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Interpretation guide of natural geographic features from ETM+ Landsat imagery and aerial photography: Esker

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Introduction

The purpose of this project is to create a visual interpretative guide to the natural geographical entities in the geospatial database (GDB) using Landsat7 ETM+ imagery and aerial photography. The methodology and information fact sheet were developed by Provencher and Dubois (2004a), and the application of this procedure to a test case has already garnered a consensus among the staff of CTI at Sherbrooke (Provencher and Dubois (2004b). The meanings of the sections of the fact sheets are explained in the appendix.

The eight natural entities in the GDB (Centre for Topographic Information, 2004) fall under eight themes that are grouped into three domains: hydrography, landforms, and vegetation (**Table 1**). In practice, for interpretive purposes they are often subdivided further and represented by 17 fact sheets.

N.B.: Elaboration of the illustrative examples and potential elements of confusion was constrained by the limited time allocated to this guide. It is recommended that they be supplemented as other cases are documented, especially from Landsat ETM+ imagery.

Table 1: Hierarchy of natural geographical entities

Domain	**Theme**	**Sub-theme**	**GDB entity**	**Fact sheet**
Hydrography	Watercourse	Perennial watercourse	Permanent water	Permanent water
		Alluvium	Intermittent water	Intermittent water
		Waterfall	Water disturbance	Waterfalls and rapids
		Rapids	Water disturbance	Waterfalls and rapids
	Waterbody	Perennial freshwater body	Permanent water	Permanent water
		Alluvium, rocky surface	Intermittent water	Intermittent water
		Saltwater	Permanent water	Permanent water
		Alluvium, rocky surface (tidal flat)	Intermittent water	Intermittent water
		Reef	Water disturbance	Reef
	Wetland	Tundra pond	Saturated soil	Tundra ponds
		Palsa bog	Saturated soil	Palsa bog
		Marsh, swamp, and uniform peat bog (wetland)	Saturated soil	Wetlands (marshes and swamps, peat bogs
		String bog	Saturated soil	Wetlands (string bog)
Landforms	Glacial landform	Glacial debris	Landform	Glacial debris
		Esker	Landform	Esker
		Moraine	Landform	Moraine
		Glacier, glacial ice cap, and ice shelf	Permanent snow and ice	Permanent snow and ice
	Periglacial landform	Polygonal soil	Landform	Tundra polygon
		Pingo	Landform	Pingo
	Littoral landform	Barrier beach and spit	Landform (sand)	Barrier beach and spit
	Eolian landform	Dunes	Landform (sand)	Dunes
Vegetation	Wooded region		Wooded region	Wooded region

1- Name of entity

Esker

2- Hierarchy

Landforms – glaciers – relief feature – esker

3- Definition

A sinuous, and sometimes branched, ridge that is usually long, narrow, and steep-sloped. It is formed from deposits in a glaciofluvial environment in intraglacial (within the ice) or subglacial (under the ice) meltwater channels. This definition essentially reflects that in the GDB.

4- Summary table of elements of identification

Table 2: Summary of identifying elements for eskers

Shape	View from top: linear, narrow and sinuous, sometimes branched View from end: triangular
Size	Length: kilometres Width and height: decametres
Topographic position	Independent of the topography
Drainage	Excellent
Vegetation	Sometimes specific, frequently absent
Emplacement process	Edge of a receding current or former glacier (perpendicular to the ice front, or terminus)
State	Usually inherited from the ice age (sometime at the terminus of current glaciers)
Spatio-temporal variations	Stable, but with seasonal differences in appearance depending on the type of vegetation
Environment	Associated with other glacial or glaciofluvial (glacial meltwater) formations
Identification on imagery	Environment with sparse tree cover: bands 3-2-1 Environment with thick tree cover: - long form: bands 3-2-1 - short form: blends with surroundings - tree cover distinct from surroundings: bands 4-3-2 or 5-7-3 - uniform tree cover: blends with surroundings
Elements of confusion	Medial, lateral, terminal, De Geer, or Rogen moraines Ridges between proglacial meltwater channels (bordering the glacier) Former barrier bars, barrier beaches, or natural levees Former parallel and transverse dunes Rocky ridges

5- Characteristics

5.1- Specific to the entity

5.1.1- Shape

A linear, narrow, and sinuous shape. It is generally simple, but may be complex. The simple form consists of a single ridge that is generally triangular with steep sides. It becomes complex when it locally branches into several ridges, sometimes accompanied by widening.

5.1.2- Dimensions

Length: from approximately 100 metres to several hundred kilometres.
Width: from decametres to approximately 100 metres, averaging about 50 metres.
Height: from decametres to over 100 metres, averaging about 50 metres.

5.1.3- Topographic position

Eskers are generally found in relatively smooth terrain, such as interfluvial (occupying the area between two watercourses) flats or valley slopes and bottoms. They are unlikely to be found in rough or mountainous areas, except at the bottoms of glacial valleys. Their emplacement process (Section 5.2.1) is such that they can occur in any topographic setting, for example straddling an interfluve.

5.1.4- Drainage

Drainage of eskers is generally excellent, since the particle size of its constituent materials is usually coarse (cf. Section5- 5.2-5.2.1-).

5.1.5- Vegetation

The plant cover of eskers typically differs from, and is less dense than, that of the neighbouring systems, which tend to be more humid. This vegetation is made up of species adapted to dry soils, such as pine. In some environments dominated by softwood stands, such as the North Shore of the St. Lawrence, the pine may be replaced by other species, including the trembling aspen.

5.2- Relative to the entity's dynamics

5.2.1- Emplacement process

Eskers appear on the edges of retreating glaciers (**Figure 1**). They consist of coarse sediments (sand, gravel, boulders) deposited by meltwater runoff in intraglacial or subglacial channels as well as in supraglacial crevasses. The triangular shape of eskers results from the collapse of their sides when the support of the ice in the tunnel beds or crevasses is withdrawn. The crest of the ridge runs perpendicular to the ice front. Eskers usually end quite abruptly, though some gradually flatten into outwash plains and others flow into the deltas of proglacial lakes (**Figure 1**). Eskers can be continuous or discontinuous. The fingers of a branching esker correspond to as many former tunnels or crevasses that crisscrossed and sometimes even coincided locally. Bulges are usually caused by a widening of the tunnels in stretches of weak ice. Eskers are sometimes part of a complex of glaciofluvial formations, including kames, kame terraces, kettles, deltas, etc. (**Figure 1**) (cf. Landry and Mercier, 1992; Genest, 2000).

5.2.2- State

Eskers are essentially inherited formations from the ice age. Some may be modified or partially destroyed by fluvial, lacustrine, or coastal erosion, while others are mined for granular materials or serve as roadbeds.

Eskers may currently be forming at the termini of some valley glaciers.

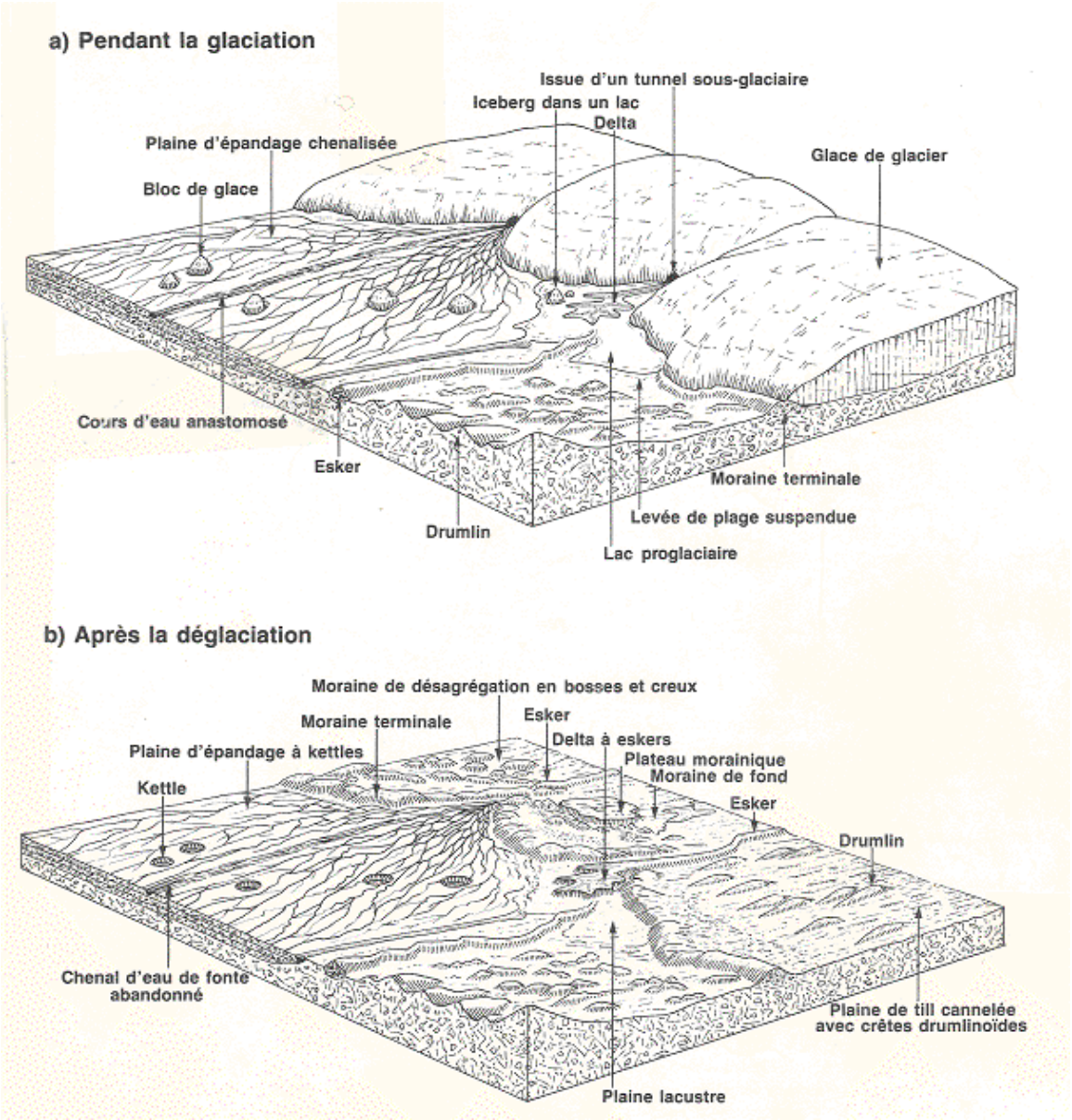
5.2.3- Spatio-temporal variations

The shape of this entity does not change in response to natural cycles or events. However, its appearance may vary seasonally with the plant cover.

5.3- Relative to the environment

Eskers can only be found in inherited glacial landscapes or in front of current glaciers.

In the first case, eskers are often found alongside other glacial forms that parallel them, such as drumlins, roches moutonnée, fluted or perpendicular surfaces like morainic systems or annual (De Geer, Rogen) moraines (cf. Landry and Mercier, 1992; or Genest, 2000). Eskers are also associated with other glaciofluvial formations, such as proglacial outwashes, kames and kame terraces, kettles, deltas of proglacial lakes, and the channels of meltwater streams.



Source : Mollard et Janes, 1985, p. 43

Figure 1 : Illustration of the development of an esker at the front of a glacier

In the case of current glaciers, eskers run perpendicular to the ice front in valley bottoms. They are parallel to medial moraines but perpendicular to terminal and recessional moraines. They are often associated with proglacial outwash, which may sometimes cover them. These eskers are also vulnerable to being rapidly eroded

by meltwater.

6- Optimal conditions for identification on satellite imagery

Eskers with a sparse tree cover (height and density) are generally easy to distinguish from their surroundings on nearly all bands or band combinations. They are easiest to identify using the combination of bands 3-2-1. In light of their unique relief, they stand out best when the lighting is oblique.

