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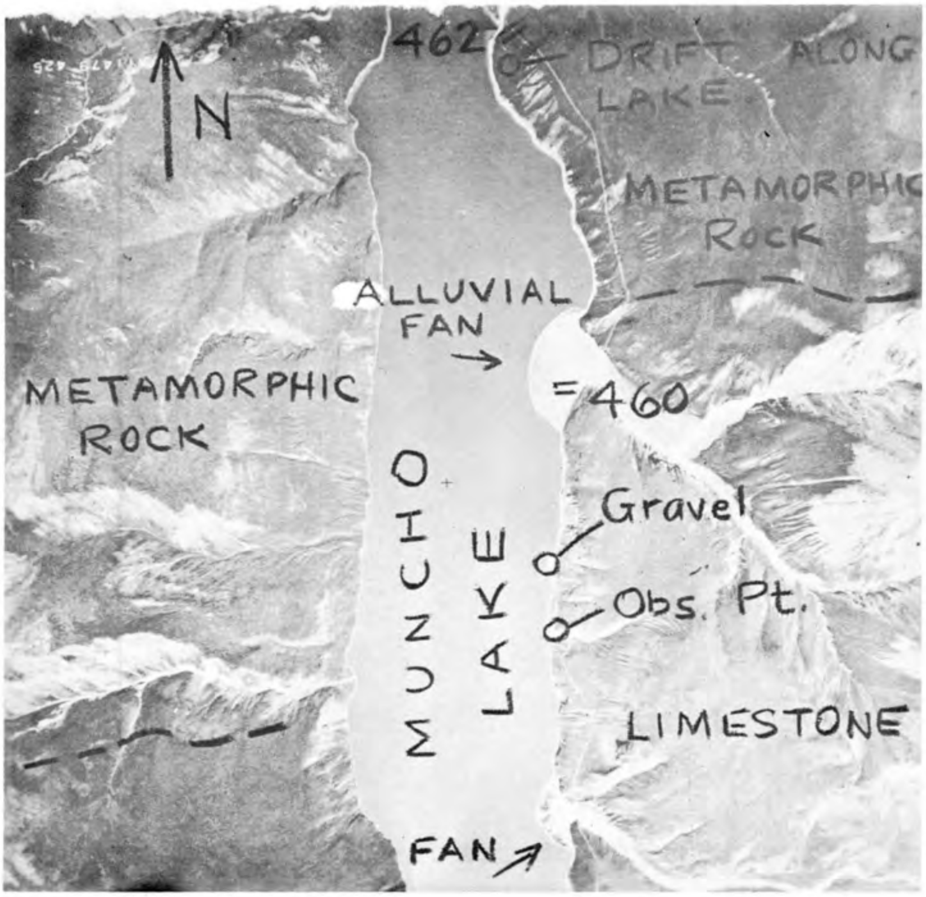
Fig. 4. Vertical airphoto of Sikanni Chief Airstrip.

Fig. 5. Hoodoos at Mile 394.

Fig. 6. Alluvial fan at edge of Toad River at Mile 436.



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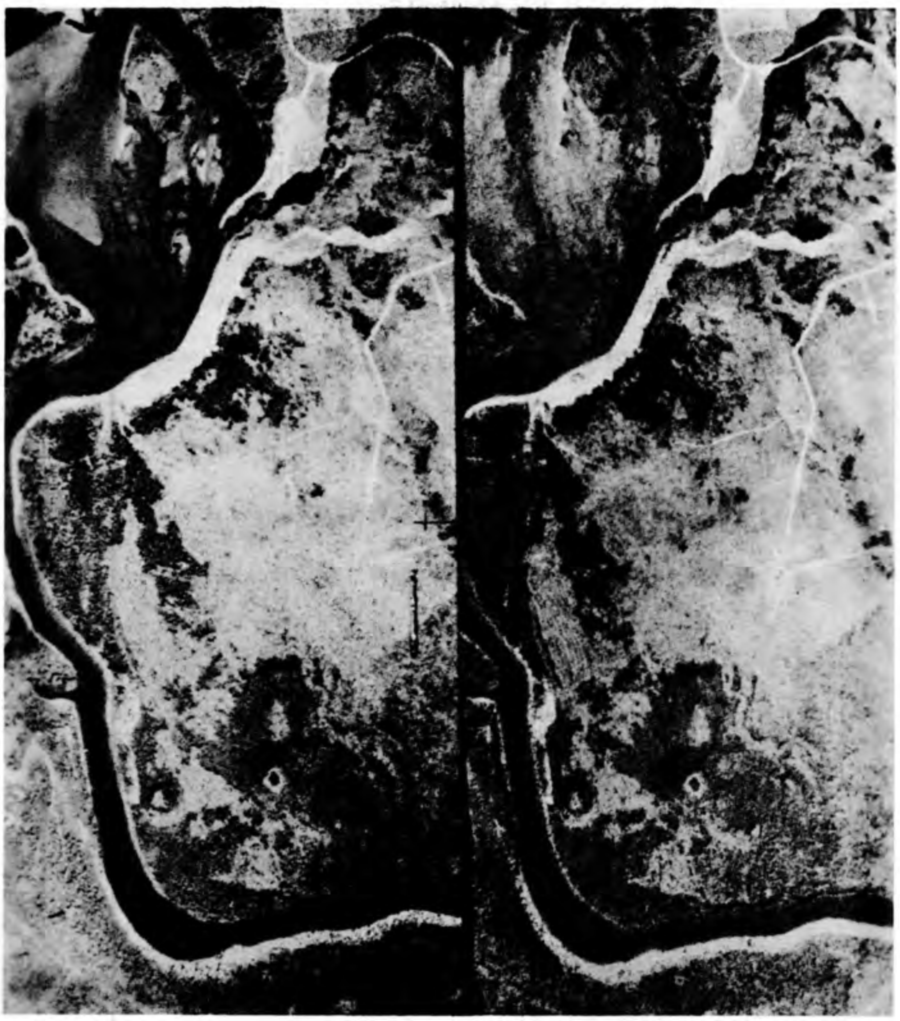

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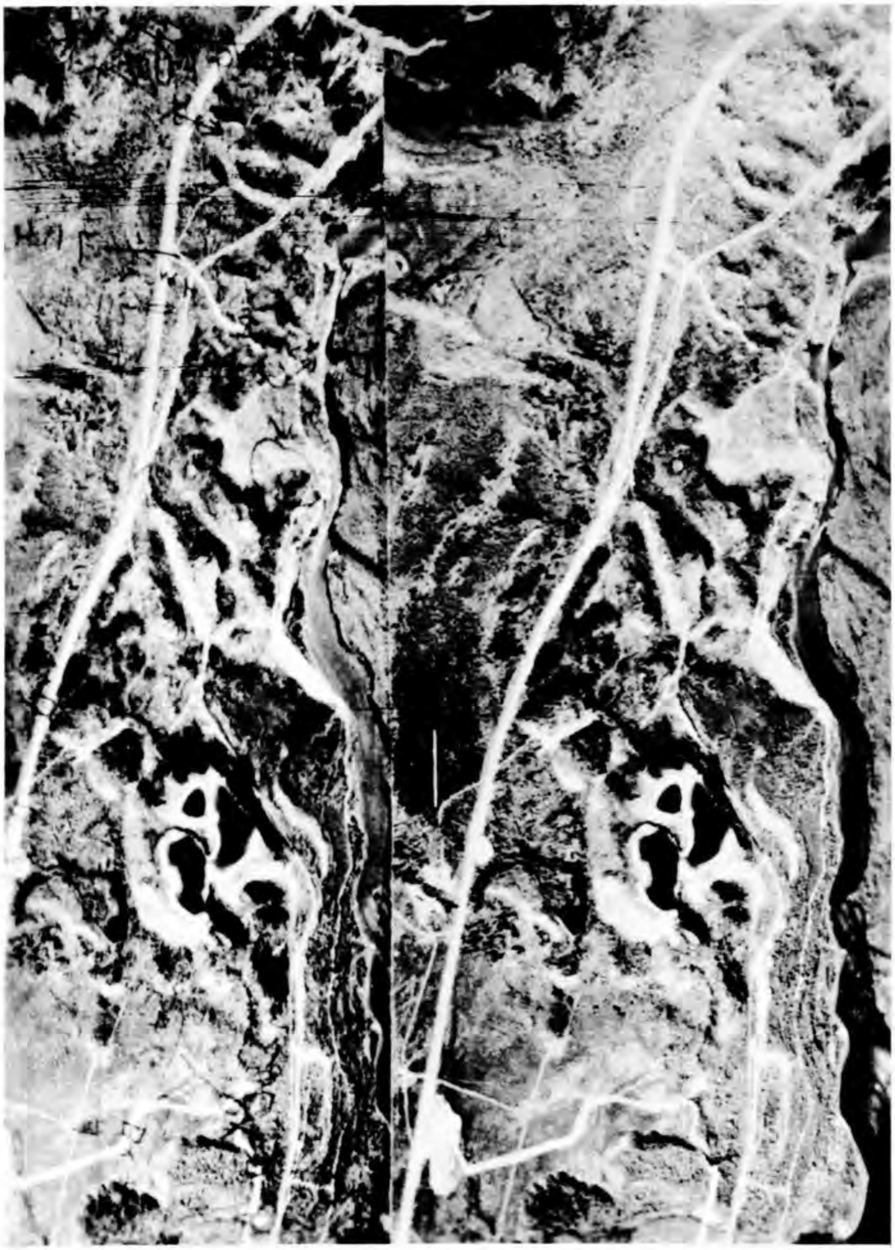

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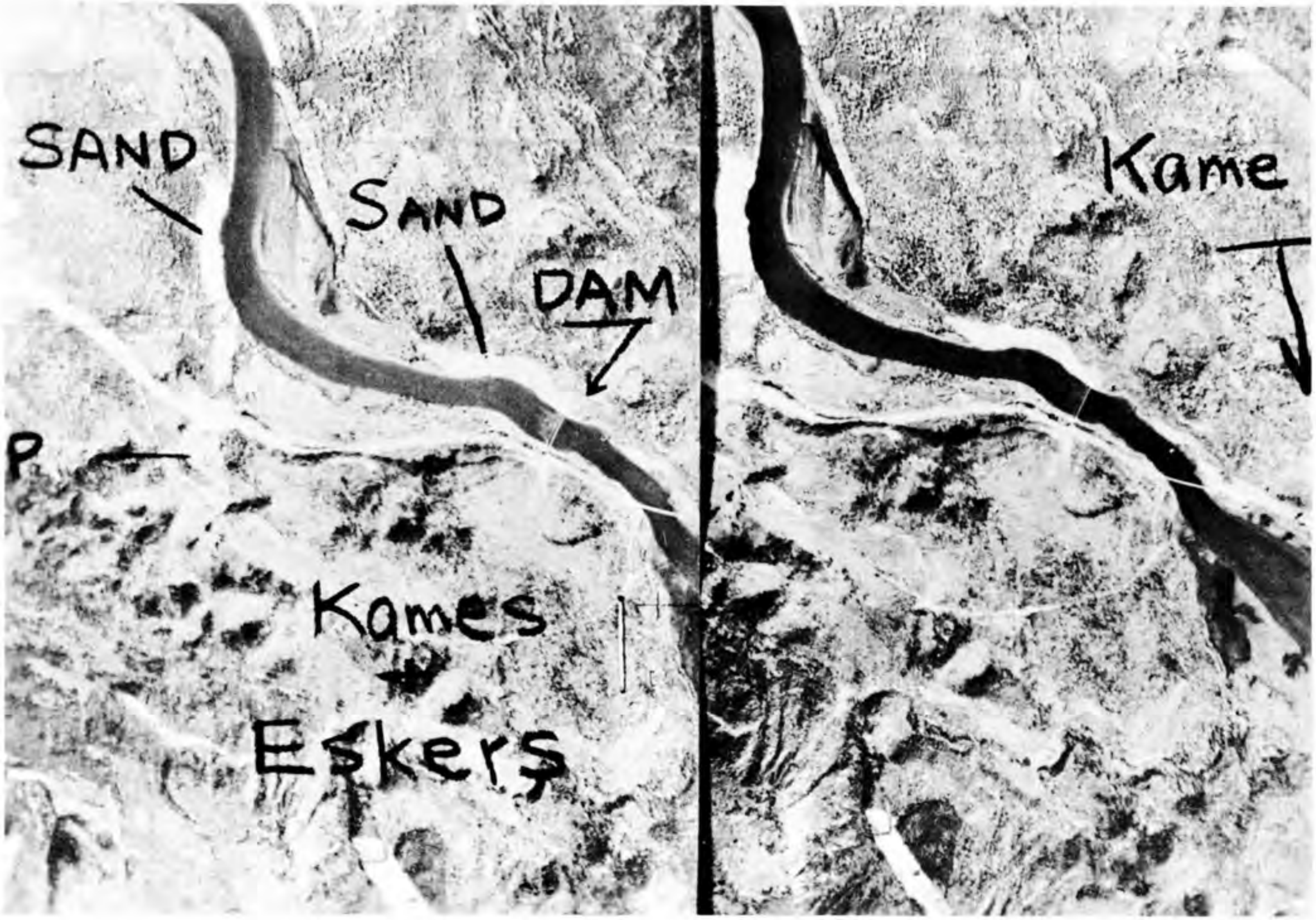

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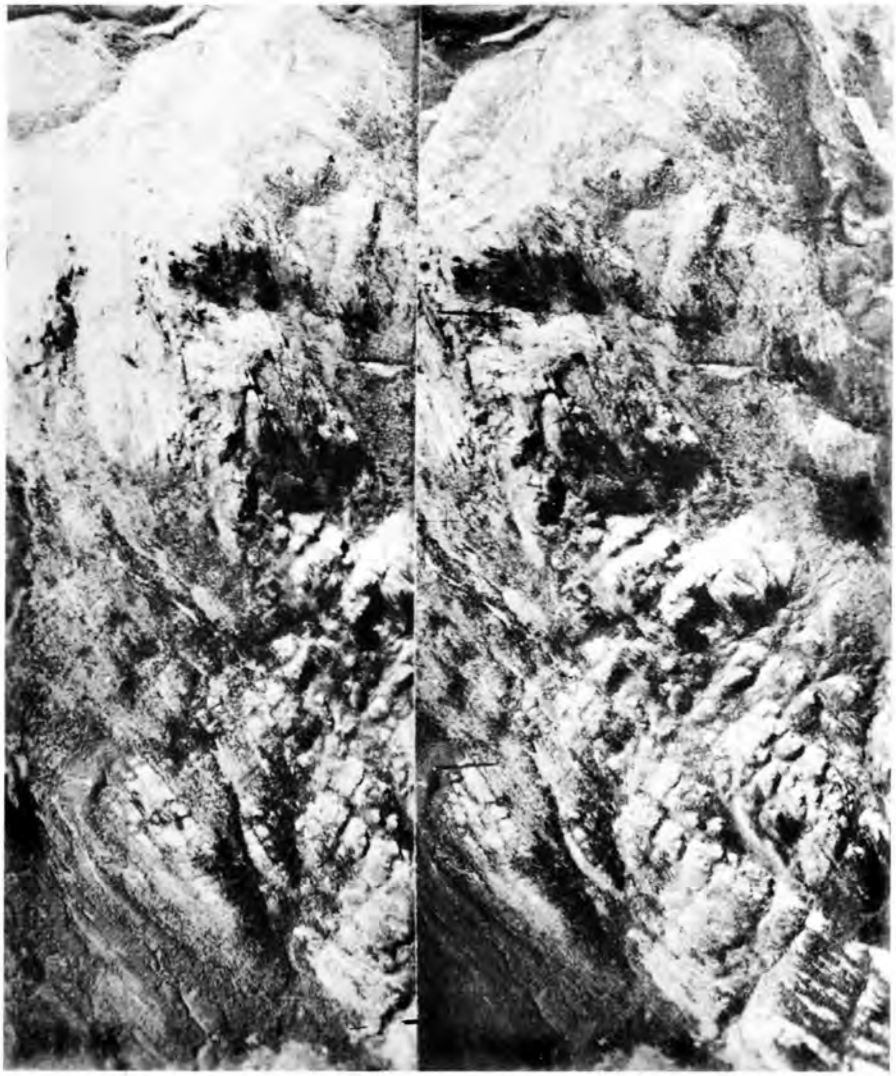

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Fig. 23. Exposed banks along Mackenzie River.

a. Great Bear Rock north of mouth of Great Bear River on Mackenzie River.

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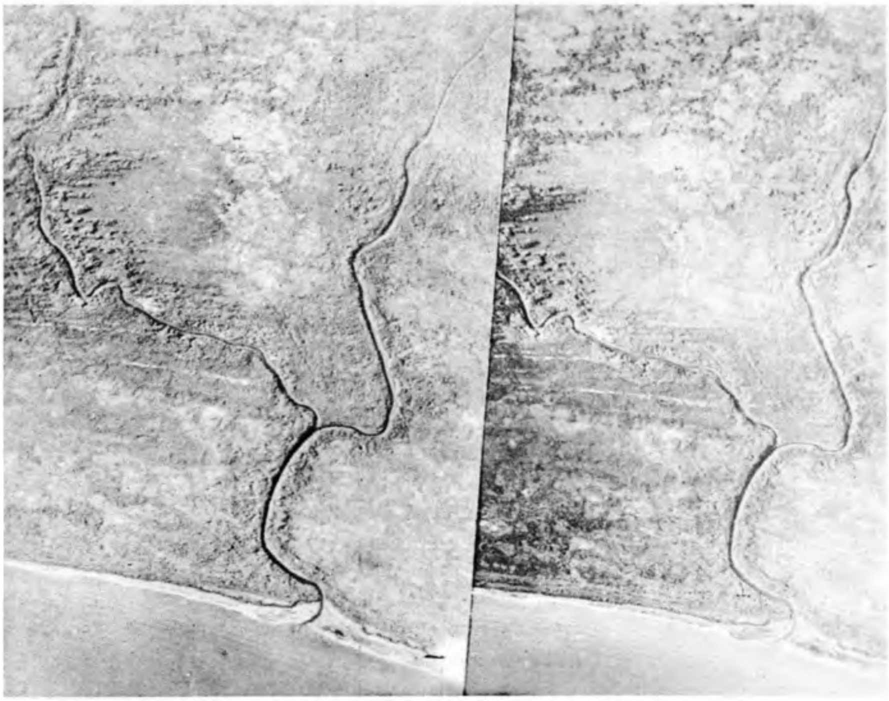
c. Landslide in drift deposits near Old Fort Point. Notice flat to gently rolling terrain.

d. "Roche-que-trempe-à-l'eau" 5 mi north of Wrigley.

Fig. 24. Topography and terrain views along Mackenzie River.



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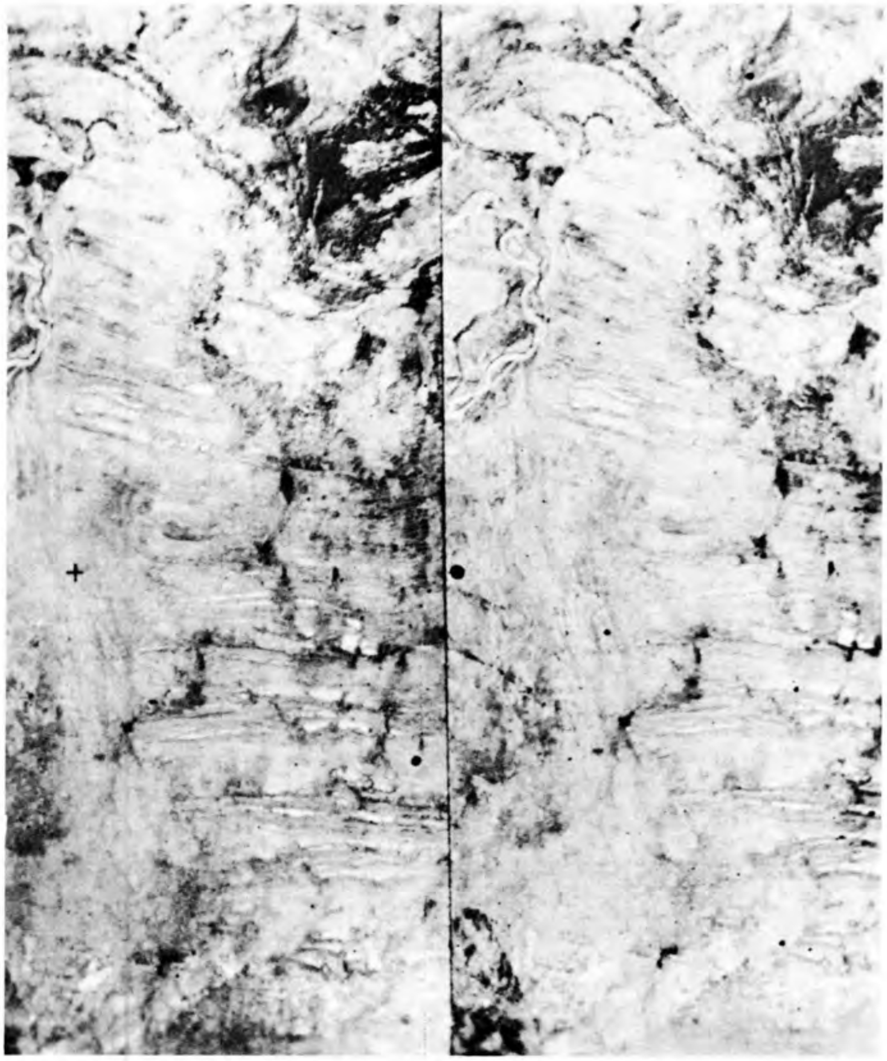

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Fig. 29. Oblique views of polygons and beach ridges of Great Slave Lake west of Hay River.

