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1962-2

Canadian Earthquakes - 1962

W. G. Milne and W. E. T. Smith

Seismological Service
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OTTAWA, CANADA

Department of Mines and Technical Surveys

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INTRODUCTION

The general program of the Seismological Service to catalogue all Canadian earthquakes, was outlined by Milne and Smith in Canadian Earthquakes - 1960 (1960-2 of this Series). The stated aim was to increase the usefulness of a previously published seismic probability map for Canada. Recently published studies, conducted in other countries, indicate that 'seismic regionalization' might be more effective. In this new approach earthquake data, processed in various ways, are combined with all other available geophysical and geological data, region by region. The originators claim that this technique, together with certain reasonable postulates, can yield more accurate estimates of seismic hazard.

All the additional types of work necessary for this approach are carried on by other Branches of the Department. Officials of these Branches were supplied with background literature and canvassed for an opinion on the applicability of the method to Canada and also for their possible individual contributions. As a consequence, a departmental Committee on Seismic Regionalization was formed, with formal authorization for continuance. Results from the work of this committee cannot be expected for some time because work in some of the disciplines has to be reoriented with the needs of the committee, while in others the essential data consist of measurements repeated at intervals of time.

Meanwhile, the present paper is another in a sequence enabling interested persons to receive currently available data without waiting for the completion of the whole project. These papers will not replace the more formal papers in the Publications series of the Dominion Observatories, which will be produced only at intervals dictated by the seismic activity.

For the purpose of describing Canadian seismicity, Canada has been divided into four regions. The most northerly is the Arctic region, comprising that part of Canada north of the 60th parallel. The area south of the 60th parallel is divided into three regions, a Western region lying west of the 113th meridian, an Eastern region lying east of the 85th meridian, and a Central region lying between the 85th and the 113th meridians.

During 1962 no earthquakes are known to have occurred in the Central region. Earthquakes occurring in the other three regions are listed in Tables I, II and III, and the epicentres are plotted in Figures 1, 2 and 3. In each of these maps the symbol representing an earthquake is related to its magnitude as indicated by a diagram in the legend.

STATION CHANGES

In previous issues, plans for new stations were discussed on the basis of the fiscal year in which money for their construction would become available. Actual additions were listed in terms of the calendar year in which stations began to contribute to the earthquake catalogue. This accounts for an apparent discrepancy between plans and progress. The expansion of the seismological network so that no point in the country will be more than 300 miles from a first-class seismological station continues. Priorities assigned to proposed sites have been rearranged. This has delayed the establishment of a station at Fort St. James, B.C., as forecast in the paper on 1960 earthquakes.

