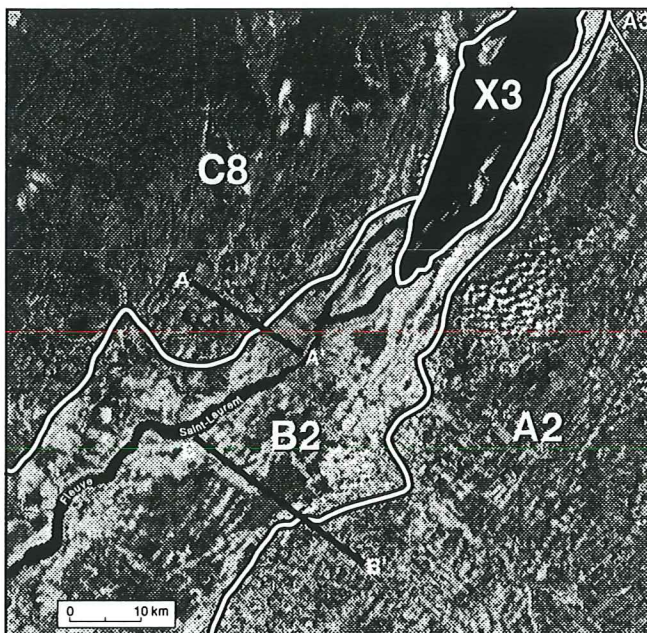
THE NATURAL REGIONS OF QUÉBEC

Again, through visual observation,

some familiar natural regions can be seen.



In a satellite image



C8

The Lac Jacques-Cartier highlands are part of the southern Laurentian Mountains, which consist of Precambrian igneous and metamorphic rocks (≈ 1 billion years).

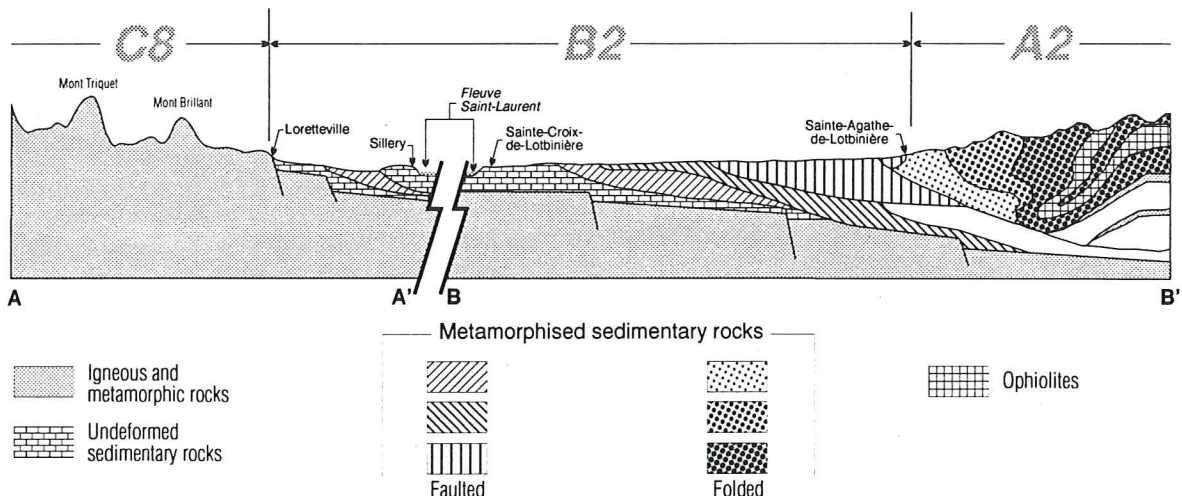
B2

The middle St. Lawrence plain makes up a large part of the St. Lawrence lowlands, which lie on Cambrian and Ordovician sedimentary rocks (≈ 500 million years).

A2

The Appalachian complex of the Beauce belongs to the Appalachians, which are composed of severely folded sedimentary and volcanic rocks that have existed since the end of the Paleozoic era (≈ 300 million years).

or using a geologic cross-section



THE NATURAL REGIONS OF QUÉBEC

In short, these two adjacent natural regions are distinguished by several basic characteristics that give them their own unique values . . .

J2

K5

<i>Basic characteristics</i>	Lac Nedlouc plateau	Lac aux Feuilles hills
Geological period	Archean	Proterozoic
Age (in billions of years)	≈ 2.7	≈ 1.6
Structural domain	Basement	Chain of folds
Tectonics	Broken	Folded
Petrography	Metamorphic rocks	Volcanic and sedimentary rocks
Metamorphism	High-grade	Low-grade
Relief	Relatively flat plateau	Parallel low hills
Drainage	Orthogonal	Parallel
Climate	Homogenous	Variable (contrast. microclimates)
Vegetation cover	Tundra	Tundra/forest
Water quality	Acid	Neutral
Soil productivity	Low	Low to moderate
Overall productivity	Low	Low to moderate
Ecological diversity	Low	High

THE NATURAL REGIONS OF QUÉBEC

Even though this territory was, on a number of occasions, buried under several thousand metres of ice during the Quaternary, the regional relief was only slightly modified; however, this strongly influenced the distribution of unconsolidated material, which in turn emphasized the differences between the three natural regions:

	<i>C8</i>	<i>B2</i>	<i>A2</i>
<i>Basic Characteristics</i>	Lac Jacques-Cartier highlands	Middle St. Lawrence plain	Appalachian complex of the Beauce
Geological period	Proterozoic	Paleozoic	Paleozoic
Age (millions of years)	≈ 1000	550-430	450-290
Structural domain	Basement	Sedimentary platform	Chain of folds
Tectonics	Broken	Subhorizontal	Folded
Petrography	Ign. and metam. rocks	Sedimentary rocks	Sedim. and volcanic rocks
Metamorphism	High-grade	None	Low-grade
Relief	High hills	Plain	Subparallel hills
Dominant deposit	Glacial and glaciofluvial	Marine and littoral	Glacial and glaciofluvial
Thickness of deposits	Thin	Thick	Thin
Dominant texture	Sandy loam	Clay and sand	Silty loam
Soil drainage	Rapid	Moderate to poor	Rapid to moderate
Soil quality	Acid	Neutral to slightly acidic	Slightly acidic
Soil productivity	Moderate to weak	High	Moderate to high
Land use	Forestry and recreation	Agricul. and urbanization	Agroforestry
Artificial structures	Weak	High	Moderate
Water pollution (risk)	Weak	High	Moderate to high

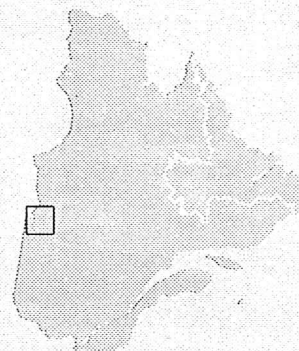
This table shows that the characteristic ecosystems of each natural region, and their functions, differ.

THE NATURAL REGIONS OF QUÉBEC

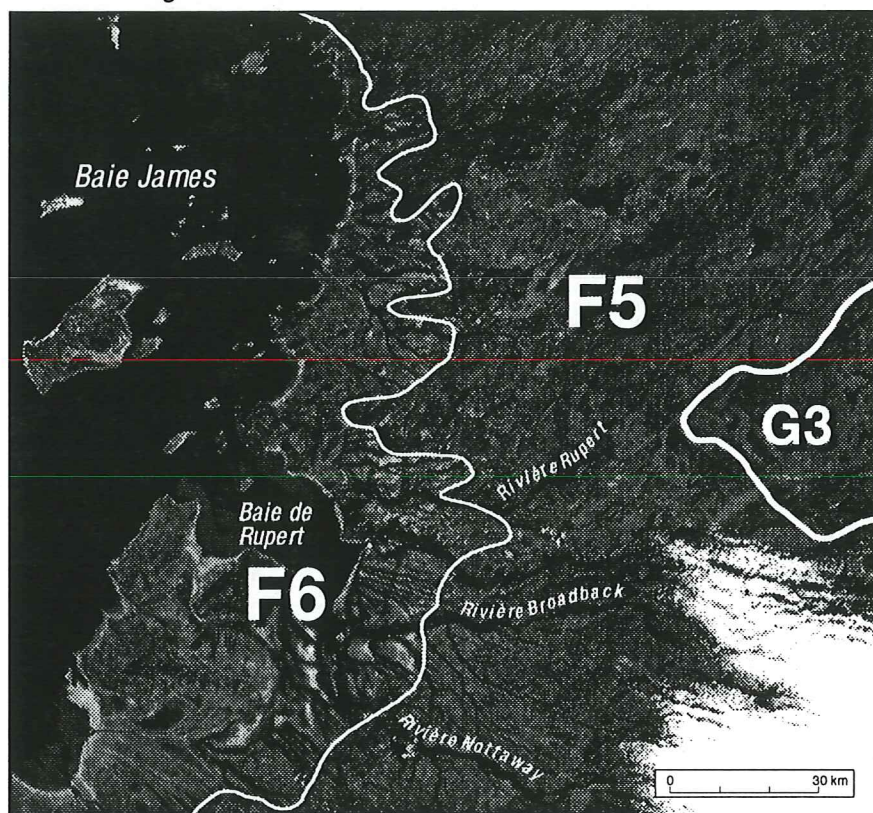
Hidden geology

The James Bay littoral plain (F6) and the lower Rupert plain (F5) have the same rocky basement but very different landscapes.

The Quaternary period influenced the landscape organization of these natural regions. Throughout this relatively complex geomorphological evolution (glaciation, proglacial lake, glacial readvances, marine intrusions, etc.), thick layers of clay loam sediments built up...



Satellite image



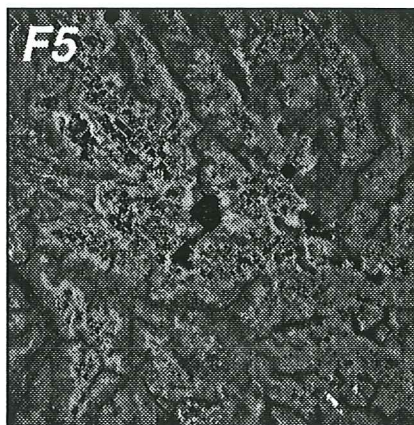
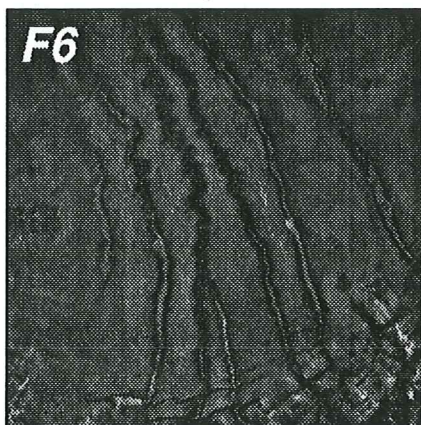
F6

In region F6, these deposits completely covered the rocky basement, creating a plain topography and contributing to the development of a parallel drainage pattern and immense peat bogs.

F5

In region F5, deposits filled in basins and helped soften the relief. Peat bogs peppered with ponds formed between rocky outcrops with dendritic drainage.

