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FAULTING IN THE VICINITY OF HALIFAX,  
NOVA SCOTIA

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### ABSTRACT

The Meguma Series east of Halifax has been extensively faulted in a NW—SE direction. The major faults were mapped by Dr. E. R. Faribault of the Canadian Geological Survey who did not state the exact age of the faulting. The present study based on aerial photograph interpretation has revealed the existence of at least twice as many minor faults as are shown on existing maps. A number of hitherto unmapped major faults were found in the immediate vicinity of Halifax, both in the granite and Meguma Series. The faults are briefly described. It is concluded that the faulting is post granite and hence post lower Devonian.

The glacial geology is briefly noted and a number of points mentioned for further study.

The major faults which cut the Meguma series east of Halifax have been mapped by the Geological Survey of Canada, mainly through the work of Dr. E. R. Faribault. The age of these faults has never been definitely stated, though in the case of the Indian Harbour fault, it was inferred that the old river valley of the St. Mary's River followed the fault and thus cut the Sherbrooke granite mass. This would give a post Lower Devonian age for the faulting. On the other hand, Malcolm (1928) p. 40, gives the succession of events as, folding, local and cross country faulting, and granite

intrusion. In pursuing a general study of faulting in N. S., the writer has made a check on all observable faults in the area from Canso to Bridgewater, as seen in aerial photographs. Some very interesting general results have been obtained, but the present discussion will deal only with the faults in the immediate vicinity of Halifax.

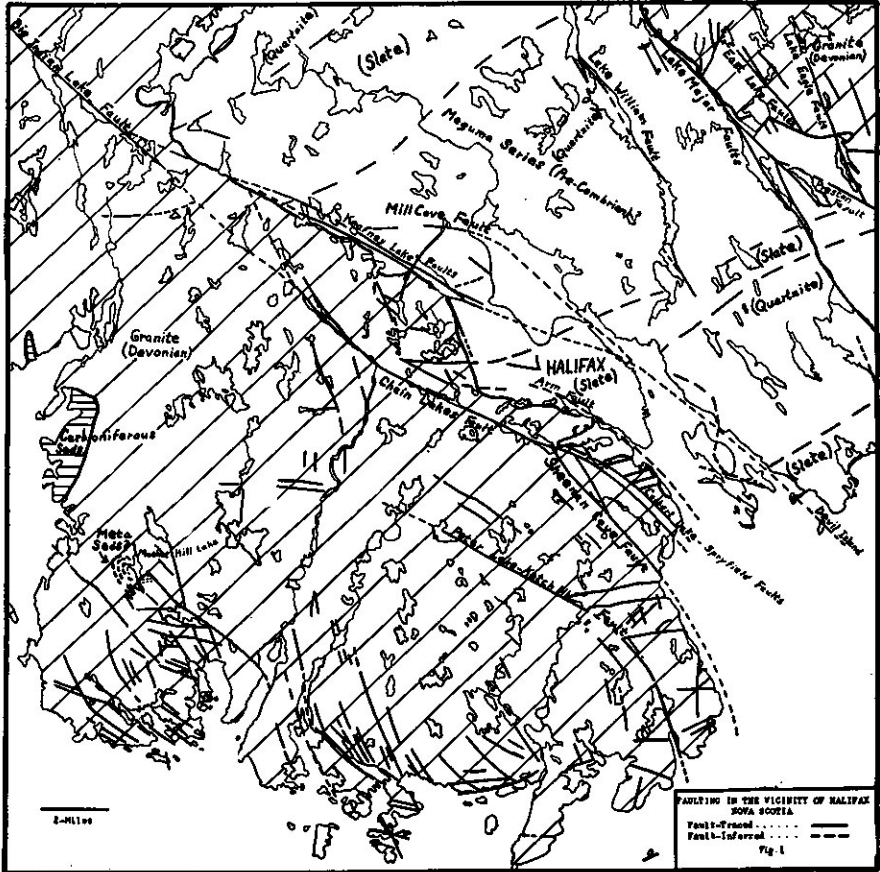


Figure 1

Figure 1 is a map of Halifax and vicinity showing the observed and inferred faults. The first point of interest is that a number of large faults cut the granite lobe west of Halifax and are quite obviously of the same age as those which cut the sediments. This fact is confirmed by many observations of the granite masses east of the map area. It can now be stated that the faulting is of post Lower Devonian and probably pre-Carboniferous age. Another interesting point is that the Meguma faults can now be definitely correlated with the Hollow-Cape George fault of the Arisaig area, and to one period of faulting in the Gaspé Area. Referring to Figure 1 the faults will be described, from east to west.