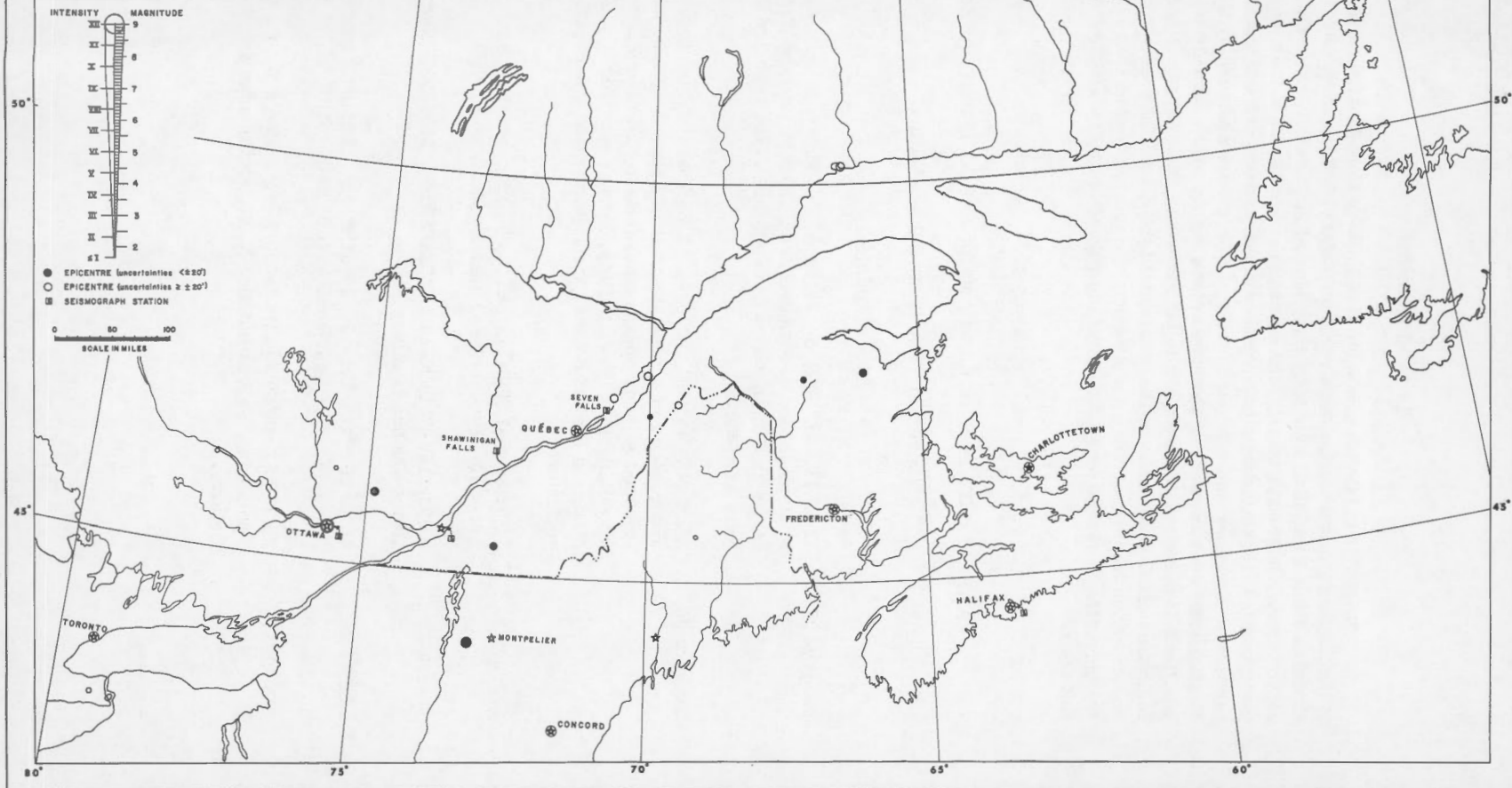
The following are the network changes made during the 1962 calendar year:

- (i) The existing instruments at Alberni, B.C. were removed about August 1, and replaced by a Willmore vertical seismometer and a Willmore recorder.
- (ii) Because of construction difficulties, instruments were not installed in the new vaults at Ottawa until December 18.
- (iii) A standard station was installed at Port Hardy, B.C. It came into operation late in December.
- (iv) A station was operated intermittently on a rather noisy site at Scarborough in conjunction with a training school for station operators.
- (v) A set of standard instruments began operation in the new vault at Schefferville, Que., on July 22.
- (vi) Renovation of the vault at Seven Falls, Que., was completed and new standard instruments installed. However, few records of value were produced owing to staffing difficulties.
- (vii) Through the cooperation of the British and Canadian governments an array of short-period vertical seismometers was installed near Yellowknife, N.W.T. One of them produces visual records and these are available for interpretation at Ottawa on a routine basis.

ACKNOWLEDGMENT

The cooperation of Rev. M. Buist, S.J., of Jean-de-Brébeuf College in supplying records from the Montreal station on a routine basis is gratefully acknowledged.

FIGURE 1
EARTHQUAKES
OF
EASTERN CANADA
AND ADJACENT AREAS
1962



EASTERN CANADA

No major earthquakes occurred in Eastern Canada during 1962. Eighteen small disturbances were recorded, eight of which were felt. They are listed in Table I and their epicentres are plotted in Figure 1. No numbers have, as yet, been assigned to these. The epicentral coordinates include the uncertainties. It should be clearly understood that these are not 'probable errors' or any other statistical evaluations. They were assigned by the writer (Smith) after consideration of the number and quality of the seismic traces, the positions of the epicentres relative to the recording stations, etc., and are an indication of his confidence in the precision of the determinations. When both uncertainties in the coordinates are adjudged to amount to less than $\pm 20'$ of arc, the epicentre is plotted as a filled circle in Figure 1; otherwise the circle is left open.