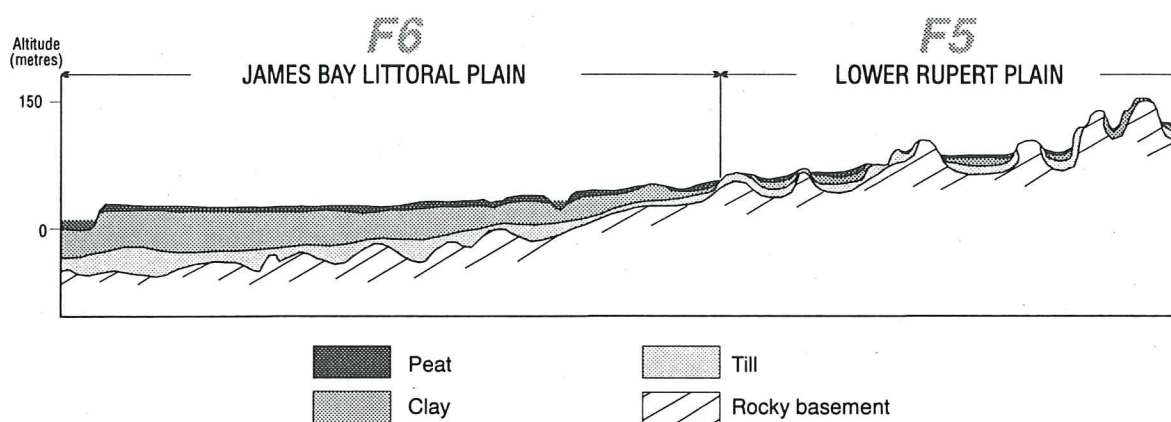
Aerial photographs



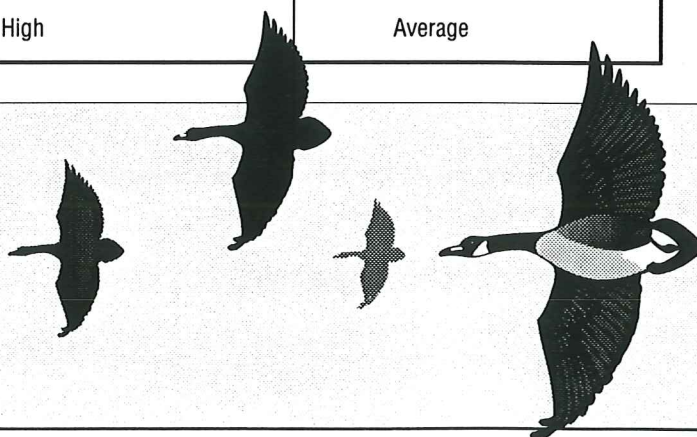
THE NATURAL REGIONS OF QUÉBEC

Ecosystems and their potential

The spatial organization of the natural environment varies from one region to the next, meaning that each region has different potential:



	F6	F5
<i>Natural Region</i>	James Bay littoral plain	Lower Rupert plain
Drainage pattern	Parallel	Dendritic
Relief	Flat	Rolling
Surficial deposit	Peat-clay	Peat-clay-till
Vegetation cover	Peat bog-marsh	Peat bog-forest
% peat bog cover	≈ 70%	≈ 50%
Dominant type of peat bog	Rich	Poor
Diversity of peat bogs	High	Low
Potential for waterfowl	High	Low
Conservation potential	High	Average

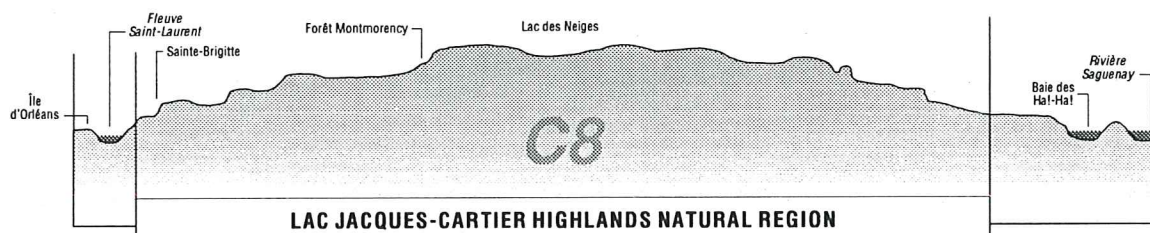


THE NATURAL REGIONS OF QUÉBEC

From natural region to ecosystem

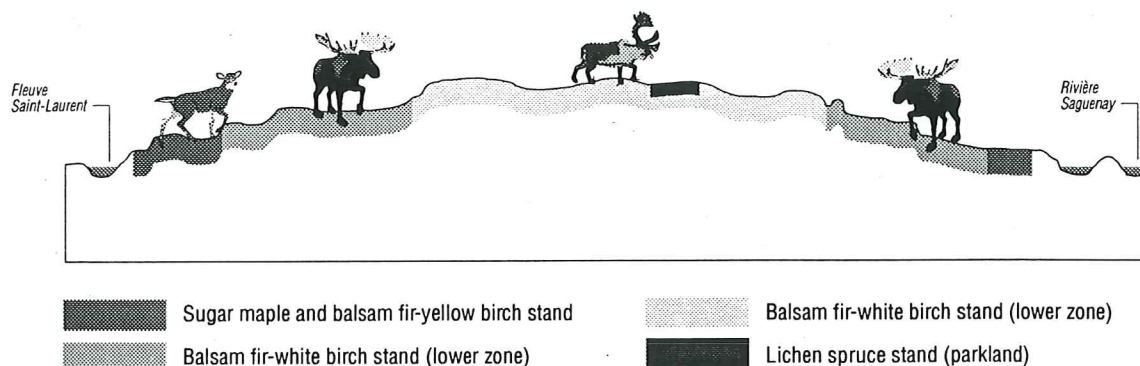
The Lac Jacques-Cartier highlands natural region (C8) is characterized by:

- An extremely old basement (1 billion years) composed of igneous and metamorphic rocks covered with thin layers of acidic deposits;
- A general dome shape;



but a variation in elevation of nearly 900 metres creates a climatic gradient:

This produces various altitudinal zones of vegetation: sugar maple-yellow birch stands at low altitudes, balsam fir-white birch stands at higher altitudes and, even in dry soil conditions (sand and gravel), subarctic parkland (Grands-Jardins).

