

GEOLOGICAL
SURVEY
OF
CANADA

DEPARTMENT OF MINES
AND TECHNICAL SURVEYS

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GEOLOGY AND LANDFORMS
AS ILLUSTRATED BY SELECTED
CANADIAN TOPOGRAPHIC MAPS

David M. Baird



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By

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D E P A R T M E N T O F
M I N E S A N D T E C H N I C A L S U R V E Y S
C A N A D A

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The maps illustrating the features described in this report may be obtained from the Map Distribution Office, Surveys and Mapping Branch, Department of Mines and Technical Surveys, Ottawa.

They are available as a collection bound in folio form at \$11.50, or may be ordered as individual sheets at current prices.

<u>Map Number</u>	<u>National Topographic System No.</u>	<u>Name</u>
1	11D/11 W	Chezzetcook, N.S.
2	11O/14 E	Codroy, Nfld.
3	21G/9 E	Hampstead, N.B.
4	21H/1 W	Wolfville, N.S.
5	21P/10 W	Tracadie, N.B.
6	22/B	Matane, Que.-N.B.
7	23G/10 W	Rannie Lake, Nfld.
8	23O/2 W	Tait Lake, Que.-Nfld.
9	24B/4 W	Dunphy Lake, Que.
10	24C/14 W	Moraine Lake, Que.
11	30M/5 W	Hamilton, Ont.
12	31D/8 E	Peterborough, Ont.
13	31H	Montreal, Canada-U.S.A.
14	31H/11 E	Beloeil, Que.
15	31F/NE	Fort Coulonge, Que.-Ont.
16	31G/5h	Blackburn, Ont.-Que.
17	34D and 44A	Belcher Islands North, N.W.T.
18	40I/5 W	Ridgetown, Ont.

<u>Map Number</u>	<u>National Topographic System No.</u>	<u>Name</u>
19	40J/10 E	St-Clair Flats, Ont.-Mich.
20	40P/4e	Ipperwash, Ont.
21	62I/7	Red River Delta, Man.
22	62K/3 W	Miniota, Man.-Sask.
23	72K/3 E	Crane Lake, Sask.
24	72I/10 W	Lumsden, Sask.
25	72K/13 W	Leader, Sask.
26	73D/11g	Rosyth, Alta.
27	75L/8	McLean Bay, N.W.T.
28	82N/16 W	Siffleur River, Alta.
29	83A/15 W	Ferintosh, Alta.
30	85H	Fort Resolution, N.W.T.
31	85G/10	Narcisse Lake, N.W.T.
32	92K	Bute Inlet, B.C.
33	93C	Anahim Lake, B.C.
34	94K/9 E	Tetsa River, B.C.
35	96E/4	Loretta Canyon, N.W.T.
36	104P/16 E	Lower Post, B.C.
37	106H/10	Sans Sault Rapids, N.W.T.
38	107C/2W	Unnamed (Mackenzie River Delta area)
39	115B and 115C	Mount St. Elias, Canada-U.S.A.

<u>Map Number</u>	<u>National Topographic System No.</u>	<u>Name</u>
40	115G and 115F	Kluane Lake, Yukon
41	120	Robeson Channel, Canada-Greenland (Denmark)
42		Mount Revelstoke National Park (MCR 208)

GEOLOGY AND LANDFORMS AS ILLUSTRATED BY SELECTED CANADIAN TOPOGRAPHIC MAPS

INTRODUCTION

Canada is a very large country embracing half a continent and therefore has an enormous variety of geological conditions, climates and vegetation, and landforms. In recent years a veritable flood of new topographic maps has been issued by the Department of Mines and Technical Surveys, on a variety of scales and with a variety of methods of showing mappable features. Individual map-sheets that show superb examples of many different types of landforms and many geological structures are now available within the several thousand published maps.

This collection of Canadian topographic maps has been selected from those available to the public at the date of writing to provide a useful tool to Canadian universities, colleges and secondary schools for teaching physiography and the relationship of geology to landforms. In addition to illustrating landforms and geological features these maps have been picked because they illustrate a variety of scales, methods of showing relief and other aspects of mapping and mapping techniques. The list of selected maps will no doubt have to be revised from time to time as new map-sheets become available and with them new examples of landforms and geological features.

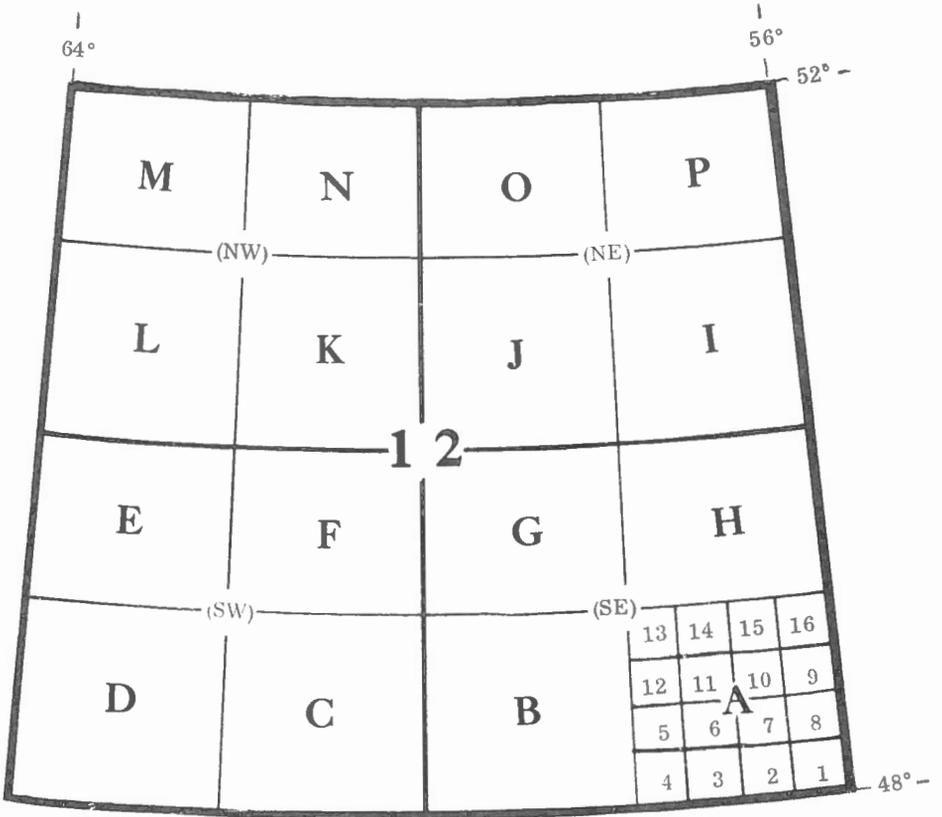
INDEXING OF TOPOGRAPHIC MAPS

Most maps in Canada are now referred to the National Topographic System, in which all of Canada is divided into a systematic pattern along meridians of longitude and parallels of latitude. The whole country is divided into numbered primary quadrangles, each 4 degrees of latitude by 8 degrees of longitude. These areas are assigned numbers which become higher from east to west and from south to north. The beginning point is 00, somewhere in the Atlantic Ocean well to the southeast of Newfoundland and Nova Scotia. By convention the right-hand digit shows the north-south spread, for example 32 lies north of 31. The digits representing tens and hundreds show the east-west spread, thus 42 lies west of 32 and 22 lies east of 32. In a general way, then, the smaller the number of the primary quadrangle the farther southeast in Canada is the area represented by the map. Parts of quadrangle 01 represent southeastern Newfoundland while parts of quadrangle 117 are in the northwest corner of Yukon Territory.

Map-sheets representing the primary quadrangles are issued on a scale of 1:1,000,000, or roughly 1 inch to 16 miles.

The primary quadrangles are divided in turn into quarters which are designated by the addition of letters indicating the northwest (NW), northeast (NE), southwest (SW) or southeast (SE) quarter. Thus 42NW is the upper left-hand or northwest corner of primary division number 42. Maps illustrating these smaller areas belong to the 1:500,000 series, or approximately 1 inch to 8 miles.

Each of the quarters is further divided into four parts so that the primary unit is now divided into sixteen parts. Each of these is assigned a letter beginning with "A" in the southeast corner and traversing westward to B, C and D along the bottom row of the primary quadrangle; then north and back eastward across the next row, E, F, G, H; then north to the next row and westward across I, J, K, L; finally north and traversing eastward again, M, N, O, P. Thus map-sheet



12A would be a 1:250,000 sheet, approximating 1 inch to 4 miles, in the southeast corner of area No. 12 which, you can see from its number lies somewhere well down in the southeastern part of Canada. Similarly 12M would be in the upper left or northwest corner and 12F would be a little lower and left of centre of area 12.

All maps showing areas as large as those represented by the 1:1,000,000, 1:500,000, and 1:250,000 sheets are on too large a scale to be convenient for most purposes. Thus each one of the lettered blocks is again subdivided, this time into sixteen squares with the numbers arranged in the same way as the letters of the larger subdivisions were, i.e. starting in the southeast corner and going 1, 2, 3, 4 to the southwest corner etc. Thus 12A/1 would be a small division of 12 in the extreme southeast corner, and 12A/16 would be in the northeast corner of the letter block in the southeast corner of primary division 12. For special purposes there are even more subdivisions but these can be studied on the national topographical system index which is included with the map collection.

Most map-sheets are given a name as well as an NTS number. This usually comes from a prominent city, river, mountain or other feature within the area mapped, and it is often convenient to refer to the name of the map-sheet rather than the NTS number. Thus we have the Ottawa map-area, 31G/5. Most commonly used map-sheets in Canada now are 1:50,000-scale maps which represent one half (east and west) subdivisions of the numbered subdivisions of the lettered subdivisions of the primary quadrangles. Thus if you were to look for the City of Ottawa and its environs you would find it straddling two map-sheets, 31G/5 E and 31G/5 W.