TABLE I

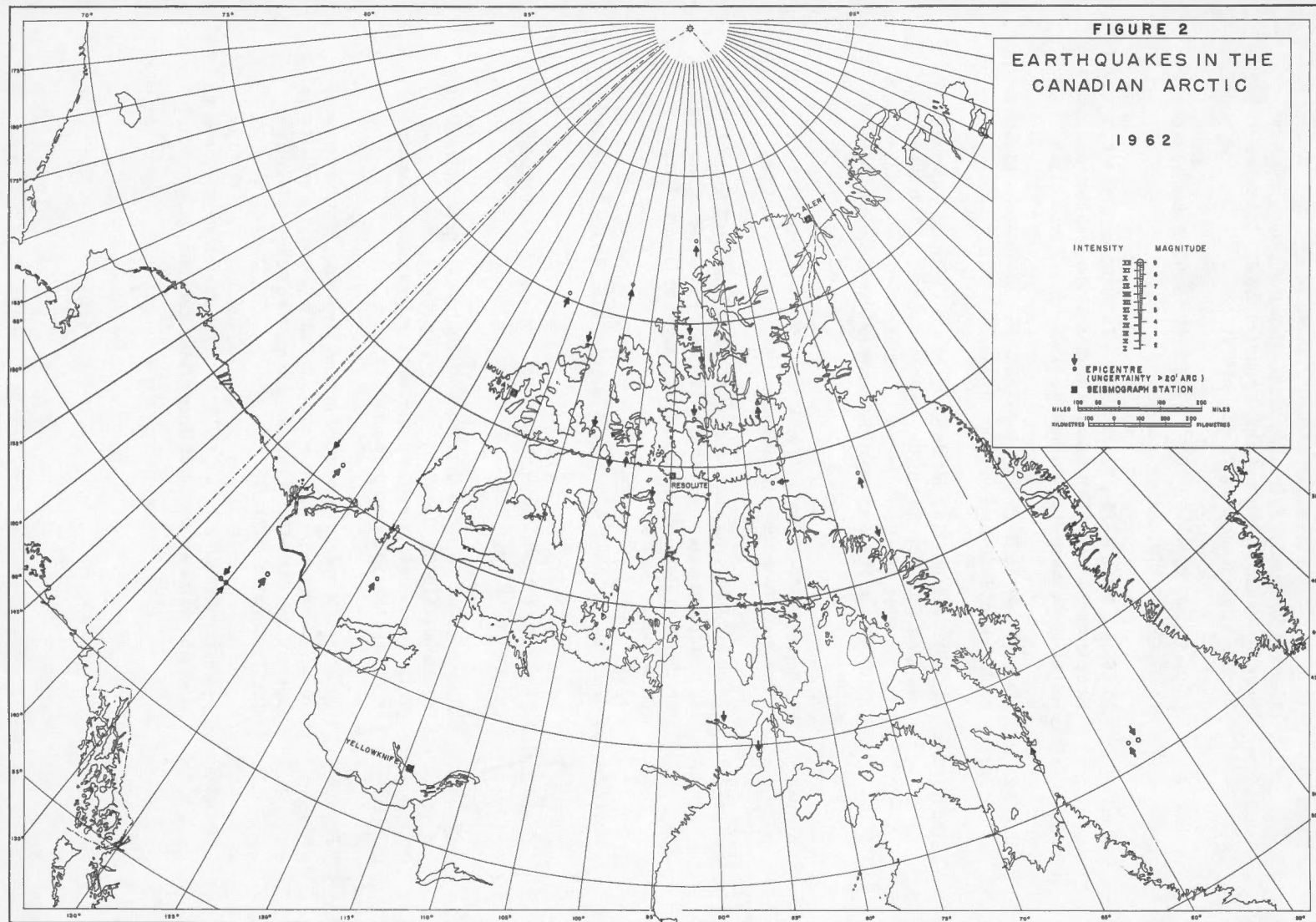
EARTHQUAKES IN EASTERN CANADA AND ADJACENT AREAS

(Universal Time is used throughout)