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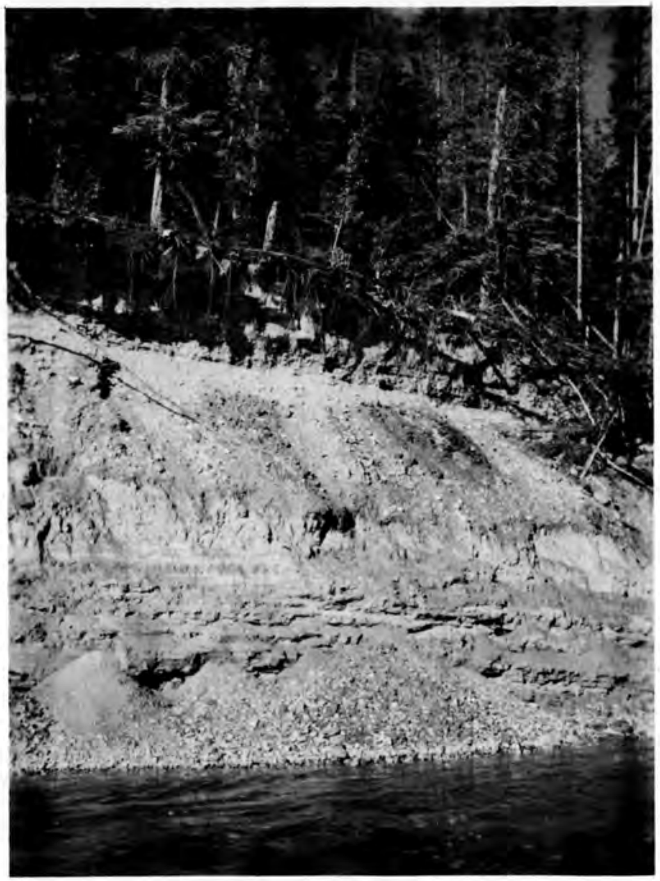
Fig. 31. Dwarf birch bog along Hay-Grimshaw Highway south of Hay River.

Fig. 32. Cutbank of the Hay River.

a. Lake-bed clays. Note gravel layer at top of section.



b. Stratified sands and gravels on lake-bed clays.

Fig. 33. Profile views about 3 mi up the Trout River from the Mackenzie River. The Trout empties into the Mackenzie downstream from Fort Providence.

Fig. 34. Beach ridges of Great Slave Lake superimposed on limestone. Louisa Falls about 35 mi south of Hay River. This falls marks the scarp boundary between the Peace River Plains and the Mackenzie Lowland.

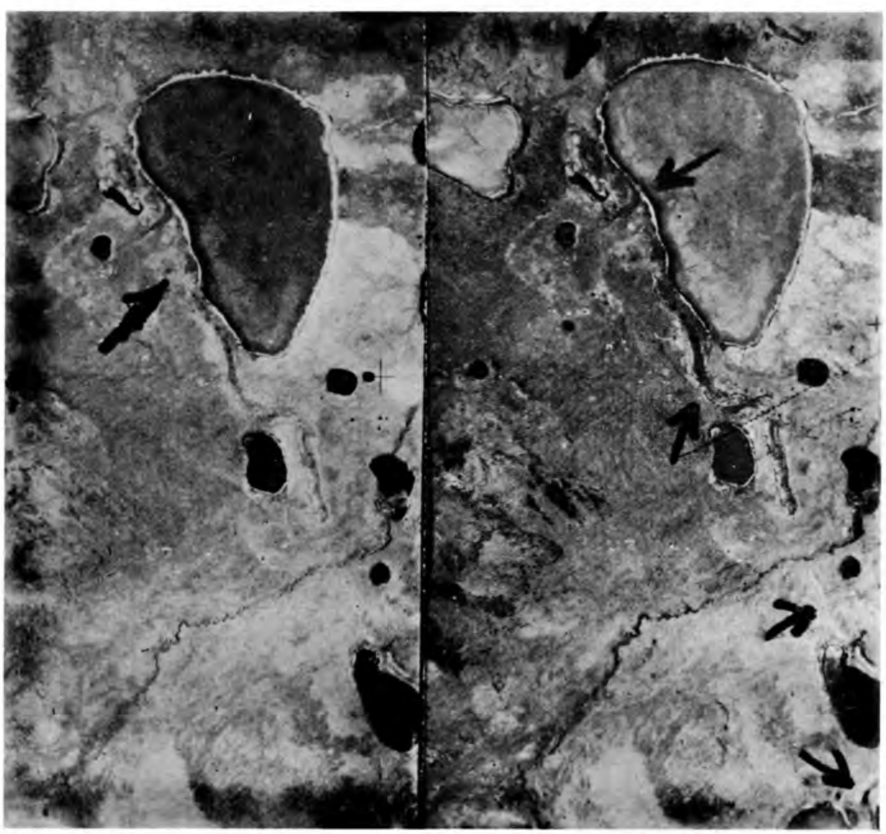


Fig. 35. Stereopair of esker ridge north of the Ontaratue River, 66°40' N, 130°0' W.

Fig. 36. Stereopair of thermokarst lakes in upland. Notice low topographic break indicated by arrows. Ramparts River alluvium does not have this type of lake.

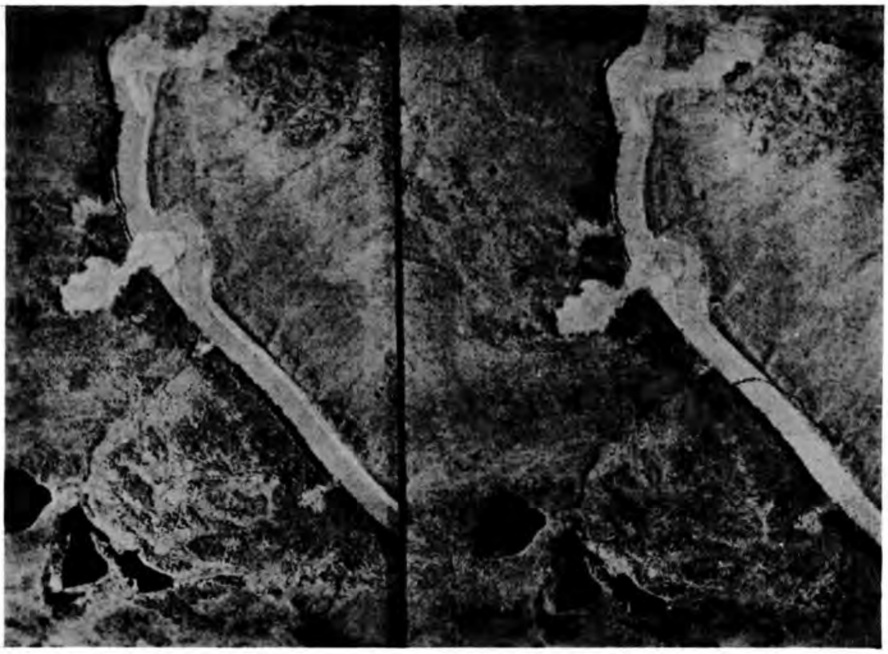


Fig. 37. Stereopair of landslides on Hume River in drift deposits. Area has several thermokarst lakes. Area also has been burned.

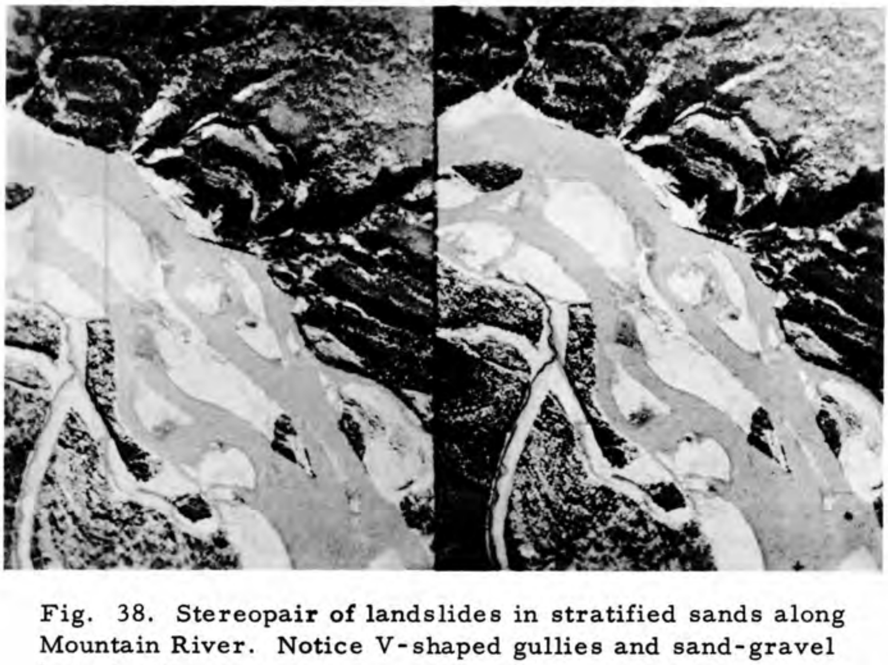


Fig. 38. Stereopair of landslides in stratified sands along Mountain River. Notice V-shaped gullies and sand-gravel bars in stream.

a. Small landslide with thick overhang of peat.

b. Permafrost exposure. Notice very thick peat layer.

Fig. 39. Permafrost exposed in cutbank landslide of Hume River.

Fig. 40. Low-altitude oblique view of sand ridge near portage at St. Charles Rapids on Great Bear River.

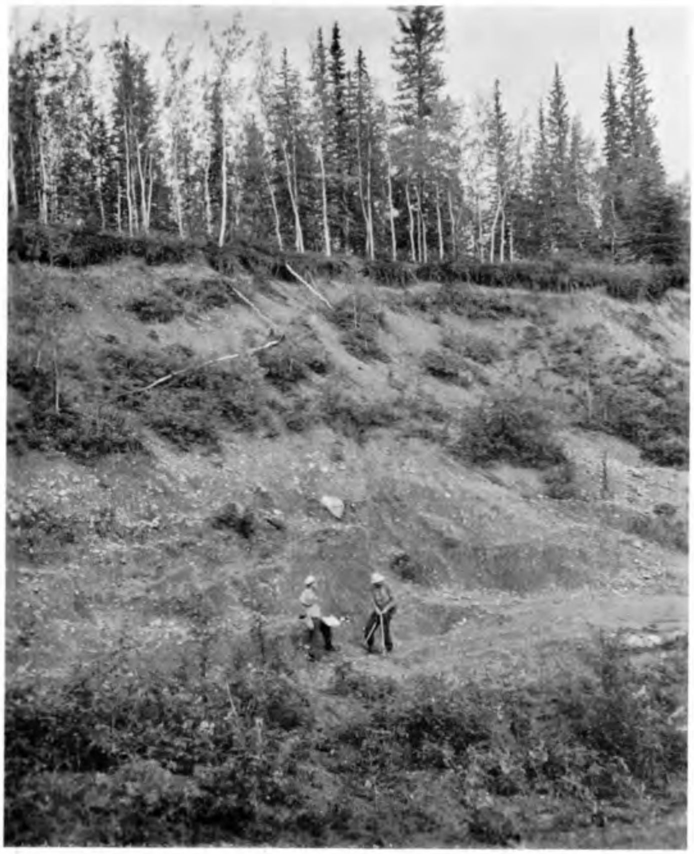


Fig. 41. Ground view of exposure shown in fig. 40.

Fig. 42. Gravel on shale exposed at portage road near St. Charles Rapids.

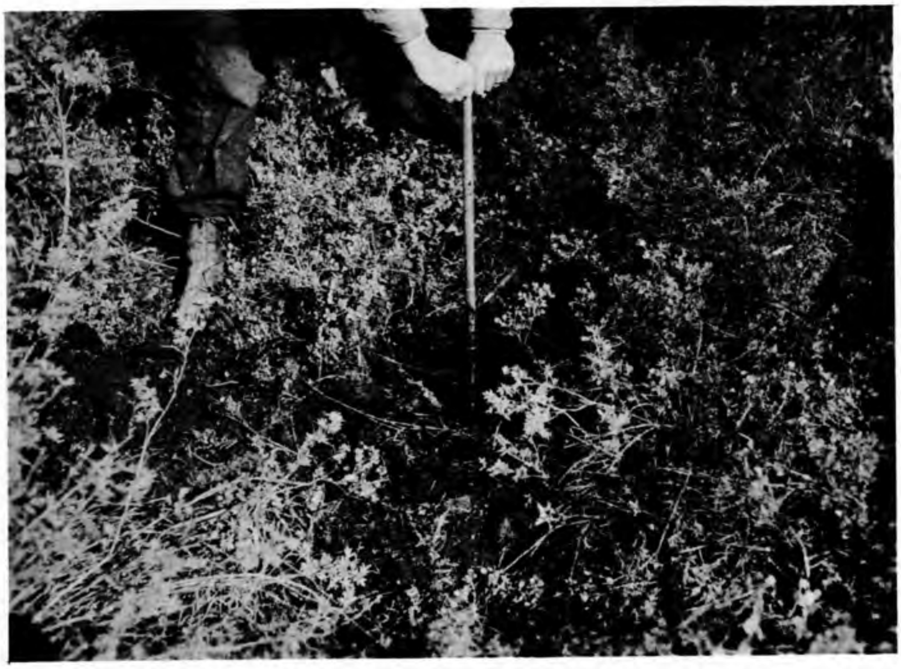


Fig. 43. Soil boring being made near portage road at St. Charles Rapids on Great Bear River.

Fig. 44. Outwash terrace with Wrigley runway in foreground. Background is a low slack-water area between terrace and Franklin Mountains.

Fig. 45. Exposed face of gravel at Wrigley airfield.

Fig. 46. Spruce vegetation in burned areas, Wrigley survey trail line. This depression area has a higher moisture content.

Fig. 47. Second growth vegetation in burned-over area along Wrigley survey trail.

Fig. 48. Leaning trees along survey trail produced by removing vegetation and subsequent thawing; Wrigley.

Fig. 49. Two terrace levels of Mountain River about one mile from Mackenzie River; 30-ft terrace is on left, 100-ft terrace on right.

Fig. 50. Dense vegetation on 100-ft granular terrace shown in fig. 51 on the right.

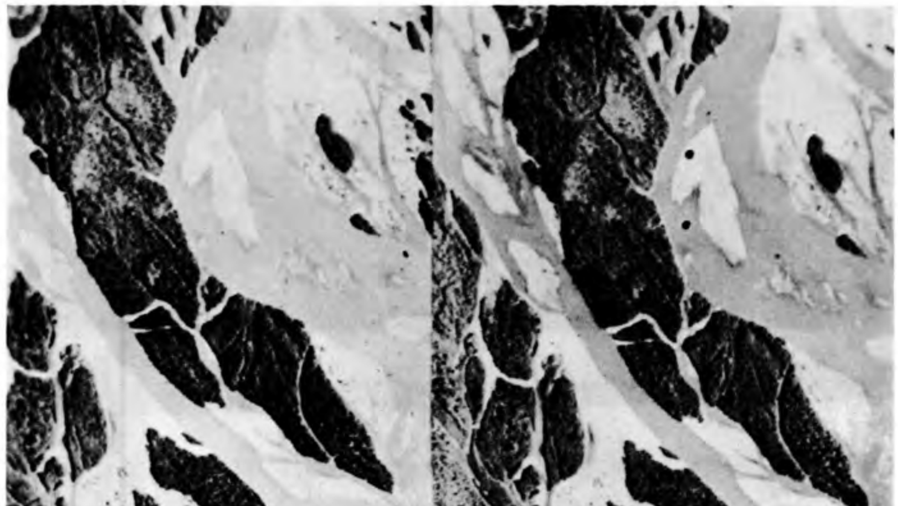
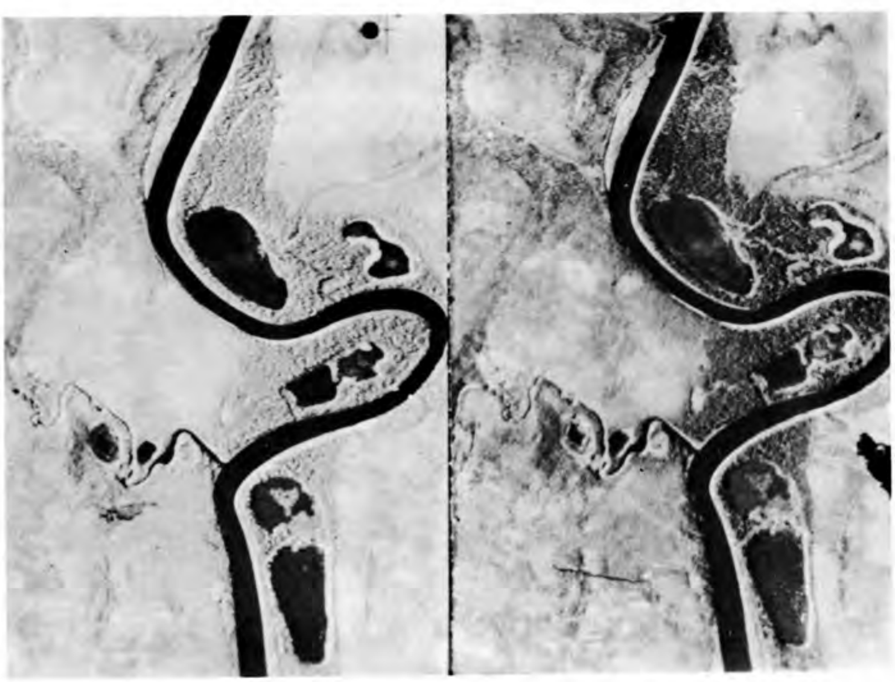


Fig. 51. Stereopair of braided stream channel of Keele River.

a. Elevated frost hummock with depressed rim on the upland about 1-1/2 mi up the Ontaratue River



b. Stereopair of Ontaratue River in area where a. was taken.

Fig. 52. Area investigated along Ontaratue River.

a. Frozen ground and ice layer; knife marks frozen soil.

b. Figs. 52a and 53a were taken at site which is about 100 ft from this gully. Notice alluvial materials overlying shales.

Fig. 53. Views of area investigated in hummocky topography on Ontaratue River.

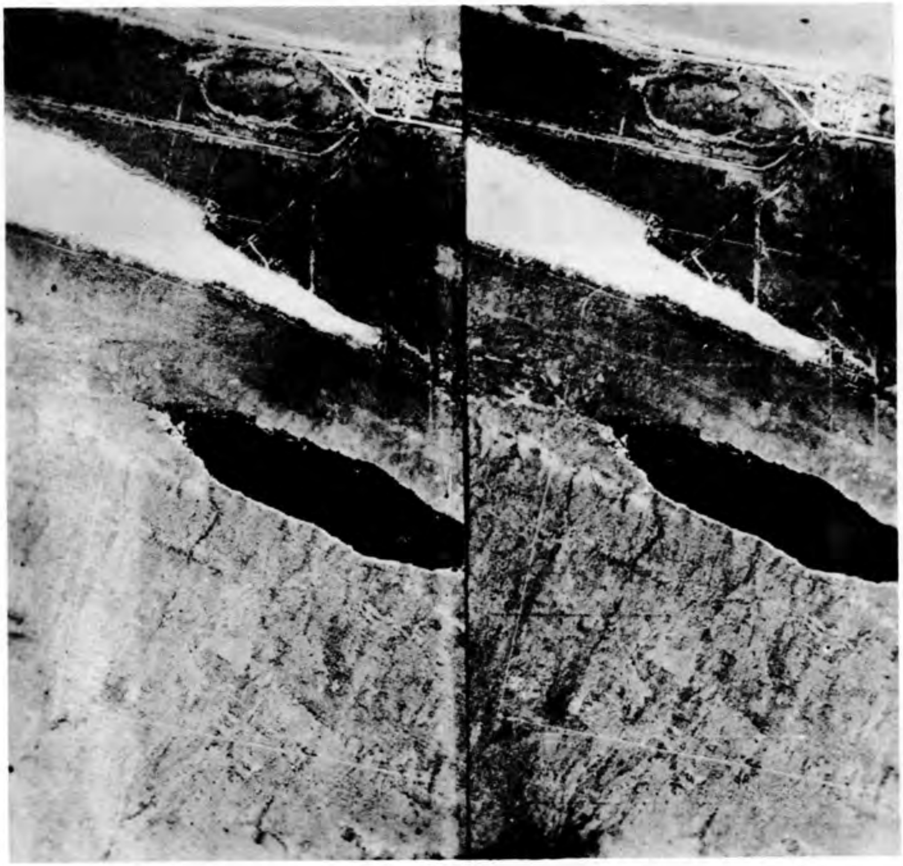


Fig. 54. Stereopair of granular terrace on which airfield is constructed at Norman Wells. Terrace may be outwash remnant.

Fig. 55. Norman Wells runway on granular terrace with Franklin Mountains in background. Depressed area beyond terrace is old channel.