The subdivisions in the National Topographic System are bounded by latitude and longitude lines. This makes for complications in the map system because meridians of longitude converge as you approach the north pole where they actually meet at a point. This means that a map-sheet in the far northern part of Canada will be long and narrow compared to a map-sheet farther to the south. This makes it necessary to modify somewhat the system of indexing, and you may note that the area of Canada north of latitude 60° has a somewhat different subdivision of the primary quadrangles. These may be studied on the index of the National Topographic System which accompanies this report.

SCALES

Maps are representations by lines and symbols of features on the ground. Their value lies in that they are portable and, when the need arises, may represent the features of a very large area on a

very small piece of paper. The scale is the relationship of the size of the map to the size of the features represented. Thus a map which is exactly the same size as the features represented would have a scale of 1:1 (sometimes referred to as "natural scale"). If a feature 10 feet long is represented by a line on the map which is only 5 feet long the scale then becomes 1:2. Some engineering plans where a great deal of detail is necessary might be on a scale like that.

A map showing the outline of a building on the other hand is more likely to be on a scale of 1:100, which means that 1 inch on the map equals 100 inches or more than 8 feet on the ground. The pattern of streets in a city would probably be on a scale of 1:10,000 or 1:25,000.

For showing the shape of the country, the distribution of lakes and rivers, and where the roads and railroads are located, a scale of about 1 inch to 1 mile (1:63,360, because 1 mile is 63,360 inches) is useful for most purposes. This makes sense in those countries where the mile is a unit of length, but even there it becomes difficult to work out scales of 1 inch to 3 miles or 5 miles or 7 miles. By international agreement a system more susceptible to decimal-system arithmetic is used, so that in Canada, as in most countries, maps are now issued on a scale of 1:50,000, replacing the old 1-inch-to-1-mile scale. Thus scales of 1:50,000, 1:100,000, 1:250,000, 1:500,000, 1:1,000,000 become logical parts of the system. Maps on all these scales are issued in Canada and form integral parts of the National Topographic System.

This collection of maps illustrating landforms and geology includes examples of a variety of scales from 1:25,000 to 1:1,000,000.

Examples of Scales

1:25,000 - Maps 16, 20, 26
1:50,000 - Maps 2, 3, 4, 5, 7, etc.
1:63,360 - Map 21
1:250,000 - Maps 6, 13, 30, 32, 33
1:1,000,000 - Map 41

Same area shown on two different scales: Map 14 (scaled at 1:50,000) depicts a small part of the area shown on Map 13 (scaled at 1:250,000).

Conversion of scale: Map 1 (from 1:63,360 to standard 1:50,000).

METHODS OF SHOWING RELIEF

The classical problem for map makers is how to show three dimensions in only two — how to depict the elevations and depressions in the earth's surface on a flat sheet of paper. Various schemes have been devised to solve this problem for different purposes.

The most useful single method of showing relief is by contour lines. In this plan we begin at sea-level and note that the shoreline represents the intersection of the flat surface of the sea with the irregular surface of the land. Thus the shoreline represents all those points with a zero elevation above sea-level and its outline shows the shape of the land at that level. Now if the sea-level were to rise 100 feet the shoreline would be in a very different place and have a very different shape. If by careful surveying we could find out all the points that are exactly 100 feet above sea-level and draw lines to represent them we would be drawing the shoreline as it would be if the sea were to come up that far. These lines really represent the shape of the land at that height and are called "contour lines". Thus contour lines on a map are lines representing the locations of the points at equal level above the sea, and they may be shown at intervals of 100 vertical feet, 1,000 vertical feet, 5 vertical feet or any other interval.

For most areas a contour interval of 20 or 25 feet is found to be convenient. In regions where very large mountains or extremely deep valleys cross the country one would expect that contours spaced at greater intervals would show the shape of the land to a satisfactory degree. In very flat areas much smaller intervals are used because it would be useless to draw 100-foot intervals if all of the land in an area to be mapped were sea-level and 50 feet. If we were to raise the sea-level a hundred feet in this case the whole landscape would be flooded and there would be no new or imaginary shoreline to show the shape of the land.

Now, by turning the reasoning around, we can see that by looking at the contour interval, invariably stated somewhere on the map, we can tell whether it is steep, rugged country that is shown or very flat country; the more rugged the country the larger the contour interval necessary, and the flatter the country the smaller the contour interval. Thus a contour interval of 5 or 10 feet means flat country; 20 or 25 feet means average rolling country; and 100 feet or more means rugged country, or at least country that has some steep features on it. Sometimes maps have two contour intervals to show the shape of the land in areas where two very different styles of landscape exist, for example a broad plain on which one very high mountain rises. The high mountain may be adequately shown with an interval of 250 feet but the plain may need an interval of only 10 feet to show its shape.

Contour intervals are also dependent somewhat on the scale of a region. Thus on maps of 1:1,000,000 it would be necessary to use a larger contour interval than on a scale of 1:50,000 for the simple reason that crowding of the contour lines may make it impossible to show the picture of the third dimension.

For most people the contour-line system has to be learned and considerable experience obtained before it is very useful to them. For this reason other systems of showing relief are convenient for purposes not requiring the same precision that contours achieve.

The shaded relief system of showing the third dimension on a two-dimensional map-sheet is one in which shadows are drawn on the map to represent what the country would look like if the sun were shining from the northeast corner. This is sort of a picture of the relief and may be used alone or in conjunction with contour lines. The Fort Coulonge and the Mount Revelstoke National Park map-areas (Nos. 15 and 42) illustrate this particular system.

Still a third method of showing three dimensions in two is the layer-tint method. In this scheme all that part of the country between sea-level and say 500 feet may be tinted pale green, those areas between 500 and 1,000 feet pale yellow, and those between 1,000 feet and 1,500 feet pale brown. In this way the map reader can quickly detect the highlands, the lowlands and, very roughly, their shape. It is really a contour-line system with the intervals between the contours coloured differently. This method of showing relief is useful on very large scale maps such as those of a whole country or a whole continent where only an approximation of land levels and their location is required. Map No. 41 (Robeson Channel) is an example of this method.

On some maps all three methods are used. On the Mount Revelstoke National Park sheet (No. 42), areas of heavy forest, light forest and bare rocks are illustrated in green, pale green and yellow respectively. Because these features are largely dependent on elevation the map is almost a layer-tint relief map too and you can see at once where the valleys are (heavily wooded and green). Contours and shaded relief are also on this map, making the relief startlingly clear.

Examples of Relief

Contours and Contour Intervals

No contours - Map 21

Interval 10 feet - Maps 16, 20, 26
 25 feet - Maps 1, 3, 4, 5, 11, 12, 14, 18, 19, 22
 50 feet - Maps 2, 7, 8, 9, 10, 27, 31, 35, 38
 100 feet - Maps 13, 15, 17, 28, 30, 34, 36, 37, 42
 200 feet - Map 6
 500 feet - Maps 32, 33, 39, 40
 1,000 feet - Map 41

Contours on ice - Maps 39, 40, 41, 42

Other Methods

Layer tinting - Map 41

Shaded relief - Maps 15, 42

Different Kinds of Relief

Flat country - Maps 5, 18, 19, 20, 21, 22
Flat country, outstanding hills - Maps 14, 37
Flat country, deep valley-cuts - Maps 24, 25
Contrasts in relief - Maps 2, 15, 30, 35
Gently rolling country - Map 31
Mountainous country - Maps 32, 39, 40, 41, 42
Deep, steep-walled valleys - Maps 2, 35
Hilly country - Maps 7, 15, 31
Parallel ridges - Map 34

Other Features

Blue-lined shores to emphasize features - Map 1
Forests shown in patterns of little trees - Maps 11, 12, 20, 35, 37
Forest, heavy and scrub - Map 31
Forest, heavy and light - Map 36
Forest, heavy, light and absent - Map 42

GENERAL ORGANIZATION OF MAPS

Topographic maps generally follow a more or less set pattern of organization. It is customary to show the country, the department of Government and sometimes the subsections of the

department responsible for printing and issuing the map at the centre of the top margin, in the lower left corner or at the bottom centre. The name of the map-sheet and the number on the National Topographic Index System may be found in several places, generally in large letters at the centre bottom margin and often repeated in some of the corners for ease of reference, for example when you have a whole drawer full of maps and the tops are covered. Scale and contour interval are usually stated under the name and these are sometimes supplemented by graphic scales where the scale is actually drawn out with inches or centimetres marked on one side and miles or kilometres on the other. Many Canadian maps include a legend to show various signs and symbols and anything special about the particular map-sheet. Some Canadian maps have an index of adjacent map-sheets in the southeast or lower right corner to make it easy to find the adjacent map-sheet if you should wish to see what is there or follow a road or river into the next area.

On each corner of the map the latitude and longitude are noted, and, on most sheets, 5-minute intervals of latitude and longitude are noted along the margins. Also along the margins you may note that where railroads and roads come to the edge of the map the next town or destination in that direction is sometimes given. On some sheets the method of map projection is also described. Because the earth is a slightly modified sphere, any area on it is really flat. This means once again that a three-dimensional form must be shown in two dimensions on the flat surface of the map. The projection described on the map is the one selected from several methods of making a flat surface out of a curved one.

Maps are used a great deal as guides for travelling, and the magnetic compass — used in airplanes, by the man in the woods, and even in cars on the highway — is one of the most common aids to navigation with maps. The north direction shown by the compass is, unfortunately, not true north because the north magnetic pole to which the needle points is not in the same place as the north astronomic pole — the point where the meridians of longitude converge at the emergence point of the axis of rotation of the earth. All maps are drawn up with the left and right margins as north-south lines and the bottom and top margins as east-west lines. It is vital to know, then, the difference between the direction the compass points to and true north by which the map is arranged. The difference is termed the "magnetic declination", and on many Canadian maps it is noted along the bottom margin; on maps showing large areas a small map is sometimes put here to show the declination of the compass needle in different parts of the map-area. There are reasons for this.