(M = magnitude)

January 27	12:11:17. $45^{\circ}55'N^{\pm}5'$, $74^{\circ}51'W^{\pm}5'$. M = 4.3. About 12 miles west-southwest of Arundel, Que. Felt strongly at Arundel and as far as Ottawa where radio station CFRA reported that 'many were awakened'.
January 30	08:08:00. $48^{\circ}09'N$, $80^{\circ}02'W$. A rockburst 3,200 to 4,950 feet underground in a mine at Kirkland Lake, Ont. The burst released seismic energy equivalent to that of an earthquake of magnitude 4.6. F.J. Hallick, former operator of a seismograph station at Kirkland Lake, kindly confirmed this event as a rockburst.
January 31	14:32:38. $47^{\circ}30'N^{\pm}12'$, $67^{\circ}08'W^{\pm}12'$. Depth 30 km. M = 3.5. About 15 miles south-southeast of Kedgwick, N.B.
March 23	02:02:21. $47^{\circ}11'N^{\pm}20'$, $69^{\circ}28'W^{\pm}20'$. M = 3.3. Northwestern Maine-Quebec boundary.
March 25	05:15:05. $47^{\circ}34'N^{\pm}15'$, $66^{\circ}01'W^{\pm}15'$. Depth 32 km. M = 4.0. About 20 miles west-southwest of Bathurst, N.B.
March 27	06:35:05. $43^{\circ}00'N^{\pm}25'$, $79^{\circ}20'W^{\pm}10'$. M = 3.0. On the Niagara Peninsula. Felt at Buffalo, N.Y., and in adjacent parts of Ontario.

- April 10 14:30:48. $44^{\circ}09'N^{\pm}9'$, $73^{\circ}03'W^{\pm}9'$. Depth 24 km. $M = 5.0$. Western Vermont. Felt in Vermont, New Hampshire and New York States and lightly in Canada south of the St. Lawrence River. Slight damage at Montpelier, Vt.
- June 3 20:09:04. $47^{\circ}02'N^{\pm}15'$, $70^{\circ}00'W^{\pm}15'$. $M = 2.9$. About 15 miles east of St-Cyrille, Que.
- June 21 02:06:48. $45^{\circ}22'N^{\pm}12'$, $72^{\circ}42'W^{\pm}12'$. Depth 25 km. $M = 3.9$. Near Granby, Que. Felt within a radius of about 40 miles, including the Lake Memphremagog area.
- July 27 17:56:57. $47^{\circ}15'N^{\pm}25'$, $70^{\circ}40'W^{\pm}25'$. $M = 4.3$. About 15 miles southwest of Baie-St-Paul, Que.
- August 3 01:31:02. $52^{\circ}0N^{\pm}2^{\circ}0$, $54^{\circ}2W^{\pm}3^{\circ}0$. $M = 4.8$. In the Labrador Sea about 75 miles east of the southeast corner of Labrador, Nfld. It is possible that the epicentre is farther north because the Halifax trace was very small and may not be associated with this shock.
- August 11 03:05:16. $47^{\circ}32'N^{\pm}20'$, $70^{\circ}03'W^{\pm}20'$. $M = 4.1$. In the St. Lawrence River about 10 miles west of Kamouraska, Que.
- August 19 14:00 to 14:30. Not recorded but felt with intensity II ($M = 2.3$), at Des Joachims colony ($46^{\circ}10'N$, $77^{\circ}46'W$) about 40 miles northeast of Pembroke, Ont. Report given by Ontario Hydro personnel.
- November 30 02:12:00. $58^{\circ}8N^{\pm}2^{\circ}0$, $54^{\circ}8W^{\pm}3^{\circ}0$. $M = 4.5$. In the Labrador Sea.
- December 1 21:29:23. $45^{\circ}34'N^{\pm}25'$, $69^{\circ}08'W^{\pm}30'$. $M = 3.0$. Central Maine where the sock was felt.
- December 6 Not recorded but felt with intensity II ($M = 2.3$), near Notre-Dame-du-Laus ($46^{\circ}08'N$, $75^{\circ}37'W$), Que., by persons around Cedar Lake reservoir. Duration estimated as 15 seconds. Report given by Ontario Hydro personnel.
- December 15 00:58:32. $M = 4.6$. Recorded only at Montreal. Probably about 15 miles from Sept-Iles ($50^{\circ}12'N$, $66^{\circ}23'W$), Que., where it was felt with intensity IV. The town manager reported to Montreal that "sidewalks cracked".
- December 20 04:23:12. $52^{\circ}8N^{\pm}1^{\circ}0$, $59^{\circ}4W^{\pm}1^{\circ}5$. Near the surface. $M = 4.4$. About 60 miles southeast of Goose Bay, Labrador.