- (1) *Preston Fault* (mapped by Faribault). Displaces the Dartmouth syncline near Preston. The change of direction is notable. It is probably due to the resistance of the granite mass to the north. The north section is approximately in line with one branch of the Lake Major fault, and is inferred to join it as shown. The displacement is left hand.
- (2) *Lake Eagle Fault* (Aerial Photograph Interpretation). Extends from Tittle Lake to Eagle Lake. It meets the Preston fault near the lower end of Eagle Lake.
- (3) *East Lake Faults* (Aerial Photograph Interpretation). Two parallel breaks which cut the granite and parallel the Lake Major fault to the west. They are not considered to be major faults. The major lines of faulting in this area are the Porter Lake and Lake Major faults.
- (4) *Lake Major Faults* (Faribault and Air Photo-Interpretation). This fault or system of faults is the major fracture system in the eastern part of the area. It can be traced from Soldier Lake in the north to the coast at Cole Harbour. The north section follows the granite-sediment contact. A number of parallel

breaks occur both east and west, as (2) above, and the Pensey Head and Little Soldier Lake faults

- (5) *Lake William Fault* (Faribault, Hind et al). This zone parallels the Lake Major fault, and where mapped has a relatively small displacement. It is believed that it extends southeast to the vicinity of Cow Bay, but heavy drift masks this section.
- (6) *Kearney Lake-Eastern Passage Faults* (Aerial Photograph Interpretation). This fault is of particular interest as it can be used to explain some local topography. The northwest section follows the granite-sediment contact from Taylor Lake to Kearney Lake. The fault continues South East from this point in an almost straight line, but the contact swings to the south with a branch fracture probably following it. The main break can be traced nearly to Rockingham where it is masked by drift. The inferred continuation parallels the Arm Fault and is supported by the discrepancies between the strike lines of the fold axis on opposite sides of Bedford Basin and Halifax Harbour. One final piece of evidence is the fault which cuts Devil Island southeast from Eastern Passage. To the North West this zone probably meets the fault which passes through Big Indian Lake.
- (7) *Mill Cove Fault* (Aerial Photograph Interpretation). A fault which starts west of Paper Mill Lake and extends east to Mill Cove. It is inferred to curve south as shown to meet the Kearney Lake fault near George Island, to form a lozenge shaped segment. A fault has been mapped by Faribault as offsetting the Waverley anticline northwest of Kearney Lake. This may be a continuation of the Mill Cove Fault or may be an echelon fault giving a "green stick" fracture effect.

- (8) *Arm Fault* (Air Photograph Interpretation). This fault parallels the Kearney Lake on the northeast and the Spryfield-Chain Lake faults on the southwest. It appears to die out near Armdale but probably increases in size to the southeast.
- (9) *Colbart Lake-Spryfield Faults* (Aerial Photograph Interpretation). Two distinct breaks which are nearly parallel to the Arm fault. However, if the Arm fault follows the curve of the coast to Sandwich Point, these faults will converge to form another lozenge shaped segment. An interesting feature is the east-west cross faults between these faults and the Arm fault.
- (10) *Chain Lakes-Sheehan Cove Faults* (Aerial Photograph Interpretation). This is believed to be the major fault zone of the central part of the area. It can be traced from Maple Lake in the northwest to Sheehan Cove and Chebucto Head in the southeast. A possible continuation to the northwest through Wright, Clay, and Big Indian Lakes would give this zone a length of thirty miles. The confirmed length of twenty miles places it in the same class as the New Harbour, Country Harbour, and West River Sheet Harbour faults.
- (11) Faults in granite lobe southwest of (9)—(See Fig. 3e and 3f)—Those parallel to the NW-SE system include the Hackett Cove, Power Lake—Prospect Bay, and Ketch Harbour faults. A number of east-west fractures are associated with these breaks. A number of north-south adjustment (?) fractures are also present.