Under a thick cover of trees they are harder to identify, especially if the species mix does not differ from that in adjacent zones. If the tree cover blends with that of the neighbouring ecosystem, eskers can only be identified under oblique lighting, ideally with the combination of bands 3-2-1. Otherwise, they can be detected using bands 4-3-2 or 5-7-3, which still works best if the lighting is oblique.

The length and sinuousness of these forms are important factors of identification. The shorter eskers are, the less sinuous they will be and the more difficult to isolate from their surroundings.

7- Examples

7.1- Ground survey photography's

Source : Centre collégial de développement de matériel didactique, photo no 6432

Figure 2 : Esker near the Foucault river in Salluit, northern Quebec

Source : Prest, 1983, p. 94

Figure 3 : Esker at the Roi Guillaume Island, Franklin district, NWT

7.2- Oblique or vertical air photography's

Source : Geological Survey of Canada, Canadian Landscape , photo no 2001-200,64°40'-109°55', Map 77 C/12

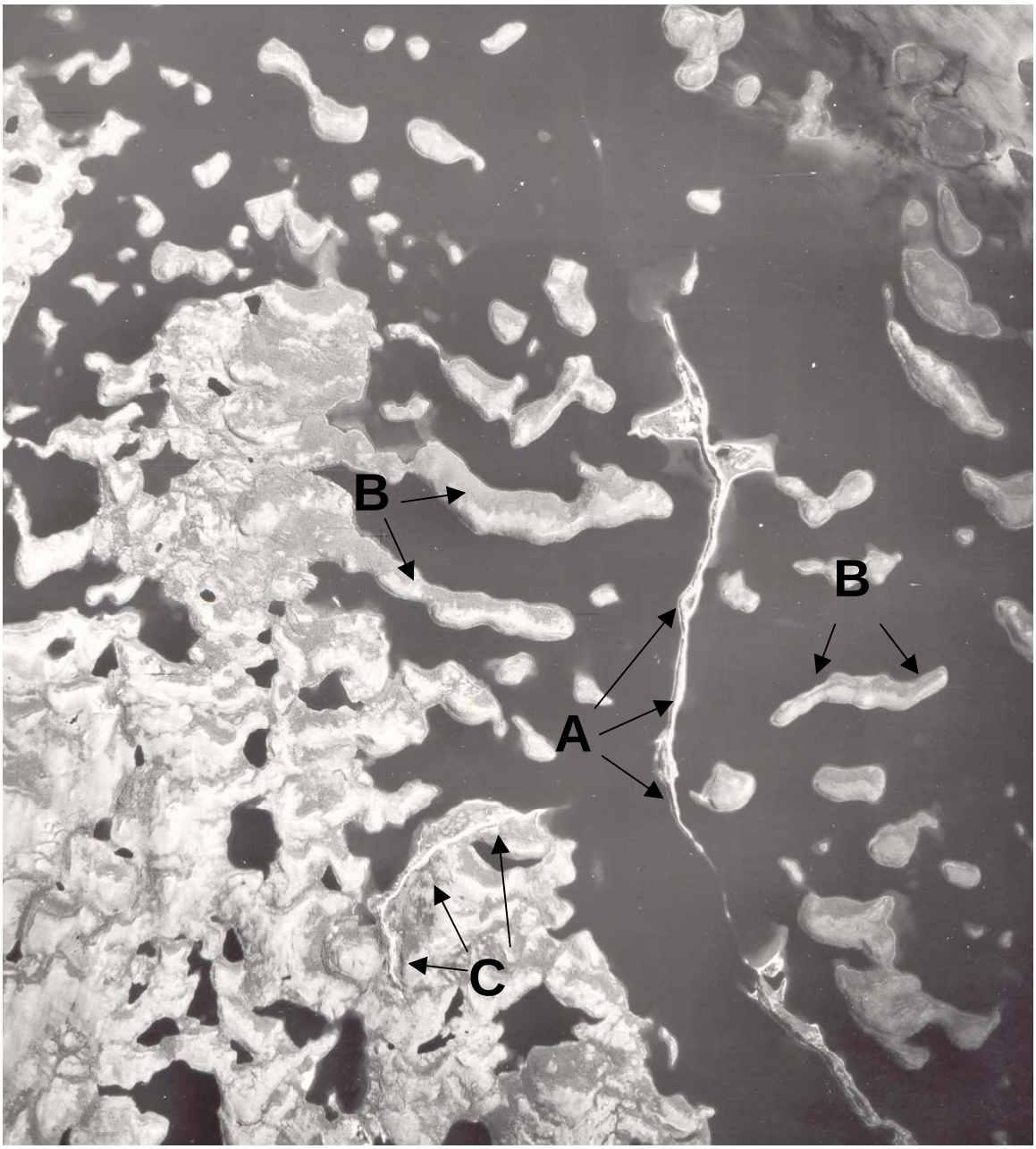
Figure 4 : Oblique view of an esker near the Lac du Sauvage , NWT

Source : Centre collégial de développement didactique, photo no 16143

Figure 5 : Oblique view of an esker under snow cover near LG-4 station, James Bay

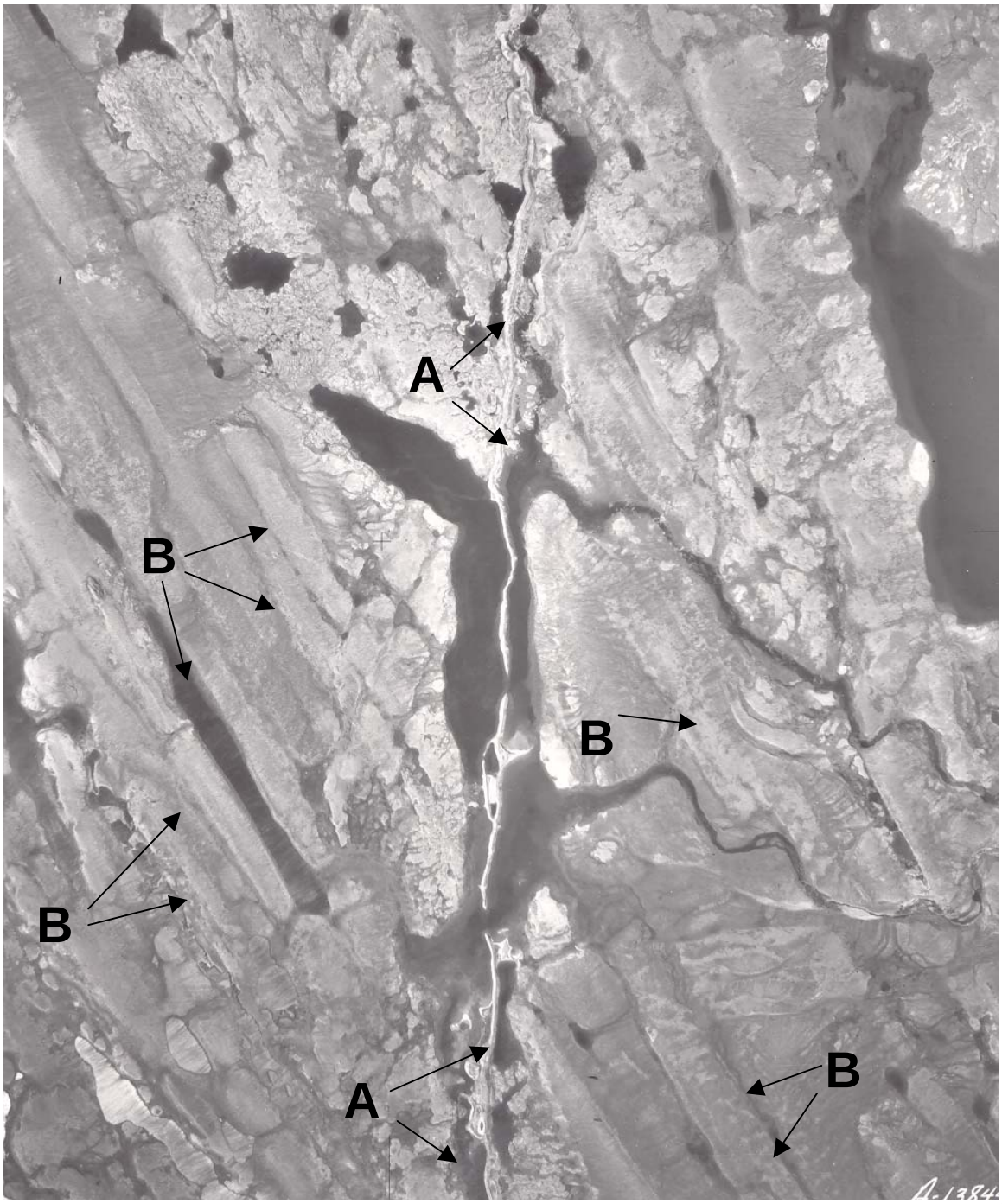
Source : Natural Resources Canada, T.S.C.A.P. no 48, photo A2711-94, 61°25'-103°20', 65 E Map

Figure 6 : Oblique view of an esker near Boyd Lake, NWT



Source : Natural Resources Canada, T.S.C.A.P. no 17, photo A12860-286, original scale 1 : 40 000, 60°27'-100°03', map 65 C/8.

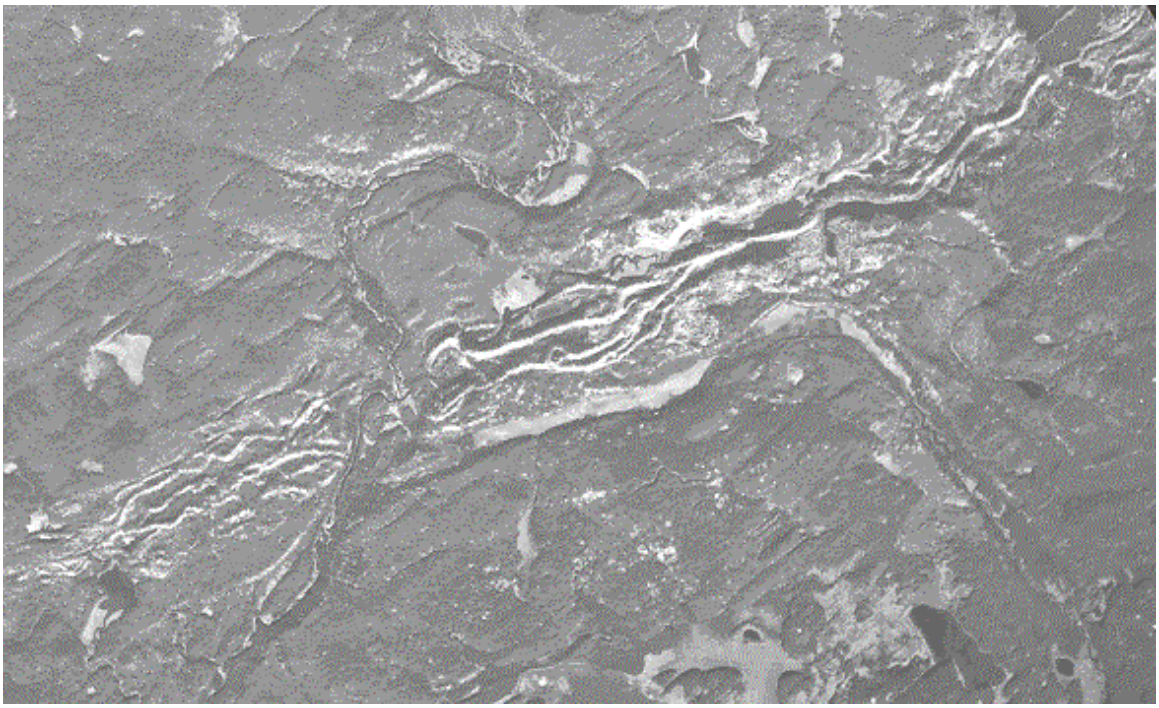
Figure 7 : Vertical view of an esker in Lake Hogarth, NWT