The north magnetic pole actually lies in northern Canada, several hundred miles south of the astronomic north pole. This means that there is a line down the middle of Canada where you could line up

the north magnetic pole with the north astronomic pole, and along this line the compass would point true north. If you travel to the east of this line the compass will generally point too far to the west, and vice versa if you travel to the west of the line. Thus magnetic declination is described as so many degrees and so many minutes west or so many degrees and so many minutes east, and people navigating in the area of the map make that correction when planning their navigation. Large bodies of iron ore, magnetic iron sands, and igneous rocks which are full of magnetic minerals may affect strongly the direction the compass points locally. This is why maps of the declination are necessary in regions where the declination changes from place to place in the map-area.

You may note another description of the magnetic declination in terms of annual change. The north magnetic pole is moving very slowly relative to the north astronomic pole so the declination slowly changes and must be noted. For exact navigation or surveying, the date of issue of the map combined with the annual rate of change will give you a correction to put on the magnetic declination stated on the map.

SYSTEM OF LOCATING FEATURES ON MAPS

For locating features on the surface of the earth a system of imaginary lines has been developed — north-south lines called "meridians of longitude" and east-west lines around the earth called "parallels of latitude". These are assigned numbers and divide the world into a grid system covering the whole surface of the earth. The 0 north-south line runs through Greenwich, England. Longitude is measured as east and west from there all the way around to a line running through the central Pacific Ocean which is 180 degrees east or west from Greenwich and, therefore, directly opposite. Latitude starts at the equator as the 0 line and runs upward in number toward the poles, which are 90 degrees north and 90 degrees south respectively. Thus Winnipeg lies at about 97 degrees west longitude and 50 degrees north latitude.

The spaces between the meridians of longitude and those between the parallels of latitude are further subdivided into sixty parts called "minutes", and these in turn are divided into sixty parts called "seconds". These are natural divisions because both latitude and longitude lines are derived by thinking of them as imaginary lines on the surface of the earth that subtend an angle of 1 degree at the centre of the earth. Thus a particular spot on the face of the earth can be defined with a very high degree of accuracy by describing it in terms of latitude and longitude down to the nearest second. If you wish then, to see the Prime Minister of Canada it would be reasonable to stand at

75°42'1" west longitude, and 45°25'28" north latitude, for that is just at the front door of the Parliament Buildings in Ottawa.

For quick reference in this map collection the location of spots using the latitude and longitude system would take too long, so a kind of shorthand system is used to describe approximately the position of various features. North, South, East and West are abbreviated "N", "S", "E" and "W". If we divide the maps into halves and quarters it becomes possible to refer to a mountain in the north half as being in N/2 or one in the southeast quarter as in SE/4. This system will do for broad features and general locations.

A slightly finer subdivision is also used, and this one is actually based on longitude and latitude but is a very simple system. Many of the map-sheets are of areas that are 15 minutes of longitude from east to west and 15 minutes of latitude from north to south. Along the margins of the maps you will find that the 5-minute intervals are marked, thus effectively dividing the map into nine rectangles, three columns across and three columns down. These "ninths" make a convenient reference system using N, E, S, and W and adding "C" for centre. Thus if we were to describe an island in a lake in the central ninth it would be described as in C. A waterfall in the northwest corner of the map would be described as in NW. As long as it is understood that we are referring to "ninths" when we see EC, NW, SE, etc., there is no need to use the "/9" in each case.

In a few instances when describing landforms that are generally distributed over the whole map, no specific location is given.

A grid system used by the Army is overprinted in pale purple on some sheets issued by the Army Survey Establishment and available to the public as part of the general Canadian map system. Arbitrary numbers referring to selected reference points are assigned to 1,000-metre squares. These you may see on sheets 14, 20, 26 and 38. Map 14 is on a scale of 1:50,000 and map 20 is at 1:25,000, and the grid squares are correspondingly of different sizes.

Map 1

CHEZZETCOOK, NOVA SCOTIA

11D/11 W

1:50,000

Structures in lower Palaeozoic slate and quartzite of the Meguma series trend generally northeast across this district. The grain of the country, however, trends in a northwesterly direction, the result of movement of the continental ice-cap over this area with its additional erosion, followed by deposition of drumlins and elongated morainal deposits. The generally submerged coastline takes its shape from the glacial landscape but has been modified considerably by wave erosion and wave deposition. The relief of the rock surface below the glacial deposits is very low so that features like Cole Harbour, Porter Lake, Lawrencetown Lake and Chezzetcook Inlet are all very shallow, with only a few spots being more than 10 feet deep. In Cole Harbour, Three Fathom Harbour and Chezzetcook Inlet, extensive mud flats are exposed at low water in a region where the tide is rarely more than 5 feet.

Landforms of note

Bay-mouth bar - WC

Tombolo - EC

Spit - WC

Cliffed drumlins - C

Drumlins - NW, NE

Railway embankment across shallow flooded area - WC

Glacially dammed lakes - N/2

Glacial direction in grain of land - N/2

Irregular roads and railway roads across grain of the country - N/2

Tidal flats - NW and WC

Marshes

Estuaries

Reference: Lawrencetown sheet No. 53, Nova Scotia, E.R. Faribault;
Geological Survey of Canada Map No. 700 (1907).

Map 2

CODROY, NEWFOUNDLAND

110/14 E

1:50,000

An uplifted surface, developed on a complex of granite, granite gneiss, and highly metamorphosed early Palaeozoic sedimentary rocks, occupies the southeast corner of the map-sheet and is separated from Carboniferous sedimentary rocks along a sharply marked fault scarp or fault-line scarp about 1,000 feet high. Glaciers have cut minor stream valleys into steep-walled U-shaped troughs along the front of the scarp. Grand Codroy River occupies a major valley that has been cut down into Pennsylvanian and uppermost Mississippian sedimentary rocks which vary in induration from soft to hard. The northwest third of the map-sheet shows a portion of the Cape Anguille Mountains, a gently rolling upland surface developed on dense, tough sandstones and conglomerates of Middle Mississippian age (Horton equivalents). The large re-entrant in the upland in the northeast corner is underlain by much softer, red, gypsiferous siltstones, shales and sandstones of the Codroy Group (Windsor equivalents).

Landforms of note

Old peneplain surfaces - SE, NW
Broad river valley
Fault line scarp - SW, SC and EC
U-shaped valleys - SW, SC and EC
Cirques at heads of valleys
Lakes in glacial valleys - SW, SC and EC
Estuary delta - WC
Youthful incised stream - (Brooms Brook) WC, NW
Shallow glacial lakes - SE, NC
V-valleys - NW
River bars (Grand Codroy River)
Delta islands - WC
Hanging streams - SE, and sides of U-valleys

Reference: Lower Carboniferous sediments in southwestern Newfoundland and their relation to similar strata of western Cape Breton Island, D.M. Baird and R.P. Cote; Canadian Institute of Mining and Metallurgy Bulletin (1964).

Map 3

HAMPSTEAD, NEW BRUNSWICK

21G/9

1:50,000

The northern third of Hampstead map-area is underlain by nearly flat sedimentary rocks of Carboniferous age. The rest is a complex of lower Palaeozoic sedimentary and volcanic rocks intruded by one round plug of granite west of the elbow of Saint John River and by smaller masses at the southern edge of the map-area. The granite plug is barely distinguishable on the surface. Rows of hills in the SC and SW (Blue Mountain, Breakneck Hill and those in the area of Island and Bacon Lakes) are made of Precambrian felsite. Large areas of recent silts occur along the main river and form the white (unforested) areas of swamps and "interval". Deposition occurs where it does because of post-glacial alteration of the mouth of the river, effectively raising the river level and flooding the land upstream this far.

Landforms of note

Islands of river deposition - E/2
Lakes made by river deposition - NC, NE
Lakes in islands of river deposition - EC, NE, NC
Marshes and swamps, river deposition - E/2
Flooded landscape - E/2
Lakes, glacial - S/2
Differential erosion - SC, SW
Disrupted drainage
Marshes and swamps, drainage disruption - SW/4
Estuaries
Stone quarry - EC
Spit - SE

Reference: Hampstead, N.B., G.S. Mackenzie; Geological Survey of Canada, Paper 51-19 (1951).

Map 4

WOLFVILLE, NOVA SCOTIA

21H/1 W

1:50,000

Triassic rocks occupy the northern two thirds of this map-area. A great thickness of northwest-dipping basalts are folded into a very gentle syncline in the northwest corner. This provides a gentle northwest slope for streams and a steep scarp on the southeast side offering possibilities for stream capture. The valley south of the Triassic scarp is underlain by very soft Triassic shales, siltstones and sandstones that outcrop in few places other than along the shoreline, being covered with deep glacial drift derived from the beds almost directly below. The higher rolling country in the southern third of the map-sheet is underlain by a complex of more resistant Palaeozoic rocks. The northeastern third of this area consists of sandstones and siltstones of the Horton Group of Lower Mississippian age, folded into anticlines and synclines that strike generally parallel to the scarpment. To the southwest the rocks consist of more highly metamorphosed slates and argillites of Lower Palaeozoic age.

The shore is unique in that Minas Basin is an area of very high and low tides, with a daily range of as much as 50 feet. Thus wharves at Kingsport, Wolfville and Hortonville which can be used by medium-sized ships at high tide may be miles from the water at low tide, and what appear to be large rivers at high tide become small streams wandering over extensive mudflats at low tide. Erosion in other parts of the Bay of Fundy by wave action, tidal currents, and general scouring produces sedimentary materials which are moved to the Minas Basin area and deposited along the shoreline, so that the low marshy areas and mudflats continue to grow into the sea. Drained of salt water and protected from high tides by dykes, these marshlands have for several hundred years made excellent agricultural land. The "aboideaus" seen at several places on the map are trap-door arrangements to allow drainage outward at low tide but to keep the water out at high tide.