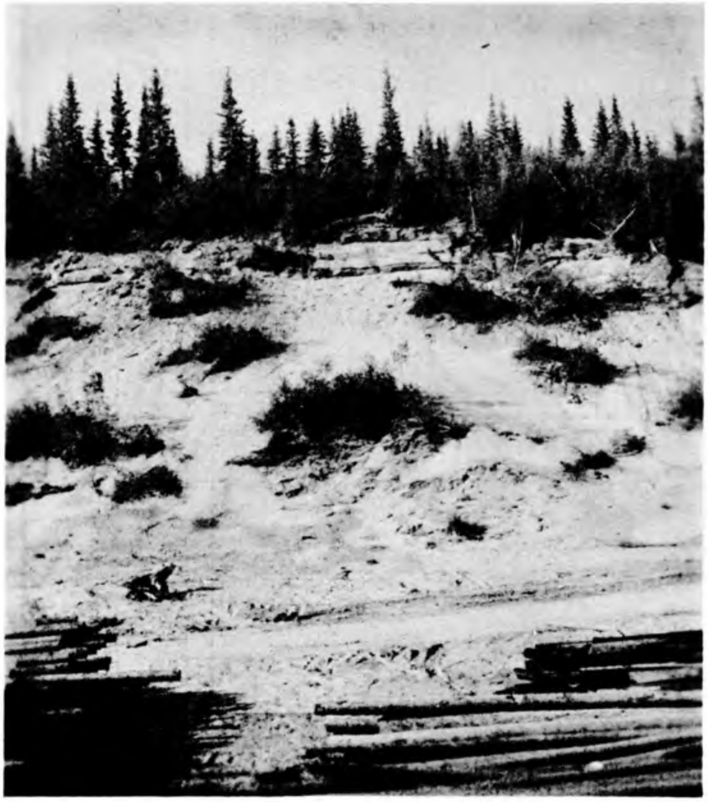


Fig. 56. West bank of Mackenzie River at Norman Wells showing stratified sands and gravels. The Canol Road landing on Mackenzie River is located at this point.

Fig. 57. Settlement of boiler plant at Norman Wells, built on short piles embedded in permafrost. New building being constructed at rear is supported on 30-ft piles that extend to shale bedrock.

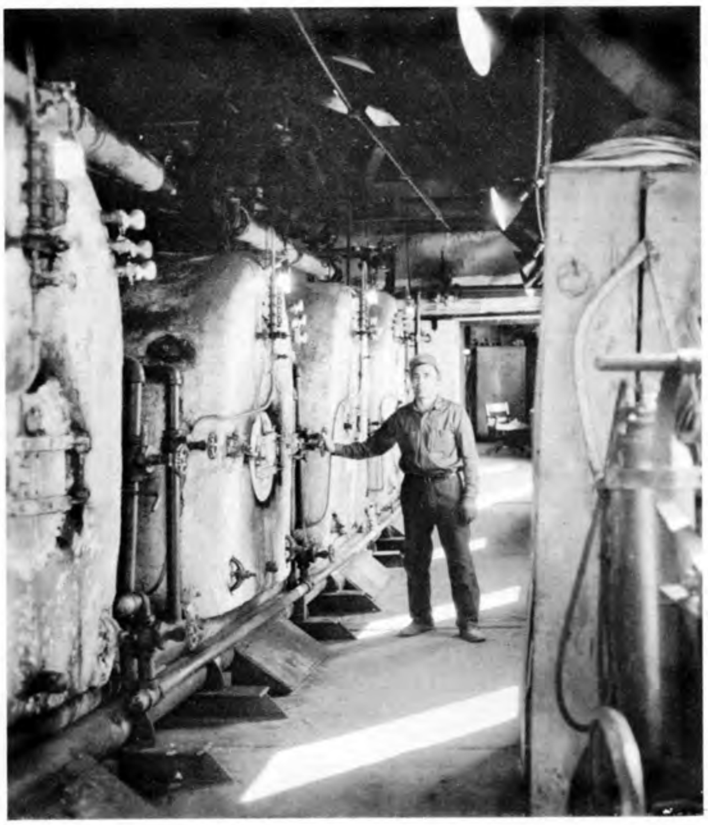


Fig. 58. Interior view of boiler plant seen in fig. 57.

Fig. 59. Building construction at Norman Wells. Subfloor and floor are fully insulated.

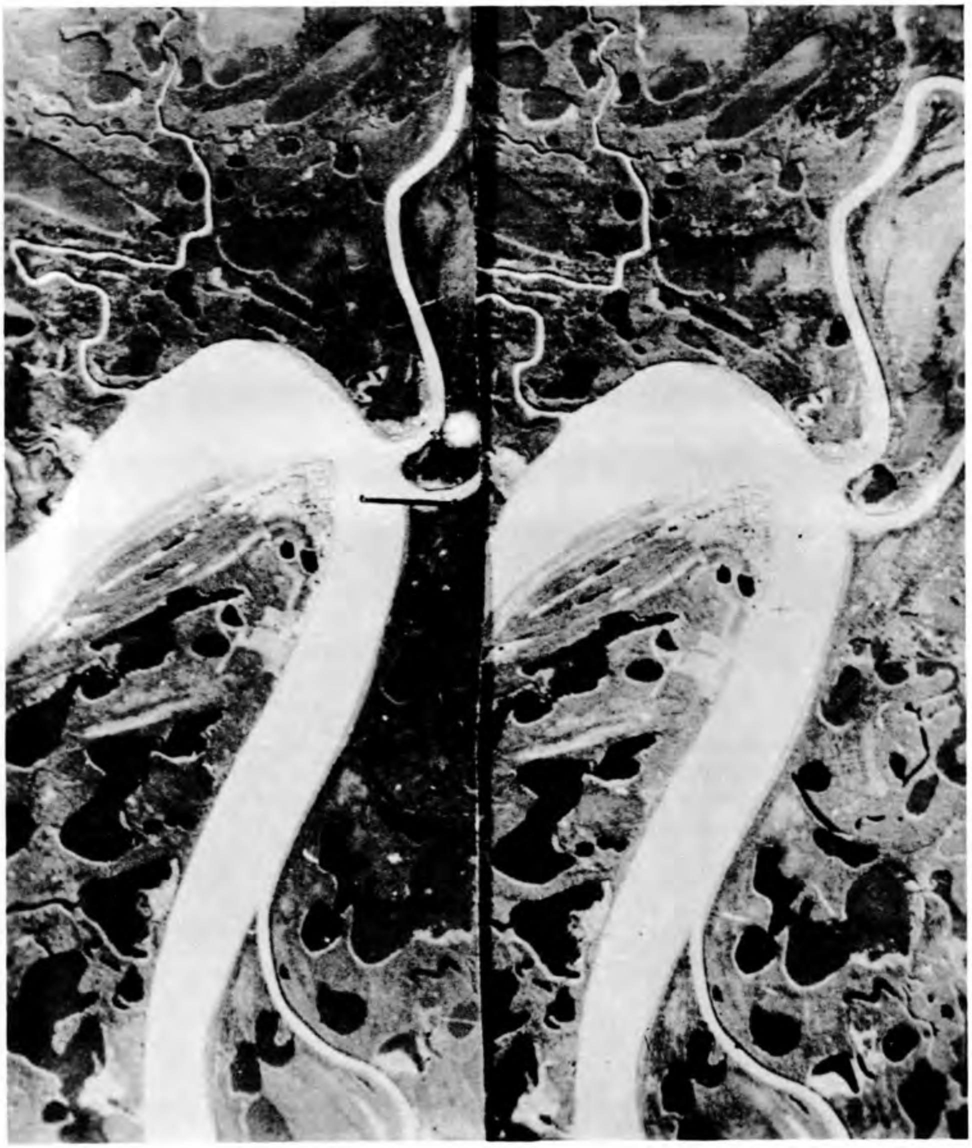


Fig. 60. Stereopair of the Mackenzie Delta at Aklavik.

Fig. 61. Sand ridges of coastal regions of Mackenzie Lowland surrounded by raised-center polygonal forms.

Fig. 62. Raised-center polygons on terrace near Caribou Hills on Coastal Plain

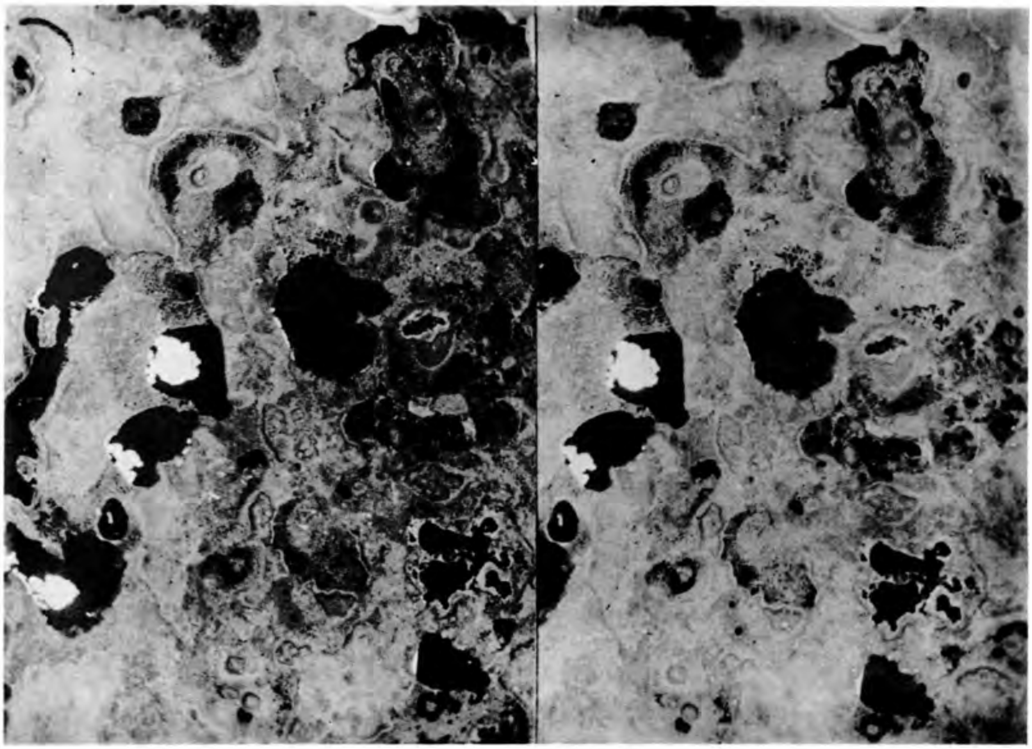


Fig. 63. Stereopair of Coastal Plain near Port Brabant showing several pingos surrounded by lakes.

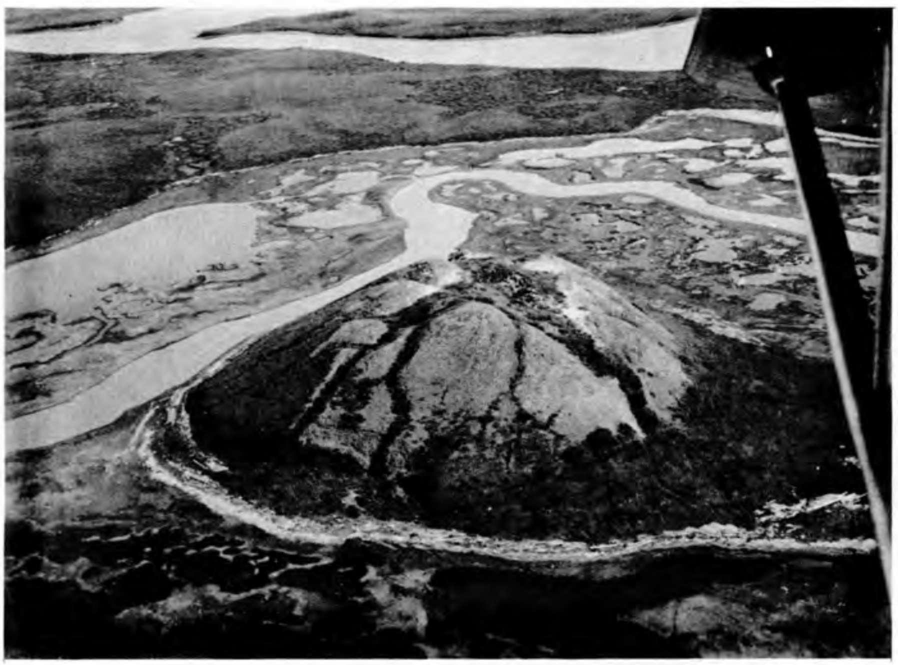
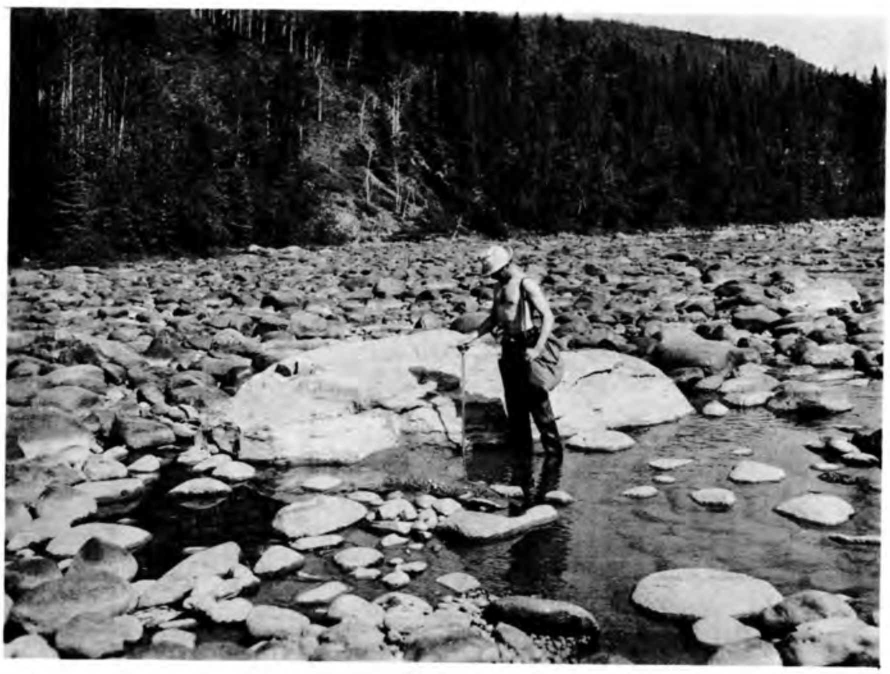


Fig. 64. Oblique view of pingo in vicinity of Port Brabant.

a. Windblown silt ridge in background. Shallow, rocky riverbed.



b. Large limestone boulder in riverbed.

Fig. 65. Terrain features along Ochre Creek north of Wrigley.

Fig. 66. Thick aspen growth on windblown silt ridge. Test pit indicated 0 to 3 in. of forest litter, 4 to 18 in. of brown powdery silt, and 18 to 36 in. of fine sandy silt. No frost was encountered in this dry, well-drained topographic position.

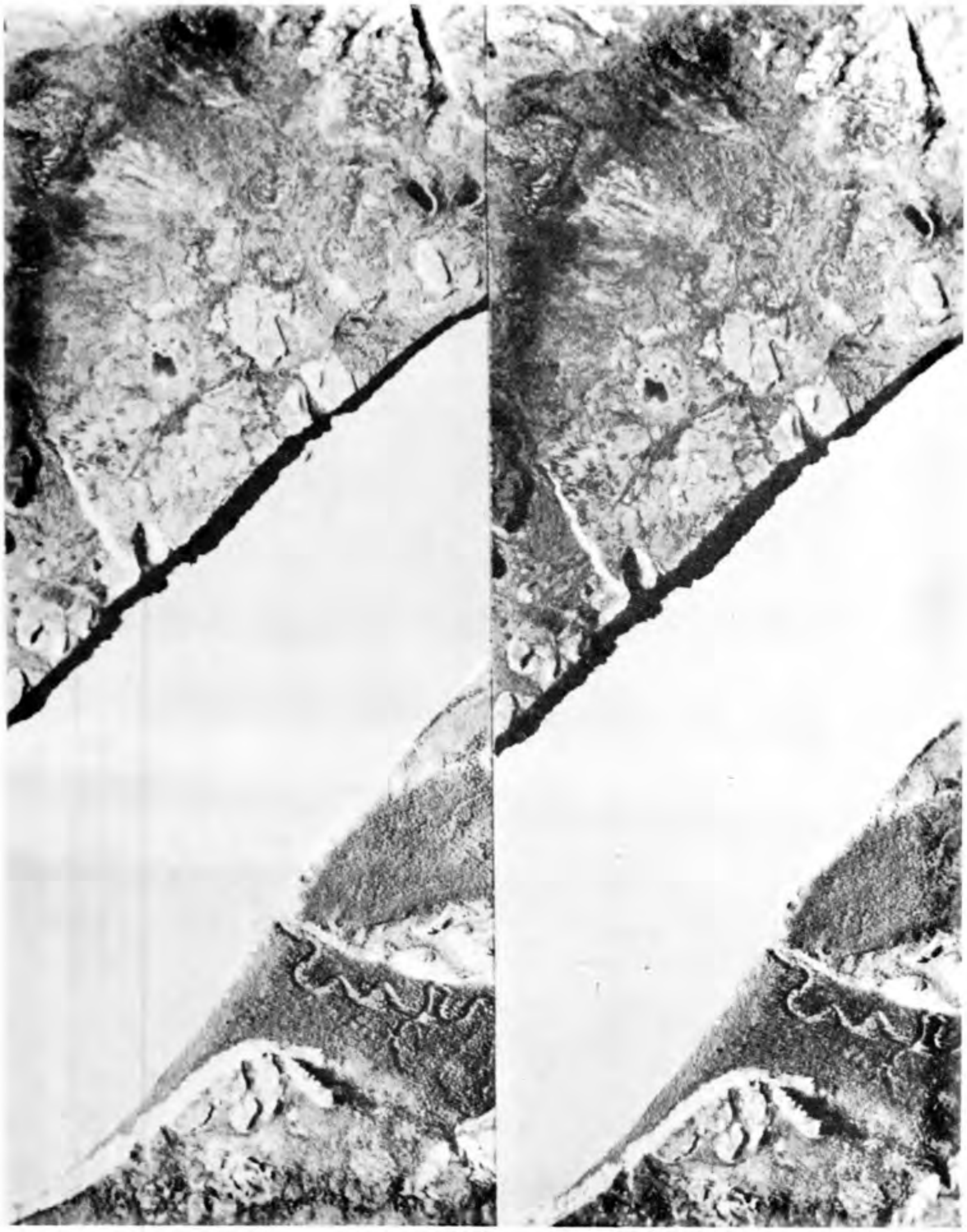


Fig. 67. Stereopair of Ramparts on Mackenzie River. Notice erosional forms of limestone on the west-bank tributary stream with very thin soil mantle. Remnants of sandstones and shales overlie the limestone.

a. Cliffs as viewed from river.

b. Stratification as viewed from top of cliffs.

Fig. 68. Views of limestone cliffs at Ramparts south of Fort Good Hope.

Fig. 69. Vegetation on materials that overlie Ramparts limestone. Opposite the mouth of the Ramparts River.

Fig. 70. Beginning of limestone outcrop upstream from the Ramparts. Shale and possibly some drift overlie limestone.

Fig. 71. Test site on granular ridge about 2 mi north of Fort Good Hope.

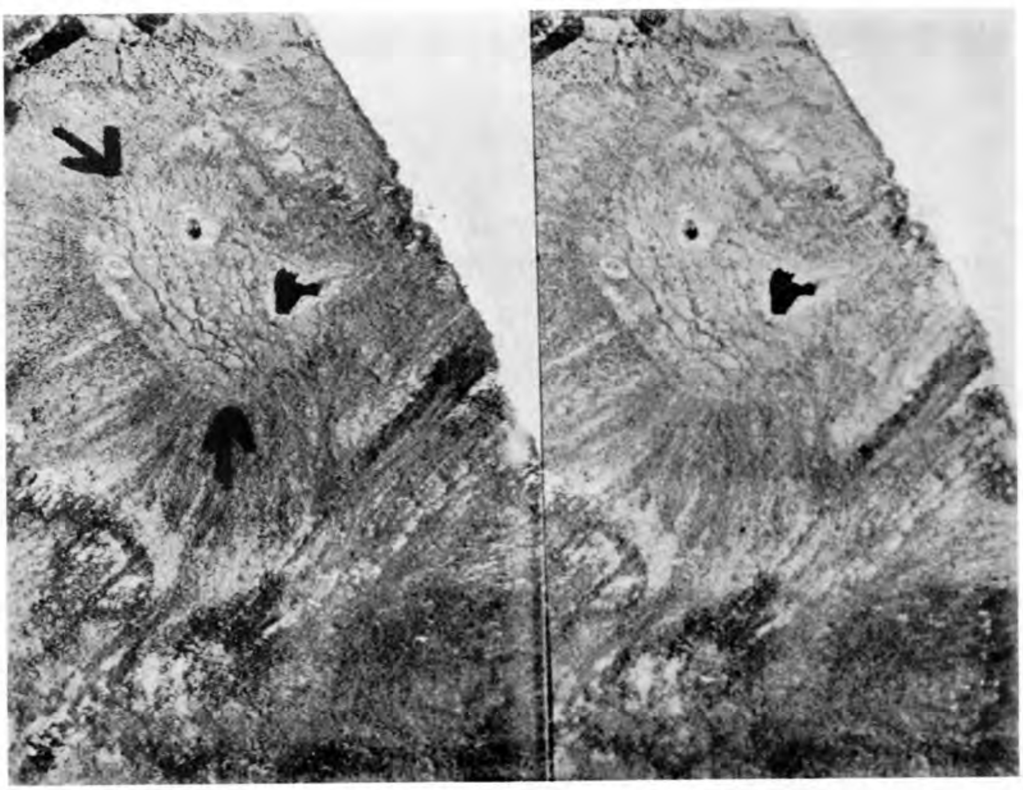


Fig. 72. Stereopair of polygons in an obliterated lake area on limestone-shale upland northeast of Fort Good Hope on Mackenzie River. Soil mantle is very thin in this area but appears deeper farther inland.