In addition to the foregoing there exist a number of local cross fractures which appear to be the ordinary grid jointing observed in many granite outcrops. Foliation parallel to some of the faults suggests that the granite may not have

been completely solid at the time of faulting. See Fig. 3b. This is not probable so the lineations may be considered as an indication of the intensity of the fracturing.

To briefly summarize; the major faults of the area belong to the great NW-SE system mapped in the area east from Halifax. The essential parallelism of the major breaks is slightly modified, probably due to the resistance of the granite masses and a number of lozenge shaped segments have developed. The movements all appear to be left hand and vary from a few feet to 3000' and more.

An area was noted near Mosher Hill Lake that shows a pattern similar to areas of sediments included in the granite near Canso. This area will be ground checked and will constitute an interesting check on aerial photograph interpretation.

Incidental to the study of the faulting a number of facts were noted about the geological structure and glacial geology of the area. Figure (2) illustrates the general glacial geology. The distribution of drumlins and glacial ridges is shown. The denuded areas and the heavily drifted areas which occur immediately south of them give further evidence of the direction of ice movement. See Figs. 3a, 3b, 3c and 3d. A number of points suggest further studies; for example (1) why is the glacial drift southeast of Dartmouth arranged in ridges rather than in drumlin form as it is across the harbour to the west. (2) The ridges of drift in the valley of the Sackville River may be lateral moraines of a local valley glacier or elongated drumlins.

The fold structures of the Meguma sediments are shown clearly and completely in the aerial photographs. Fig. 3f shows the Bedford syncline with all its symmetry of line and form. Fig. 3c shows the fracturing and loss of symmetry where the granite intrusion comes in and faulting has occurred. Fig. 3e covers the area of suspected meta-sediments near Mosher Hill Lake.

In conclusion, the data presented in this paper was obtained mainly from the stereoscopic study of aerial photo-

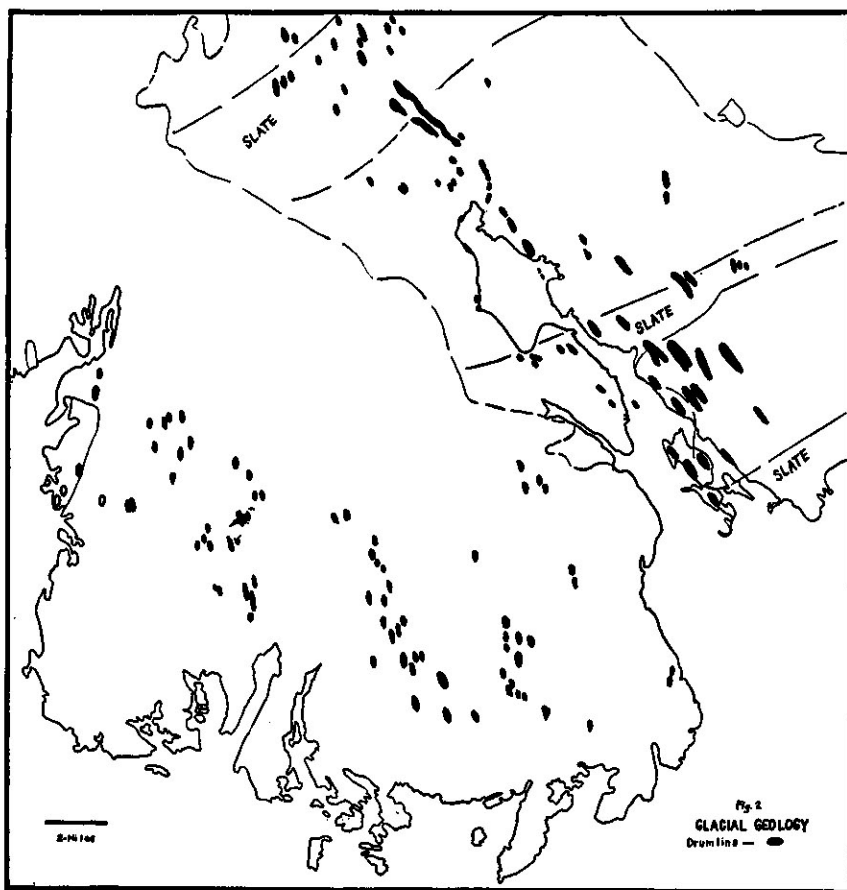


Figure 2

graphs. However, it must be kept in mind that the interpretation was based on the experience of the writer on the ground in similar areas elsewhere in Nova Scotia, and on the study of many photographs of other areas keyed to ground data.