Landforms of note

Tidal flats - NE/4
Tidal estuaries - C, EC
Shoreline deposition - C, EC
Pseudo-old-age stream - (Cornwallis River) WC, SW
V-gorge and stream - SW
Dammed lake - SC
Escarpment - NW
Gently dipping rocks - NW
Soft and hard rock layers - NW
Possible future stream-capture - NW
Dyked land - C, EC
Artificial levees and dykes - EC, SW, C, WC
Linear valley - Gaspereau River, Black River and extension - NW
Aggrading shoreline - C, EC
Swamps - C, EC

Reference: Kingsport sheet, Hants and Kings Counties, Nova Scotia, H. Fletcher;
Geological Survey of Canada, Map 13A (1911).

Map 5

TRACADIE, NEW BRUNSWICK

21P/10 W

1:50,000

Horizontal sandstones and shales of Pennsylvanian age occupy the whole northeastern corner of New Brunswick and underlie a very extensive plain that dips gently out underneath the sea, which has flooded its margin. Very low valleys give way to shallow estuaries that are cut off where wave erosion and deposition have produced an extensive series of bars and spits along the shoreline.

Landforms of note

Flat plain of northeastern New Brunswick - W/2

Estuaries - SW, N/2 (Pokemouche River)

Drowned rivers - SW, N/2 (Pokemouche River)

Marshes - NE/4

Bars and spits - E/2

Recurved spits - SC, EC

Wave depositions - SC, EC

Tidal channels in offshore bars - EC, SC

Incurved spits - EC, SC

Secondary shoreline - (Shepard) E/2

Deposition inside offshore bars

Reference: Geology of Chaleur Bay region, F.J. Alcock; Geological Survey of Canada, Memoir 183 (1936).

Map 6

MATANE, QUEBEC-NEW BRUNSWICK

22/B

1:250,000

The Gaspé Peninsula consists generally of a strip of Ordovician rocks, approximately 15 miles wide along the south side of the St. Lawrence River, a central core of Devonian rocks of various ages extending as a series of belts up the centre of the Peninsula, and a strip, approximately 10 to 25 miles wide along the Restigouche River and Chaleur Bay, of Ordovician rocks with patches of Pennsylvanian rocks along the coastline itself. An elongated fault block of Pre-Ordovician (possibly Precambrian) rocks is inserted as a fault block and forms the Shickshock Mountains. Structural trends are strongly east-northeast in rocks of all ages. Drainage is generally northward to the St. Lawrence River on one hand and southward to Restigouche River and Chaleur Bay on the other. Drainage is strongly influenced by the parallel rock structures in the northwest corner but is more or less dendritic in the southwestern section. The fault block of the Shickshock Mountains has modified the drainage strongly in the north-eastern quarter. Stream valleys cut across the fault block in several places and give the general appearance of an antecedent river system. The present stream arrangement is the result of a complicated pattern of stream capture, reversal of drainage, antecedence, and glacial disruption.

Landforms of note

Tidal flats - SE

Estuary - SE

Dendritic drainage - (R. Nouvelle) SE

Antecedent rivers - (Shickshock Mountains) EC, NC

Water gap - (Matane Lake, R. Cap Chat)

Parallel drainage - NW

Parallel ridges - NW

Finger lakes - SW, WC

Smooth shoreline - NW

Spits and bars - SE

Fault-block mountains

References: Gaspé Peninsula, H. McGerrigle; Quebec Department of Mines, Map 1000 (1953).
Geology of Quebec, J.A. Dresser and T.C. Denis; Quebec Department of Mines, Geol. Rept. No. 20 (1944).

Map 7

RANNIE LAKE, NEWFOUNDLAND

23G/10 W

1:50,000

Precambrian, granitic and more basic gneisses, granulite, granite, amphibolite, and highly metamorphosed sedimentary rocks underlie the area just west of the Labrador trough where it bends from its south-southeasterly trend to a southwesterly trend. The rocks of the area are essentially homogeneous so that the topography reflects little more than the joints and faults in it and glacial modifications of drainage.

Landforms of note

Joint pattern - S/2
General texture in massive jointed rock
Lake in fault valley - SW
Bare hilltops in wooded country
Rounded hills
Irregular drainage
Disrupted drainage system
Eskers - N/2
Joint-pattern lakes

Reference: Iron-formations and the Labrador geosyncline, Quebec-Labrador, G. A. Gross; Geological Survey of Canada, Paper 60-30 (1960).

Map 8

TAIT LAKE, QUEBEC-NEWFOUNDLAND 23O/2 W 1:50,000

Precambrian sedimentary rocks which include metamorphosed conglomerate, grit, slate, argillite, quartzite, dolomite and iron-formations intruded by thin sills of gabbroic rocks are folded into a series of northwest-trending anticlines, synclines, elongated basins and domes. The strong U-shaped pattern of the rocks and of the lakes and streams in the northwest corner of the map-sheet reflects the nose of a southeast-plunging anticline. Just northwest of Tait Lake an irregular domal structure is plainly visible in the distribution of the lakes, streams and ridges. Immediately east of Tait Lake the U-pattern is the surface expression of a northwest-plunging anticline with a narrow northwest-plunging syncline, partly visible in the landforms at the extreme southeast end of Tait Lake. Between Lac Hayot and Ferrum River a strong northwest-trending linear pattern reflects the upturned edges of the same rock formations folded into an anticline that plunges very gently to the southeast. The extensive flat swampy area in the southwest corner is developed on easily eroded slates. The lake and swamp area that includes Lac Vulcain and Lac Pluton in the northeastern part of the map-area is also developed on easily eroded slates. The slightly higher country in the extreme northeastern corner reflects the occurrence there of numerous gabbroic sills. Throughout the area and particularly in the domes and anticlines in the Tait Lake-Twisted Lake belt the presence of gabbro sills, 200 to 800 feet thick, intruded into the sedimentary rocks, emphasizes surface expression of structures.

Landforms of note

Disrupted drainage pattern
Lakes of unusual shapes
Parallel ridges - S/2
Eroded dome - C, NC
Plunging anticlines - EC, NW
Swamps
Annular drainage - C
Rock structures reflecting topography
Linear lakes
Islands in lakes

Reference: Iron-formations and the Labrador geosyncline, Quebec-Labrador, G. A. Gross; Geological Survey of Canada, Paper 60-30 (1960).

Map 9

DUNPHY LAKE, QUEBEC

24B/4 W1/2

1:50,000

The unusual topography of this area is developed on a series of metasedimentary rocks which have been intruded by gabbro sills from 200 to 1,000 feet thick. The northern part of the map-area forms part of a structural basin whose centre lies to the north, so that dips are consistently in that direction. A fault clearly disrupts the general pattern of escarpments and gentle slopes. South of Dunphy Lake a small basin structure is clearly visible in the pattern of the ridges.

Landforms of note

Disrupted drainage pattern

Linear lakes

Fault-offset lakes

Basin structure - N/2, SE

Gabbro sills

Annular drainage pattern - SE

Swamps

Nearly treeless area

Cuestas

Reference: Iron-formations and the Labrador geosyncline, Quebec-Labrador, G.A. Gross; Geological Survey of Canada, Paper 60-30 (1960).

Map 10

MORaine LAKE

24C/14 W

1:50,000

Gently rolling country, with very little to mark structural patterns in the rocks typifies this area south of Ungava Bay. The rocks are metasedimentary members of the Labrador trough group, which includes conglomerate grit, slate, argillite, greywacke, arkose, quartzite, dolomite, chert and iron-formation. The surface clearly shows the effects of the passage and melting of the continental ice-cap in this region.

Landforms of note

Recessional moraine - NE/4
Numerous islands - NE/4
Disrupted drainage system
Pseudo-old-age stream - SC
Oxbows and cutoffs - SC
Sparsely wooded area

Reference: Iron-formations and the Labrador geosyncline, Quebec-Labrador, G.A. Gross; Geological Survey of Canada, Paper 60-30 (1960).

Map 11

HAMILTON, ONTARIO

30M/5 W

1:50,000

The escarpment crossing irregularly from the southwest corner northward towards the northern margin marks a geological boundary in nearly-flat-lying sedimentary rock formations. To the east the surface outcrops consist of red sandy shale of the Queenston Formation of uppermost Ordovician age. The line of the escarpment itself marks the outcropping edges of the Medina Formation, mostly sandstone, the Clinton Formation, mostly dolomitic limestone and grey shale, and the Rochester Formation, dark grey shale. The escarpment is capped by massive light grey dolomite of the Lockport Formation. This makes the steep cliffs along the upper edge of the escarpment in several places, notably at Mount Nemo (NC), Rattlesnake Point (NW) and the large stone quarries in the southwest corner north of Dundas. A prominent bay bar (SE), has been made by wave and current action.

Landforms of note

Bay bars - SE

Beach - SE

Escarpment - NW, C, and SW

Low cliffs along shoreline - SE, SC

Youthful V-streams in flat country - NE, EC

Terraced topography - C, NW

Rectangular and nearly rectangular road pattern

Gullied slopes - SC

Stone quarries - SW

Major city - SC

Strath - NE

Primary shoreline

Reference: Toronto-Hamilton, Ontario (1 inch to 4 miles); Geological Survey of Canada, Map 584A (1961).

Map 12

PETERBOROUGH, ONTARIO

31D/8 E

1:50,000

Peterborough map-area lies in a belt of Ordovician rocks that crosses the peninsula of southwestern Ontario from Georgian Bay to Lake Ontario. The rocks are dominantly limestone, dolomite and shale. Landforms, however, are almost completely dependent on surficial deposits. The flat, swampy belt across the northern quarter of the map-area is mostly stony and sandy recessional moraine material. The rest of the map-area is dominated by swarms of elongated hills about 100 feet high and a mile long. These are drumlins and their parallelism indicates the movement of the glacial ice over this area in a south-southwesterly direction. The swampy areas between the drumlins are underlain for the most part by a sandy ground moraine with some patches of organic rich, swampy muck. Sand and gravel deposits along the valley of Indian River show that it follows an old spillway for glacial meltwaters. Another old spillway leads southwestward from Warsaw just south of the main diagonal highway there. Sand, silt and clay in the flat valley of the Ouse River in the southeastern part of the map-area indicate that a lake once occupied the area.