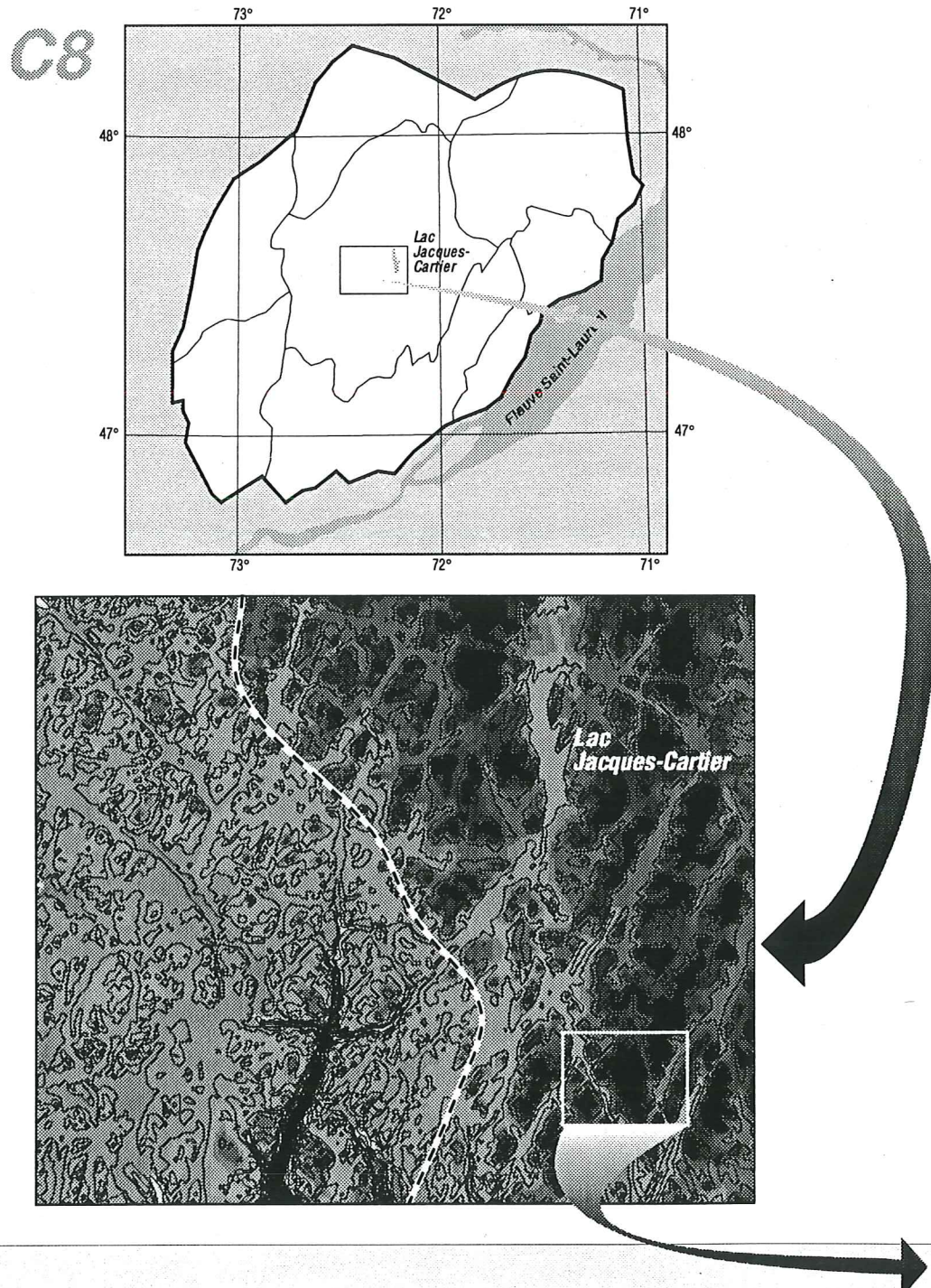


THE NATURAL REGIONS OF QUÉBEC

Within the natural region

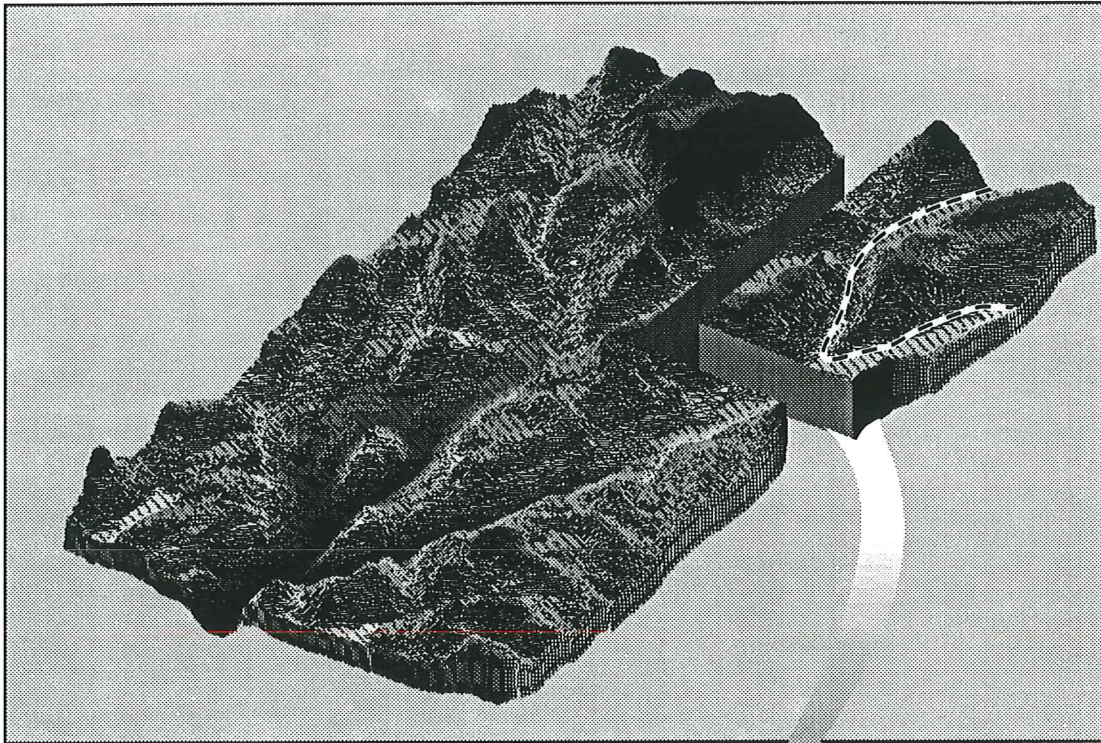
a succession of increasingly simpler levels of spatial organization can be seen.

The Lac Jacques-Cartier highlands natural region can be subdivided according to its tectonics, physiography or drainage pattern:

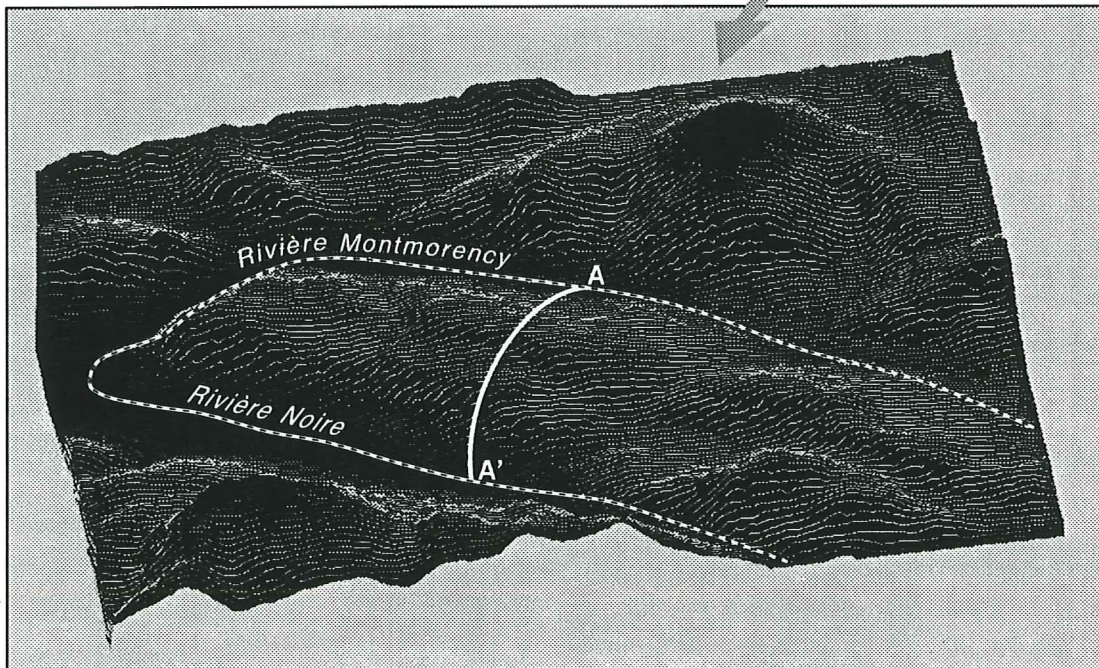


THE NATURAL REGIONS OF QUÉBEC

If the analysis is taken further



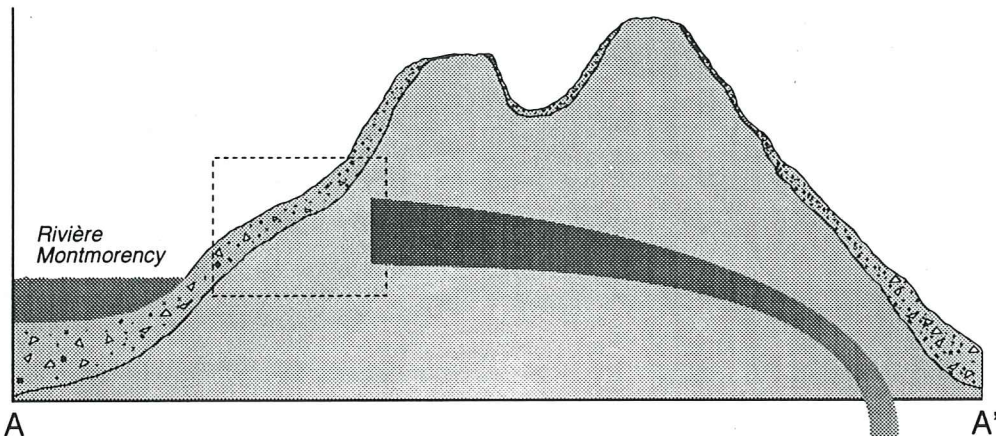
the spatial organization