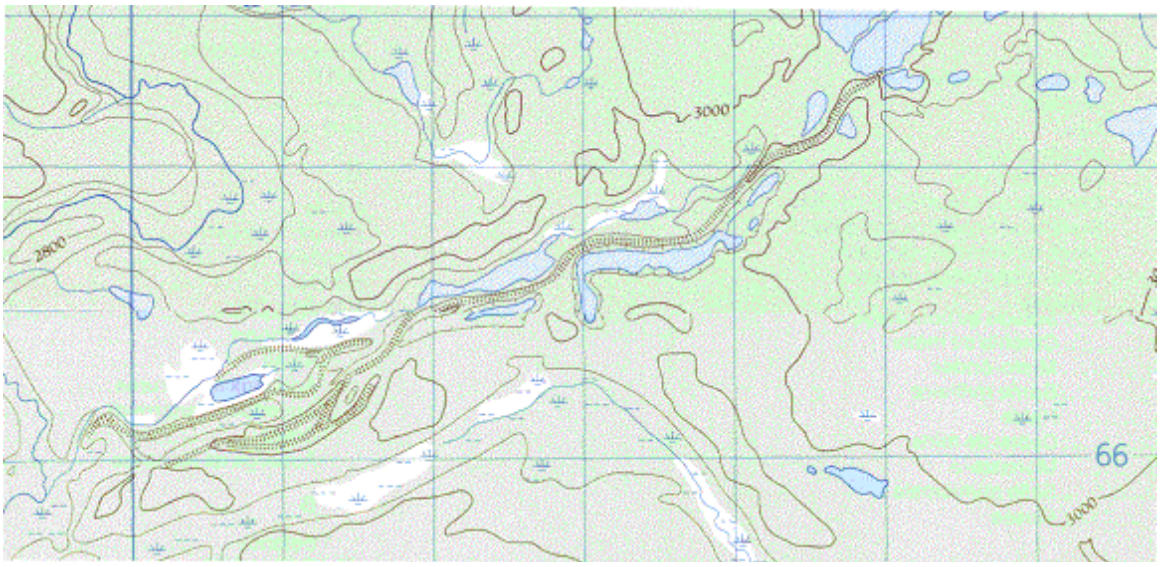
Source : Natural Resources Canada, T.S.C.A.P. no 108, photoA13844-75, original scale 1 : 40 000, 59°48'-70°35', Map 24 M/15

Figure 8 : Vertical view of an esker near Lake Thury, northern Quebec

Bulges and splitting of the crest are present. Also, the orientation of the esker (A) is similar to the one of the drumlins (B) which indicates the glacier flow direction.



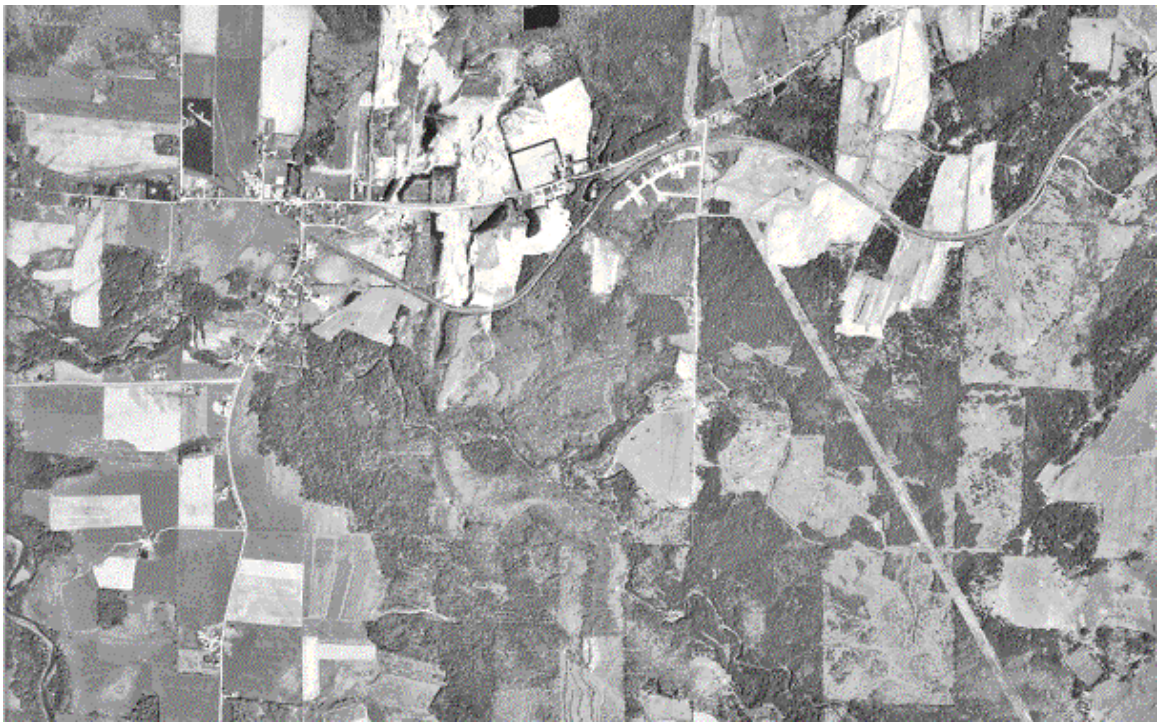
Source : Natural Resources Canada, photo, T.S.C.A.P. no 120, photo A15046-132, original scale 1 : 70 000, 54°50'-123°30', 93 J/12 et 13 maps



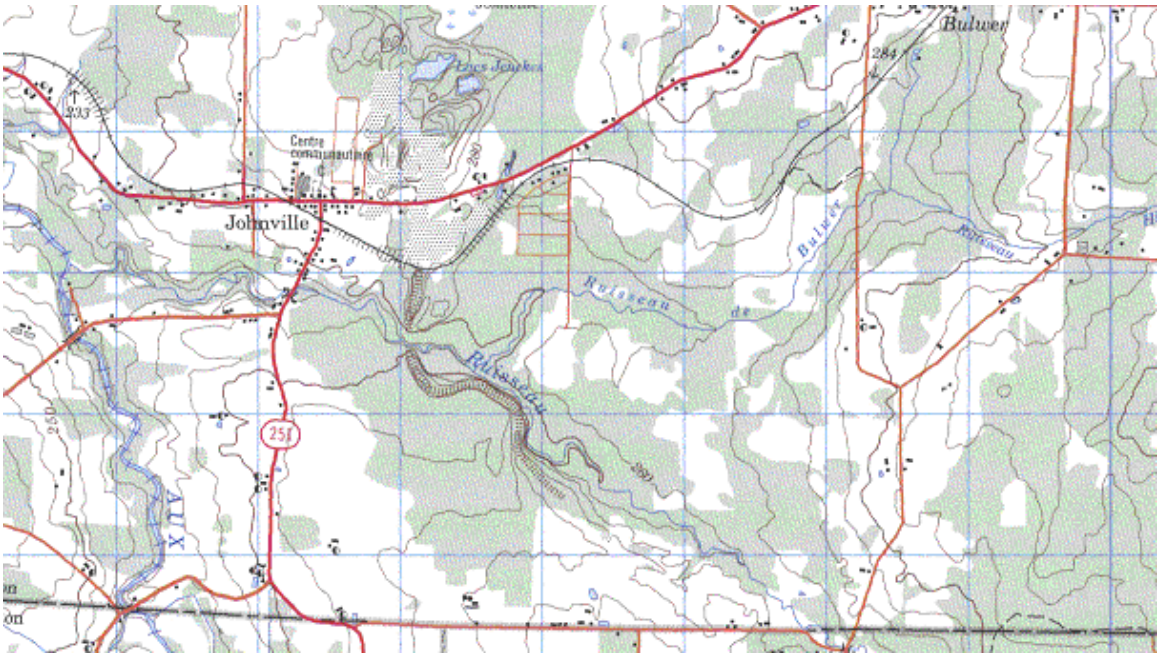
Source : Natural Resources Canada, 93 J/12 et 13 maps Original scale 1 : 50 000)

Figure 9: Vertical view of a branching esker in the Salmon Lake, British Columbia, area.

The esker is slightly angled with respect to the orientation of the drumlins, indicating that the glacier's path was south-west. The esker is sufficiently imposing that it would be recognizable from the shape of the contour lines on the map even without the symbol. On the photograph, it stands out because of the oblique lighting.



Source : Ministère des ressources naturelles du Québec, photo Q86526-5, Original scale 1 : 30 000, 45°20'-71°44', 21 E/5 map



Natural Resources Canada, 21 E/5 Topographic map Original scale 1 : 50 000)

Figure 10 : Vertical vue of an esker partially excavated in Martinville, southern Québec

The Martinville esker is sufficiently high to be identifiable with the contour lines on a map.

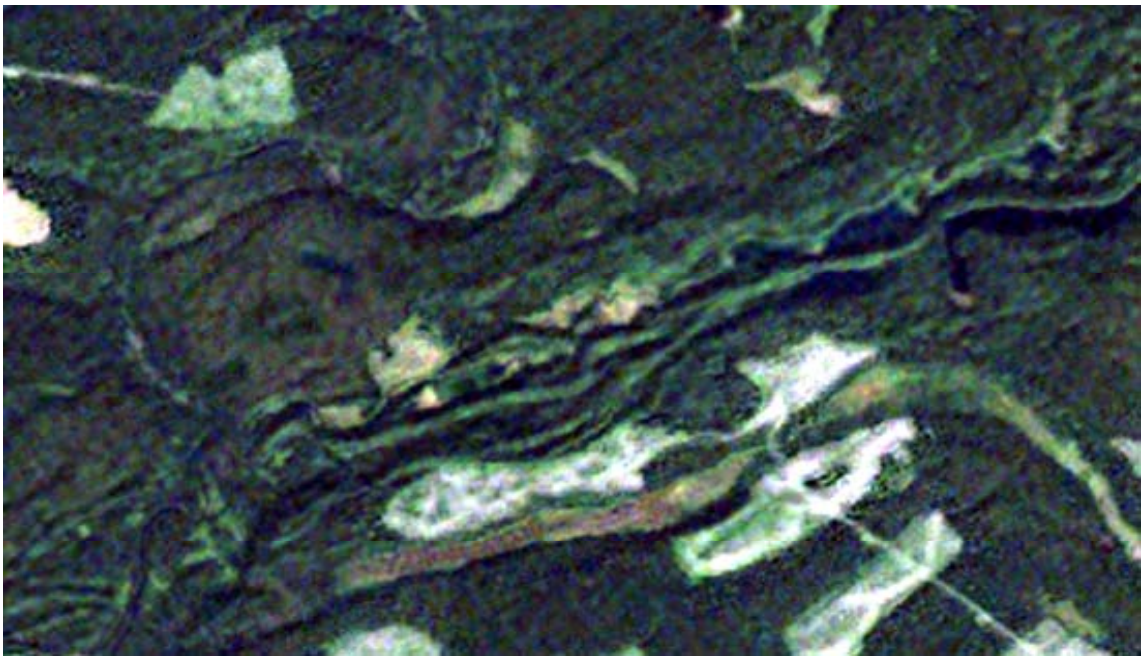
7.3- Satellite imagery

Two images of eskers with differing appearances and in different environments are presented for purposes of illustration. On the first image (**Figure 11**), we find the esker with a sparse tree cover that was featured in Figure 9. The second image (**Figure 12**) shows an esker in a densely forested environment. For purposes of comparison, both examples are presented using the same bands and band combinations.