As photogrammetrist for the Nova Scotia Research Foundation, the writer wishes to thank the Foundation for the use of their Aerial Photograph Library and the plotting

stereoscope (Multiscope), and particularly for their encouragement in this project as an example of photogrammetry in pure science.

### ILLUSTRATIONS

- Fig. 1. Map of Faults in Vicinity of Halifax.  
Fig. 2. Glacial Forms in Vicinity of Halifax.  
Fig. 3. a. Aerial Photograph of Halifax.  
b. Long Lake Area.  
c. Kearney Lake.  
d. Terrence Bay.  
e. Mosher Hill Lake.  
f. Bedford Syncline.

### BIBLIOGRAPHY

- C. K. Howse—Report on Geology of Purcell's Cove Area, Halifax County, Nova Scotia, Pro. N. S. Inst. Sci., XVIII, Part 2.  
W. Malcolm—Goldfields of Nova Scotia, C. G. S. Mem. 156, 1928.  
Manual of Photogrammetry—Am. Soc. of Photogrammetry, 1946.





Figure 3-A

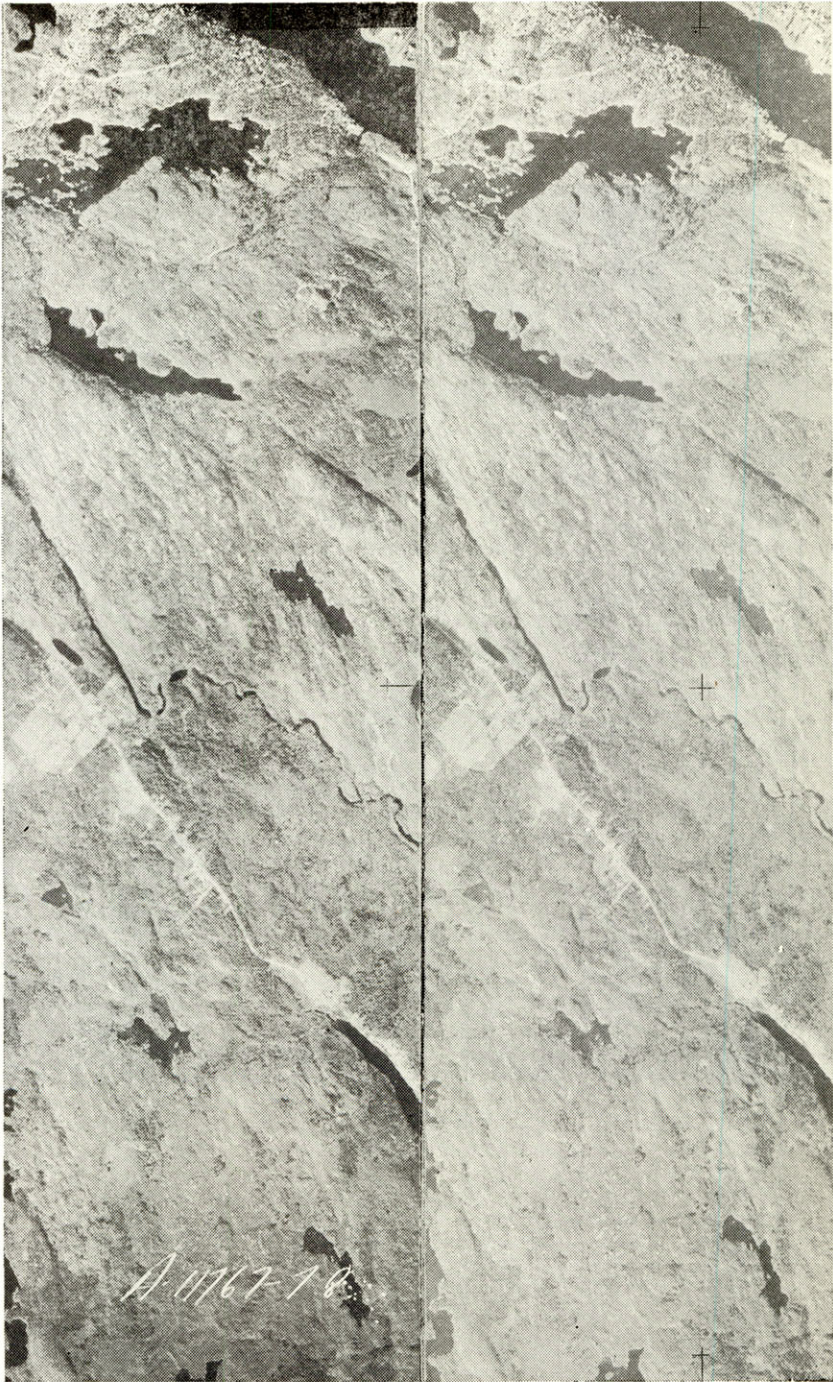


Figure 3-B (East)  
(Stereo pair)