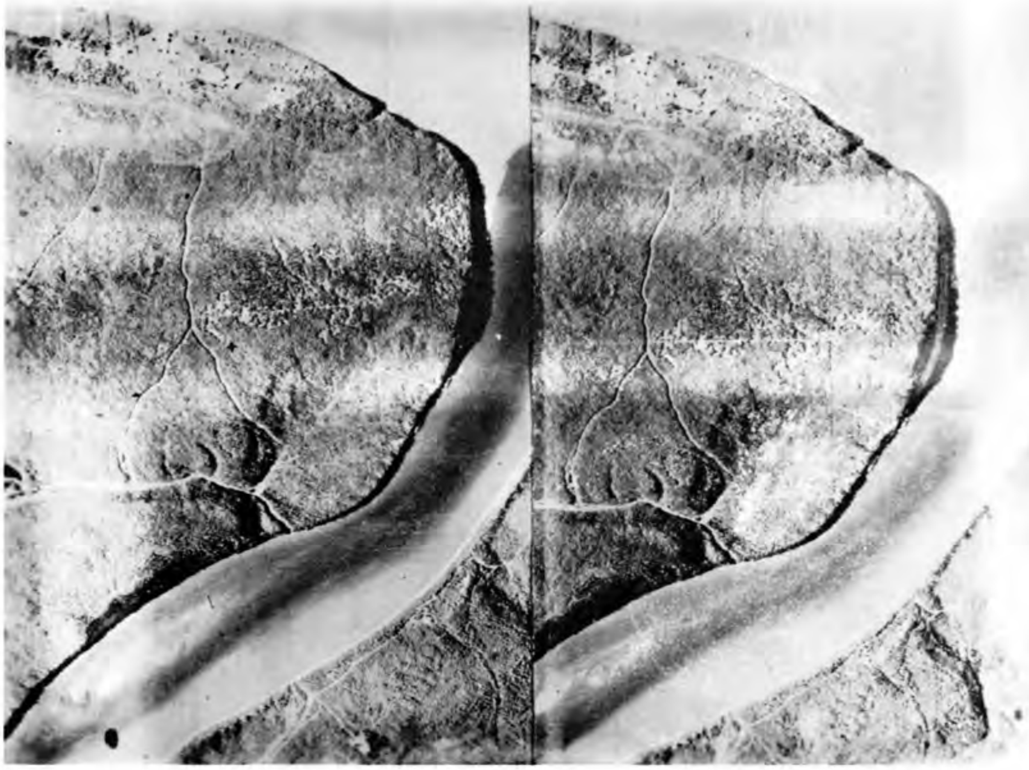


Fig. 73. Stereopair of Fort Norman and mouth of Great Bear River on Mackenzie River. The dark area in the river is clear water of the deep channel. The ridge between tractor trail and river is composed of wind-blown silt overlying semiconsolidated sands and gravels and shales. The spotted area of vegetation is a cutover area.

Fig. 74. Exposure of ice in winter tractor trail near Fort Norman. Site located about 300 ft from Great Bear River.

Fig. 75. Drift plains dotted with lakes and muskegs in vicinity of Great Bear River.

Fig. 76. Lignite beds and semiconsolidated sandstone near Fort Norman.

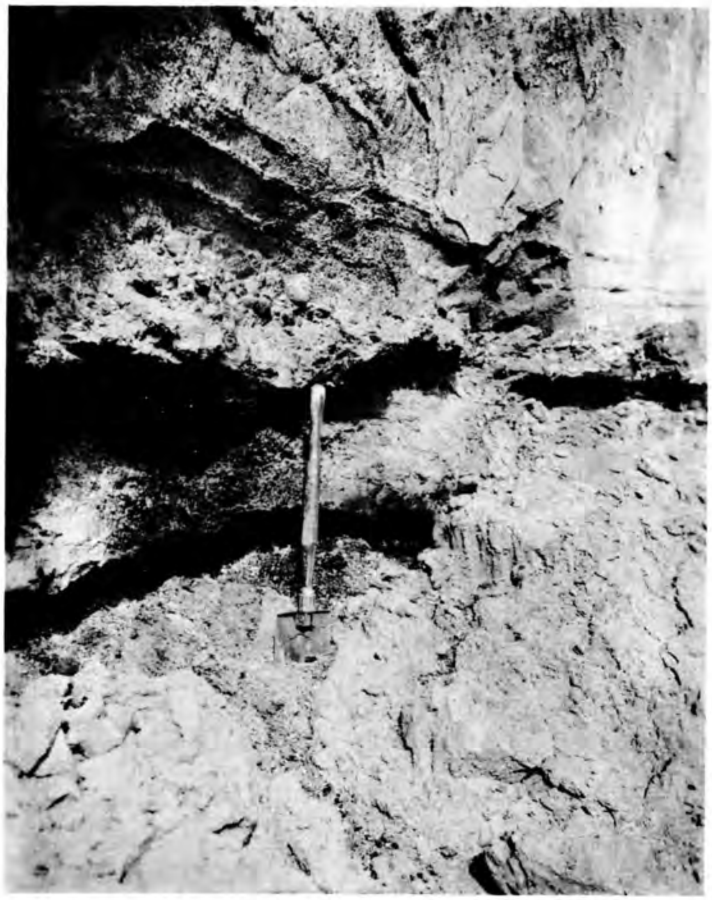


Fig. 77. Burning banks of lignite on Mackenzie bluff near Fort Norman.

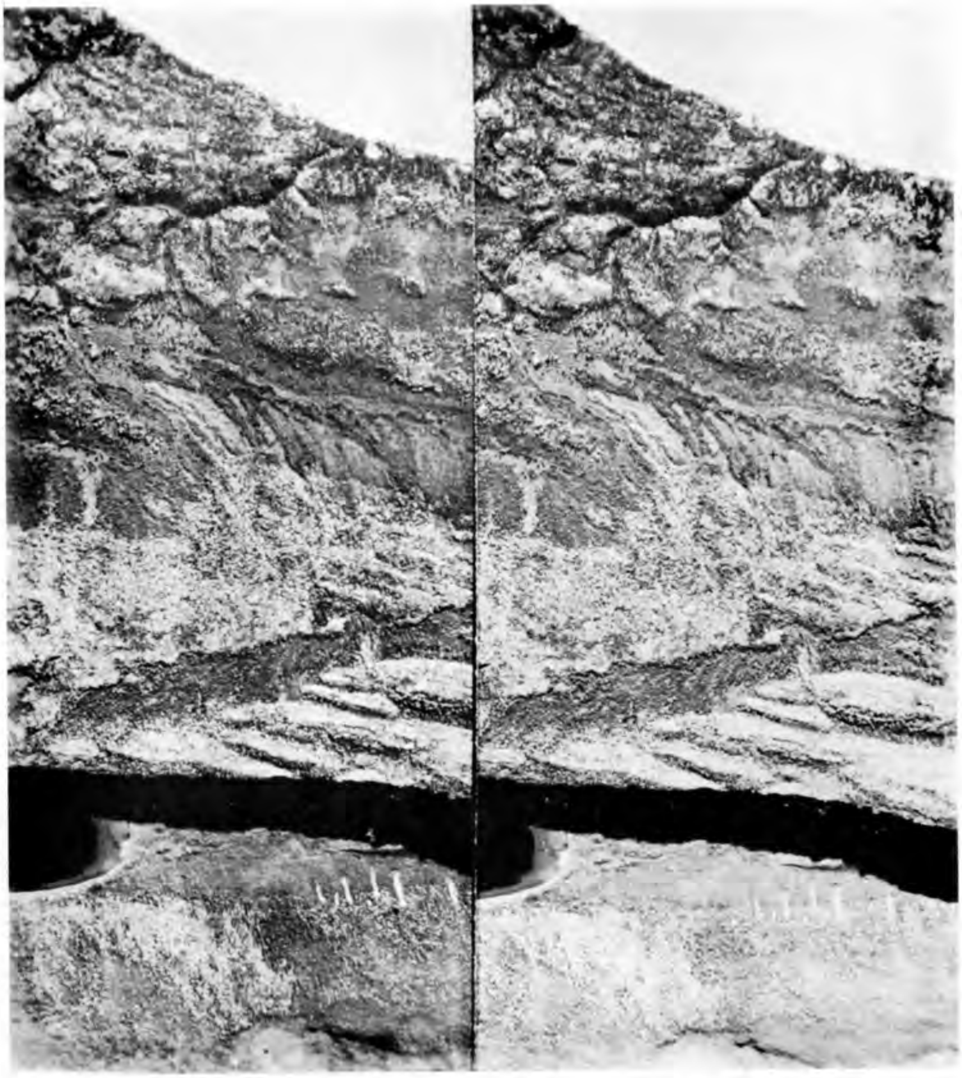


Fig. 78. Stereopair of parallel scarps of the Carcajou Ridge. The exposed bank of river showed stratified silt and sand as evidenced by V-shaped gullies. The small parallel knobs on dip slope are rock knobs believed to be grooved by glacial action.

Fig. 79. Rock ridge near foot of Carcajou Ridge.

a. Carcajou Ridge in background and burned area in foreground.

b. Carcajou Ridge where it is cut by Mackenzie River.

Fig. 80. Terrain views of Carcajou Ridge along Mackenzie River.

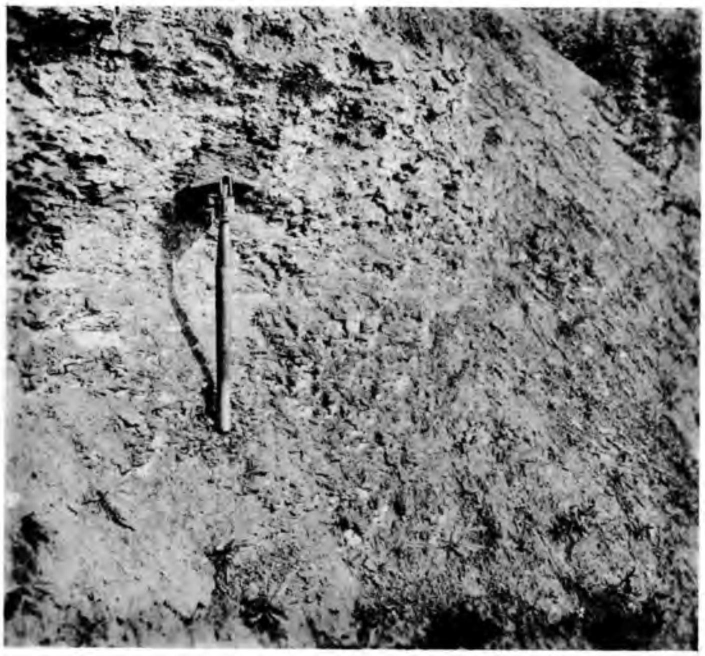


Fig. 81. Shale outcrop near East Mountain of Carcajou Ridge.

Fig. 82. Stratified silts and sands overlain by 2 ft of peat. Permafrost is exposed under peat overhang. On the surface frost was encountered in peat at 10 to 14 in. or at 14 to 36 in. in sandy silt. This exposure is on opposite bank of Mackenzie River from Carcajou Ridge.

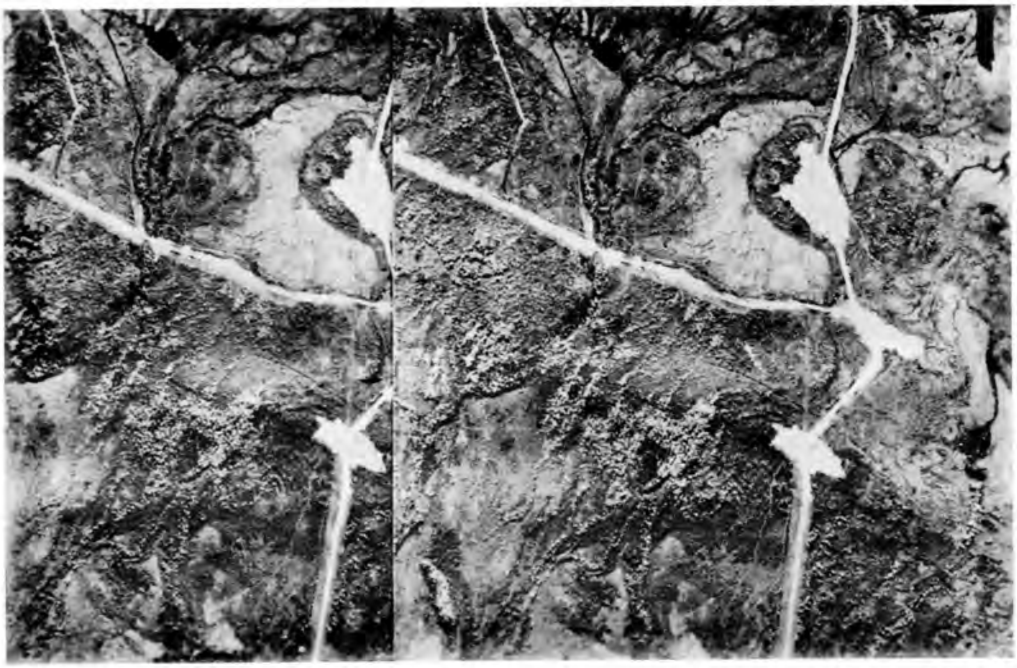


Fig. 83. Stereopair of terraces underlain by shale on Canol Pipeline Road.

a. Mackenzie River terraces along Canol Road.
River in background.

b. Dodo Canyon with Canol Road on right.

Fig. 84. Terrain along Canol Road at Norman Wells.

Fig. 85. Exposure of shale on upper terrace seen in fig. 83.

Fig. 86. Sand and gravel exposure in ridge at mile post 18-1/2, Canol Road.

a. Lakes and bare rock ridges east of Yellowknife.

b. Bare rock knobs with thin glacial valley fill east of Great Bear Lake.

Fig. 87. Topographic features of Keewatin section of Canadian Shield.

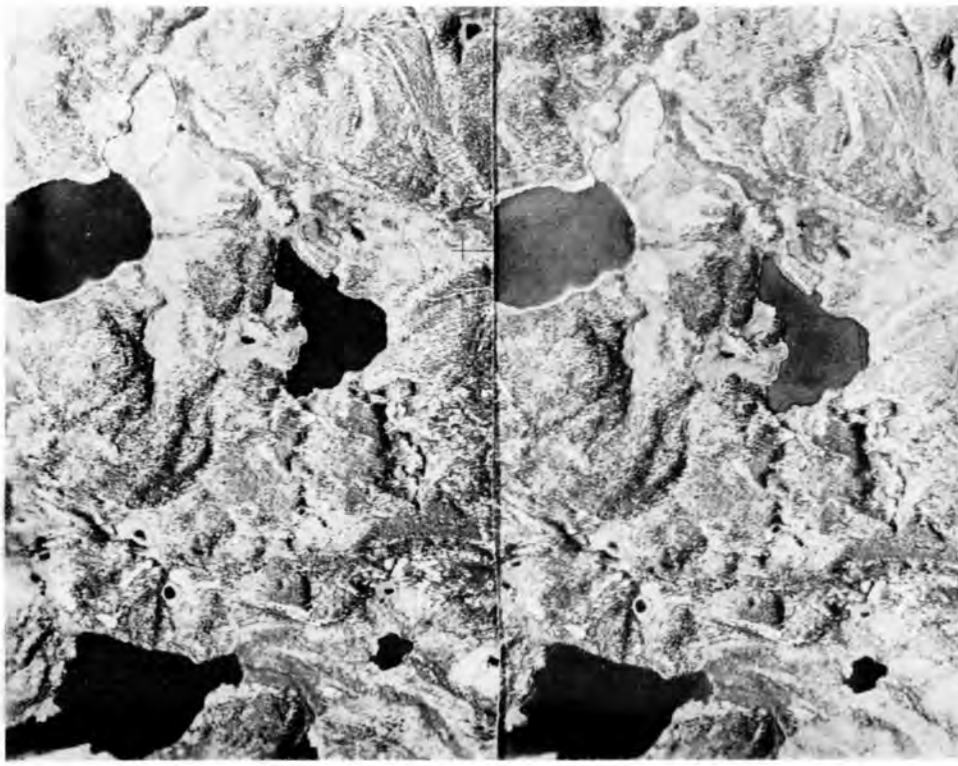


Fig. 88. Stereopair of glaciated area in Keewatin section southeast of McLeod Bay, Great Slave Lake. The material is granular as evidenced by absence of surface drainage and steep angle of repose.

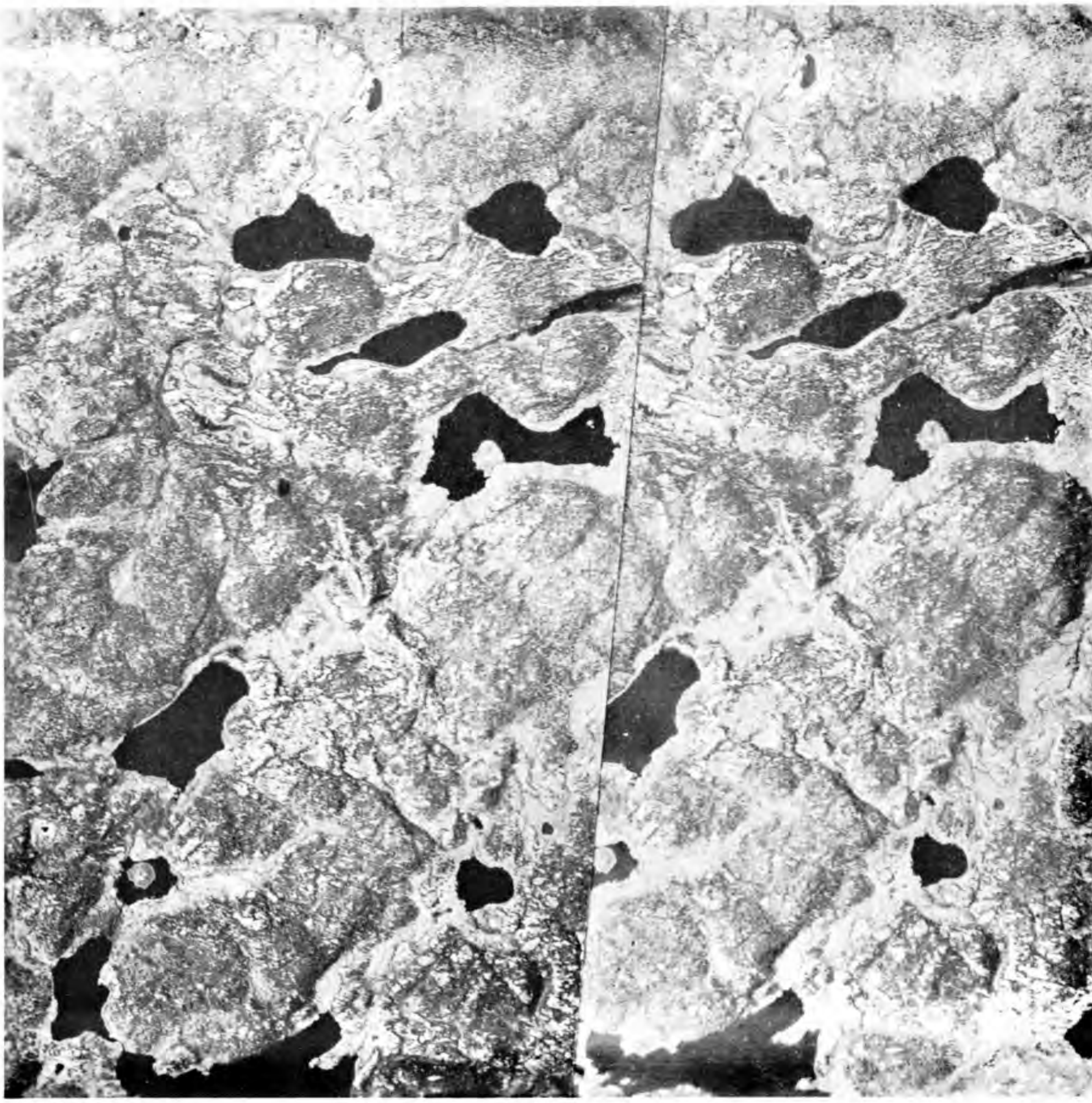


Fig. 89. Stereopair of glaciated area in Keewatin section southeast of McLeod Bay, Great Slave Lake. Minor outwash plains are illustrated. Notice the dissected esker in central portion of figure. Exposed bedrock gives white-spotted pattern to the hills; streams and gullies outline the joints in bedrock.