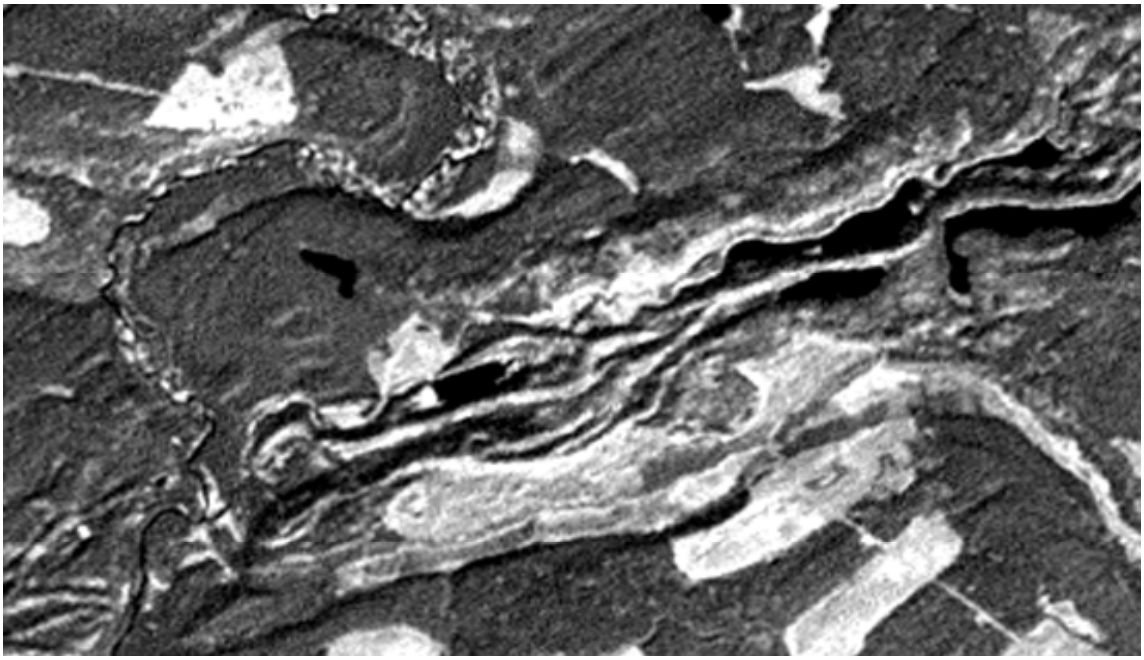
In the case of the Salmon Lake esker, the sparseness of the vegetation and the oblique lighting reveal the sinuousness of the form clearly in nearly all bands and band combinations. The best results are obtained with the bands or band combinations illustrated in **Figure 11**. However, some elongated surfaces, such as the banks of watercourses, can be confused with eskers. Indeed, the oblique lighting and the sparse vegetation on these surfaces, oriented toward the south-west, gives them the same appearance. We find an excellent illustration of this on the slope that is parallel to the esker and located to the north-west of the series of waterbodies in the centre of the image. The potential for confusion is particularly evident on images B, C, and D of **Figure 11**, but less so on image A. This is one of the factors that led to the choice of the combination of bands 3-2-1 as best for identification.

The Martinville esker is over one kilometre long and merits being mapped. However, it does not appear clearly in any band or band combination. In fact, the dense tree cover, the absence of favourable lighting, and the extreme fragmentation of its surroundings by human activity render it very difficult to detect and delimitate. If it were not already represented on the topographical map, it would have been nearly impossible to distinguish, despite the fact that the tree cover differs from that of its surroundings. A comparison with the topographical map reveals that the part of the esker located between the river and the railroad tracks has undergone significant development.

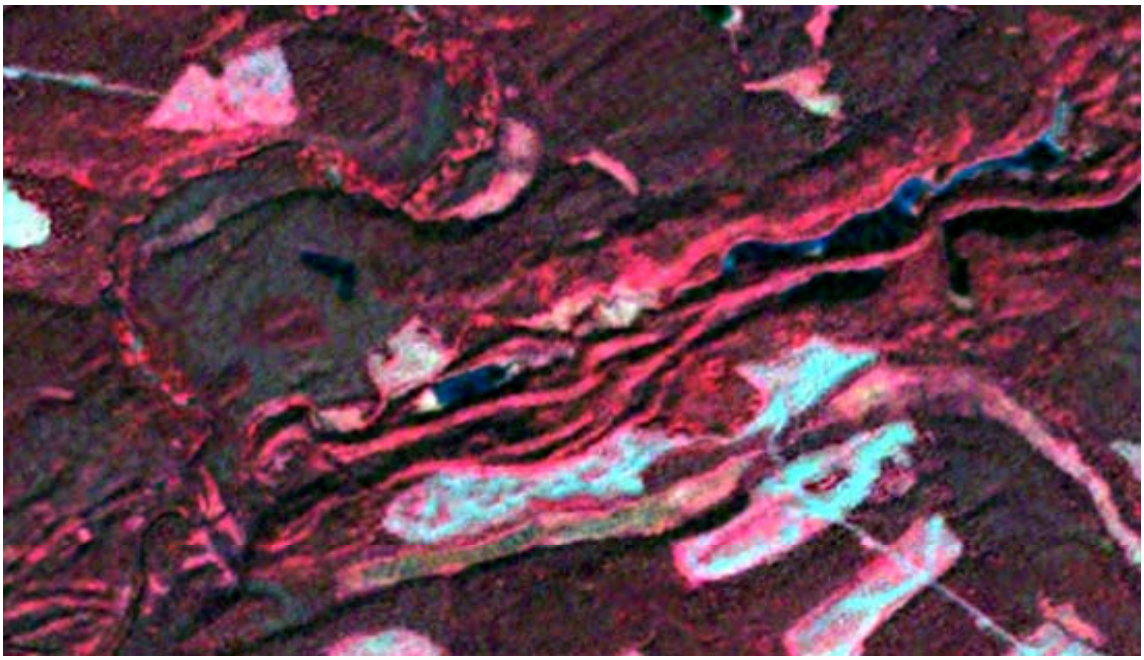
These two examples reveal that there is no single pathway to distinguishing eskers from their surroundings. The chosen procedure will depend on factors such as the nature of the adjacent ecology and landscape, the attitude and size of the form, and the lighting. In many cases the only reliable way to identify eskers is by stereoscopy.