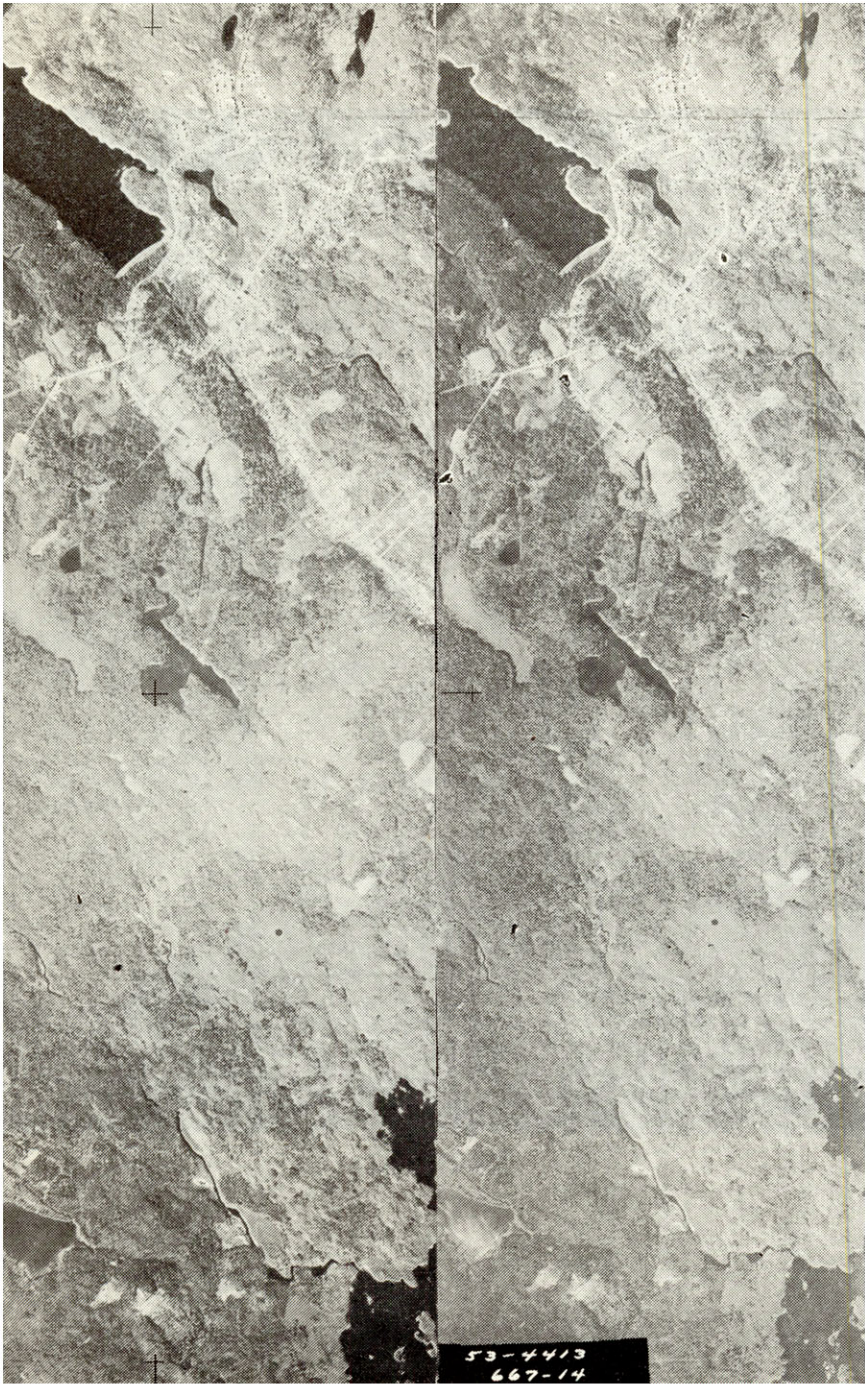


Figure 3-B (West)  
(Stereo pair)