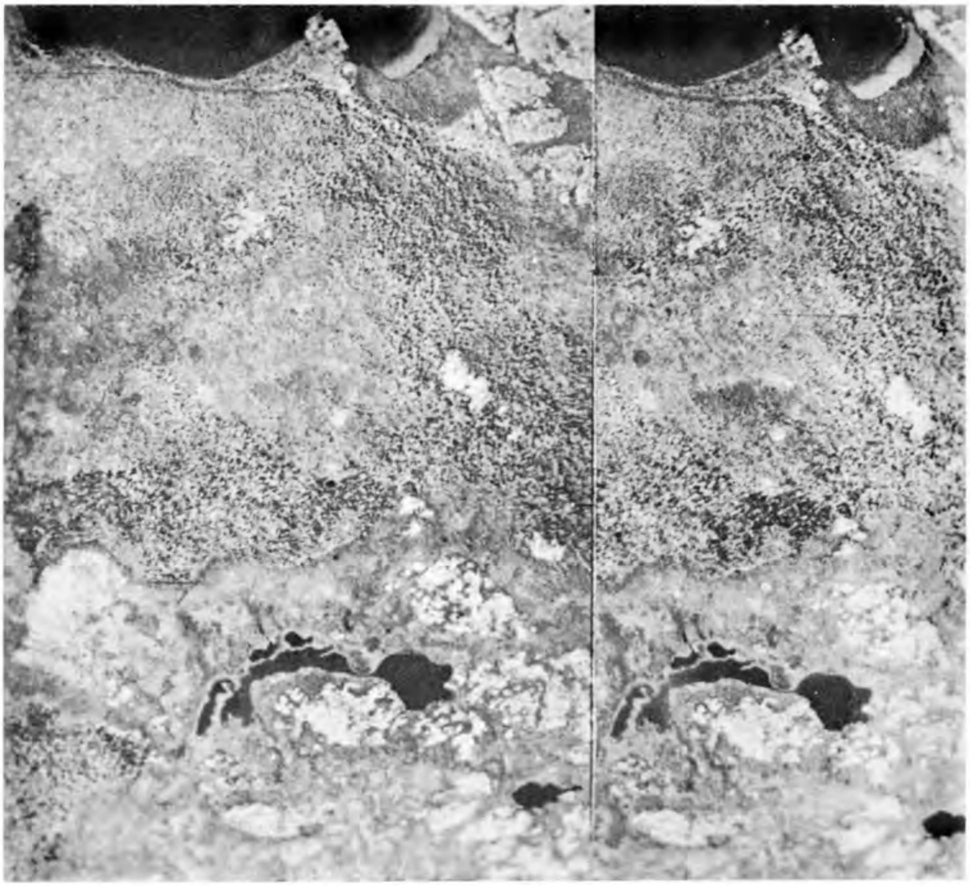


Fig. 90. Outwash plain at Yellowknife on which the Yellowknife airfield was later constructed.

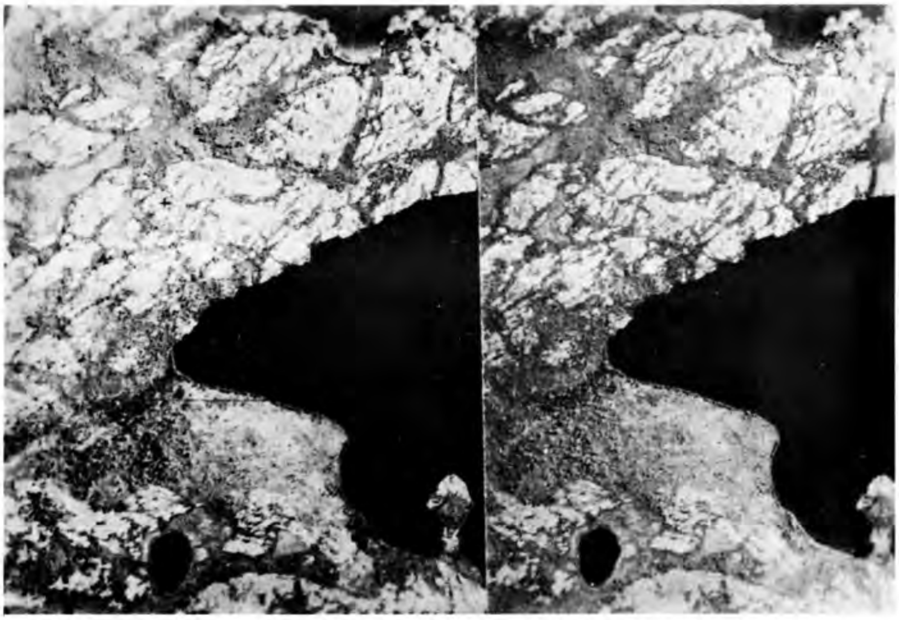


Fig. 91. Stereopair of a small **glacial** outwash plain in bedrock region near Yellowknife. This view was taken before gravel pit was opened for road construction in the vicinity. Note vegetation outlining joints where soil has accumulated.

Fig. 92. Ground view of stratified gravels, sands, and silts exposed by **borrow pit** operation of the outwash shown in fig. 91.

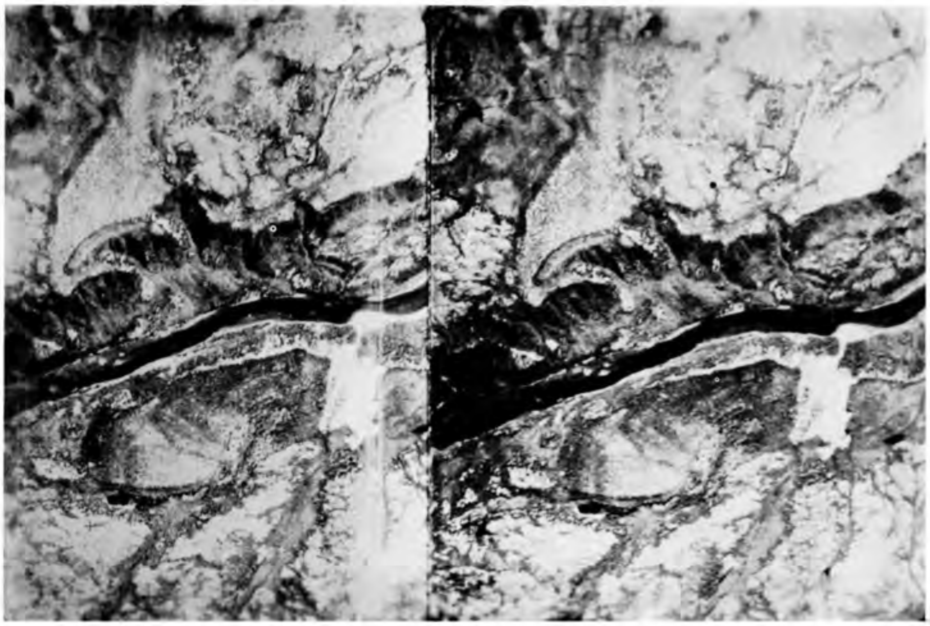


Fig. 93. Stereopair of sandy terraces along Lockhart River on the east arm of Great Slave Lake. The fracture pattern combined with light tones and irregular topography identifies the surrounding area as bedrock.

Fig. 94. V-shaped gully in sand terrace shown in fig. 93. The terrace is covered with white spruce while on the bare rock ridges of the background, vegetation is sparse because of the lack of soil except in gullies.

Fig. 95. Coarse granular beach ridges below diabase outcrop on Et-Then Island in Great Slave Lake.

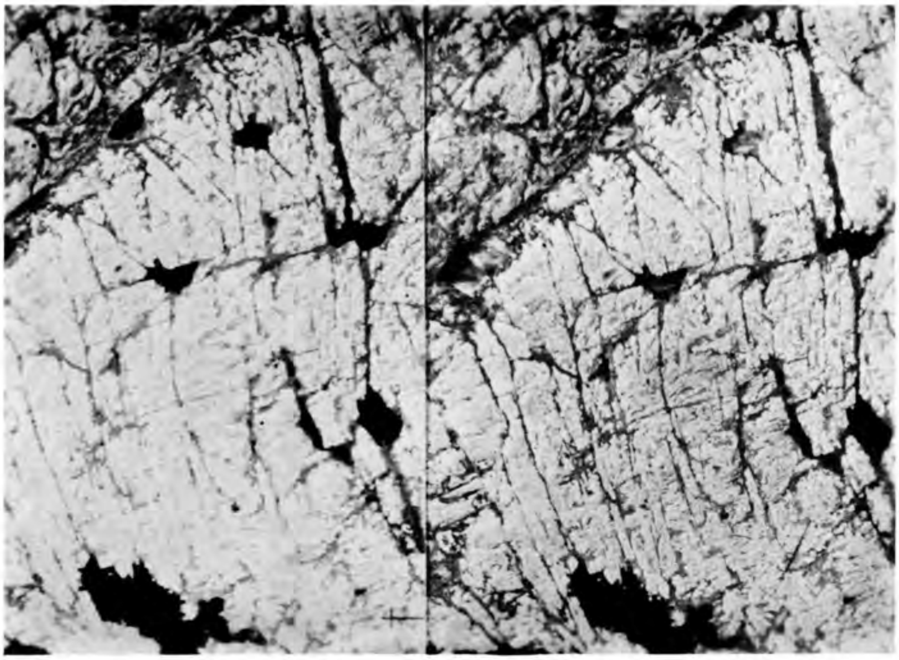


Fig. 96. Stereopair of much fractured granite crossed by a fault in Keewatin section near Yellowknife. The major fault in upper right-hand corner separates the light-toned granites from complicated area of metamorphic and basaltic bedrocks. Soil is found only in the crevices.

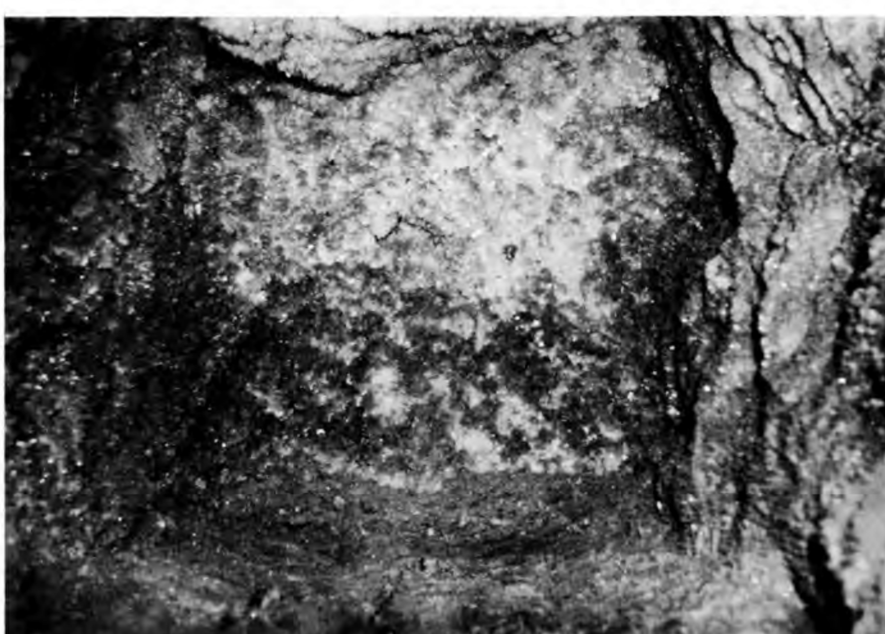


Fig. 97. Ice crystals formed in unventilated tunnel at 115-ft level of Giant Gold Mine No. 2 at Yellowknife.

a. Irregular erosional forms of igneous intrusives with many fissures and crevices.

b. Regular erosional forms of slate (graywacke) forming smooth rounded knobs. Surface rocks are glacial-deposited or frost-thrusted.

Fig. 98. Topography in the Yellowknife area.

Fig. 99. Glacial erratics frequently found in Keewatin section and also in Barren Lands. The boulders above are granites left on graywacke (slate) knolls.

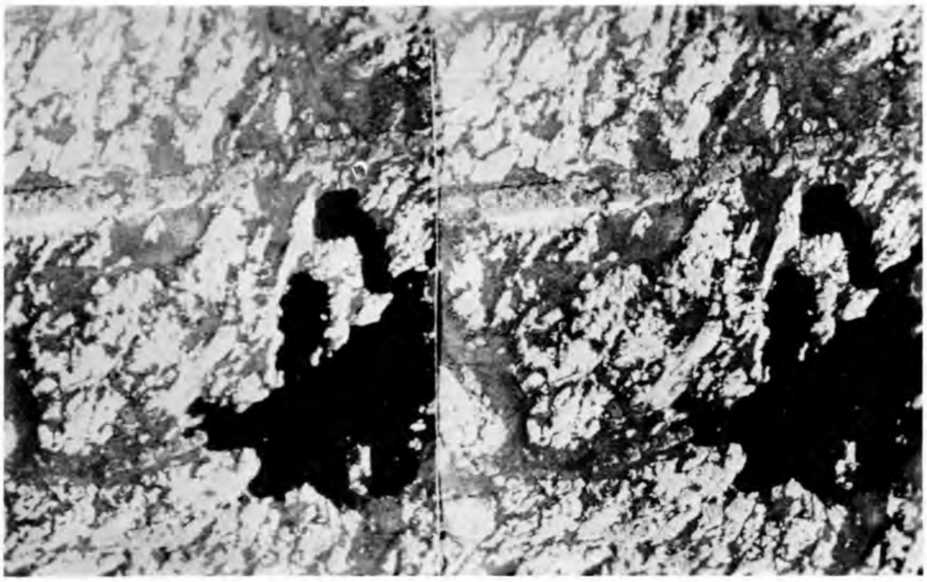


Fig. 100. Stereopair of fractured granite crossed by two igneous intrusive dikes. One dike forms a prominent resistant ridge, while the other is a small ridge in valley that empties into lake. The contrasting photo tones show the different lithological characteristics. Such large dikes are obstacles to overland movement.

Fig. 101. Narrow intrusive dike crossing intrusive granite.
Notice absence of any soil development.

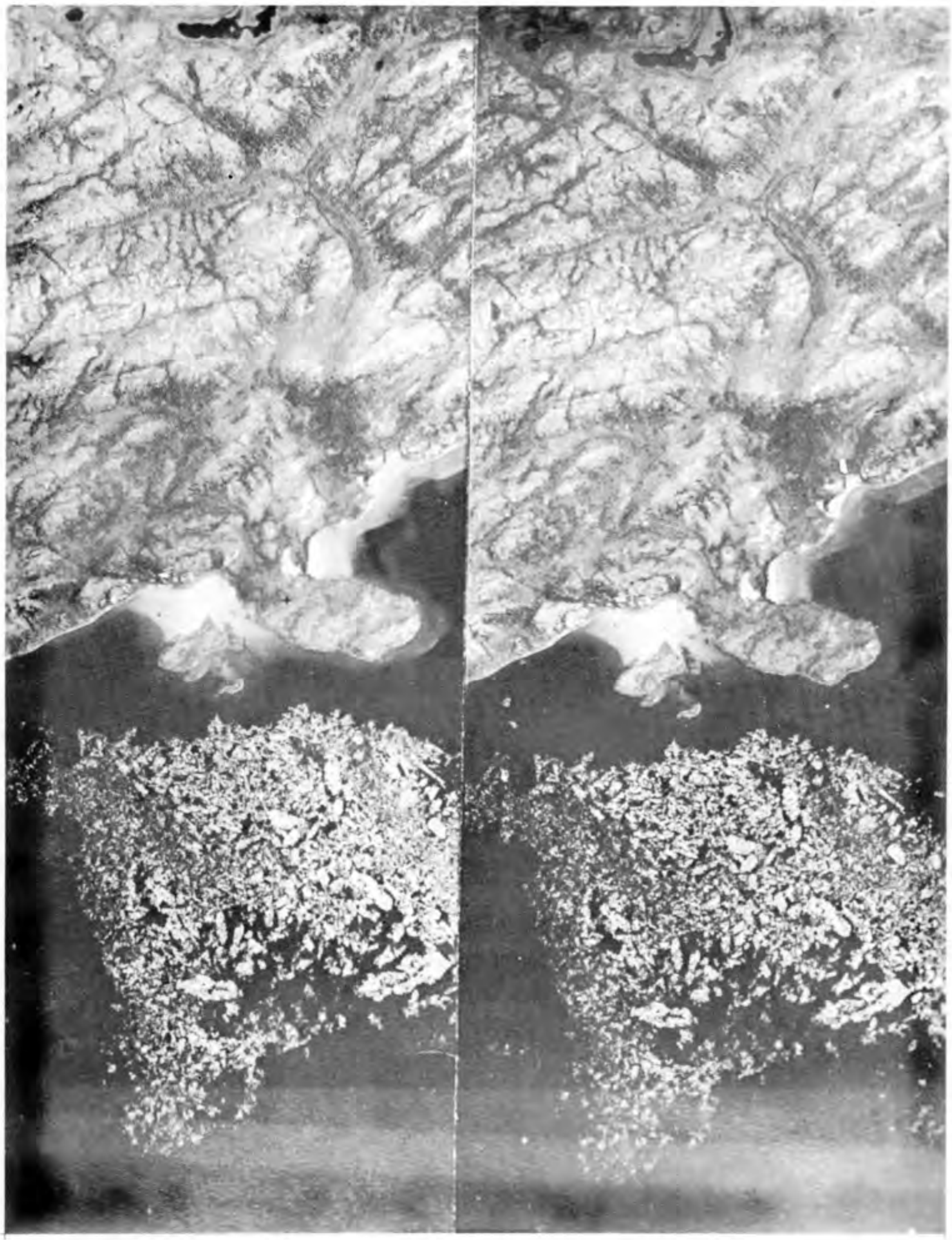


Fig. 102. Stereopair of topography of granitic rocks in Keewatin section on northwest shore of Artillery Lake. The channels and crevices are filled with soil which supports vegetation. Bare rock appears as white tones. Contrast this pattern with fig. 116 which shows the glaciated tundra region on southeast shore of Artillery Lake. Note that trees (dark tones) are restricted to south-facing slopes.

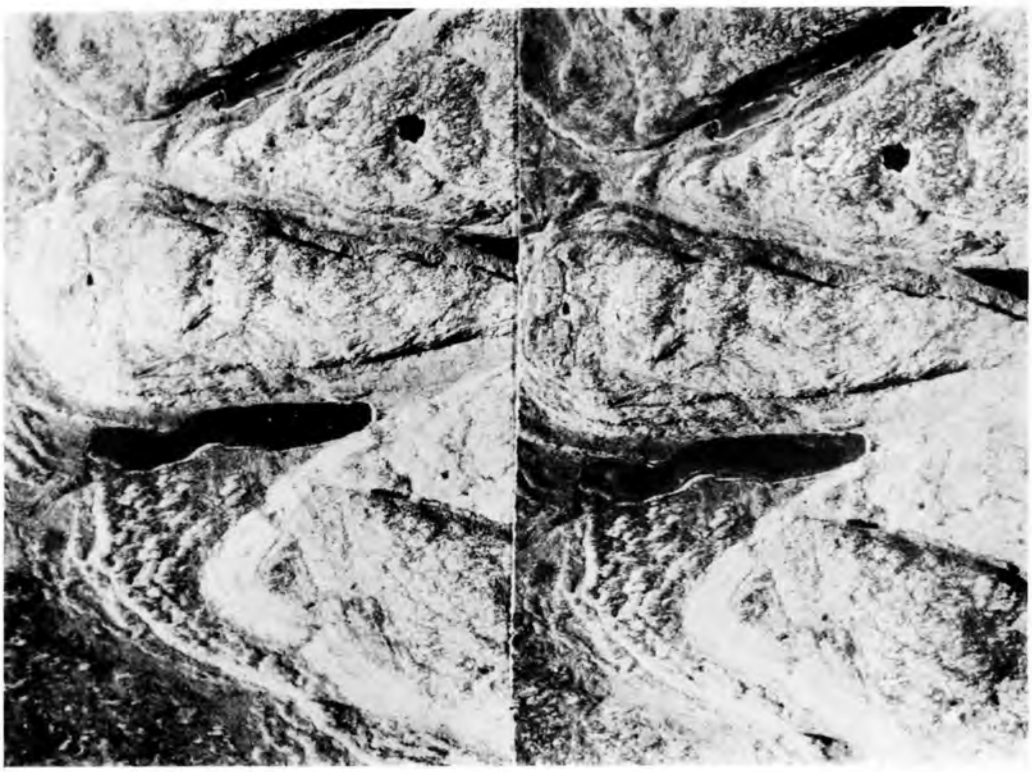


Fig. 103. Intrusive sill overlying sedimentary rocks in east arm of Great Slave Lake. Intersecting faults are probably responsible for the diamond-shaped outcrop pattern; lakes lie in the eroded fault-valleys.

Fig. 104. Diabase sill with columnar structure overlying pre-Cambrian limestones. Horizontal stratification is indicated in the underlying limestone scarp.

Fig. 105. Columnar jointing in an exposed intrusive sill.