becomes simpler

THE NATURAL REGIONS OF QUÉBEC

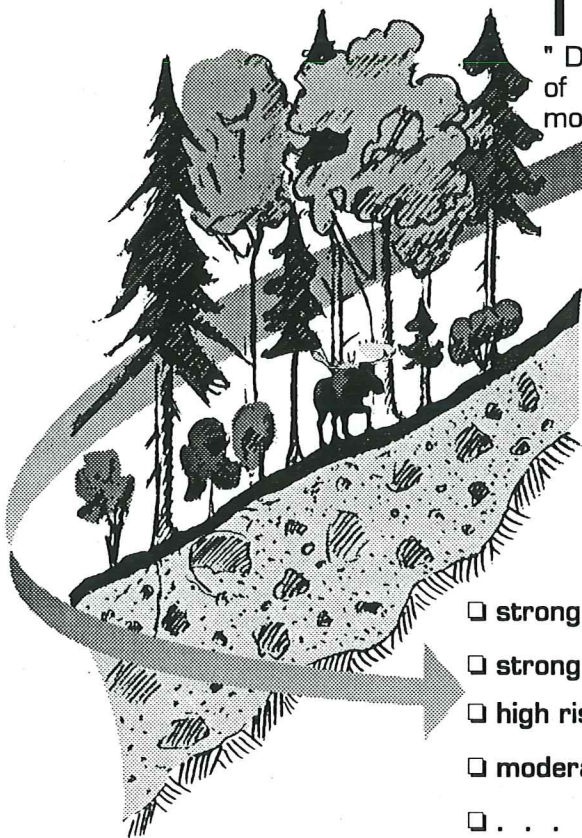
until it reaches . . .



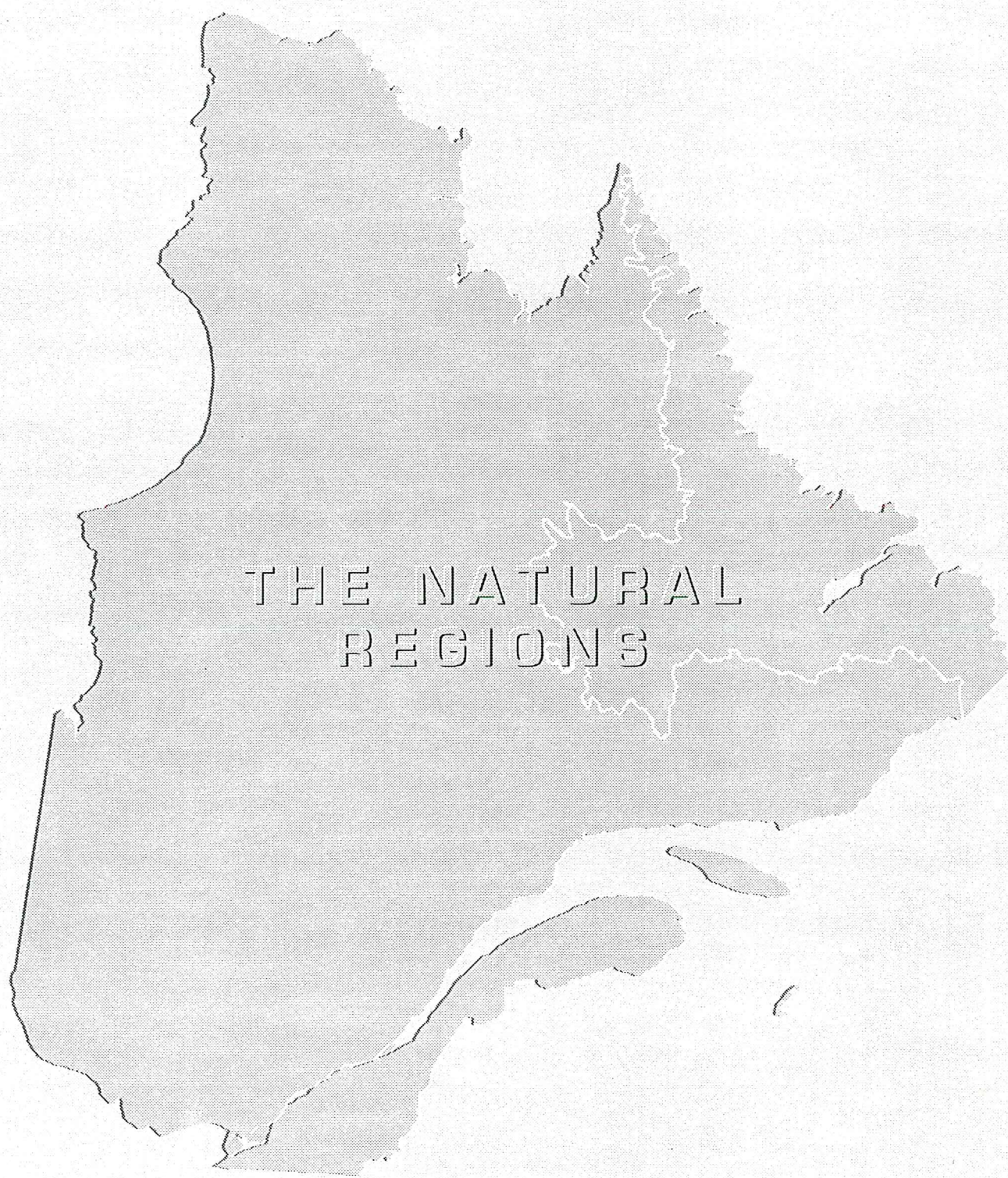
the most basic ecosystem.