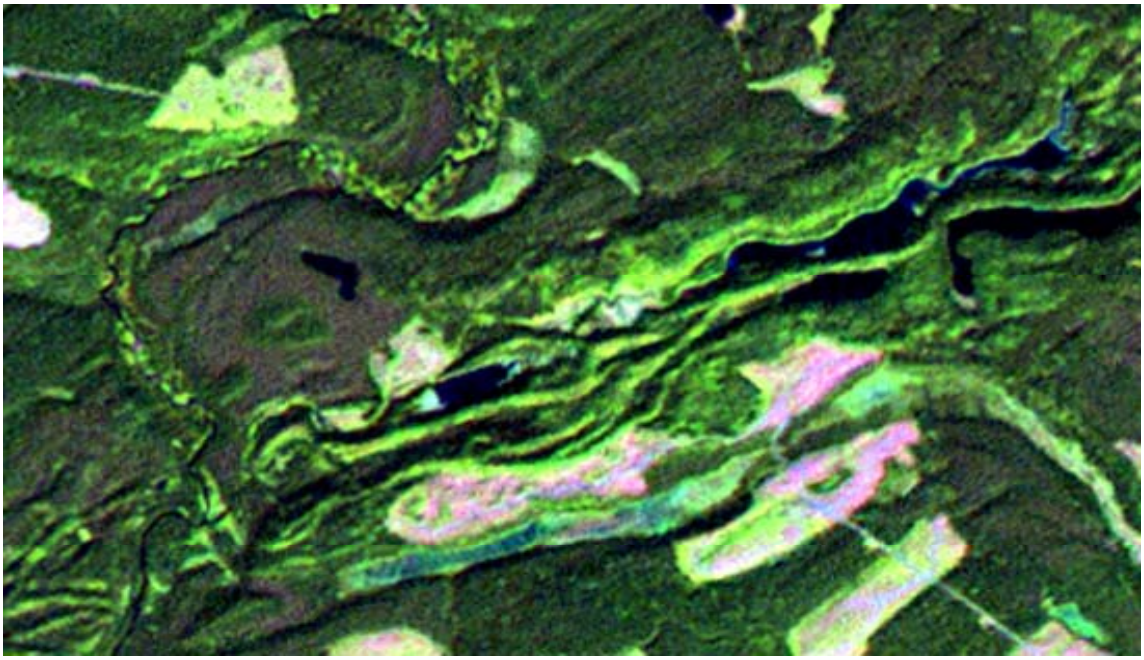
A) Combination of bands 3-2-1



B) Band 7



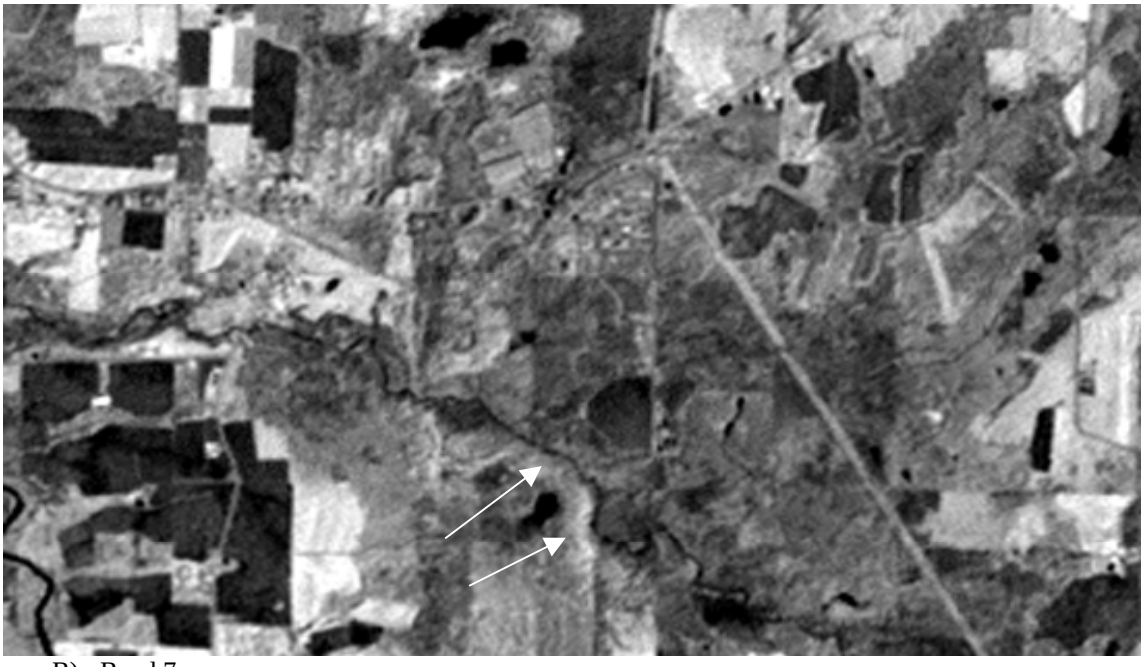
C) Combination of bands 4-3-2



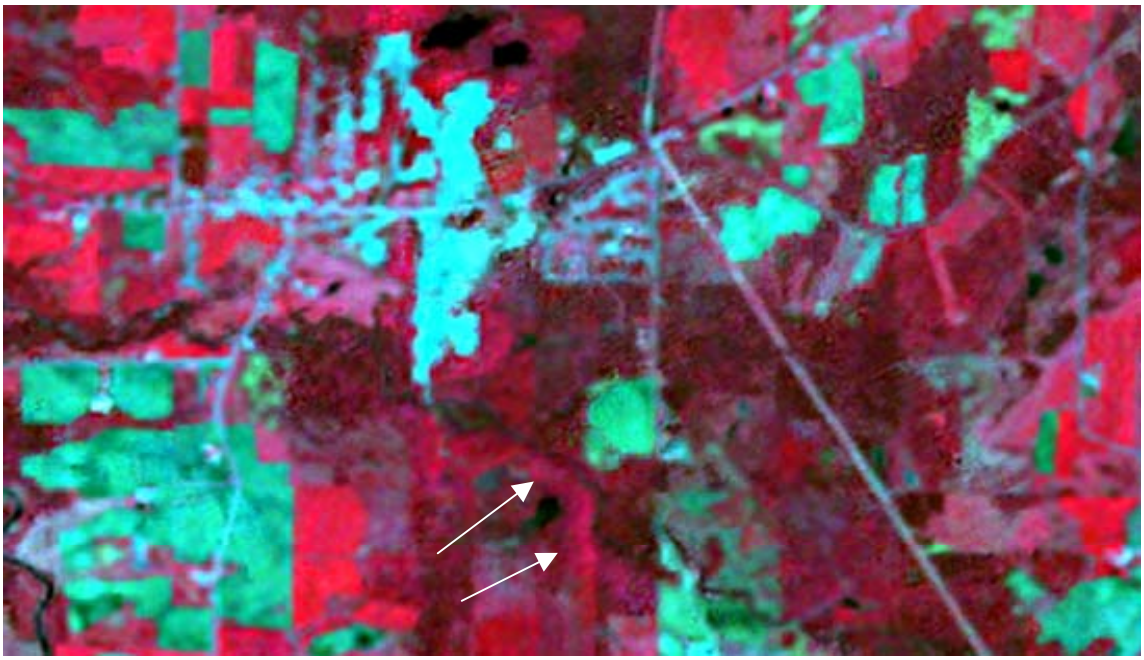
D) Combination of bands 5-7-3

Figure 11 : ETM+ imagery of an esker in Lake Salmon region in BC

A) Combination of bands 3-2-1



B) Band 7



C) Combination of bands 4-3-2

D) Combination of bands 5-7-3

Figure 12 : ETM+ imagery of the Martinville esker, southern Québec

8- Interpretation

8.1- Critical path

The critical path encompasses two phases: distinguishing and delimiting the form, and identifying it.

8.1.1- Distinction and delimitation

The decisive criterion for identifying an esker is its triangular, narrow, long, and sinuous relief. If its shape is distinct from its surroundings, then it should stand out on the combination of visible bands: 3-2-1. Otherwise, other criteria or methods must be used: vegetation, lighting, and stereoscopy.

The second criterion relates to vegetation, which may be the same as, or differ from, that of the surroundings. If it is different, the esker may be distinguished by the combination of bands 4-3-2 or 5-7-3, which are usually used to identify forests. If it is similar, identification remains problematic.

The third criterion concerns lighting. If the lighting is oblique, the formation's sinuousness is highlighted (**Figure 5 Figure 7** Figure 9) and discernable on nearly all bands and band combinations. If the lighting is overhead, the form may blend with neighbouring landforms owing to the absence of contrast.

If none of these methods allows the esker to be delimited, then the most reliable method is stereoscopy (aerial photography or stereoscopic imagery).

8.1.2- Identification

The identification process for eskers requires that the analyst address the various elements of confusion and recognition, which are quite numerous, as we observed in **Table 1**. The greater the analyst's knowledge and experience, the more accurate the outcome of this labour of discrimination will be.

8.2- Use of complementary sources of information

Appendix 3 contains supplementary documentation on occurrences of the entity, on banks of photographs and images representing the entity, and on other general documents describing the entity.

Occurrences of the entity can be verified in a general manner on maps by Fulton (1989), while the limits of the ice sheets during the Wisconsin Glaciation are given in Snead (1980).

The principal publications on the emplacement process of eskers are Fairbridge (1968) and Goudie et al. (1985).

Internet sites that present examples are *Le Québec en images* (www.ccdmd.qc.ca/quebec) and *Canadian Landscapes* (www.nrcan.gc.ca/gsc). Other examples are found in the collections of photographs by Bostock (1968), Natural Resources Canada (T.S.C.A.P., s.d.), Mollard (1973), Mollard and Janes (1985), and Prest (1983).

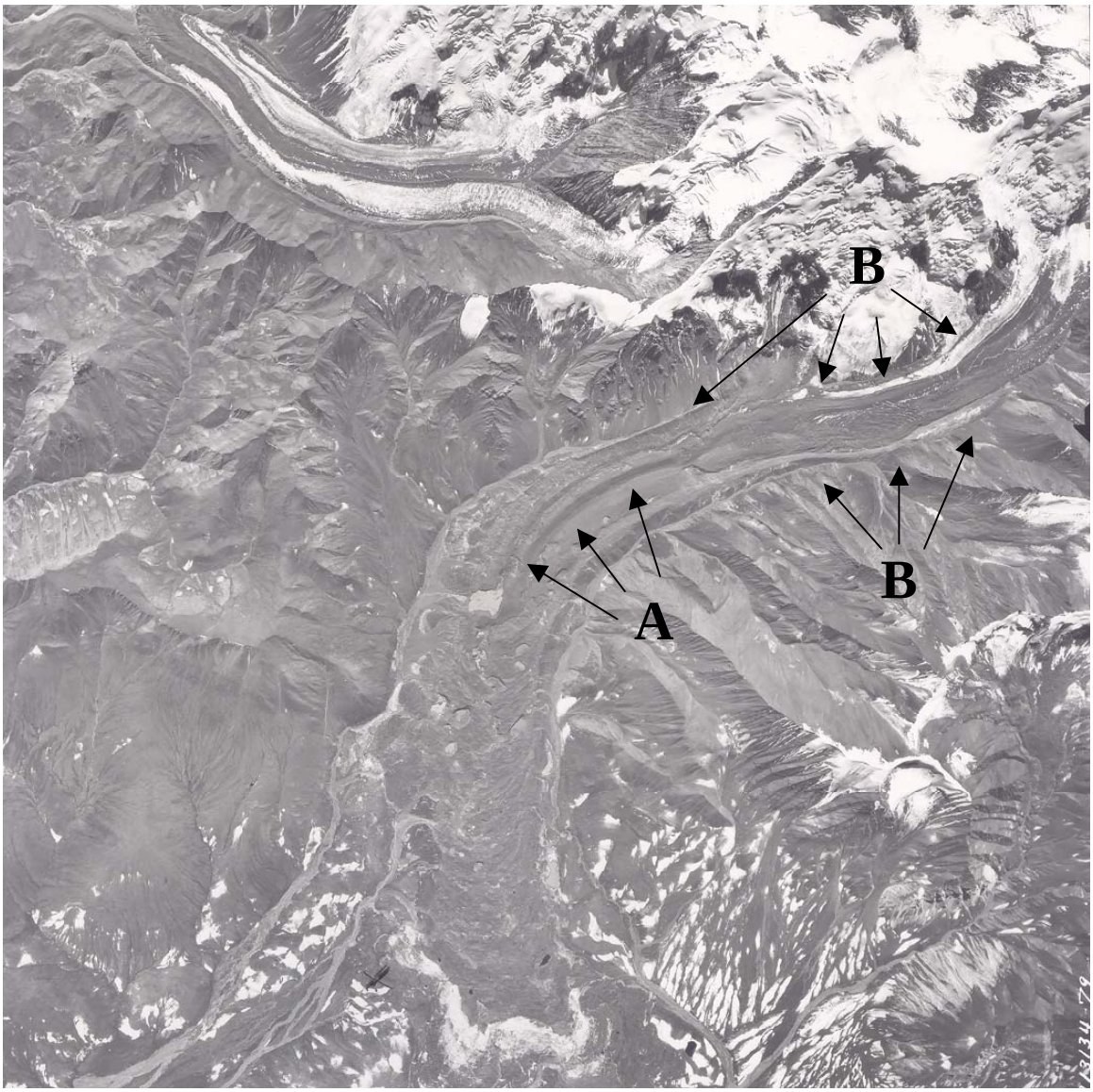
9- Elements of confusion

Eskers can be confused with the following entities and forms: moraines, ridges between proglacial channels, former barrier bars, former barrier beaches, former natural levees, former parallel and transverse dunes, and rocky ridges (Table 3).

Table 3: Elements of confusion and recognition between eskers and other entities or forms

Entity or form	Elements of confusion	Elements of recognition	Examples
Alpine moraine			
Medial moraine	- Elongated shape - Comparable dimensions - Location in valley bottom - Parallel to retreat of glacier	- Shape generally less sinuous	**Figure 13 Figure 14**
Lateral moraine	- Elongated shape - Comparable dimensions - Parallel to retreat of glacier	- Shape generally less sinuous - Asymmetric sides - Location on mid-slope	**Figure 13 Figure 15 Figure 16**
Terminal moraine	- Elongated shape - Comparable height and width	- Short bowed shape - Sometimes asymmetric sides - Perpendicular to retreat of glacier	**Figure 14**
Moraine in a continental environment			
De Geer moraine	- Elongated shape - Comparable height and width	- Succession of elongated and lobed ridges - Perpendicular to retreat of glacier	**Figure 17**
Rogen moraine	- Elongated and sinuous shape	- Succession of irregular, lobed ridges - Higher and wider - Perpendicular to retreat of glacier	**Figure 7**
Terminal moraine	- Elongated shape	- Lobed shape, with a wide radius of curvature - Perpendicular to retreat of glacier	**Figure 18 Figure 19**
Proglacial form			
Ridges between proglacial channels	- Elongated shape - Sometimes comparable height and width	- Short - Succession of irregular ridges - Flat-bottomed and tiered trenches between the ridges - Location typically on mid-slope - Perpendicular to retreat of glacier	**Figure 20**
Coastal form			
Former barrier bar	- Elongated, frequently sinuous shape - Sometimes comparable height and width	- Constant altitude of each bar - Independent of direction of retreat of glacier	Figure 21 **Figure 22**
Former barrier beach	- Elongated shape - Frequently comparable height and width	- Straight - Succession of parallel ridges - Frequently terminus is a splayed formation - Constant altitude - Independent of direction of retreat of glacier	Figure 21 **Figure 22**
Fluvial form			
Former natural levees	- Elongated, sinuous shape, frequently discontinuous - Vegetation often distinct from surroundings	- Low and narrow - Parallel to watercourse - Sometimes succession of parallel ridges in meanders - Independent of direction of retreat of glacier	**Figure 23**

Eolian form			
Former parallel dune	- Elongated shape - Vegetation often distinct from surroundings	- Straight - Low and narrow - Independent of direction of retreat of glacier	Figure 24 Figure 25
Former transversal dune	- Elongated, sinuous shape - Frequently comparable height and width - Vegetation often distinct from surroundings	- Irregular shape - Asymmetric sides - Associated with parabolic Dunes - Independent of direction of retreat of glacier	**Figure 26**
Structural form			
Rocky ridge	- Elongated, sometimes sinuous shape - Frequently comparable height and width - Comparable topographic position	- Topography typically irregular - Independent of direction of retreat of glacier	**Figure 27**



Source : Natural Resources Canada, photo T.S.C.A.P. no 369, photo A13134-79, Original scale 1 : 70 000, 61°30'-140°55', map 115 F