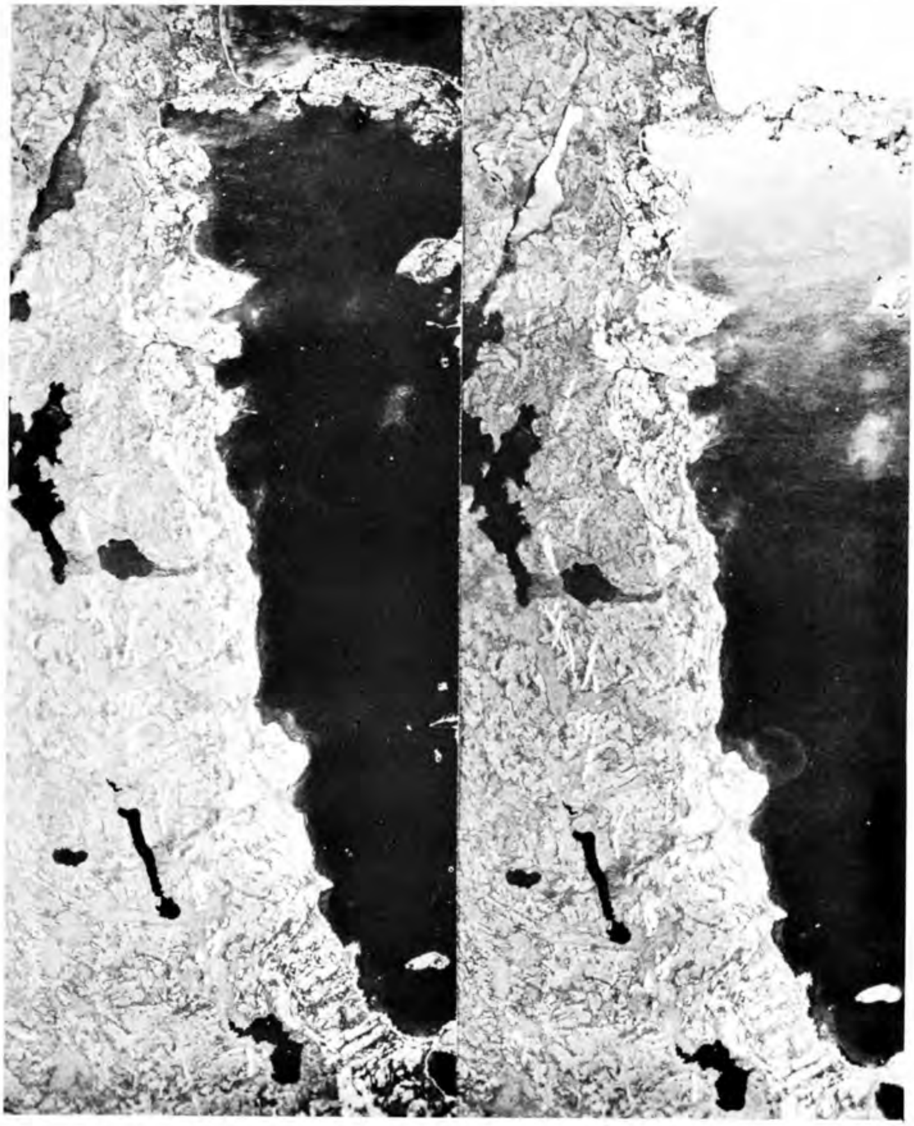


Fig. 106. Stereopair of bedrock in Keewatin section near Sparrow Lake north of Yellowknife. Light-tone areas are granite intrusives while the dark areas are metamorphosed schists and slates. There is no soil development except in hollows.

Fig. 107. To the right of the power-line tower on opposite shore columnar structure of flow is evident.

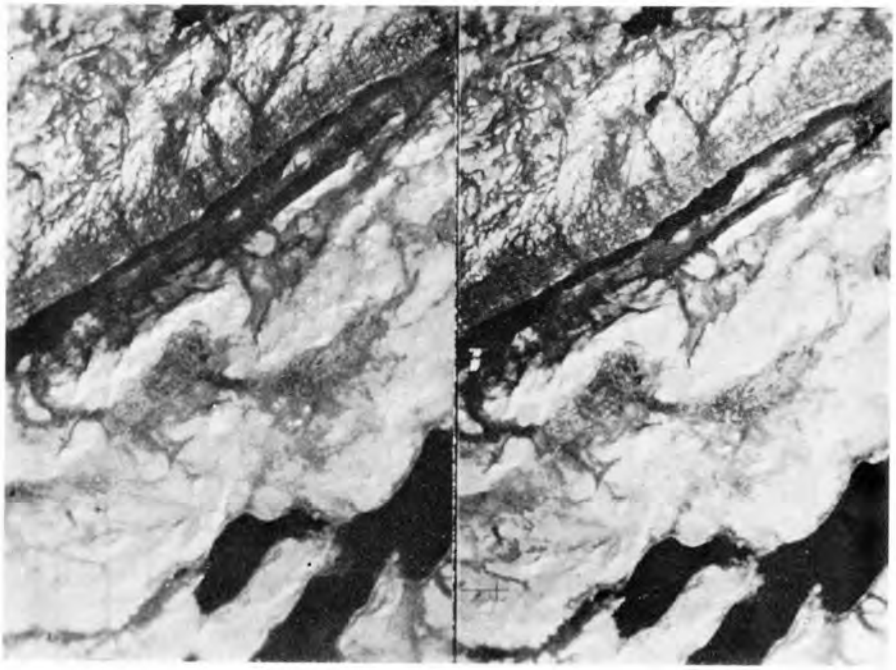


Fig. 108. Stereopair of large fault separating bare rock showing fractures mantled with vegetation, from glacial deposits showing little vegetation. Fractured bare rock is exposed in the ridges of the drifted area indicating that drift is relatively thin and mainly consists of valley fill.

Fig. 109. Large fault in Canadian Shield. This view is along the strike of the fault seen in fig. 108 with the drift-mantled region to the right. Notice how trees disappear in background.

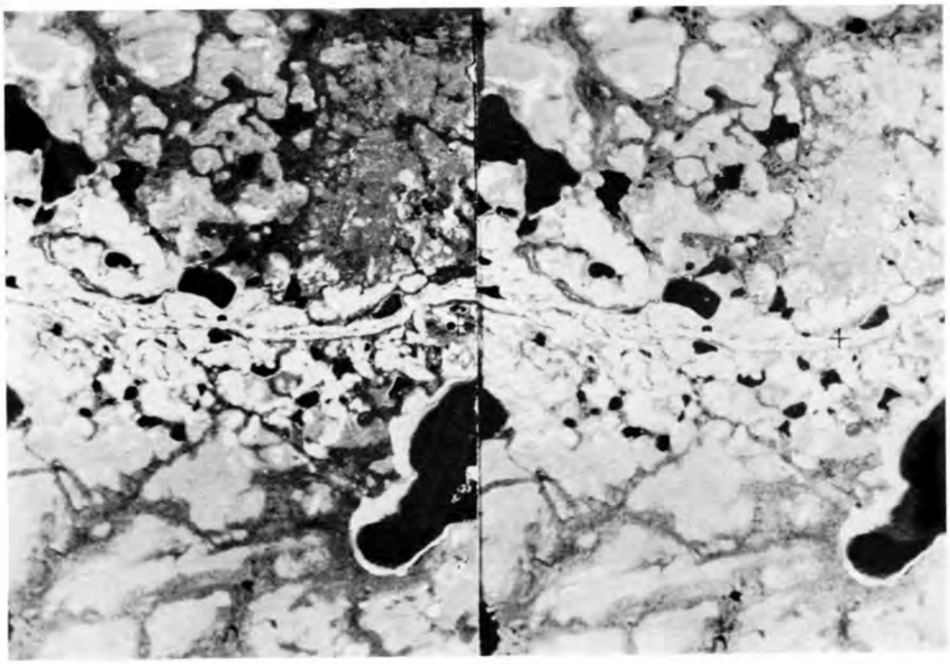


Fig. 110. An esker form with characteristic steep slopes and narrow crest. Many kames, kettles, and troughs are found associated with these long, serpentine ridges. Drumlinoid forms may also be observed. Some eskers are as much as 100 to 150 mi long and are conspicuous granular ridges.

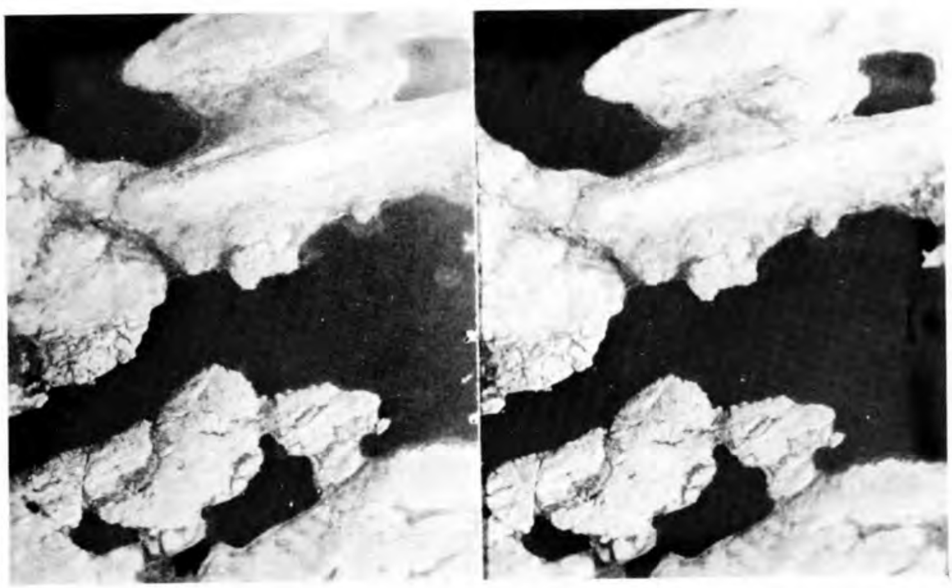


Fig. 111. Stereopair showing large ridge with a broken polygonal surface believed to be caused by frost action. The white irregular spots are bare rock exposures indicating drift mantle is thin.

Fig. 112. Oblique view of polygons on ridge similar to that of previous illustration. Notice also the polygons in filled valley beyond ridge.

Fig. 113. Vegetation in polygon rims on granular ridge. Notice size and roundness of granular particles. Shovel in mid-distance gives scale.

Fig. 114. Raised-center type polygons in valley filling beyond ridge shown in fig. 112. There is deep peat development in the low depressions, and these polygons are the result of the growth of ice lenses from high amounts of groundwater in the thick peat.

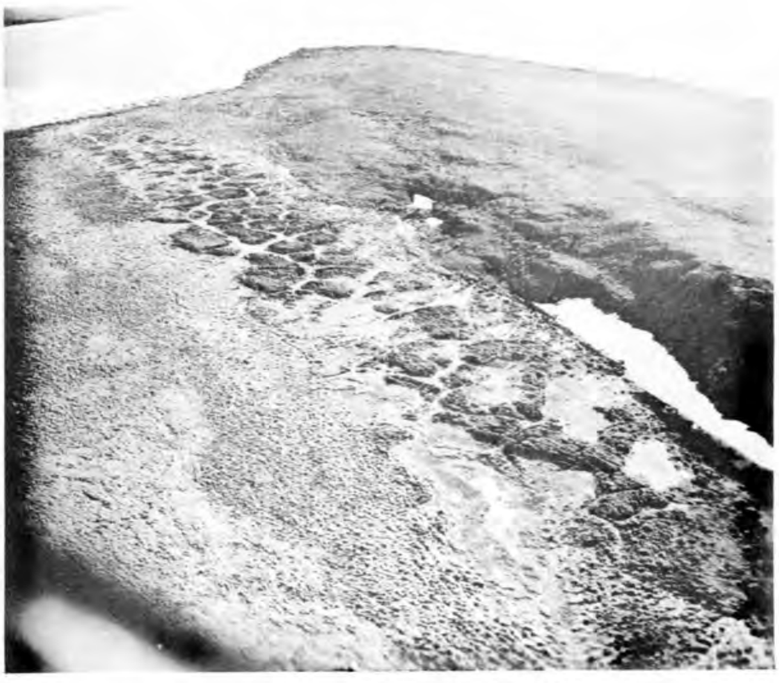


Fig. 115. Peat polygons in glacial-fill valley with drift ridge in background.

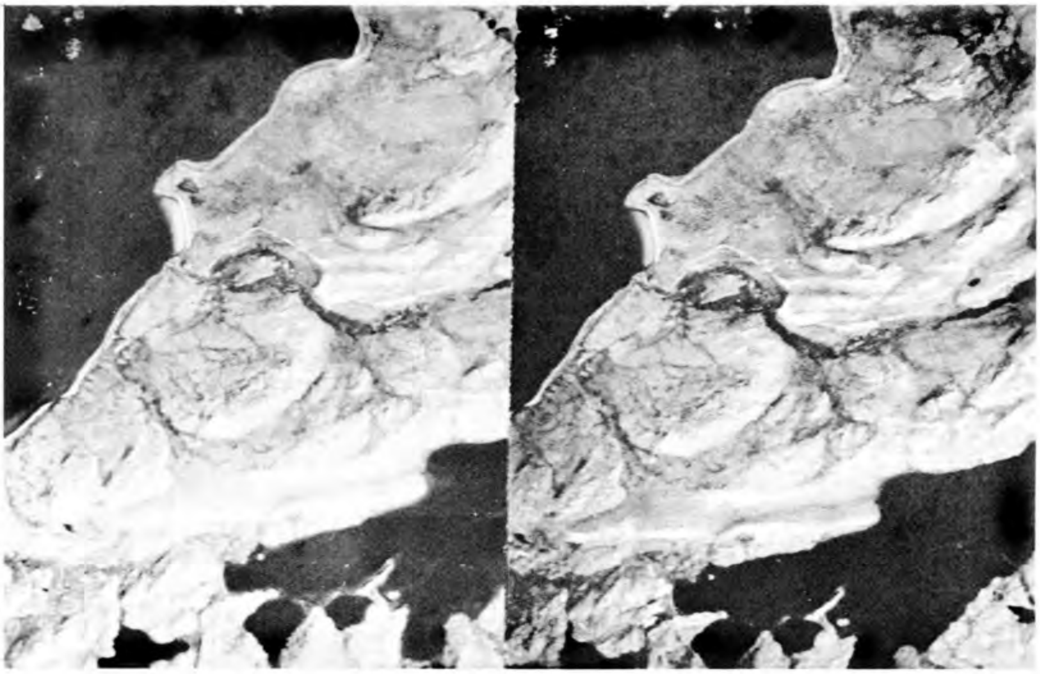


Fig. 116. Stereopair of glacial-mantled bedrock with a small esker lake at bottom of picture. Notice peat polygons near Artillery Lake shore (upper left) and polygons extending up slope and over the drift ridges. It is believed ridges are crevasse fillings as they are granular with somewhat rounded particles.

Fig. 117. Rock field resulting from glacier activity and frost thrust on bedrock. Bedrock is angular and much fractured. Thin glacial mantle will give smooth effect to slopes as in background. Notice enormous boulder in foreground. Spruce trees are about 15 to 20 ft high.

Fig. 118. View from a drift ridge in fig. 116 showing esker jutting into lake. Note boulders on rock in middle distance.

Fig. 119. Peat polygons on shore of Artillery Lake. Notice rock outcrops along beach and in lower right-hand corner.

Fig. 120. Stunted spruce on rocky slope in Barren Lands section. These are about 10 ft tall.

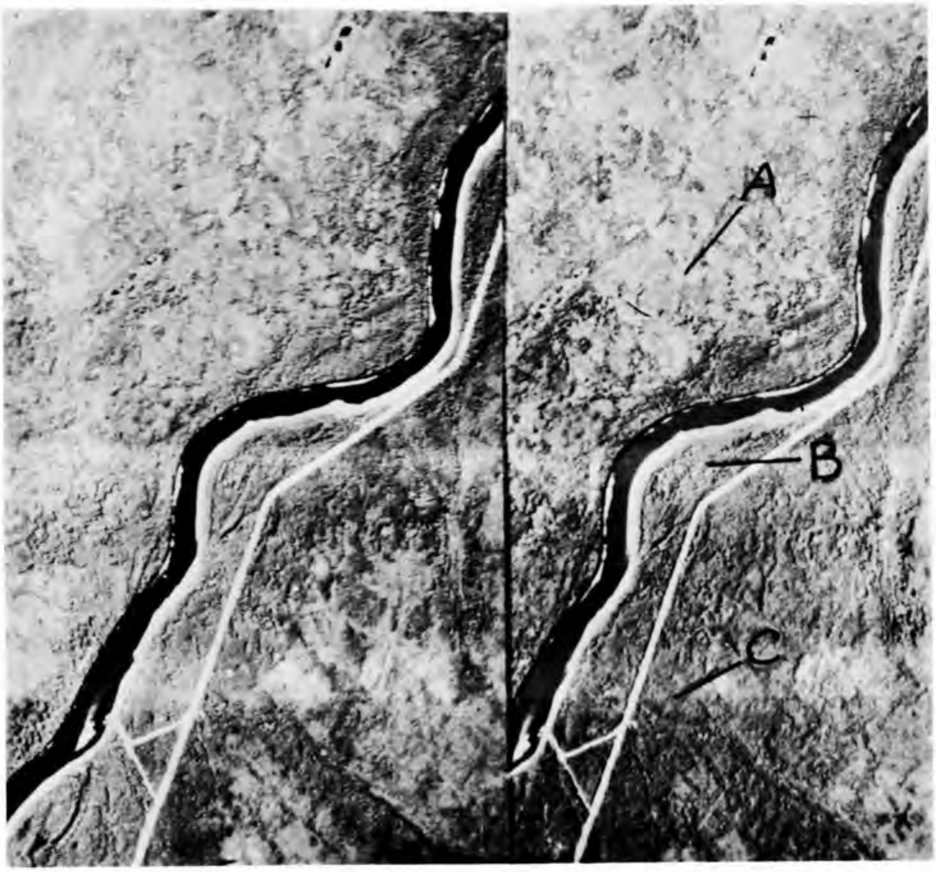


Fig. 121. Stereopair of a typical mixed forest along the Grimshaw Highway. The cover type is aspen with an admixture of white spruce and jack pine. Where aspen is the dominant tree (C), the photo texture is relatively smooth and uniform. The open stand (B) is about one-half spruce and one-half aspen. The stippled pattern on the left side of the road between B and C is produced by a stand composed principally of white spruce with a few jack pine and aspen. The sandy soil is fairly well drained under the forested areas and very poorly drained in the peat-filled bogs (A). Permafrost is found at an average depth of 2 ft in the depressions, and is absent or at depth of 5 ft or more beneath the mixed forest.

Fig. 122. A white spruce-aspen-jack pine stand on a dry granular plain along the Grimshaw Highway south of Great Slave Lake. The shaggy, rounded crowns of jack pines are readily distinguished from the uniform, narrow spires of spruces. The aspens were just beginning to leaf when this photo was taken.

Fig. 123. A mixed forest composed of white spruce, balsam poplar, and aspen on the moist, fine-grained alluvium in the Mackenzie bottomlands near Mills Lake. During the early part of the growing season, the aerial observer can distinguish balsam poplars from other hardwoods by their shiny leaves, regular pyramidal form, and pointed crowns.

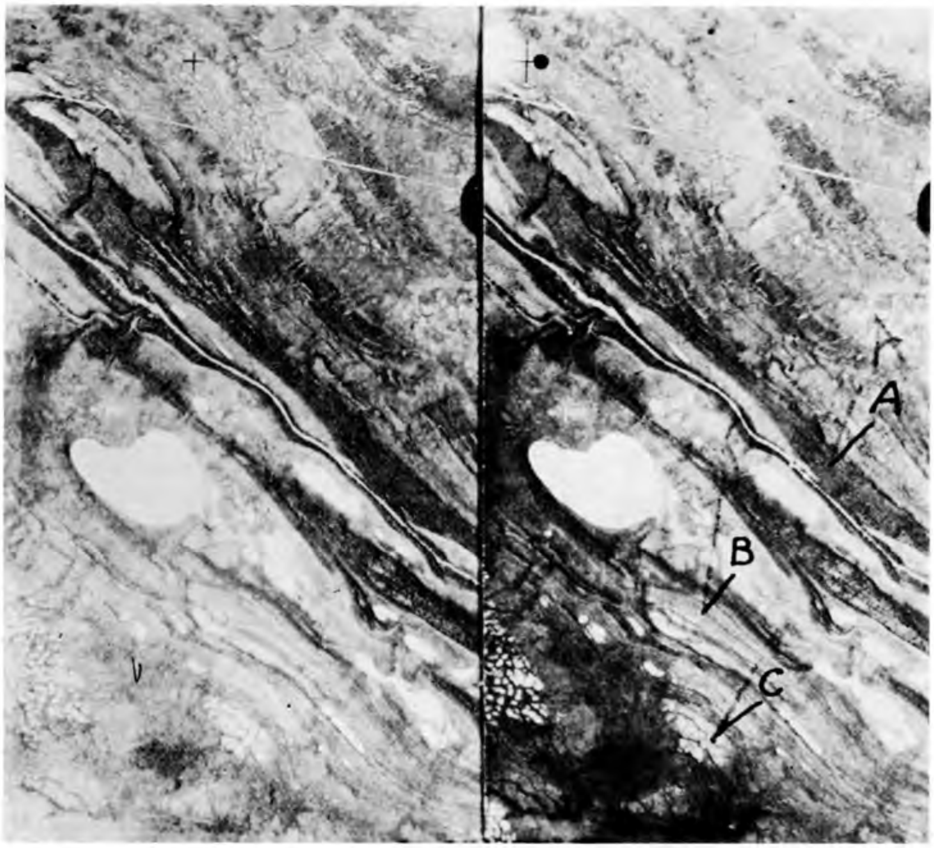


Fig. 124. Stereopair of a mixed forest in the Mackenzie Lowland. Dense tree cover is confined to well-drained natural levees (A). On small-scale photos like this, it is possible to distinguish a deciduous tree from a conifer on the basis of tone, conifers being darker. However, it is not possible to differentiate one deciduous species from another. The forested ridges are surrounded by willow and alder thickets (B) and poorly drained sedge bogs containing depressed-center polygons (C). Note the winter tractor trail constructed on top of a natural levee.