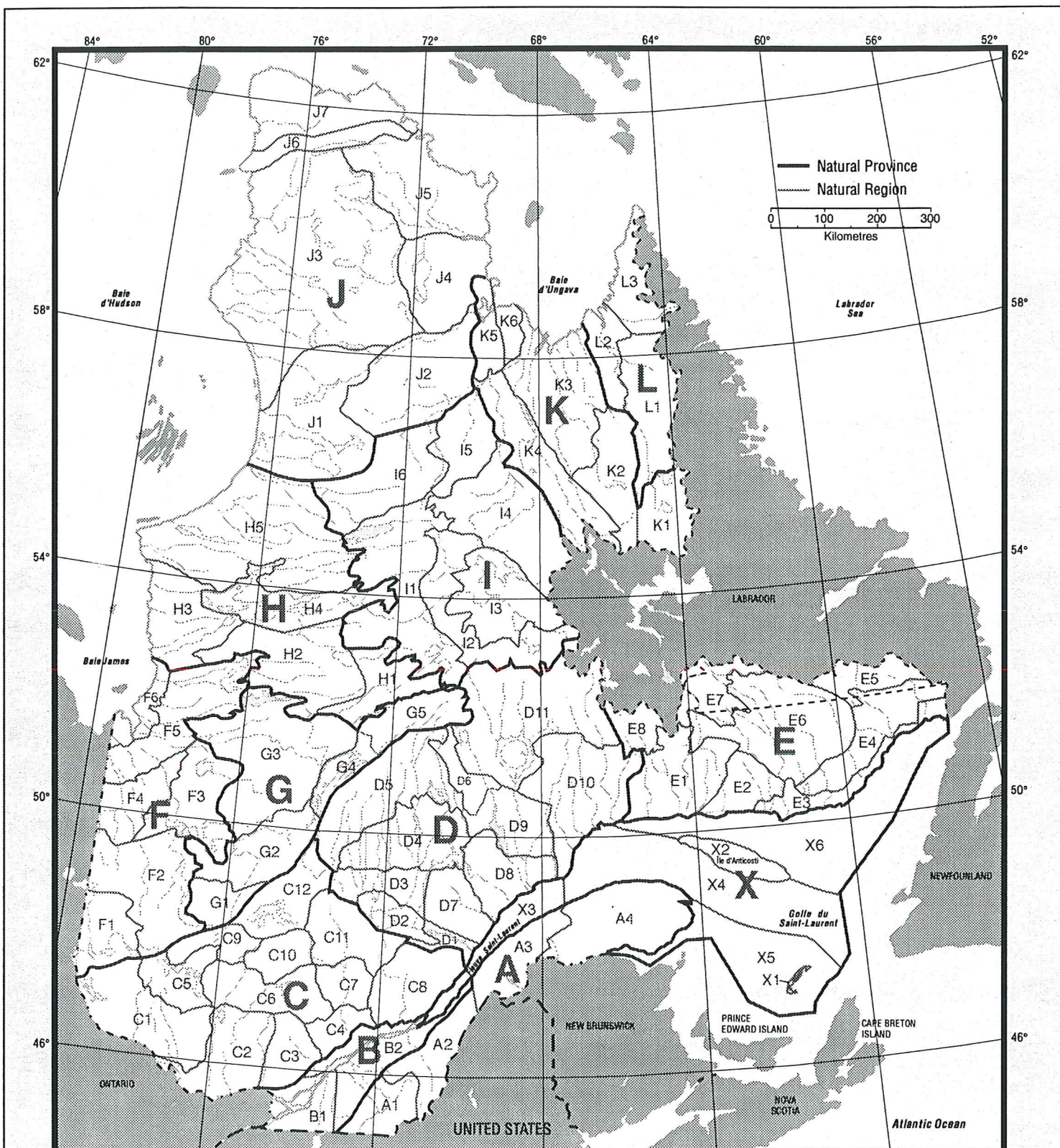
THE ECOSYSTEM

" Deep basal till that is well-drained at the foot of the slope; balsam fir-white birch and mountain maple stand ".



- ☐ strong potential for moose habitat
- ☐ strong forestry potential (> 4m³/ha/yr)
- ☐ high risk of vegetation competition
- ☐ moderate to high risk of erosion after deforestation
- ☐ . . .





THE NATURAL PROVINCES AND REGIONS OF QUÉBEC

PRELIMINARY VERSION

Direction de la conservation et du patrimoine écologique



Gouvernement du Québec
Ministère de l'Environnement
et de la Faune

April 1994

*The natural provinces and regions of Québec **

A Les Appalaches

- A1 Appalachian complex of Estrie
- A2 Appalachian complex of Beauce
- A3 Appalachian complex of the Lower Saint-Laurent
- A4 Péninsule de la Gaspésie

B Saint-Laurent Lowlands

- B1 Upper Saint-Laurent Plain
- B2 Middle Saint-Laurent Plain

C Southern Laurentides Mountains

- C1 Dumoine Plateau
- C2 Mont-Laurier Depression
- C3 Mont Tremblant Highlands
- C4 Lower Saint-Maurice Hills
- C5 La Vérendrye Depression
- C6 Lac Kempt Terrace
- C7 La Tuque Depression
- C8 Lac Jacques-Cartier Highlands
- C9 Chochocouane Hills
- C10 Parent Plateau
- C11 Windigo Highlands
- C12 Reservoir Gouin Depression