Figure 3-C

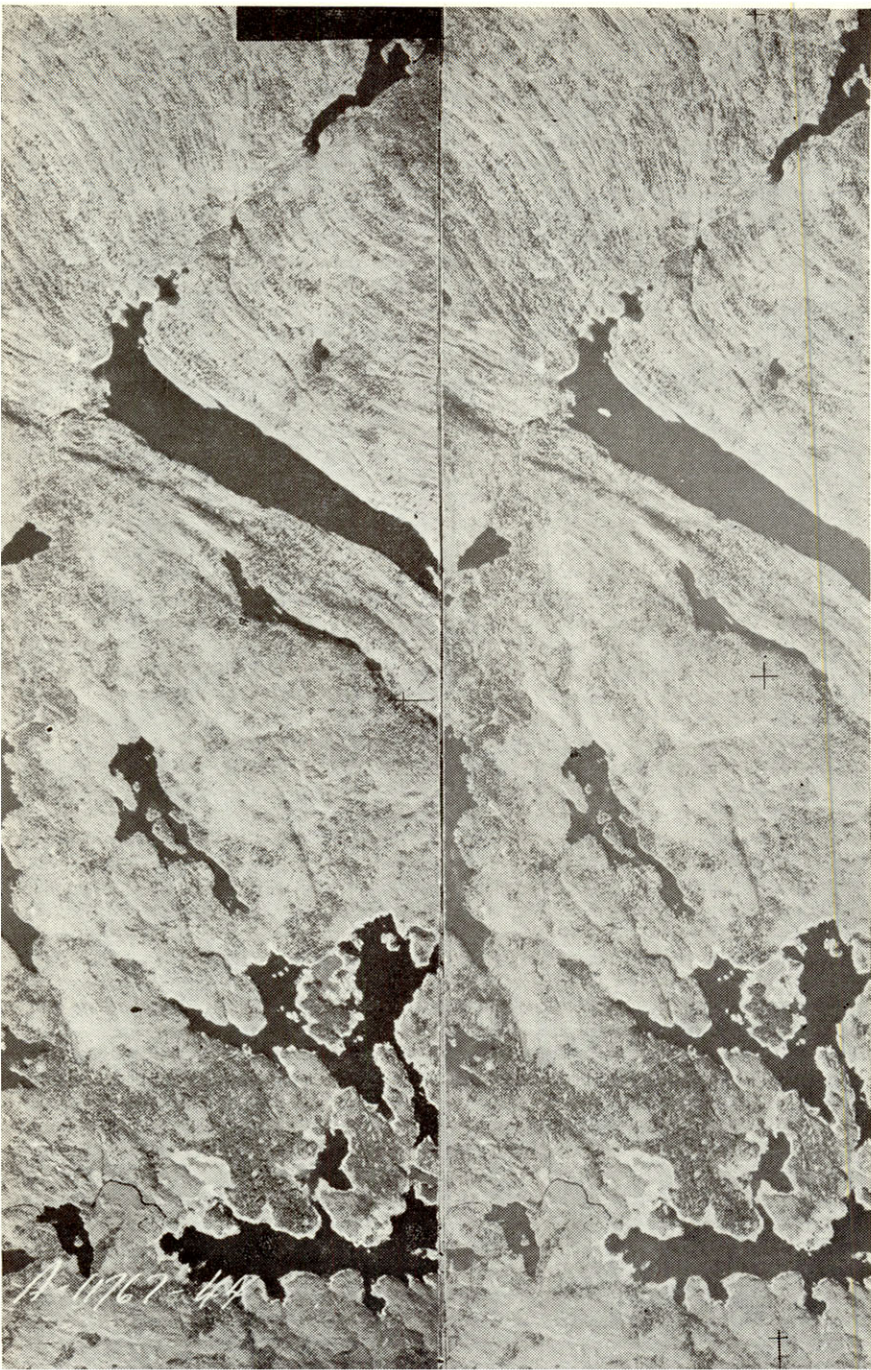


Figure 3-D (East)  
(Stereo pair)