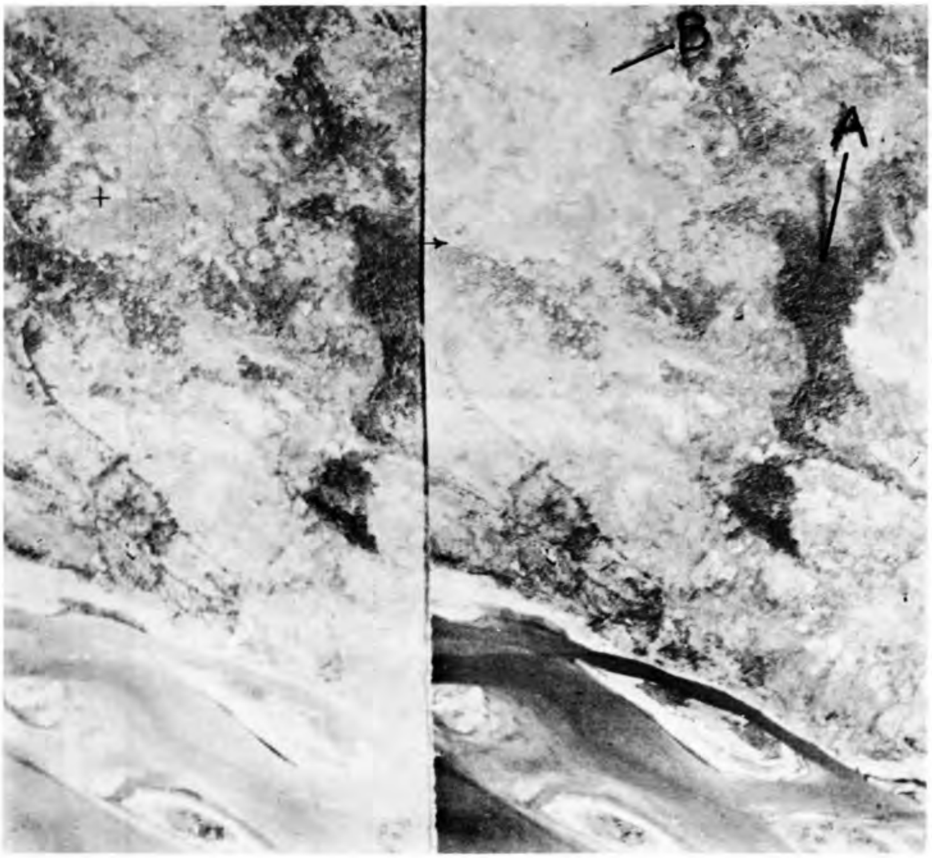


Fig. 125. Stereopair of a typical burned-over area in the upper Mackenzie Lowland. Remnants of the original white spruce stand (A) occur in irregular patches and are not associated with the existing surface-drainage pattern. The smooth to fine pebble-grained pattern (B) is willow and small reproduction. Extensive areas in the general vicinity of Providence, where this picture was taken, were burned over about 20 years ago.

Fig. 126. A dense 60-ft aspen stand on a fairly dry, sandy silt bench near Hay River. The straight, slender boles are branchless two-thirds of the total height. Unlike the sharp-pointed crowns of mature balsam poplar and birch, aspen has a rounded crown.

Fig. 127. Balsam poplar stand on moist fine-grained alluvium near Simpson in the Mackenzie bottomlands. Note the open, feathery, pointed shadow cast by this species. Branches persist on the trunk over two-thirds of the total height. Compare the general appearance of this tree with aspen shown in fig. 126. Note white spruce zone between poplar stand and central cleared area.

Fig. 128. Typical open black spruce-tamarack bog along the Grimshaw Highway south of Hay River. The active layer in the peat-filled depression is about 2 ft in this vicinity. In the better-drained surrounding sites which support a white spruce-aspen-jack pine forest, permafrost is either absent or at relatively great depths.

Fig. 129. Scattered tamarack and black spruce on perimeters of depressed-center polygons near Hay River. The sedge-covered paddies are very wet. Willows and other woody plants occur only on the locally better-drained ridges.

Fig. 130. An open 50-ft jack pine stand on a dry granular beach ridge in the southern Great Slave area. The interspaces between trees are partially covered with lichens and low-lying shrubs which photograph snowy white.

Fig. 131. A ground view of the open jack pine stand shown in fig. 130. In open stands, branches persist on jack pine nearly to the ground, but in closed forests the trunk is free of branches three-quarters of its height. The white-boled trees in the background are aspen.

Fig. 132. A low oblique airphoto of globular willow clumps on wet fine-grained alluvium near Mills Lake. The open areas between clumps are covered with a dense sedge cover. Insulating moss mantle is thin or nonexistent. The trees located on better-drained sites are balsam poplar.

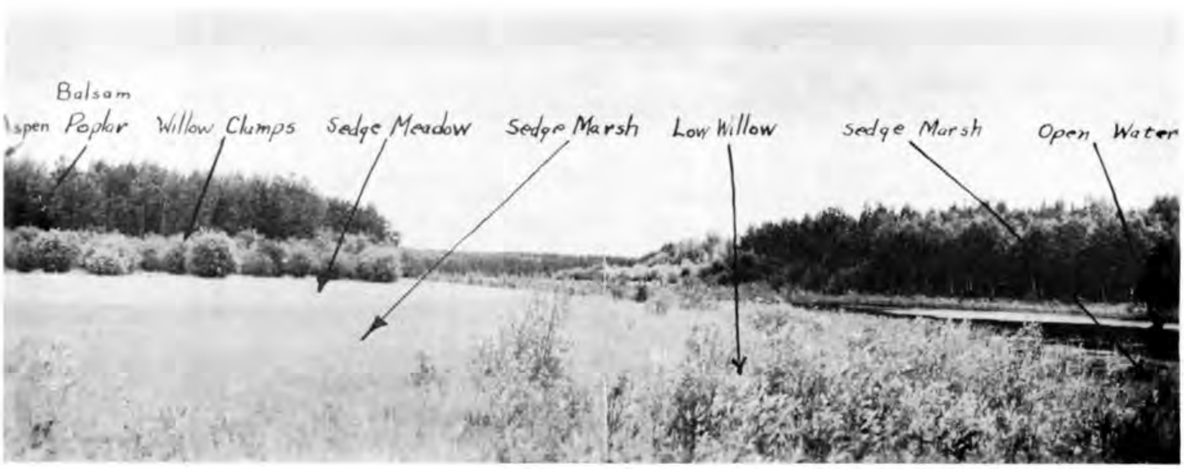


Fig. 133. A panorama cross-sectioning the inner bend of a meander showing several distinct plant communities found in concentric bands paralleling the water's edge. Note the distinct tonal difference between the saturated sedge marsh and the slightly elevated, very moist sedge meadow.

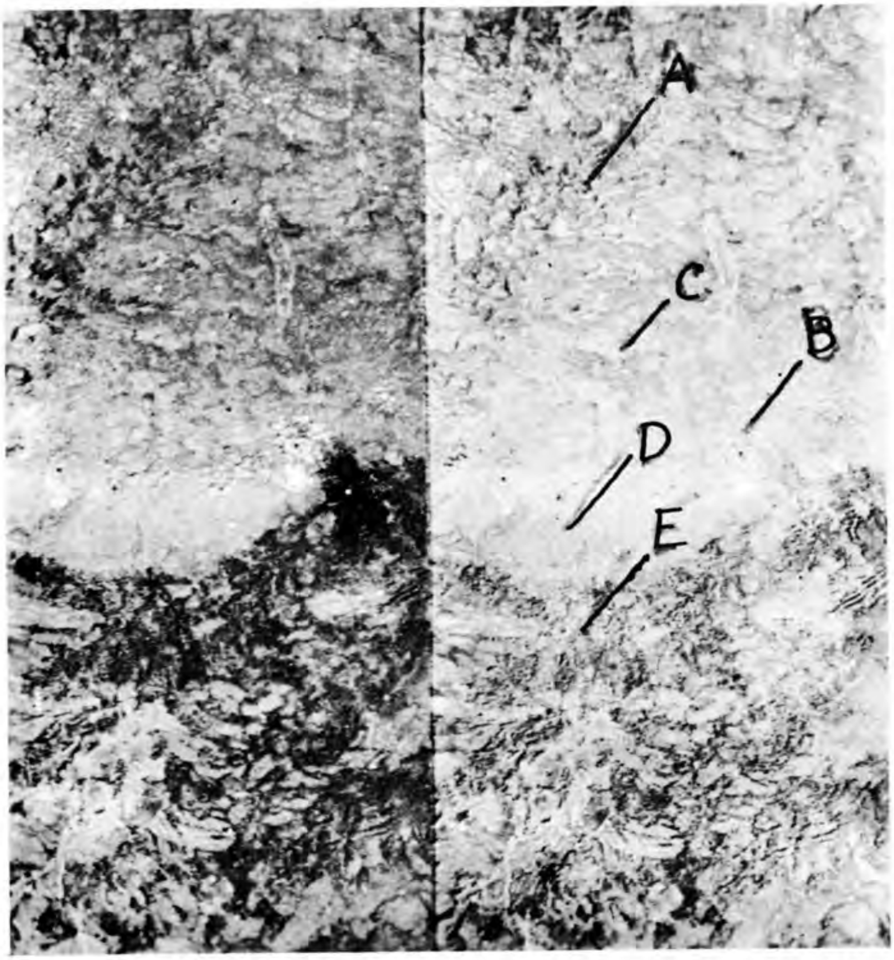


Fig. 134. Stereopair of an extensive bog area on the south side of Great Slave Lake. Cover types indicated on the photo are as follows: stunted spruce-tamarack forest on elevated sites (A,E), a heath bog having a slightly mottled medium gray pattern (D), a sedge bog with a uniform light gray tone (C), and depressed-center polygons with willow covered perimeters (B). The entire area is very wet and is probably frozen within several feet of the surface.

Fig. 135. An oblique airphoto of an open parklike white spruce stand on alluvium at Big Island. The interspaces are mantled with a continuous mat of low-lying heaths which appear light golden-brown early in the growing season when the new green leaves are not fully developed.

Fig. 136. Ground view of the heath cover shown in the interspaces between trees in the above illustration. In the early part of July, the relatively dry, brown, fibrous peat was frozen at a depth of 17 in. Vegetation consists of ledum, blueberries, ground birch, some sedge, and fruticose lichens.

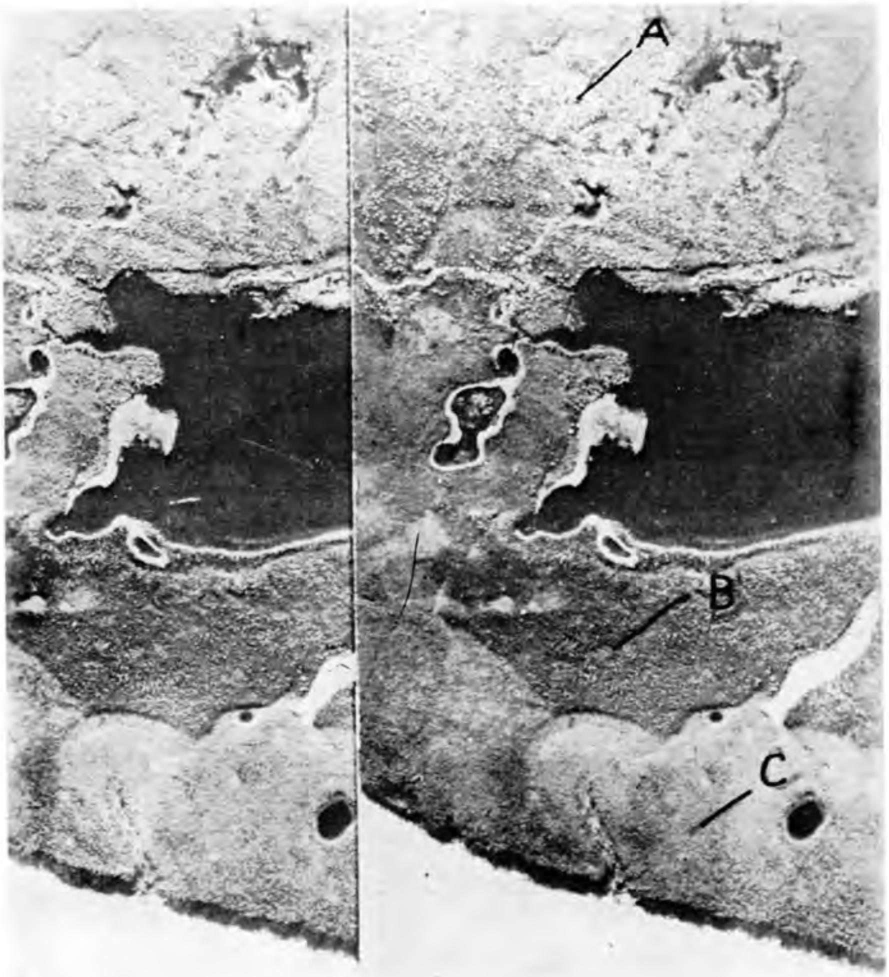


Fig. 137. Stereopair of a white spruce-birch forest on a high granular terrace near Norman Wells. These photos were taken on 1 September, after deciduous trees changed to autumn colors. The yellow autumn leaves of white birch photograph white on panchromatic film. The composition of white spruce-birch forests is readily discernible on photography made during the freeze-up period. Over half of the dominant trees at A are birch, while the stand at B is nearly pure white spruce, the climax forest of the region. Most of the area has been burned over within the last century. A well-established second-growth spruce-birch stand is found at C. Permafrost is continuous in this vicinity, with the active layer varying in thickness from 2 to 4 ft except under ponds and sedge marshes (the white-toned depression between B and C) where the active layer is considerably thicker.

Fig. 138. White spruce stand on alluvial silt near Fort Norman in spruce-birch area. Average height of spruce is 65 ft, with the maximum about 80 ft. The mature stand in foreground is practically pure white spruce; the hardwoods in center background have established themselves following fire.

Fig. 139. Ground view of the same white spruce stand shown in fig. 138. The center tree with the man at its base is 75 ft tall, which is a few feet taller than the average. Frost level in this stand on July 21 was 31 in.

Fig. 140. Recently burned white spruce-birch forest near Fort Norman. Birch trunks break high forming conspicuous tall, white-barked (-boled) snags. The color tone on very recent burns is dark on airphotos.

Fig. 141. Second-growth birch-spruce-tamarack forest established following old burn along the Root River. The taller spruces survived the fire. This secondary or temporary role of paper birch following disturbance is typical of the tree.

Fig. 142. White spruce-birch type in kettle-kame terrain along Great Bear River. Paper birch (A) is distinguished from aspen (B) on such photos by its proportionately longer crown, less conspicuous white trunk, and sharper top.

Fig. 143. Floating mat of sedge and buckbean in bog of the white spruce-birch region near mouth of Hume River. The mat in the foreground will not support a man's weight.

Fig. 144. Black spruce-tamarack bog in the white-spruce-birch forest near Loon River. The trees and mat of heath shrubs occupy raised perimeters of depressed-center polygons, where the frost line on 9 August was encountered at a depth of 12 to 18 in. Shallow basins 2 ft below the ridges support sedge tussocks standing in a few inches of water, beneath which the deep peat deposit is frozen at a depth of 15 in.

Fig. 145. Stereopair of sedge-horsetail marsh near Wrigley. Water-sedge (foreground) produces a very light tone on airphotos. It is underlain by 1 ft of peat over silt. Horsetail rush surrounds the open water, occupying most of the marsh. The rounded willow clumps bordering the marsh occupy soil made up of alternating layers of peat and silt.

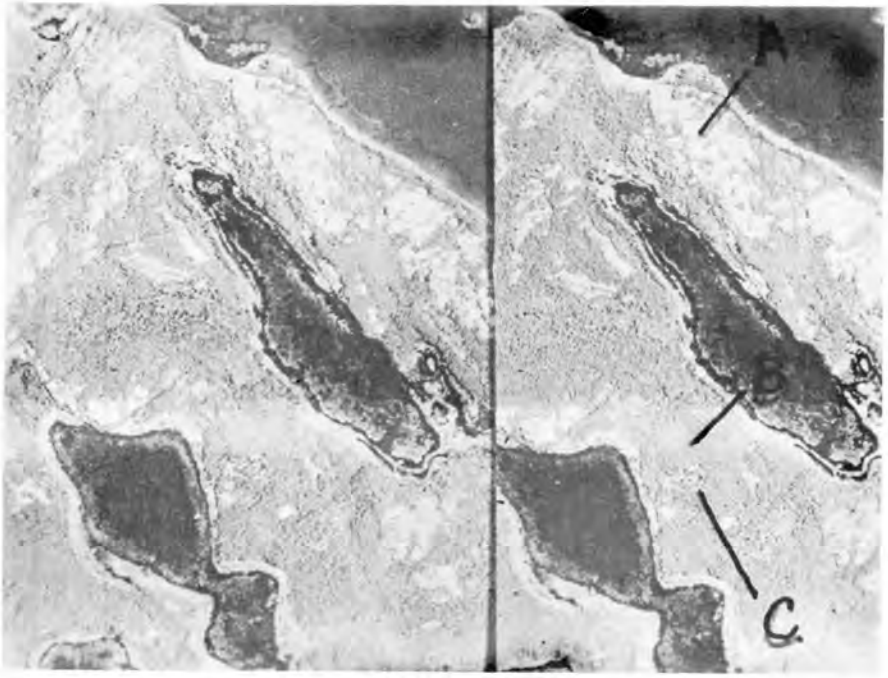


Fig. 146. Stereopair of a generally closed forest on thin glacial deposits in the Canadian Shield. Scattered stunted stands (A) occur on local bedrock knobs and ridges which are scoured free of soil. Where the soil mantle is deeper (B), closed forests are firmly established. The fine pebble-grained, light gray pattern at B is produced by a white birch-aspen stand. The open forest at C is a white spruce-jack pine-lichen parkland. The drift mantle is probably very thin or composed of very dry granular material at this exposed location. Note the rather wide triangular shadows cast by broad-crowned jack pine.

Fig. 147. Closed cover of conifers, paper birch, and aspen on glacial drift near Yellowknife. White spruce occupy the more moist slopes, jack pine and hardwoods the dry ridges where fire eliminated much of the spruce. Jack pines, shown at lower right, are readily identified by their broad, rounded crowns.

Fig. 148. Open white spruce parkland on a dry gravel bench near Reliance. Average height is about 50 ft. Inner bends of meanders show bands of low willows, balsam poplar, and denser white spruce. The steep cutbanks are typical of coarse granular materials.

Fig. 149. Open white spruce stand on sandy gravel north of central Great Slave Lake. Paucity of undergrowth and wide spacing of trees indicate a dry, coarse substrate. On silty soils willow and alder undergrowth is usually dense.

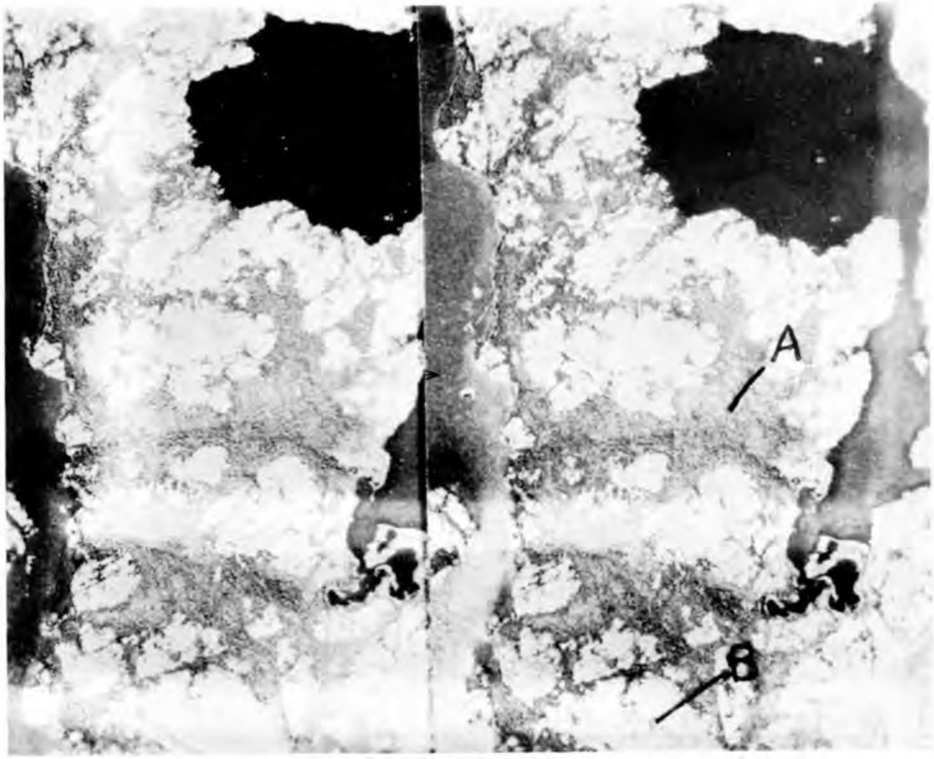


Fig. 150. Stereopair of scattered tree growth on bare rock knobs in the Canadian Shield transition forest. Closed forests (A) of black and white spruce with a few tamarack are confined to peat-filled depressions. The active layer in these poorly drained sites averages about 2 ft thick. Tree growth on the bare granitic rock uplands (B) consists of stunted white spruce, jack pine, and paper birch, which anchor their roots in shallow fissures and joint planes. Scarcity of trees on the uplands is attributed to lack of soil and unfavorable moisture conditions rather than climatic conditions.

Fig. 151. Dry granite ridge with thick, dome-shaped masses of reindeer lichens. These produce a uniform light tone on airphotos. Scattered jack pines occur in crevices. Dense white spruce stands are found in nearby moist valleys.