Landforms of note

Drumlins
Disrupted drainage
Spillways
Swamp and hill topography
Clay pit - NW
Irregular glacial hillocks - NE
Rectangular road pattern
Swampy lakes

Reference: Surficial geology, Lindsay-Peterborough area, Ontario, C.P. Gravenor; Geological Survey of Canada, Map 1050A (1958).

Map 13

MONTREAL, CANADA-UNITED STATES

31H

1:250,000

The Canadian Shield, with typical rugged topography to 2,000 feet above sea-level, lakes and disrupted river systems, occupies the extreme northwest corner of this map-area. The southwestern part is underlain by rolling country and rugged hills of the Sutton Mountain Group and others on the northwestern edge of the Appalachian Mountain belt. The rocks are metamorphosed sedimentary types of Lower Palaeozoic age that have been intruded by a wide variety of igneous rock types. The plain between the Canadian Shield in the northwest and the mountainous country to the southeast is underlain by nearly flat limestones and shales of Ordovician age with a few patches of uppermost Cambrian rocks. A series of round pipe-like intrusive masses now forms a line of erosional remnants standing high above the plain and extending from Mount Royal on the west to Sheffer and Broam on the east. Some of these may represent the stumps of deeply eroded volcanoes. The works of man have been profoundly influenced by the nature of the terrain as shown by the changing pattern of roads and railroads from place to place.

Landforms of note

Volcanic necks (Montreal to Granby)
Monadnocks (Montreal to Granby)
Finger lakes - SE
Large river - NW/4
Islands of river deposition - NW/4
Rapids - WC
Lake above rapids - WC
Small delta - SC
Swamps - NW, SC, and SE
Radial drainage - C
Rock barrier - (Lachine Rapids) WC

References: Southern Quebec (west sheet); Geological Survey of Canada, Map 703A (1958).
Geology of Quebec, J.A. Dresser and T.C. Denis; Quebec Department of Mines, Geological Report No. 20 (1944).

Map 14

BELOEIL, QUEBEC

31H/11 E

1:50,000

The St. Lawrence Lowland is an area of nearly horizontal Ordovician shales and limestones overlain by a varying thickness of glacial deposits and late marine clays. In this flat region, rock outcrops are few and most of the shallow brooks and river channels are cut into the surficial deposits only. St. Hilaire Mountain is a round plug of igneous material that now stands high above the rest of the surrounding region as an erosional remnant or monadnock. The small lake on top is partly artificial and partly dammed with glacial debris. Drainage is radial outward from the mountain.

Landforms of note

Round mountain - SW
Radial drainage - SW
Straight river - W/2
Flat agricultural land
Monadnock - SW
Islands in river - WC
Flat plain on surficial deposits
Straight roads

References: Southern Quebec (west sheet); Geological Survey of Canada, Map 703A (1958).
Geology of Quebec, J.A. Dresser and T.C. Denis; Quebec Department of Mines, Geological Report No. 20 (1944).

Map 15

FORT COULONGE, QUEBEC-ONTARIO

31F/NE

1:125,000

A sharp change in the general style of landforms marks most of the southern edge of the Canadian Shield. In this area it is quite clear that the northeastern section of the map-area, typical Shield country with rolling hills, numerous lakes and disrupted drainage systems, is different from the much flatter country to the southwest. The Shield area is underlain by a complex of ancient granite, granite-gneiss, and other highly metamorphosed rocks that resist weathering as a nearly homogeneous mass except where they have been broken by faults, and joint patterns such as in Aldfield County, just east of centre. The Ottawa River, a post-glacial river system made up of bits and pieces of preglacial drainage patterns and post-glacial channels, follows along the edge of the Shield for the last 125 miles of its course, and upstream from this it flows between surface outcrops of Shield rocks and patches of lower Palaeozoic sedimentary rocks lying on the Shield. Allumette Island and the peninsula north of Beachburg and west of Fort Coulonge (NW/4) is one such patch. The escarpment crossing the map-area between the northwest and southeast corners is considered by some to be controlled by a complex system of faults. Muskrat Lake (WC) and others aligned with it probably represent old drainage channels. The Ottawa River alternates between large lake-like expansions and narrower channels with rapids and swift currents, conditions typical of a glacially disrupted drainage system. Old shorelines of the Champlain Sea are visible here and there along the Ottawa Valley, especially conspicuous being the one along the 400-foot contour line between Bristol and Starks Corners (SC). Recent streams have cut small nicks all along it. This terrace extends a little farther to the east but is largely destroyed in the Quyon River valley by landslides.

Landforms of note

Contrast between Shield and lowlands
Escarpment - SE
Typical Canadian Shield lakes
Glacially dammed lakes
Disrupted drainage system
Lakes in river channel - SC, NW
Old river channel - WC
Islands in river - WC
Pseudo-old-age stream - (Snake River) WC
Swamps - WC
Joint pattern - EC, NW
Erosion in massive rocks - NC
Temporary streams - SC
Rectangular road patterns - SW, SC
Irregular road patterns - N/2

References: Preliminary report on Onslow-Masham area, Pontiac and Gatineau counties, R.J. Sabourin; Quebec Department of Mines, P.R. No. 293 (1954).
Report on the geology and natural resources, northwest quarter-sheet, No. 122, counties of Pontiac, Carleton and Renfrew, Quebec and Ontario, R.W. Ellis; Geological Survey of Canada, Publication No. 977 (1907).

Map 16

BLACKBURN, ONTARIO-QUEBEC

31G/5h

1:25,000

Bedrock in this area is very rarely exposed except along the main escarpment just south of the Ottawa River and in the hills in the northwest corner of the map-area. The southern two thirds of the area is underlain by a blanket of surficial deposits which include glacial till, outwash sands, Leda clay from the Champlain Sea, and river-channel deposits. Shale, sandy shale and some with dolomite layers, and black shale are the dominant rock types. Older formations are exposed farther north toward the Ottawa River where Black River, Trenton and Chazy limestones with some shale and sandstone are exposed along the scarp and the slightly higher country just south of it from beyond Orleans in the east to Rothwell Heights and Ottawa in the west. The escarpment in some places is a rock-defended terrace of the Champlain Sea while in others it is a cliff of Leda clay as much as 100 feet high. In one place, between the conspicuous clover leaf and the Rothwell Heights area in the west-central section these "quick" clays have sagged in a massive slide. On the flats on both sides of the river, occasional outcrops show that the area is underlain by the still older Oxford Formation of Beekmantown age and the Rockcliffe Formation of Chazy age. In the extreme northeast corner the slightly higher country is underlain by the Nepean Sandstone of uppermost Cambrian or lowermost Ordovician age. In immediate post-glacial times, temporary spillways carved channels with islands, now abandoned but still clearly visible in the southern half of the map-area.

Landforms of note

Major river

River-channel islands - NW

Champlain Sea terraces - N/2

Landslide - WC

V-cut tributary - WC (Green Creek), NE

Abandoned river channels and islands - S/2 (Mer Bleue)

Peat bog - SE (Mer Bleue)

Stone quarries - C, WC

Sand pits - SC, SW

Strath - (Green Creek) NC

Straight roads

Flood-plain lake - (McLaurin) NC

References: Geology of the Ottawa-St. Lawrence Lowland, Ontario and Quebec, A. E. Wilson; Geological Survey of Canada, Memoir 241 (1946).
Surficial geology of Ottawa map-area, N. R. Gadd; Geological Survey of Canada, Paper 62-16 (1962).

Map 17

BELCHER ISLANDS NORTH, NORTHWEST TERRITORIES 34D and 44A 1:250,000

All rocks in the map-area are included in the Belcher Group of clastic and chemically precipitated sedimentary rocks with intercalated volcanic flows. They have been intruded by basic sills and dykes and have a combined thickness of more than 20,000 feet. Shorelines range from very steep cliffs to gently rounded, reflecting the heavy glaciation of the area, which is also responsible for widespread erratics. The area can be considered to be a flooded landscape although the most recent event has been an emergence as shown by terraces and marine fossils now as high as 150 feet above present sea-level. The shapes of the islands reflect accurately the structure of the bedrock beneath and show a series of anticlines and synclines whose axes form a set of sweeping curves with centres far to the west. Tukarak Island is an anticline with a gentle northerly plunge, as is the northern half of Flaherty Island where the anticlinal shape and northerly plunge is shown very clearly in the curve of Wiegand Island. This anticline tilts over to plunge gently southward at the southern edge of the map-area at Kasegalik Lake. Another anticline with the curving axis is to be found on Kugong Island and northward into Johnson Island. A doubly plunging syncline is clearly visible in Wetalltok Bay and northward to the middle of the U-shape between Gushie Point and Blocked passage. The southward-plunging syncline is very clearly seen in the shape of Wetalltok Bay itself and the more open northward plunge in the northern shoreline. Other synclines are visible in Omarolluk Sound in the peninsula just east of Kasegalik Lake and in the long thin Coates Bay, along whose southernmost shore the synclinal trend is clearly shown. The northern Belcher Islands are not quite so spectacular but consist again of north-trending anticlines and synclines.

Landforms of note

Plunging anticline - Cape Bartlet EC, Weigand Island NC, Kasegalik Lake SW

Plunging syncline - Wetalltok Bay SC, C, and SW

Elongated dome - Tukarak Island SE/4

Lakes, parallel structures

Shorelines, parallel structures

Primary shoreline

Flooded landscape

Reference: Belcher Islands, Northwest Territories, G.D. Jackson; Geological Survey of Canada, Paper 60-20 (1960).

Map 18

RIDGETOWN, ONTARIO

40I/5 W

1:50,000

Nearly all of this map-area is underlain by black fissile shales of the Kettle Point Formation of Devonian age, but bedrock is well hidden under unconsolidated glacial and lake-bottom sedimentary materials. The shoreline of Lake Erie is, generally; a receding one, so that streams such as those that enter Rondeau Harbour are extended consequents. At present lake level, wave activity has been scouring the coast in the EC part of the map-area, so that low cliffs developed in sands and gravels are supplying the material that currents are sweeping out toward Point aux Pins. Counter currents along the southern edge of the map-area have modified the end of the compound spit and sealed off Rondeau Harbour, now cut through by an artificial entry.