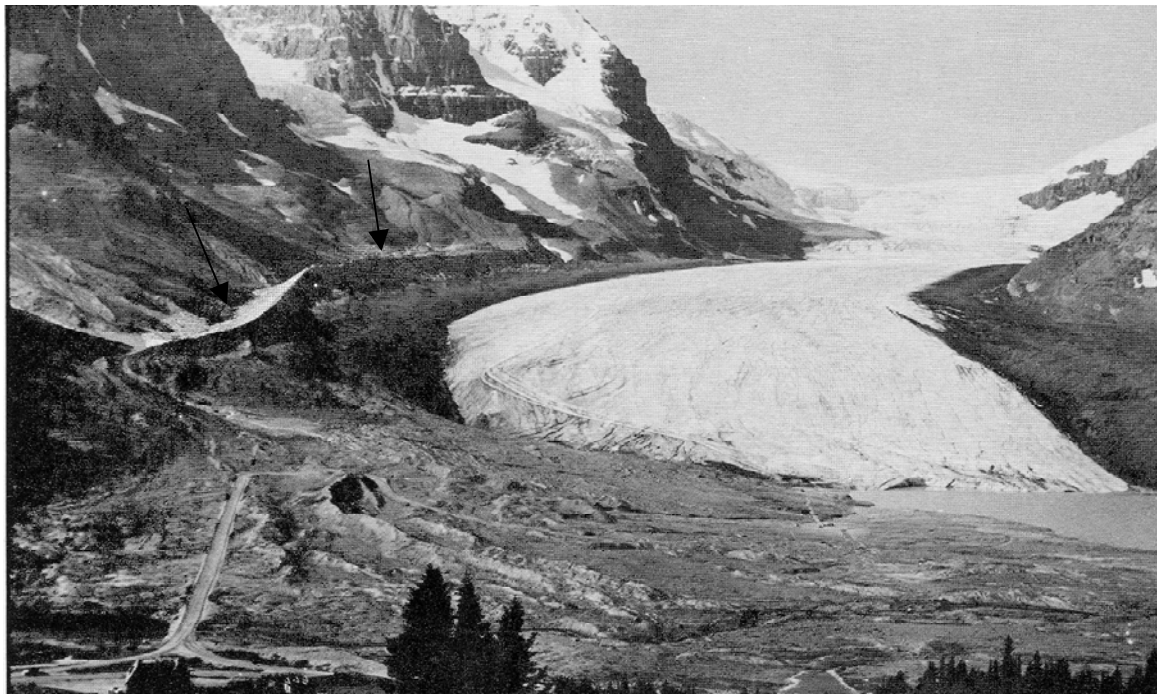
Figure 13 : Medial and lateral moraine complex, Kluane Lake, Yukon

Source : Natural Resources Canada, photo T.S.C.A.P. no 252, photo A15728-63, Original scale 1 : 70 000, 61°30'-140°46', map 115 G

Figure 14 : Sinuous medial moraines (A) and end moraines (B), Kluane Lake area, Yukon

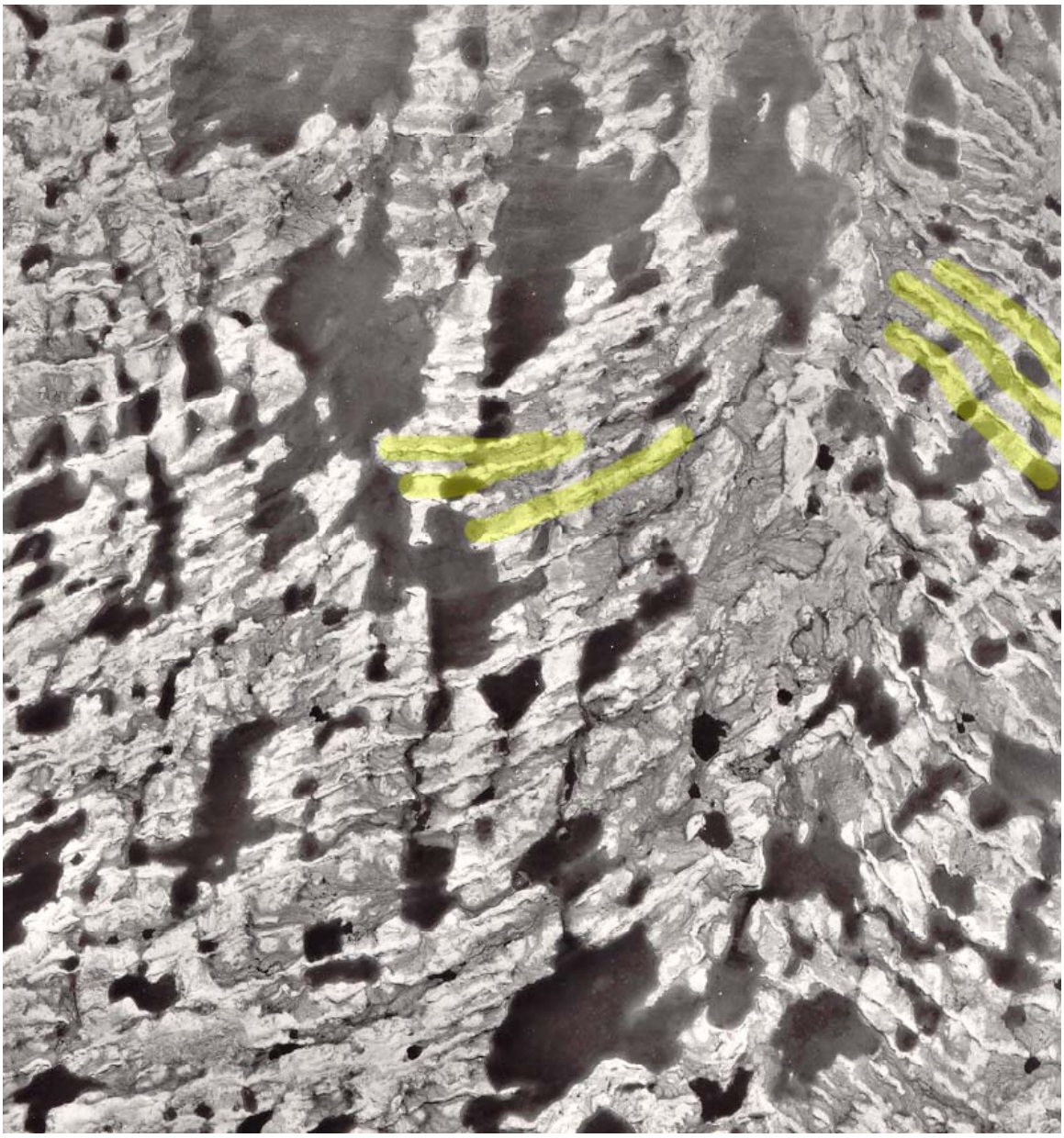
Source : Natural Resources Canada, photo T.S.C.A.P. no 379, photo A17019-140, Original scale 1 : 60 000, 68°55'-69°59', Map 27 B

Figure 15 : Sinuous lateral moraine detached from a small ice cap, Ekalugad Fjord area, Baffin Island, Nunavut