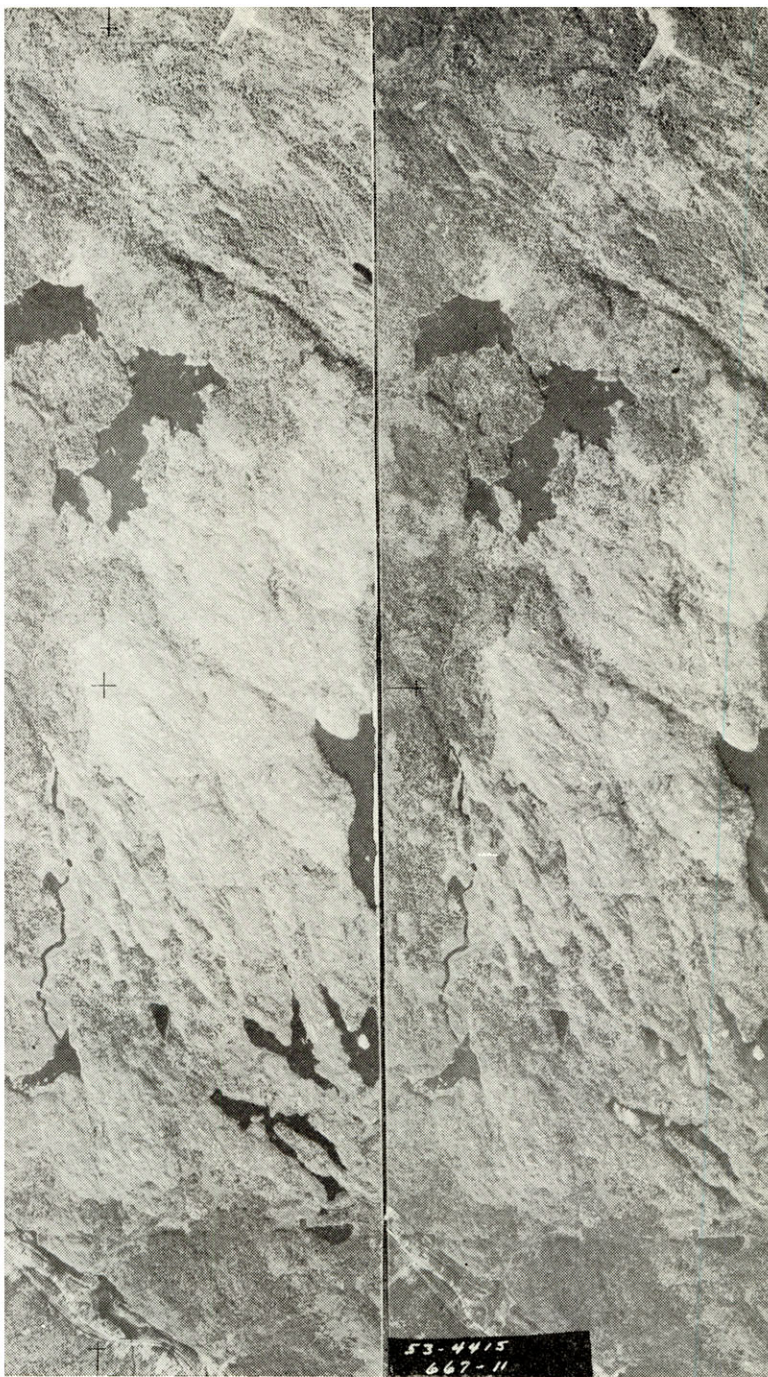


Figure 3-D (West)  
(Stereo pair)



**Figure 3-E**  
(Stereo pair)