D Central Laurentides Mountains

- D1 Fjord du Saguenay
- D2 Lac Saint-Jean Plain
- D3 Girardville Hills
- D4 Lac Péribonka Hills
- D5 Lac Manouane Depression
- D6 Manouanis Highlands
- D7 Monts Valin
- D8 Betsiamites Plateau
- D9 Manicouagan Plateau
- D10 Sainte-Marguerite Plateau
- D11 Reservoir Manicouagan Basin

E Basse-Côte-Nord Plateau

- E1 Lac Magpie Highlands
- E2 Lac Watshishou Hills
- E3 Collines de Mécatina
- E4 Middle Saint-Augustin Hills
- E5 Upper Saint-Augustin Plateau
- E6 Petit Mécatina Plateau
- E7 Lac Brûlé Plain
- E8 Lac Fournier Plateau

F Abitibi and Baie James Lowlands

- F1 Lac Témiscamingue Lowlands
- F2 Abitibi Plain
- F3 Matagami Depression
- F4 Turgeon Plain
- F5 Lower Rupert Plain
- F6 Baie James Littorale Plain

G Mistassini Highlands

- G1 Lac Mégiscane Hills
- G2 Chibougamau Depression
- G3 Upper Rupert Plateau
- G4 Lac Mistassini
- G5 Monts Otish

H La Grande Rivière Low Hills

- H1 Upper Eastmain Hills
- H2 Opinaca Hills
- H3 Lac Duncan Plaine
- H4 La Grande Rivière Depression
- H5 Grande rivière de la Baleine Plateau

I Nord-du-Québec Central Plateau

- I1 Lac Bienville Plateau
- I2 Lac Opiscotéo Hills
- I3 Reservoir de Caniapiscou Depression
- I4 Caniapiscou Plateau
- I5 Lac Châteaugay Plateau
- I6 Lac D'Iberville Hills

J Péninsule d'Ungava

- J1 Lac à l'Eau Claire Plateau
- J2 Lac Nedlouc Plateau
- J3 Lac Couture Hills
- J4 Lac Faribault Plateau
- J5 Plateau de la Vachon
- J6 Monts de Puvirnituq
- J7 Salluit Plateau

K Baie d'Ungava Basin

- K1 Lac aux Goélands Depression
- K2 Lac Champdoré Depression
- K3 Rivière à la Baleine Lowlands
- K4 Labrador Hills
- K5 Lac aux Feuilles Hills
- K6 Lac Diana Plateau

L Monts Torngat

- L1 Rivière George Upper Plateau
- L2 Rivière George Lower Plateau
- L3 Monts Torngat

X Golfe du Saint-Laurent

- ☐ Land environment
 - X1 Îles de la Madeleine
 - X2 Île d'Anticosti
- ☐ Aquatic environment
 - X3 Fleuve Saint-Laurent
 - X4 Golfe du Saint-Laurent (Déroit d'Honguedo)
 - X5 Golfe du Saint-Laurent (Îles de la Madeleine)
 - X6 Golfe du Saint-Laurent (Côte-Nord)

* Toponyms have been approved by the Québec Commission de toponymie.

THE NATURAL REGIONS OF QUÉBEC

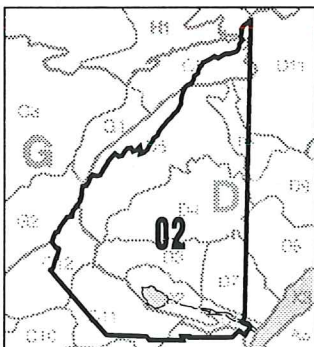
Natural regions are concrete spatial entities. Their boundaries are defined by major ecological limits in which geology plays an essential role.

The boundaries make these spatial entities **permanent**.

Each natural region has a distinctive spatial organization that reflects the organization of fundamental ecological variables (**geology, relief, hydrography and geomorphology**). These variables affect and combine with **climate** to create a unique **vegetation** and **wildlife** pattern and determine the ecosystem's function.

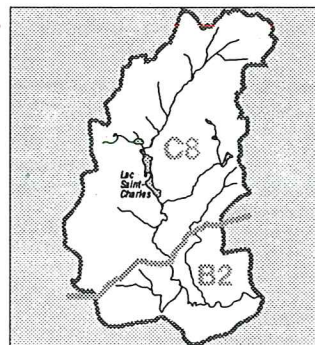
Based on this knowledge, it is possible to establish the land capability and **potential** and environmental sensitivity of each natural region, as well as an **ecological diversity index**.

Natural regions will soon be used
as a **reference framework** for:



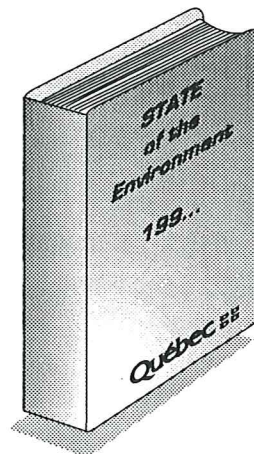
Administrative région 02
Saguenay — Lac-Saint-Jean

- ☐ planning the conservation of protected areas (parks and ecological reserves...),
- ☐ managing resources (forests, wildlife, water, and landscape),
- ☐ assessing the environmental impact of major development projects,
- ☐ drafting state of the environment reports,
- ☐ managing biodiversity,
- ☐ establishing an ecosystem-based land management policy.



Rivière Saint-Charles
drainage basin

Due to their properties, natural regions should soon emerge as the leading spatial reference framework for **environmental data bases** in Québec.



THE NATURAL REGIONS OF QUÉBEC

PRODUCTION TEAM

Research :

Tingxian LI
Jean BISSONNETTE

Text :

Jean-Pierre DUCRUC
Vincent GERARDIN
Line COUILLARD

Illustrations and layout :

Yves LACHANCE

Word processing :

Josée-Maude LÉVESQUE

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