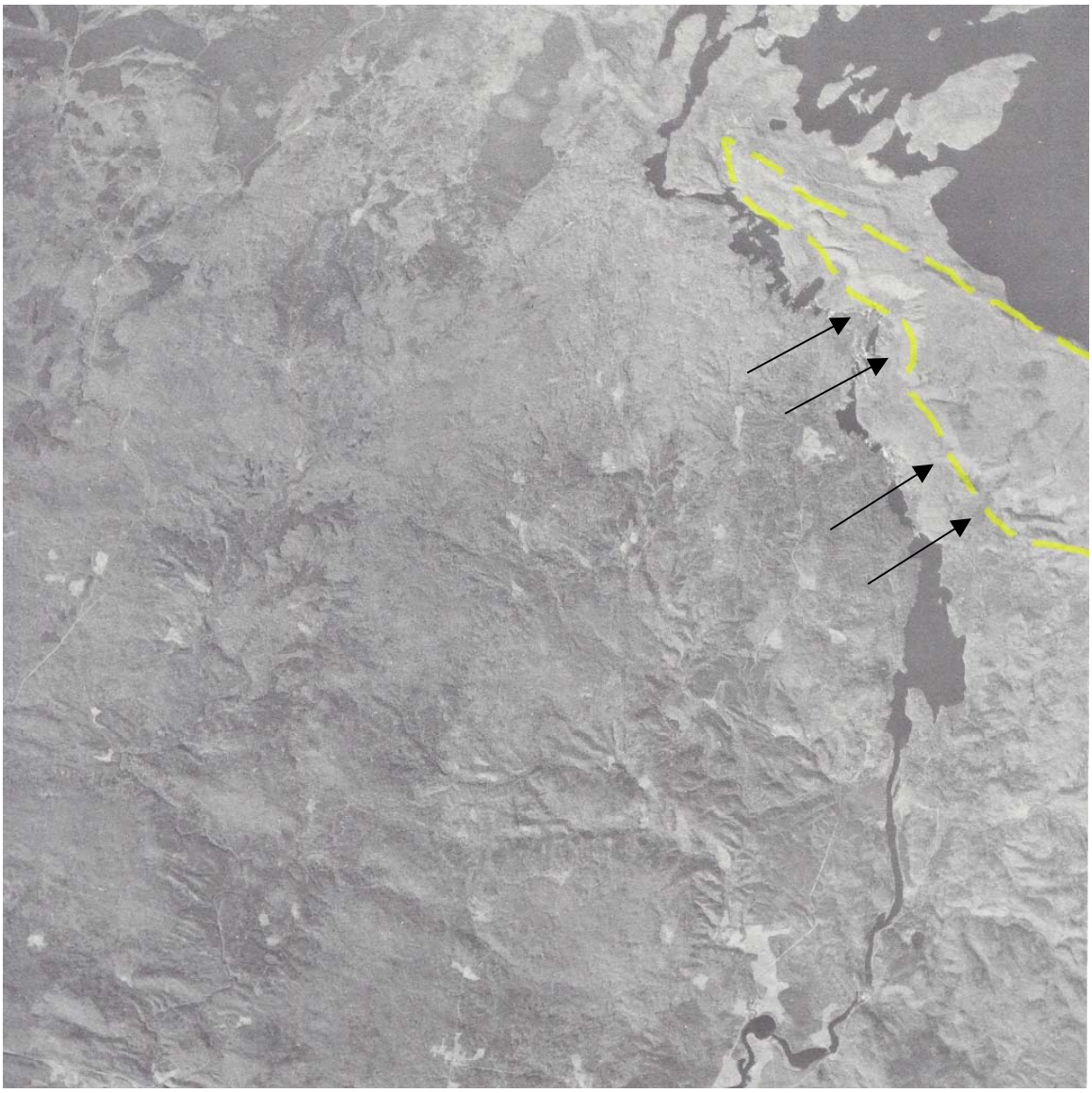
Source : Prest, 1983, p. 20

Figure 16 : Ground view of a lateral moraine of the Athabaska glacier in Alberta



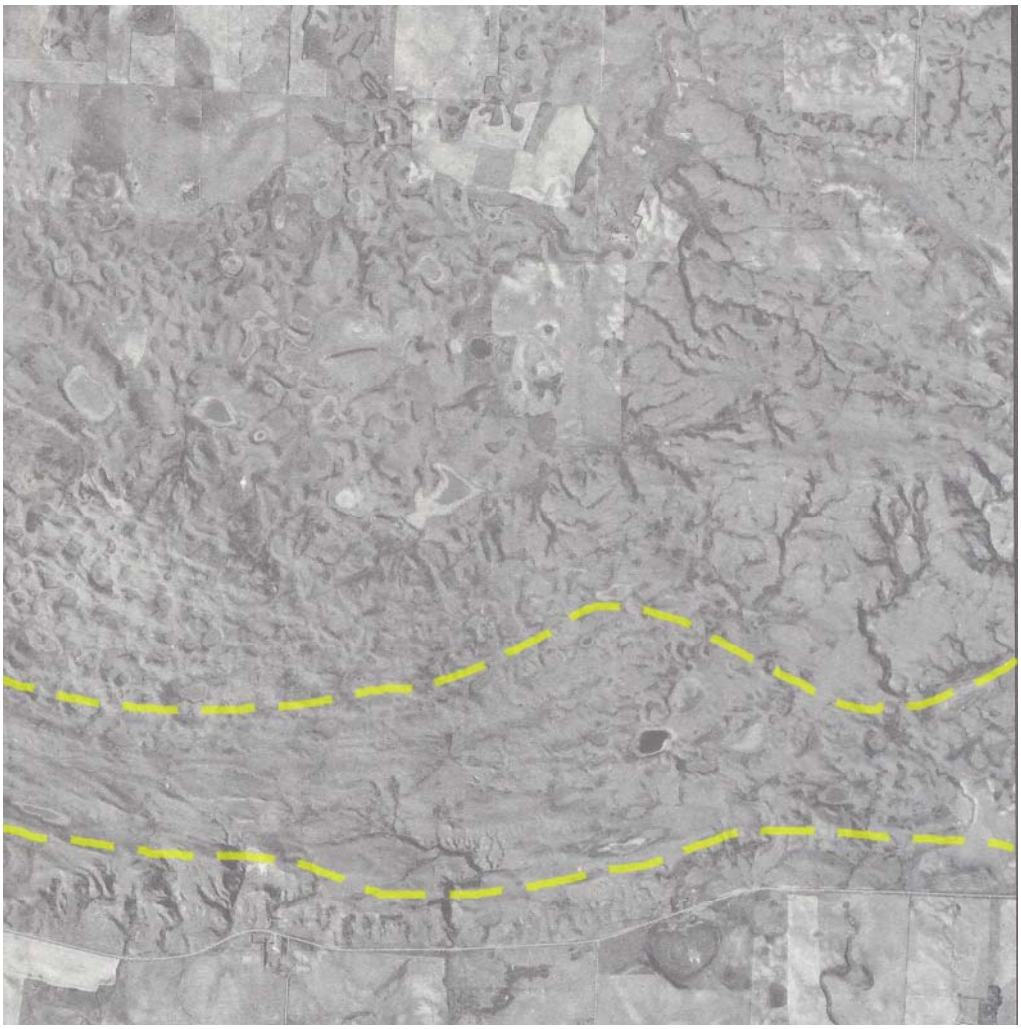
Source : Natural Resources Canada, photo T.S.C.A.P. no 147, photo A14877-97, Original scale 1 : 25 000, 58°49'-76°50', Map 34 K

Figure 17 : De Geer moraine complex, Innuksuak River area, northern Québec



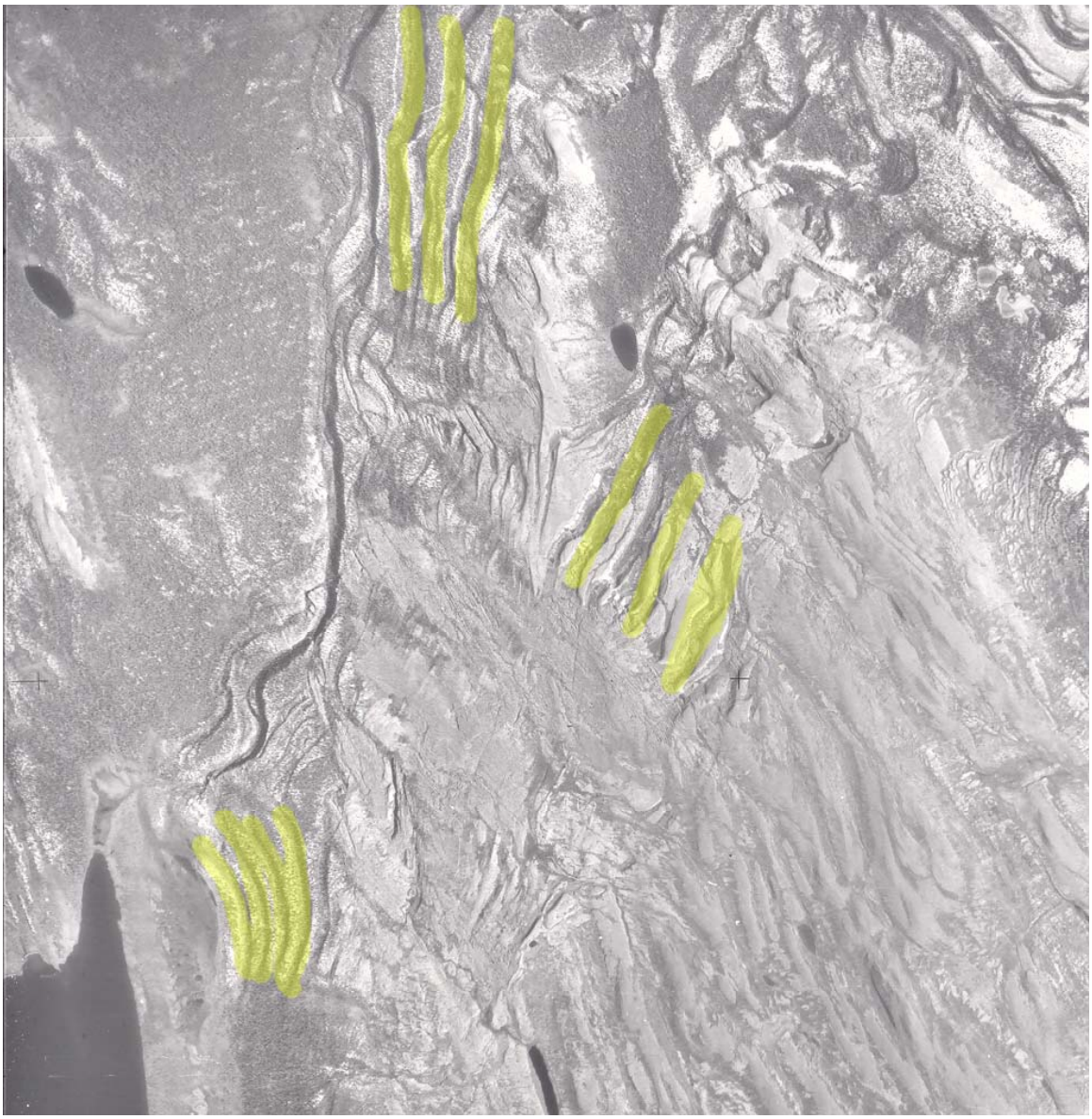
Source : Mollard, 1985, p. 257

Figure 18 :End moraine crest south of Lake Dog, Ontario



Source : Mollard, 1985, p. 244

Figure 19 : End moraine composed of a series of parallel crests, south of Moose Jaw, Saskatchewan

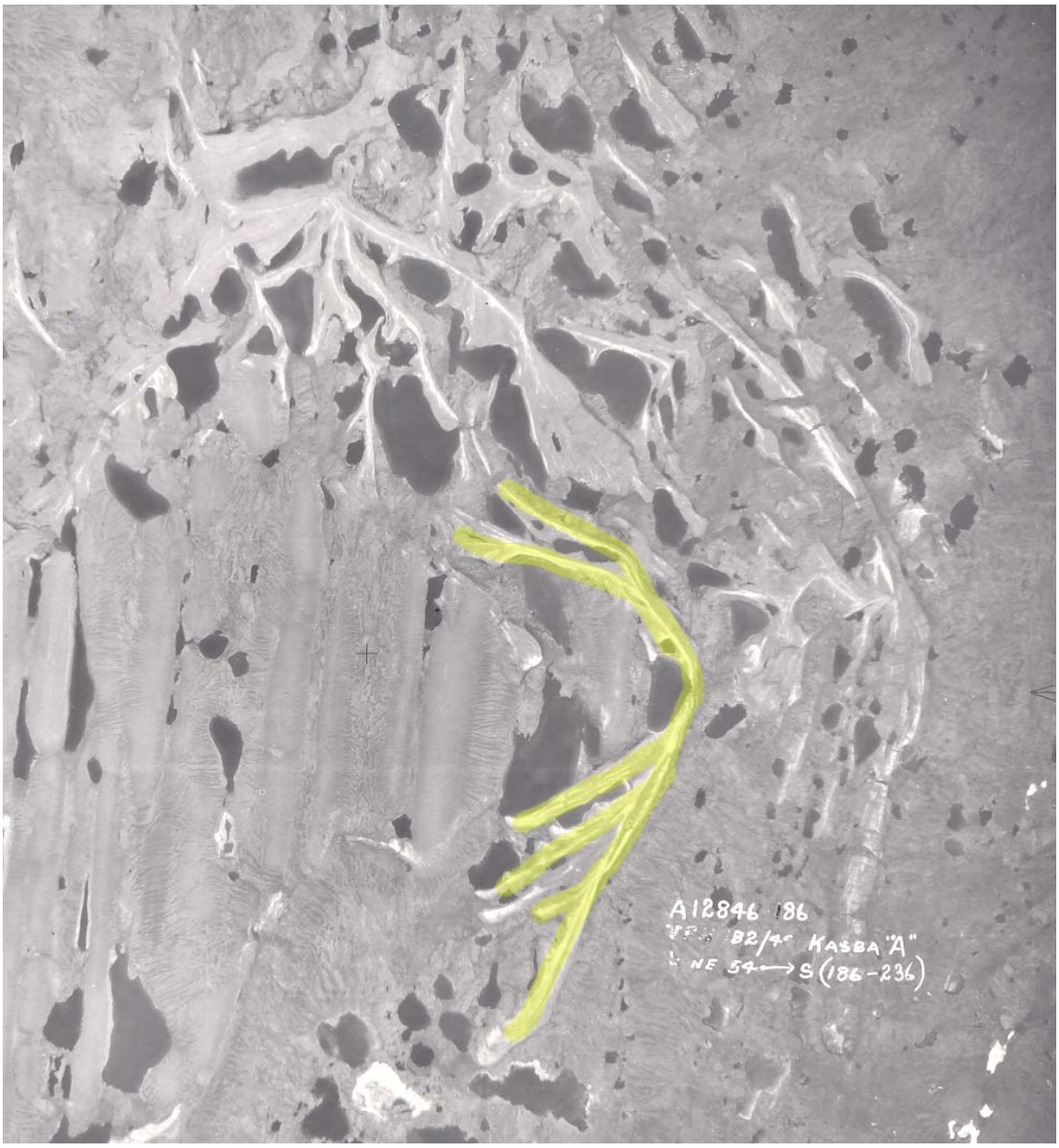


Source : Natural Resources Canada, photo T.S.C.A.P. no 327, photo A11530-42, Original scale 1 : 35 000, 55°20'-67°50', map 23 O

Figure 20 : Proglacial channels, Swampy Bay River, northern Québec

Source : Natural Resources Canada, photo T.S.C.A.P. no 57, photo A4116-37, 66°40'-117°49', map 86 K

Figure 21 : Oblique view of a series of spits and barrier beaches in the Sloan River area, NWT