Fig. 152. A typical view of open vegetational "mosaic" on granitic bedrock east of Great Bear Lake. Severity of climate here approaches timberline condition. Small white spruce stands, with some dwarfed paper birch, are confined to gullies and depressions where some soil has collected. Lichens dominate the dry exposed rock domes.

Fig. 153. Open white spruce-paper birch vegetation with scattered jack pine on bare rocks near Yellowknife. Trees become established in joints and crevices of the greenstone bedrock. Low juniper mats are typical. Aspen is uncommon on rock sites like this, but common on sand and gravelly drift.

Fig. 154. Very scattered small white spruces at timberline near Hornby Bay, Great Bear Lake. Igneous bedrock surface has occasional glacial boulders. No other tree but white spruce occurs here. Ground birch and crowberry form the dominant shrubby cover.

Fig. 155. A southern transition forest bog near Yellowknife, with black and white spruce 10 to 35 ft high. Jack pine and a few white spruce occupy the exposed rock sites.

Fig. 156. A burned area near Yellowknife with 13-year jack pine established on granitic rocks. The bog in the center was covered, prior to the fire, by a dense 15-ft stand of black spruce and tamarack.

Fig. 157. A bog in a granular lacustrine plain near Fort Franklin, Great Bear Lake; 30-ft black spruce and larch occur on the peat. There is less than 5 ft difference in relief between the bog, occupying obliterated lakes and meanders, and the light-toned mat of reindeer lichens on the flat treeless benches.

Fig. 158. Bog over clayey silt valley fill along Great Bear River. Black spruce are less than 15 ft tall. The frost line was 15 in. deep on 23 July. Reindeer lichens produce the light tone on the higher parts of the bog between trees.

Fig. 159. Timberline white spruce stands in Artillery Lake region. Trees occur in sheltered drainageways and along the lakeshore. Maximum height of trees growing on organic soils (A) is 10 to 15 ft, while individuals reach a height of 25 ft on sandy soils (B).

Fig. 160. Timberline white spruce in a protected drainageway at Artillery Lake. Soil is 1 ft of peat underlain by sand. Maximum height of spruce is 13 ft, and maximum diameter is 3.5 in. although stumps were observed that ranged up to 10 in. in diameter in this vicinity. Clumped shrubs at the right are ground birch.

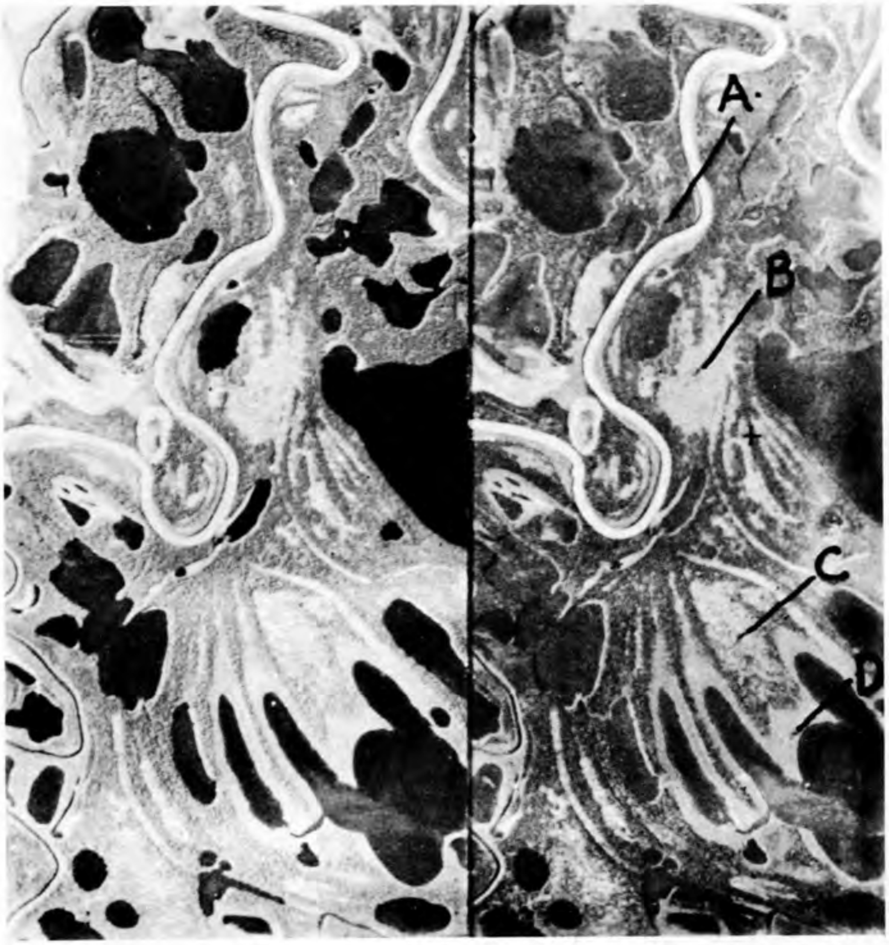


Fig. 161. Stereopair of the transition forest in the Mackenzie Delta. As the northern limit of trees is approached in the delta region, white spruce forests (A) decrease in height, from approximately 40 to 20 ft, and become more discontinuous in extent. Near the fringe of the treeline, white spruce are confined to locally better-drained, elevated islands and natural levees. Willow-alder-covered depressions (B) have a slightly mottled, medium gray tone. Some obliterated ponded areas (C) contain polygons whose perimeters support high brush and whose centers are continuously mantled with sedges. Nearly all lakes and ponds are bordered by very dense willow-alder thickets (D). At forested sites, the average depth to permafrost rarely exceeds 2 ft. The active layer beneath willow-alder thickets is less than 30 in. thick except at locations adjacent to the water's edge where the permafrost table is considerably deeper.

Fig. 162. The Mackenzie Delta transition forest north of Aklavik. The spruce cover is sparse and trees small compared with the stands south of Aklavik. Only fine-grained alluvial soils occur in the delta. At A is shown a dense alder-willow thicket 10 to 15 ft tall. Note "drunken forest" bordering the pond at B.

Fig. 163. Typically poor spruce stand in the northern half of the Mackenzie Delta on a low alluvial island. Spruce averages about 40 ft tall. The balsam poplar on the bank top is stunted in size and typical in form, being near its northern limit.

Fig. 164. Dry tundra ("rock deserts") on south shore of Amundsen Gulf. Plant cover is extremely sparse, affecting the photo pattern only in depressions. Note absence of patterned ground on the bare rock bench.

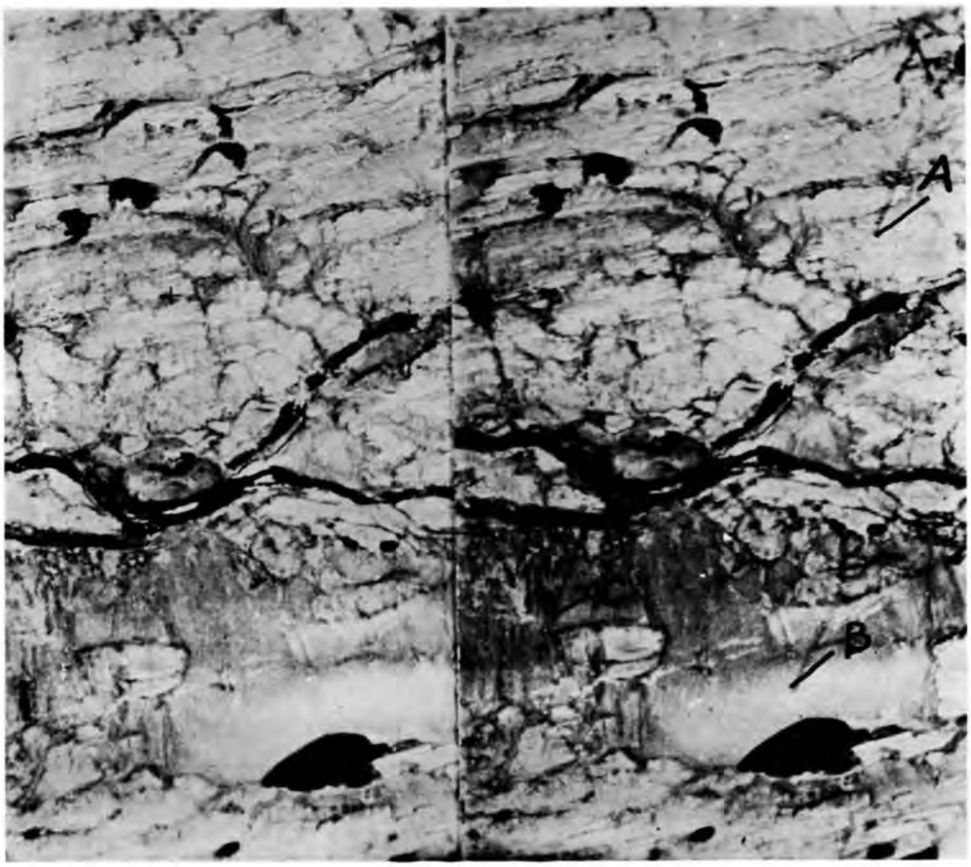


Fig. 165. Dry tundra on bedrock south of Coronation Gulf. With the exception of lichens, virtually no vegetation occurs on the glacier-scoured bedrock (A) which produces a light gray to white photo tone. Isolated surficial granular deposits of glacial origin (B) support a rather sparse growth of low-lying plants such as dryas, bearberry, and ground birch. Stone or vegetation stripes (C) found on more moist slopes of hills composed of unconsolidated materials are produced by solifluction. Note the conspicuous absence of marsh and bog development adjacent to the lakes dotting the uplands, indicating the complete absence of peat development. The vegetation established on the island in the deep protected gorge in the center of the photo probably consists of clumps of ground birch which produce a coarse pebble-grained airphoto texture. Permafrost is of little concern in dry tundra areas.

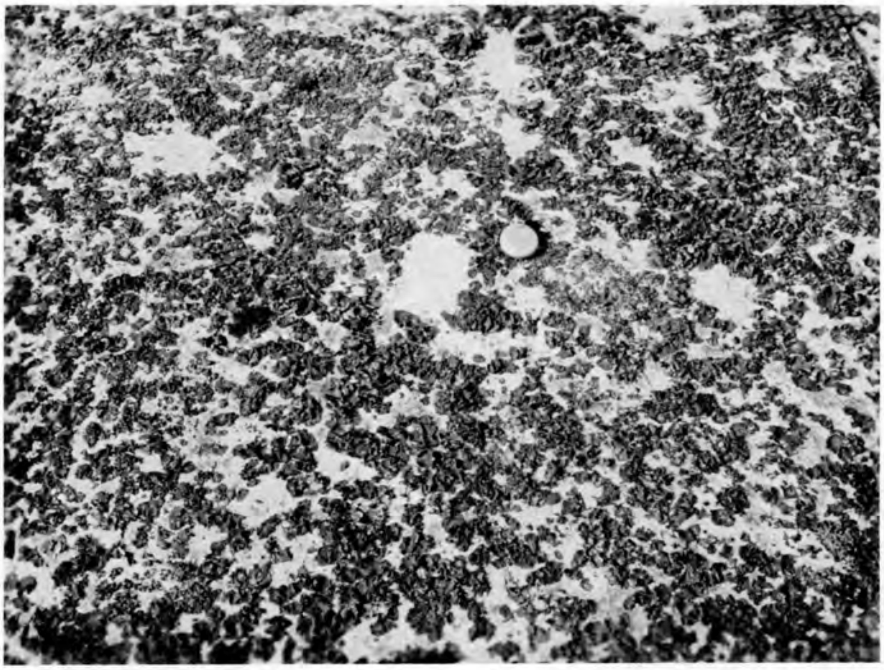


Fig. 166. Detail showing black foliose lichens on light granite. Lichens are the dominant plants on rock exposures in the dry tundra. Dense growth of such plants may reverse the color tone of rock outcrops on airphotos. The pocket compass indicates scale.

Fig. 167. Rocky dry tundra site north of Hornby Bay, Great Bear Lake. Dominant plants are the woody shrubs ground birch (A) and crowberry. Crustose and foliose lichens cover the rock at (B).

Fig. 168. Dry tundra vegetation on top of a dry sandy gravel esker. Plant at left center is ground birch; the low plant bordering it is crowberry. The glove at center indicates scale.

Fig. 169. Dry tundra vegetation on windswept gravel bench 40 ft above the sandy plain adjacent to the Arctic Ocean. Prostrate mats of dryas sparsely occupy the dry coarse-gravel substrate.

Fig. 170. Stereoview of fissure polygons on dry tundra of a coarse drift ridge. This shows denser vegetation than typical dry tundra habitats. From the air, the 30-ft polygons are very distinct, but in a ground photo, stereovision is needed to trace the channels. The axe indicates a channel. Channels are 3 ft wide and as much as 8 in. deep, and support denser ground birch and ledum than the centers, which support in addition heath, sedge, and lichens.

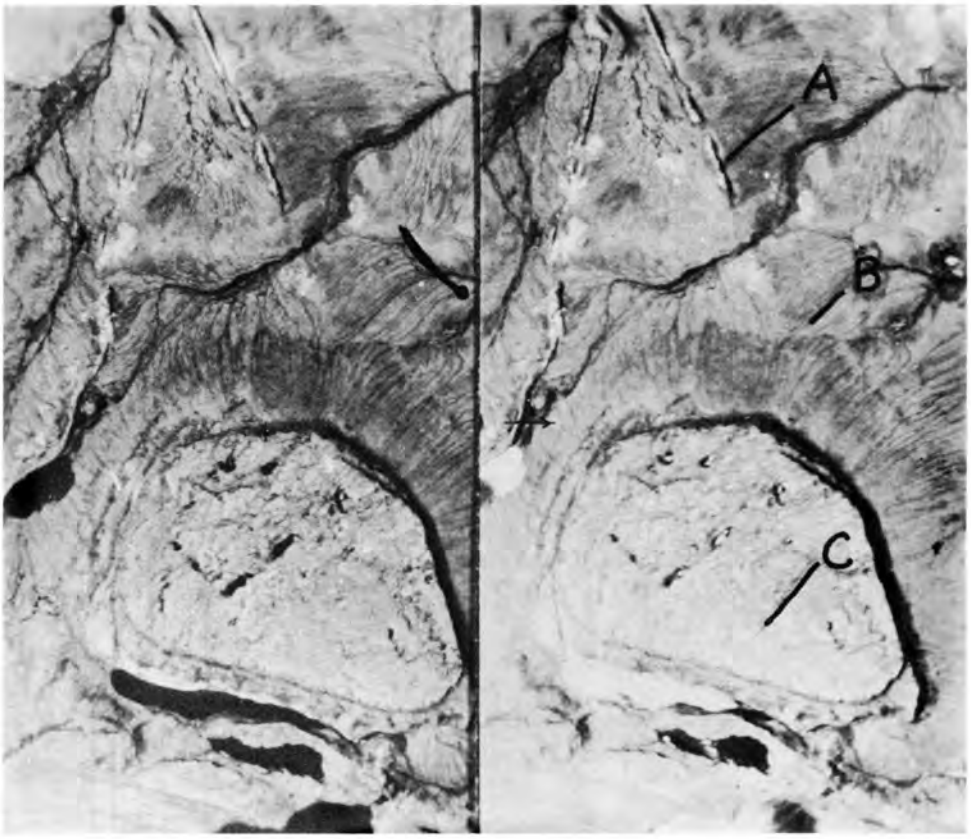


Fig. 171. Stereopair of a moist tundra region south of Coppermine. Most of the area, with the exception of a volcanic rock bench (C), is covered with a continuous mat of low-lying vegetation, principally sedges, mosses, and various shrubby plants. A relatively thin continuous peat mantle is characteristic of this type. Vegetation stripes (B) which run normal to the slope are widespread in moist tundra regions. The airphoto tone of moist tundra area is considerably darker than that of dry tundra. The active layer in this type averages about 15 in. in thickness. Note the dike at location A.

Fig. 172. Moist tundra on thick mantle of glacial drift in the Canadian Shield. Polygons are absent in the uplands, but soil slips are common on slopes (lower right). Wet tundra occurs in a strip at A, where the dark tone is caused by peat polygons. Although definitely a tundra habitat, and so indicated on maps, a small grove of dwarf white spruce is seen at B.

Fig. 173. Typical moist tundra on sand along Arctic Coast east of Mackenzie Delta. The quadrat frame stands 18 in. high. Principal shrubs are ground birch, alder, ledum, mountain cranberry, and dwarf blueberry.

Fig. 174. Moist tundra surrounding a local dry tundra site north of Great Bear Lake. An open stand of ground birch occurs on an elevated windswept granular terrace in the foreground. Elsewhere the vegetation cover is continuous.

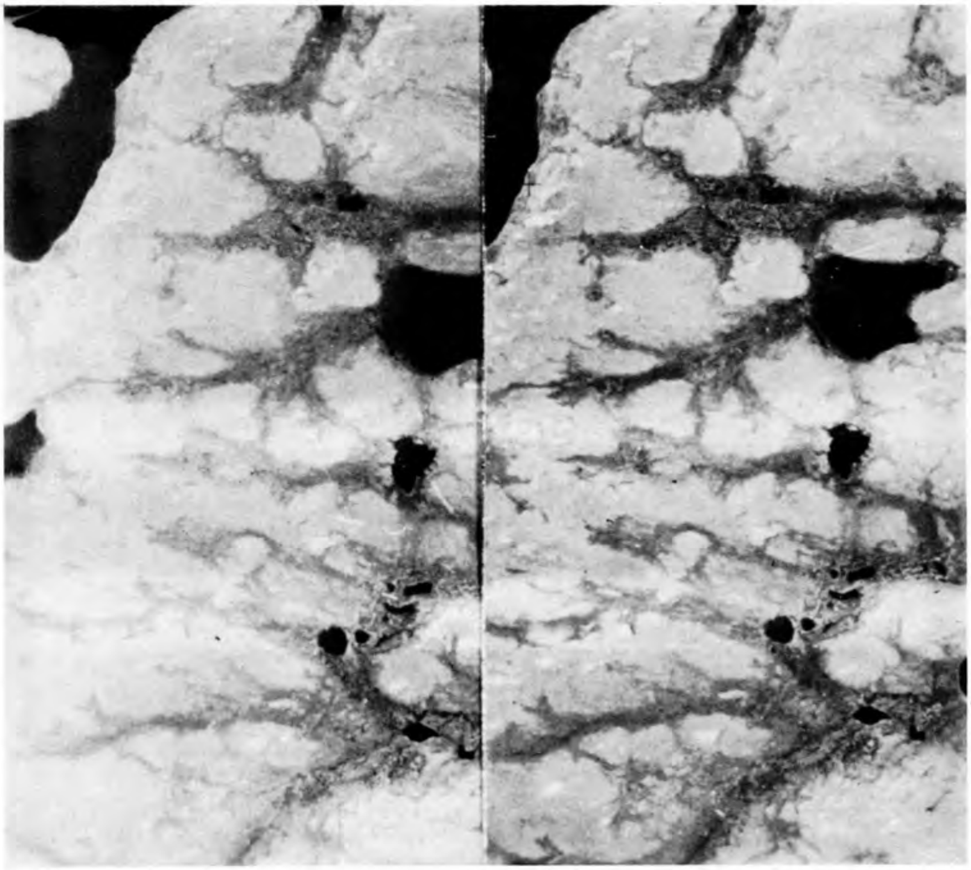


Fig. 175. Stereopair of moist and wet tundra on glacial drift northeast of Great Slave Lake. The medium gray tone indicates moist tundra, and the dark gray-to-black tone represents local wet tundra sites in poorly drained drainageways and small basins. Exposed ridges and knobs which support a discontinuous, sparse dry tundra vegetation have a light gray to white tone. Polygonal ground is widespread both in wet and moist tundra, but is absent or faint on locally well-drained dry tundra sites. Because of the dense luxuriant vegetation occurring in the wet tundra, peat deposits are relatively thick -- that is 2 ft or more. Vegetation rings, peat hummocks, fissure polygons, and depressed-center polygons are characteristic of wet tundra.

Fig. 176. Peat-filled depressions on shore of Artillery Lake with fissure polygons. The centers are free of vegetation, due to violent frost action, and appear deep chocolate brown to black from the air.

Fig. 177. Stereopair of fissure polygons in wet tundra occupying a peat-filled, hummocky depression between dry drift hills. Polygon centers, 20 to 90 ft across, display peat hummocks up to 3 ft high by 4 ft wide, sparsely covered with ground birch, ledum, blueberry, moss, and reindeer lichens. By late June, the peat was thawed to a depth of 4 to 10 in. The water-filled channels, 7 to 15 ft wide and containing dense cotton sedge, were thawed to a 14-in. depth.

Fig. 178. Wet tundra habitat at timberline on Artillery Lake. Peat hummocks range from 1 to 4 ft high and from 1 to 8 ft in diameter. Vegetation consists of moss, ground birch, ledum, sedges, blueberry, and lichens. The peaty soil in late June was thawed twice as deep (9 in.) on the hummocks as in the depressions. Hand axe furnishes a scale.

Fig. 179. Vegetation rings (A) on a poorly drained gentle slope and irregular polygons in a wetter site (B). The rings range in size from 10 to 30 ft in diameter.

Fig. 180. Vegetation rings or rock rings in wet tundra in the Canadian Shield. On small-scale airphotos such patterned ground appears pitted. The rock rings submerged offshore appear to consist of 2-ft boulders. Note faint polygonal markings on low, level bench on the right.