Landforms of note

Consequent and extended consequent streams - EC, SW

Compound cusped spit - SC

Complex spit - SC

Lake formed by cusped spit - SC

Rectangular road pattern

Low, wave-scoured cliffs - EC

Smooth shoreline - EC

Reference: Elgin, Ontario, J.F. Caley; Geological Survey of Canada, Map 692A (1942).

Map 19

ST-CLAIR FLATS, ONTARIO-MICHIGAN 40J/10 E 1:50,000

Surficial deposits from 70 to 140 feet thick almost completely cover the bedrock, which is largely black and dark grey fissile shale and sandy shale of upper Devonian age. An unusual delta is developed in Lake St. Clair where a limited sweep does not allow waves to alter delta construction significantly.

Landforms of note

Large river - W/2

Crow's foot delta - S/2

Delta lakes - SE

Distributaries - S/2

Rectangular and square road systems - N/3

Frilly contour line - N/3

Reference: Palaeozoic geology of the Windsor-Sarnia area, Ontario, J. F. Caley; Geological Survey of Canada, Memoir 240 (1945).

Map 20

IPPERWASH, ONTARIO

40P/4e

1:25,000

Bedrock in this area consists entirely of limestones and shales of the Hamilton Group of Devonian age. Glacial debris and outwash cover the bedrock to considerable depth, and recessional beach deposits with some wind-blown sand cover the land in the vicinity of the shoreline to the north.

Landforms of note

Smooth shallow shoreline - N/3
Dunes along shoreline - NE
Old beach ridges - NC, WC
Square road pattern interrupted by shore
Settled farm land
Silted-up river mouth
Consequent streams
Primary shoreline

Reference: Palaeozoic geology of the London area, Ontario, J.F. Caley; Geological Survey of Canada, Memoir 237 (1943).

Map 21

RED RIVER DELTA, MANITOBA

62I/7

1:63,360

The axis of Lake Winnipeg in this area at its south end lies on a belt of limestones and dolomites called the "Red River Formation" of Ordovician age. These are deeply covered by glacial debris and sediments laid down in the ancient Lake Agassiz formed when an ice-mass lay to the north and dammed the northward drainage in the district. The Red River delta is a heavily modified crow's foot delta in a lake in which there is enough sweep to form large waves that modify the leading edge of the delta into a smooth shoreline. An interesting reverse feature is formed in Netley Lake where distributaries in the delta are formed by currents going in an up-river direction. A similar feature is found in Folster Lake.

Landforms of note

Very large lake - N/2
Smooth shoreline
Very flat country
Extensive marshes
Square road pattern
Modified crow's foot delta
Distributaries
Natural levees
"Reverse deltas"
Secondary shoreline

Reference: Geological map of Manitoba; Geological Survey of Canada, Map 850A (1946).

Map 22

MINIOTA, MANITOBA-SASKATCHEWAN 62K/3 W 1:50,000

The flat western plains are here directly underlain by grey and greenish grey shale of the Riding Mountain Formation of upper Cretaceous age. They are thoroughly masked in this area, however, by glacial deposits of considerable thickness. Minor ripples in the surface, produced as recessional glacial features, fill with meltwater in spring to form temporary lakes that dry up gradually during the summer.

Landforms of note

Dry prairie

Sloughs

Intermittent streams

Square road pattern

Stream crossing grain of country

Recessional moraine pattern

Meltwater channels (Niso Creek valley) across moraine pattern

Reference: Surficial geology, Riding Mountain, Manitoba, R. Klassen;
Geological Survey of Canada, Map 11-1963 (1963).
Assiniboine, Manitoba and Saskatchewan, R.T.D.
Wickenden; Geological Survey of Canada, Map 713A (1942).

Map 23

CRANE LAKE, SASKATCHEWAN

72K/3 E

1:50,000

The Canadian plains, here underlain by Cretaceous shales and sandstones, are heavily masked by surficial deposits. Extensive areas of wind-blown sand, which in a few places forms discrete crescent dunes or barchans, cover the north half of the map-area and an area east of Crane Lake. Several temporary lakes are formed in low-lying parts of the land where spring meltwaters collect and gradually disappear during the summer. Crane Lake, though permanent, changes its shorelines drastically in the wet and dry seasons.

Landforms of note

Areas of wind-blown sand - N/2

Barchans - N/2

Temporary lake - SE, NC

Treeless plains

Shallow extensive lake - (Crane)

Lakes with indefinite shorelines - SE, EC

Square road system

Meandering stream - SC

Reference: Geological map of Saskatchewan; Geological Survey of Canada, Map 895A (1947).

Map 24

LUMSDEN, SASKATCHEWAN

72I/10 W

1:50,000

Soft Cretaceous shales and sandstones of this part of the great plains are completely obscured by surficial deposits. Directly overlying the bedrock are boulder clays and bouldery glacial till. South of Qu'Appelle River, the boulder clays are in their turn overlain by glacial-lake clay and silt. These are stripped off and exposed in the steep-walled valleys of Waskana Creek, Buggy Creek and Flying Creek. In the main Qu'Appelle valley and the tributary coming in from the north, water-washed boulder clays are exposed along the flanks, but fine recent stream silts and clays floor the main parts of the valleys themselves. The very large, almost completely abandoned valleys crossing the northern half of the map-area represent changes in the drainage system brought about by the glaciation. Enormous quantities of meltwater from the receding ice-sheet carved some of these valleys, which also had to drain off areas now served by the South Saskatchewan River.

Landforms of note

Abandoned river valleys - NC

Misfit stream - N/2

Strath - (Waskana Creek)

Pseudo-old-age stream - (Qu'Appelle River) C, WC

Square road system

Dry prairie

Temporary lake - SE, NW

Deep tributary streams

Reference: Surface deposits, southern Saskatchewan; Geological Survey of Canada, Map 48-18 (1948).

Map 25

LEADER, SASKATCHEWAN

72K/13 W

1:50,000

Flat-lying Cretaceous sedimentary rocks that underlie this area below a surficial cover are exposed only in a few places along the main South Saskatchewan River valley, and even here are largely covered with their own weathering products. The bottom of the main valley consists of older glacial clays modified by water erosion and covered in some places by recent silt and clay. North of the main river valley the surface of the land consists mostly of boulder clay or till, part of the recessional moraine pattern covering a large area to the north. South of the river, however, the surface of the plateau land is covered with glacial-lake, clays, silts, and sand. In some places the sand has blown about a good deal and has combined with sand that migrated into the area, now forming a well-marked dune area. Some of these are crescent shaped and qualify as barchans.

Landforms of note

Sand dunes - SW, WC

Barchans - SW, WC

Sloughs - EC

Temporary streams - N/2

Strath - NW

Meander - NW

Incised river course - N/2

Badlands topography - WC

Channel deposits - N/2

Island in river course - N/2

Temporary stream -N/2

Square road pattern

Trees restricted to river valley - N/2

Reference: Surface deposits, southern Saskatchewan; Geological Survey of Canada, Preliminary Map 48-18 (1948).

Map 26

ROSYTH, ALBERTA

73D/11g

1:25,000

The surface of this part of the prairie is covered with surficial deposits. Immediately below these are pale beds of grey bentonitic sand, and grey, yellow and dark carbonaceous shale with occasional thin coal seams. In the sides of the valley of Battle River, slightly older rocks of the Birch Lake Formation and the Grizzly Bear Formation, consisting of sand, sandstone and shale beds, all of upper Cretaceous age, outcrop intermittently. The valley of Battle River is clearly larger than the present river system justifies so it appears very likely that this is a meltwater channel occupied by a large temporary river coming from the melting ice during the waning of the continental glaciers. The pitted and bumpy area extending southward through the centre of the map-area appears to be pitted morainal deposits.

Landforms of note

Pitted glacial moraine
Lakes in glacial pits
Misfit stream - NW
Loops and meanders - NW
Oxbows - NW
Cutoffs - NW
Temporary lakes
Depression contours
Pseudo strath - NW
Partly developed badland topography - NW
Temporary streams - NW
Pseudo-old-age stream - NW

Reference: Hardisty, Alberta; Geological Survey of Canada, Map 502A (1939).

Map 27

McLEAN BAY, NORTHWEST TERRITORIES 75L/8 1:50,000

A variety of Precambrian rocks underlies this area just south of the eastern arm of Great Slave Lake. A vast sea of granite, granite-gneiss and migmatites extends southward from the prominent escarpment that runs from near the southwest corner, northeasterly to the eastern margin and is indicated as "MacDonald Fault". This group of rocks is more or less homogeneous in its reaction to erosion and is covered by the usual variety of lakes and irregular river systems characteristic of the Canadian Shield. A variety of Precambrian sedimentary rocks with bodies of diabase and quartz diabase occupies the area north of the MacDonald Fault, with the highly varied landforms resulting in part from differential erosion of different rock types. In the extreme northwest corner, for example, the peculiar little indentation and the east-west valley adjacent to it are developed on easily weathered arkoses and shales. The strangely shaped island with the long projection on the south side at the centre of the northern edge of the map-area is underlain by conglomerate and slate, with the long peninsula to the southwest being held up by a core of diabase. The sharply marked rounded hill one mile north of "McLean" of McLean Bay (WC) is held up by a small mass of quartz diorite that is much more resistant than the surrounding dolomite, limestone, arkose, siltstone and slate. The same circumstances account for the hills just north of Wilson Lake and just southeast of the "RK" of Stark, NW. A second major fault crosses the area through the north side of Wilson Lake (NE), southwestward through the north side of the west end of the long peninsula on the north side of McLean Bay.