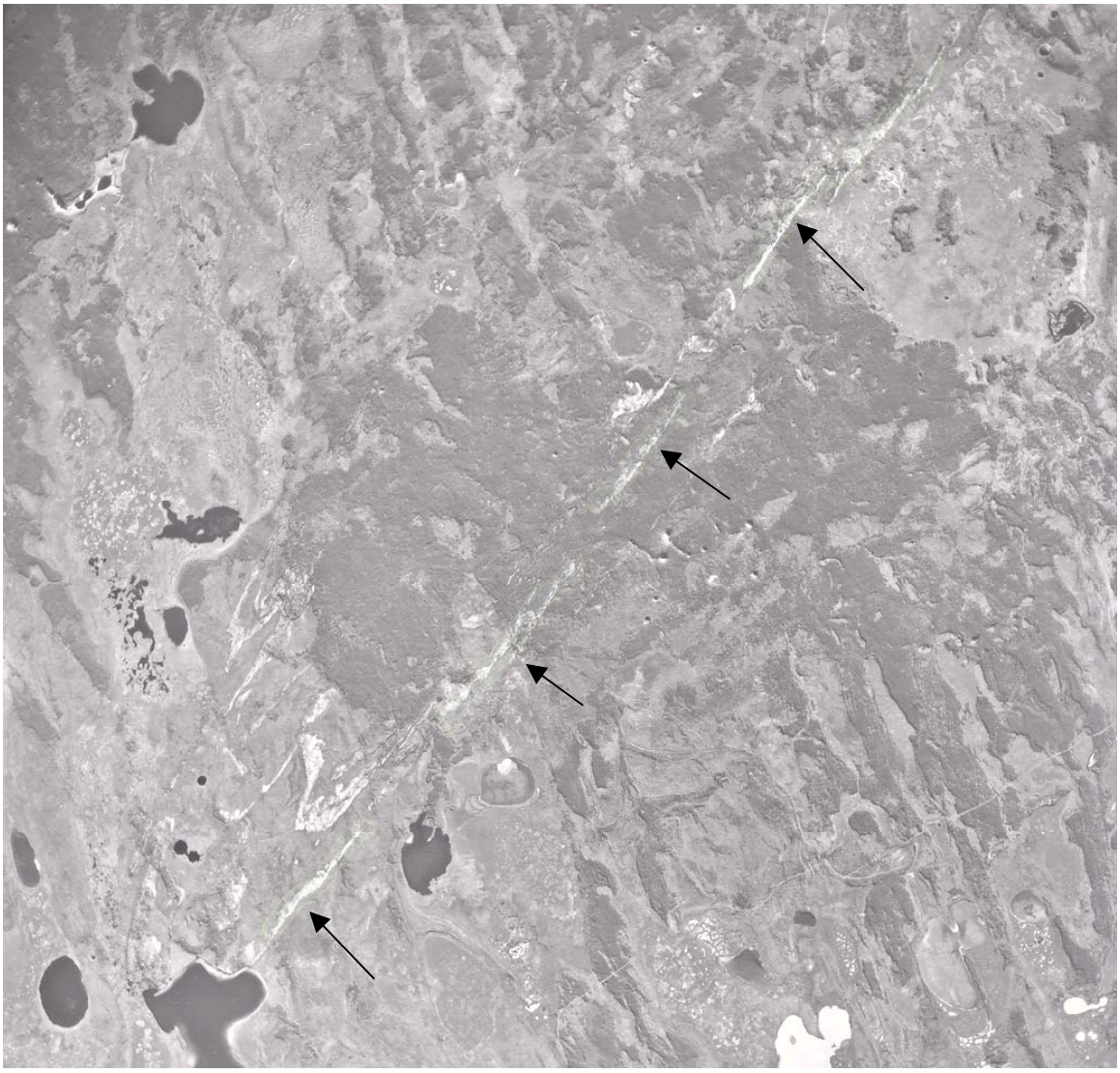


Source : Natural Resources Canada, photo T.S.C.A.P. no 15, photo A12846-186, Original scale 1 : 40 000, map 55 E

Figure 22 : Spits and barrier beaches in the Eskimo Point area, NWT

Source : Natural Resources Canada, photo T.S.C.A.P. no 281, photo A15183-40, Original scale 1 : 40 000, 58°55'-118°10', map 84 L/16

Figure 23 : Series of fluvial levees bordering the Hay River, Alberta



Source : Natural Resources Canada, photo T.S.C.A.P. no 94, photo A14712-55, Original scale 1 : 60 000, 60°30'-114°30', map 85 B/10

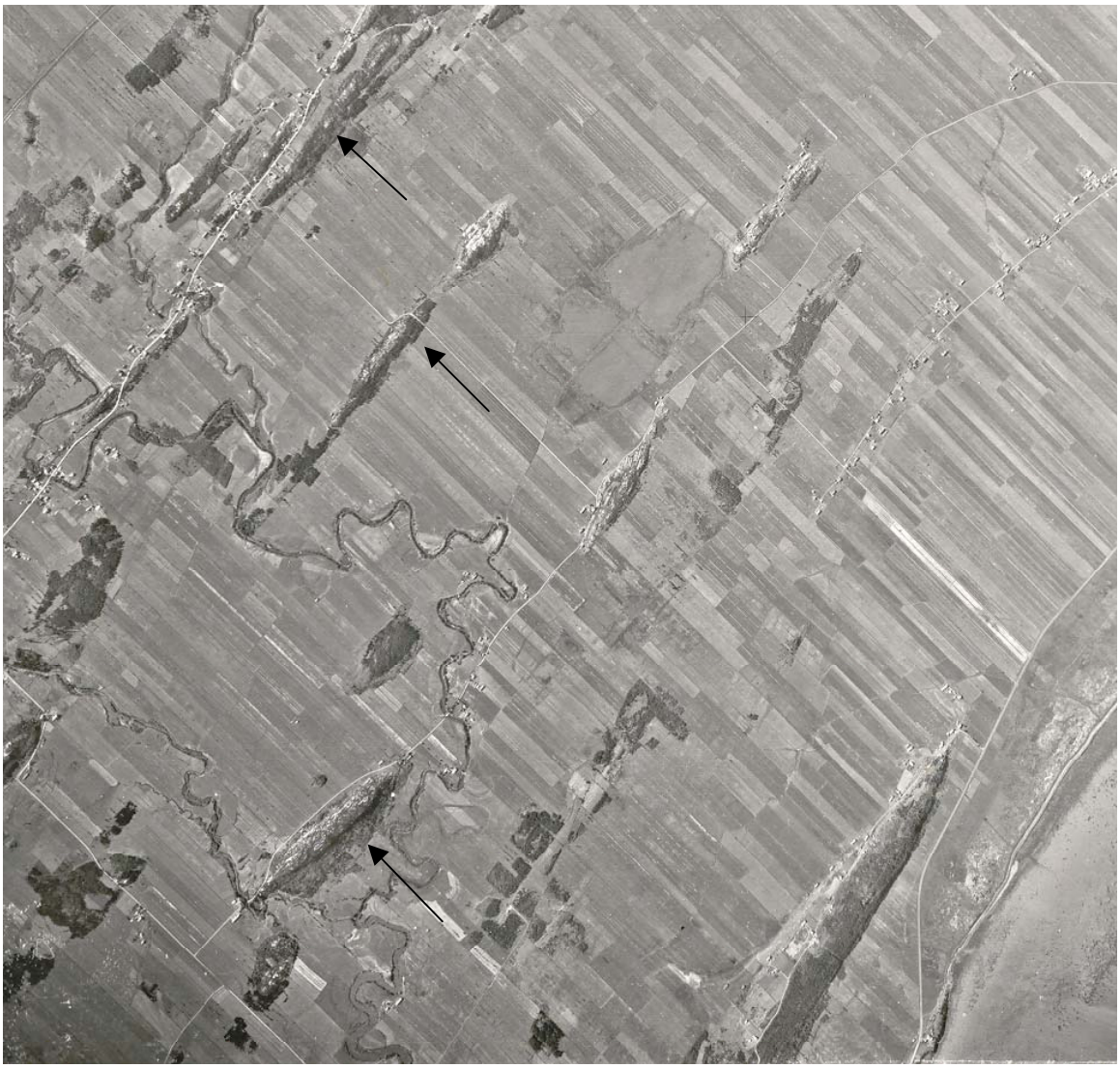
Figure 24 : Parallel dunes associated to parabolic dunes in the Buffalo River area, NWT

Source : Mollard, 1985, p. 366

Figure 25 : Parallel dunes south of Claire Lake, Alberta

Source : Mollard, 1985, p. 361

Figure 26 : Series of transverse dunes in the Fort Simpson area, NWT



Source : Natural Resources Canada, photo T.S.C.A.P. no 7, photo A11660-290, Original scale 1 : 35 000, 47°30'-69°55', map 21 N/12

Figure 27 : Appalachian rock outcrop crests in the Saint-Pascal area, lower St-Lawrence, Québec

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Appendix: the meanings of the sections

1. Name of entity

The name of the entity as it appears in the GDB and in Topolan7.

2. Position in hierarchy

The position of the entity in the hierarchical structure of entities in the GDB.

3. Definition

A brief description based on the entity's principal characteristics and allowing it to be distinguished from any other natural or manmade entity in the GDB.

Only the core features are part of the definition. A detailed description of the characteristics necessary for identification is given in Section 4.

4. Summary table of elements of identification

Presentation of a table summarizing the entity's characteristics (Section 5), of the optimal conditions for identification on ETM+ imagery and black and white (B/W) aerial photography (Section 6), and of the elements of confusion (Section 9).

5. Characteristics

Categorization and description of the characteristics useful for visual identification of the entity.

5.1. Specific to the entity

Characteristics unique to the entity that allow all aspects useful for its identification to be grasped.

5.1.1. Shape

Distinction between linear, point, and areal shapes, three-dimensional pattern of the entity.

5.1.2. Dimensions

Expanse (length, width, diameter) and height of the entity: minima, maxima, and means.

5.1.3. Topographic position

Location of the entity relative to major landforms: drainage basin, mountain, plateau, plain, valley, slope, etc.

5.1.4. Drainage

Surface moisture, outside of saturated zones, in connection with the texture of the materials in the entity.

5.1.5. Vegetation

Presence of vegetation typical of the entity or patterns of plant associations making it possible to distinguish the entity.

5.2. Relative to the entity's dynamics

Characteristics pertaining to the origin and the state of the entity.

5.2.1. Emplacement process

The agent or set of agents responsible for the entity's emplacement and evolution.

5.2.2. State

Dynamic state of the entity: inherited or current. In the case of inherited features, we speak of paleolandforms; in the case of current landforms, we speak of their ongoing formation.

5.2.3. Spatio-temporal variations

Variations in the entity or its appearance that are functions of cyclical conditions (seasonal, multi-year, etc.) or event driven.

5.3. Relative to the environment

Characteristic of the conditions in the entity's milieu and its relationship with other entities or forms present in this milieu.

6. Optimal conditions for identification

Drawing on documentary sources and the experience of the participants, establishment of the optimal conditions for visual identification of the entity. Using satellite imagery, determine the capability of Landset7 ETM+ to capture the characteristics of the entity and identify the band or combination of bands best for visually distinguishing and identifying the entity. Using B/W aerial photography, identify the hues and textures that are most representative of the entity. In cases in which the relief may be significant, recommend the use of stereoscopy.

7. Examples

Illustrating the entity with examples reflecting several of its aspects:

7.3. Land-based photography

Photographs of the landscape that present one or several examples of the entity's aspects, as they might be seen from the ground.

7.3. Aerial photography

Oblique or vertical aerial photographs that present on or several examples of the entity's aspects, as they might be seen from the air.

7.3. Satellite imagery

Satellite images (from Landsat7 ETM+) that present one or several examples of the entity's aspects, as they might be seen from space.

8. Interpretation

Identification of the entity proceeds from interpreting the information in the imagery or aerial photography and complementary sources of information. The quality of the outcome of this interpretive activity will depend upon the knowledge and the experience of the analyst.

8.1. Critical path

Establishing a unique critical path of interpretation for each entity from the imagery or aerial photography on the basis of its characteristics.

8.1.1. Distinction and delimitation

The possibility of distinguishing and delimiting the shape on the image or aerial photograph has been established and the criteria for success have been described.

8.1.2. Identification

Contrasting the various elements of confusion and recognition with other entities or forms for purposes of identification.

8.2. Use of complementary sources of information

Complementing or cross-checking the interpretation with additional sources of information that are easily accessible, such as those on known Internet sites.

9. Elements of confusion

Identifying the entities and forms with which the entity in question can be confused in a table, along with the differentiating features.

10. Bibliography

A list of useful documents quoted in the previous sections.