Landforms of note

Disrupted drainage - S/2
Typical Canadian Shield country - S/2
Lakes parallel to fault scarp - C
Fault scarp shoreline - NE
Fault scarps - N/2
Deep swift river in rock canyon - SW
Rapids - SW
Steep shoreline - N/2
Cliffs of glacial origin submerged - N/2
Rock islands in lake - NW
Esker - SE
Sand - SW
Swamps
Differential erosion - N/2

Reference: McLean Bay map-area, District of Mackenzie, N.W.T., F.Q. Barnes; Geological Survey of Canada, Paper 52-5 (1952).

Map 28

SIFFLEUR RIVER, ALBERTA

82N/16 W

1:50,000

The Rocky Mountains near the north end of the main body of Banff National Park belong principally to the central ranges and are thus made up of great thicknesses of Precambrian, Cambrian and Ordovician sedimentary rocks which have been uplifted, tilted and folded in great open folds. These are separated by a major through-going fault, the Castle Mountain thrust, from the front ranges which occupy the whole eastern side of the Rocky Mountain system in the latitude of this map-sheet. The Castle Mountain thrust passes from the centre of the top (north) margin of this map-area along the main valley of Siffleur River and then out toward the eastern margin, probably along the valley of Escarpment River. Mountains to the northwest of this line consist of tightly folded, faulted and broken blocks of Palaeozoic and Mesozoic rocks. The area was glaciated during the Pleistocene period, but in waning stages of the glaciation local glaciers on the mountains carved a steep and rugged topography. The present glaciers may be looked upon as remnants of much more extensive glaciers of the recent past. Thus the high mountains are full of fine examples of alpine glacial erosion.

Landforms of note

Braided stream - NC, SW, and WC
U-valley - C
Hanging-valley falls - WC, NC
U-drainage - SC
Cirques - SE, etc.
Cirque lakes
Alpine glaciers - SE, SW, and EC
Valley-bottom glacial lake - SW, WC
Matterhorn - Mount Loudon WC, Siffleur Mountain NC
Two-step cirques - NW, EC
Wooded valleys, bare mountain, timber-line
Sand - NC
Underground drainage - C
Depression contours - C
Lake with no outlet - C
Cliffs (glacial cut)
Arêtes

Map 29

FERINTOSH, ALBERTA

83A/15 W

1:50,000

The surface of the bedrock in this drift-covered area is argillaceous sandstone and dark carbonaceous shale with minor coal seams of the Edmonton Formation of Upper Cretaceous age. These rocks are exposed only along the side of the valley of Battle River and in the steep-walled gorge of Camrose Creek coming in from the north. Most of the valley bottom of Battle Creek is covered by recent alluvium and silt near the head of Driedmeat Lake. Some outcrops of Tertiary and early Pleistocene alluvium are found on the south side of the main valley along the north end of Driedmeat Lake and as far northwest as Ferlow Junction. A rolling plain of glacial till (ground moraine) covers the southern part of the map-area south of the Twelfth Base Line. Channel deposits cover the surface in the valley of the two lakes in the southwest corner. From Twelfth Base Line northward the surface is covered with lake sediments, mostly sand and silt. North of the Battle Creek valley the surface is again largely rolling moraine with a small patch, however, of lake sediments northwest of the junction of Camrose Creek. The large valley in which Battle River is situated and the valley in the southwestern corner of the map-area both represent meltwater channels, now containing only remnant drainage.

Landforms of note

Misfit river - NW
Sloughs - C
Lake in river valley - EC, SW
Finger delta - EC
V-valley tributary streams - NC
Square road system
Oil wells - NE
Oxbows and cutoffs - NW
Meanders - NC
Pseudo strath - NC, NW
Pseudo-old-age stream - NC, NW
Abandoned river channel - SW
Temporary lakes - SE, SC
Lake with indefinite shore - SC, SW
Cliffed lakeshore - EC
Gravel pits in glacial moraine - SW

References: Surficial geology, Red Deer-Stettler area, Alberta, A.M. Stalker; Geological Survey of Canada, Memoir 306 (1960).
Geological map, Stettler, Alberta, R.L. Rutherford; Geological Survey of Canada, Map 503A (1939).

Map 30

FORT RESOLUTION, NORTHWEST TERRITORIES 85H 1:250,000

The delta of Slave River pushes out into Great Slave Lake, covering the boundary between the Canadian Shield to the east and flat-lying Palaeozoic sedimentary rocks to the west. The delta itself has been built in very recent geological times and is even now in the process of active construction. Two tiny patches of Devonian limestones outcrop at the mouth of Little Buffalo River (SW) and in the neighborhood of Fort Resolution (SW). On the other side of the delta Precambrian granite and granite-gneiss with remnants of highly metamorphosed sedimentary gneisses present a more or less uniform surface for erosion except where through-going faults and major joint patterns are present. Such structures are suggested by the alignment of lakes and streams in several places in this area and by the very straight shoreline from the edge of the delta northeastward along the south side of Hornby Channel and inland through the valley of La Loche River. The two flat areas of Preble Island and the eastern end of the large island just to the north are underlain by Proterozoic conglomerate, sandstone and quartzite. The rest of the islands are underlain by intrusive igneous rocks, with a strong linearity on the north side of the Simpson Islands and Wilson Island probably being due to through-going faults.

Landforms of note

Major river - SW/4
Oxbow and cutoff - SC
Distributaries - SW/4
Delta lakes - C
Yazoo tributaries - SW/4
Contrast delta and shield
Typical Shield country - E/2
Joint pattern in rivers and lakes - SE/4
Rock shore vs. delta shoreline
Numerous islands of submergence - N/2
Drowned topography - N/2
River delta - SW/4
Wave-modified delta - SW/4
Islands in river - SC
Waterfalls - SE
Long narrow lakes - SE, EC
Long narrow islands - NE
Fault-scarp coastline - EC, NE
Meanders - SW/4

Reference: Fort Resolution, Northwest Territories, I. C. Brown;
Geological Survey of Canada, Paper 50-28 (1950).

Map 31

NARCISSE LAKE

85G/10

1:50,000

Gently rolling country filled with lakes and an irregular disrupted drainage pattern typifies enormous areas of the Canadian Shield. Areas such as this one — underlain by nearly continuous granite with small masses of pegmatite, diabase and schists — present a more or less uniform surface to erosion except where through-going faults and large-scale joint patterns are present. Examination of this map will show certain alignments of lakes and streams such as the one that crosses from just east of centre on the lower margin northwestward.

Landforms of note

Typical Shield topography

Lakes of various shapes

Disrupted drainage

Alignment of lakes and streams along structures

Swamps and bogs

Reference: Prosperous Lake, District of Mackenzie, Northwest Territories, A.W. Jolliffe; Geological Survey of Canada, Map 868A (1946).

Map 32

BUTE INLET, BRITISH COLUMBIA

92K

1:250,000

Vancouver Island is separated from the mainland of British Columbia by this island-studded series of channels and inlets about half-way along its length. The rocks of the mainland and most of the island are part of a huge igneous mass that extends from the United States border northward into Alaska. In it the principal rock types are granite and granodiorite. The flat southern peninsula of Quadra Island and most of that part of Vancouver Island on this map-sheet consists of Mesozoic sedimentary rocks intruded by small offshoots of the main igneous mass to the east. The area was subjected to prolonged river erosion and then heavily glaciated so that the channels and inlets are essentially glaciated river valleys now drowned beneath the sea.

Landforms of note

Drowned shoreline
Island swarms
Delta at estuary head - EC, NC
Alpine glaciers - NE/4
Fjords
U-valleys
Tarns - N/2
Cirques - N/2
River-channel islands - NE, NC
Meandering stream - EC
Dendritic drainage
High mountains
Valley-bottom lakes
Grainless topography - N/2
6,000 feet relief

Reference: Geological map of British Columbia; Geological Survey of Canada, Map 932A (1948).

Map 33

ANAHIM LAKE, BRITISH COLUMBIA

93C

1:250,000

A variety of intrusive rocks related to the Coast Range batholith occupies the rugged country in the southwest corner of the map-area. Two large volcanoes are seen in Rainbow Range and Ilgachuz Range, with a more deeply dissected mass of volcanic rocks in Itcha Range to the east. An isolated volcanic neck sticks up as Anahim Peak (NW) just east of Rainbow Range. Most of the rest of the area is underlain by lava flows and related volcanic rocks of Cretaceous and Tertiary age. The very flat area surrounding Anahim Lake (a little to the left of the centre) is surfaced with till, gravel, silt, and clay of Pleistocene age.

Landforms of note

Eroded volcanoes - NW
Volcanic neck - NW
Differential erosion in complex rocks - SW
River-valley lakes - SW
Lake in till plains - C, WC
Finger lakes - SW
Oxbows and cutoffs - NW
Meandering stream - NW, EC
Alpine glaciers - SW
Braided stream - SW
U-valley - SW
Finger delta - (Lonesome Lake) SW
Swamps - C
Alkali flat - EC
Radial drainage - NW (Rainbow and Ilgachuz), SW Panorama Ridge
Temporary lake - C

Reference: Anahim Lake, British Columbia, H.W. Tipper; Geological Survey of Canada, Map 10-1957 (1954).

Map 34

TETSA RIVER, BRITISH COLUMBIA

94K/9 E

1:50,000

This part of northern British Columbia includes some of the plains region in the northeast, underlain by gently undulating Cretaceous shales, and some of the Foothills belt in the southwest, consisting of low rolling hills and open valleys, steepening somewhat in the southwest corner. The south-southeast-trending ridge beginning just south of Tetsa River (between the "E" and "A" of "PEACE" and extending toward "ER" of "RIVER") marks a double anticline with cores of the Middle Triassic Liard Formation, with the valleys on both sides of the ridge being Cretaceous shale. Similarly the ridge extending southeastward from the "P" of "PEACE" and between the "I" and the "V" of "RIVER" is the trace of the axis of another anticline similarly exposing the older Liard Formation along the crest between flanks developed on Cretaceous shales. Lower and middle Triassic formations are exposed where the rivers cut across the anticlinal ridges in deep canyons such as the unnamed stream just below the large "river", some 3 miles north of Chischa River. The ridges in the southwest, including the high bald hill at 5,811 feet above sea-level, also mark the axial regions of anticlinal folds. These differ from the others however, in that they are more complicated, with synclinal axes immediately adjacent in some cases and more of the older rocks exposed along their cores because of the sharper folding. Drainage in this valley-and-ridge type of topography follows a modified trellis pattern with some indication in the wind gaps and water gaps of an early antecedent stream system or possibly superimposed stream system. Summit levels in these ridges rise gradually to the southwest.

Landforms of note

Braided rivers - (Chischa) S, (Tetsa) N
Water gaps - WC, SC, and EC
Antecedent or superposed streams - (Chischa and Tetsa)
Modified trellis pattern
Subsequent streams
Parallel mountains - C, SE, and NE
Swamp - NE
Anticlinal ridges - C, SE, and NE
Synclinal valleys - C, SE
Ridges of complicated structure - SW
Timber-line - SW
Wind gap - C

Reference: Tetsa River, British Columbia, B.R. Pelletier; Geological Survey of Canada, Map 29-1959 (1958).

Map 35

LORETTA CANYON, NORTHWEST TERRITORIES 96E/4 1:50,000

The major escarpment running northwest-southeast across the lower part of the map-area marks the edge of folded and faulted lower Palaeozoic rocks in the Carcajou Mountains on the one hand, and more gently dipping, easily eroded Cretaceous sedimentary rocks to the northeast. Mackenzie River, to which the Carcajou River is tributary, lies some 10 miles to the northeast of the northeast corner of this map-area. The map-area itself is about half way from the outlet of Great Slave Lake and the mouth of the Mackenzie at the Arctic Ocean. The spectacular alluvial fans at the foot of the mountains occur in a series of intermittent valleys along the mountain front. In these valleys, reversals of drainage seem certainly to have taken place. This is especially noticeable where the valley meets the western margin of the map-area.

Landforms of note

Escarpment - S/2

Deep youthful canyons - SC, NE

Alluvial fans - WC, SE

Braided streams - SE, C, and SE

Glacial lakes

Islands and bars in river channel - (Imperial and Carcajou Rivers)

Sand - EC

Strath - NE

Two-stage valley - S/2

Reference: Lower Mackenzie River area (sheet 1), Northwest Territories and Yukon, G.S. Hume; Geological Survey of Canada, Map 1032A (1953).

Map 36

LOWER POST, BRITISH COLUMBIA

104P/16 E

1:50,000

Liard River is one of the major tributaries of the Mackenzie River, draining a very large area in the southern Yukon. A great part of its valley is floored with thick Tertiary and recent gravels, overlying, in this area, folded and faulted Palaeozoic sedimentary rocks. The belt of depression contours in the northern part of the map-area indicates a belt of highly soluble rocks.

Landforms of note

Sinks - N/3

Sink lakes - N/3

Outcrop-soluble rock - N/3

Karst topography - N/3

Silt-laden river

Meander - EC

Distributaries

Cut banks - SE

Lakes - S/2

Strath - WC, C, and EC

River-channel deposits - WC, C, and EC

V-shaped valley - SE

Reference: Geological map of British Columbia; Geological Survey of Canada, Map 932A (1948).

Map 37

SANS SAULT RAPIDS, NORTHWEST TERRITORIES 106H/10 1:50,000

Mackenzie River encounters a series of folded rock ridges just above Fort Good Hope, approximately two thirds of the way from its beginning in Great Slave Lake, to its mouth at the Arctic Ocean. One of these is East Mountain, made of rocks of the Ramparts Formation, limestone and calcareous shale, with a narrow core of Silurian or Devonian Bear Rock Formation, largely dolomite. The surrounding plain is underlain by Cretaceous sandstone and shale with one other small patch of the Ramparts Formation sticking up as West Mountain (WC). The westward extension of the resistant rocks of East Mountain accounts for the large rapids that give the map-sheet its name.

Landforms of note

Old-age-type stream - (Carcajou River)
Oxbows and cutoffs - SE, C, NW, and SC
Meanders (small) - SC
Meanders (large) - SE, C
River-channel islands - EC, NC
River-island growth lines - NC, C, and EC
Lakes in river-channel islands
Deep V-tributaries - WC
Rock barrier in river - NC
Erosional remnant - NC, NE, and WC
Monadnock - WC, NE
Rapids - NC
Glacial lakes

Reference: Lower Mackenzie River area (sheet 2), Northwest Territories, G.S. Hume; Geological Survey of Canada, Map 1033A (1953).

Map 38

MACKENZIE RIVER DELTA AREA

107C/2 W

1:50,000

Lake-strewn flat areas like this lie just west of the main delta region of Mackenzie River. This may best be described as a pitted morainal plain of very shallow relief. Underneath are nearly flat, soft, Mesozoic sedimentary rocks.

Landforms of note

Lake-pitted plain

Non-intergraded drainage

Low relief

Army grid

Map 39

MOUNT ST. ELIAS, CANADA-UNITED STATES

115B and 115C 1:250,000

The highest mountain area in North America lies along the Yukon-Alaska boundary and includes Mount Logan, at 19,350 feet, the highest point in Canada (WC). Superb alpine glaciers lead down the principal valleys from the snowfields on the heights, giving way to debris-strewn valley flats and choked river channels. The NE/4 is underlain by a complex of sedimentary rocks from Devonian to Recent age, intruded by Cretaceous and later granite with patches of Tertiary volcanic rocks in the region of Kaskawulsh Mountain and Felsite Creek (NE).

Landforms of note

Ice-cap - WC (Seward Glacier)

Valley glaciers

Moraines in valleys - E/2

Meltwater streams - NE

Braided streams - NE

Medial moraine - (Kaskawulsh Glacier) NE/4, (Malaspina Glacier) SW

Mount Logan - (highest point in Canada) WC

Two-way drainage - (Kaskawulsh Glacier) NE

Alluvial fan - (Disappointment River) NE

Piedmont Glacier - SW (Malaspina)

Debris-covered glacier - SW (Malaspina)

Lateral moraine - (Kaskawulsh) NE/4

Nunatacks - C

Berging glacier - SC

Ice contours

Reference: Kaskawulsh, Yukon Territory, J.O. Wheeler; Geological Survey of Canada, Map 1134A (1963).

Map 40

KLUANE LAKE, YUKON TERRITORY 115G and 115F 1:250,000

A complex of older metamorphic rocks intruded by masses of granodiorite and granite of Mesozoic age occupies all of the map-area northwest of the Alaska Highway, which is placed generally along a valley floor of recent sands and gravels. Southwest of the highway the higher country is underlain by belts of Palaeozoic and Mesozoic sedimentary and volcanic rocks intruded here and there by masses of Mesozoic granitic rocks. One of these intrusive masses forms that part of the hill system under the word "Kluane" in the northwest corner, southwest of Hazel Creek and Edith Creek valleys. The hills northeast of these valleys are underlain by volcanic rocks with some sedimentary members. The area features superb displays of glaciers and their moraines in the southwestern half, and unusual drainage features in the northeast.

Landforms of note

Alpine glaciers - SW/4
Terminal moraine - WC
Medial moraine - WC
Lateral moraine - WC, SC
Braided streams - NW, C
Finger lakes - NC, EC
Rearranged drainage patterns - NE/4
Stream capture - NE/4
Spit - C, SW
Sand beaches - C
Islands in river - NC
Islands in lake - SE
Valley-bottom lakes - NC, EC
Pitted outwash lakes - NW
Nunatack - SW
Alluvial fan - SC (Spring Creek) (Steele Creek)
Subsequent streams - (Hazel Creek) (Edith Creek) NW
River meanders - NC

References: Geological map of Yukon Territory; Geological Survey of Canada, Map 1048A (1957).
Northwest Shakwak Valley, Yukon Territory, H.S.
Bostock; Geological Survey of Canada, Map 1012A (1951).

Map 41

ROBESON CHANNEL

NTS No. 120 1:1,000,000

Ellesmere Island on the western edge of this map-area includes some spectacular rugged country, with glaciers, deep fiords and the northernmost point in Canada at Cape Columbia. East of Kennedy Channel the map shows a part of northern Greenland with a rocky rim around the Greenland Ice-cap.

The part of Ellesmere Island on this map is underlain principally by lower Palaeozoic sedimentary rocks with patches here and there of rocks as young as late Mesozoic and Tertiary. The near parts of Greenland appear to belong to the same general sequence of rocks although separated from Ellesmere Island apparently by a major through-going fault that accounts for the straight-line coastal features there.

Landforms of note

Greenland Ice-cap - SE/4

Valley tongues - SW (Peterman Glacier)

Berging glaciers - SW, Peterman C (Ryder)

Fiords

Remnant ice-caps - WC

Nunatacks - C, SC

Ice-dammed lakes - (Romer) SW, C, and EC

Fault-controlled coastline - (Kennedy Channel)

Delta fan - (south side Daly Promontory) SW

Sea cliffs - SW, NW

Braided streams - SW, NW

Estuary deltas - SW

References: Geological reconnaissance, north coast of Ellesmere Island, Arctic Archipelago, Northwest Territories, R.J. Blackadar; Geological Survey of Canada, Paper 53-10 (1954).
Northeastern Ellesmere Island, District of Franklin, R.L. Christie; Geological Survey of Canada, Paper 62-10 (1962).

Map 42

MOUNT REVELSTOKE NATIONAL PARK

The Selkirk Mountains are developed on a series of ancient sedimentary rocks, now highly metamorphosed and intruded by large masses of acidic igneous rocks. The rocks are almost homogeneous in their resistance to erosion so that there is no particular "grain" to the mountains. Deep erosion by running water has produced a more or less dendritic pattern of valleys and ridges which have been modified by glaciation. In the western part of the area the straight-line valley of Columbia River separates the Selkirk Mountains from the Monashee Mountains to the west. This map is a beautiful example of shaded reliefs.

Landforms of note

Youthful rivers and streams
Alpine glacier remnants
Lakes, glacial
Divides (boundaries) - SE/4
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Arêtes
Nunatack
Timber-line
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