THE CANADIAN ARCTIC

(North of 60°N)

Eighty-five seismic disturbances were recorded in the Arctic region during 1962. They are listed in Table II without numbers, pending further research to eliminate those not connected with the seismicity of the area. No major earthquakes occurred. Twenty-nine epicentres were located instrumentally and are plotted in Figure 2. Uncertainties were assigned to the epicentral coordinates in the same manner as for Eastern Canada. The increased number of disturbances recorded and the greatly increased proportion of epicentres located results from the operation, throughout the year, of the two new stations at Mould Bay and Alert N.W.T. At this writing a new station at Coppermine, N.W.T. is being instrumented for even better coverage in the Northwest Territories.

TABLE II

EARTHQUAKES IN THE CANADIAN ARCTIC

(Universal Time is used throughout)

(M = magnitude)

January 2	17:55:31. M = 1.6. 121 miles from Resolute, N.W.T.
January 3	19:34:56. M = 2.1. 102 miles from Resolute, N.W.T.
January 5	23:56:28. 82°8N [±] 0°5, 90°9W [±] 2°0. Depth 25 km. M = 3.5. About 48 miles northwest of Alert Point, Ellesmere Island, N.W.T.
January 6	04:24:19. 78°5N [±] 0°5, 90°4W [±] 2°0. Depth 20 km. M = 3.9. Near the southern tip of Axel Heiberg Island, N.W.T.
January 12	03:56:19. M = 1.3. 35 miles from Mould Bay, N.W.T.
January 13	12:25:41. 74°2N [±] 1°0, 81°7W [±] 3°0. Depth 25 km. M = 3.6. Near Cape Sherard, Devon Island, N.W.T.
January 14	09:45:44. M = 2.0. 37 miles from Resolute, N.W.T.
January 17	09:10:25. M = 2.0. 109 miles from Resolute, N.W.T.
January 18	01:23:19. M = 1.0. 35 miles from Resolute, N.W.T.
January 18	04:37:44. M = 2.1. 153 miles from Resolute, N.W.T.
January 18	16:34:23. M = 1.0. 15 miles from Resolute, N.W.T.
January 18	20:52:08. M = 1.4. 46 miles from Resolute, N.W.T.

January 27	04:02:35. M = 1.8. 56 Miles from Resolute, N.W.T.
January 28	07:51:32. M = 2.2. 112 miles from Resolute, N.W.T.
January 28	12:40:39. M = 2.2. 112 miles from Resolute, N.W.T.
January 31	00:40:19. $68^{\circ}2N \pm 1^{\circ}0$, $123^{\circ}9W \pm 2^{\circ}0$. M = 4.3. About 140 miles northwest of Great Bear Lake, N.W.T.
February 4	20:03:45. $82^{\circ}1N \pm 0^{\circ}5$, $82^{\circ}0W \pm 2.5$. Depth 30 km. M = 3.4. Ellesmere Island, about 50 miles north of Greely Fiord, N.W.T.
February 4	23:09:46. M = 2.4. 117 miles from Resolute, N.W.T.
February 11	07:40:01. M = 1.6. 64 miles from Resolute, N.W.T.
February 12	13:21:37. M = 1.8. 122 miles from Resolute, N.W.T.
February 15	14:09:29. Depth 27 km. M = 3.6. 241 miles from Resolute, N.W.T.
February 23	11:10:29. M = 2.1. 46 miles from Resolute, N.W.T.
February 24	02:29:44. $81^{\circ}1N \pm 0^{\circ}5$, $105^{\circ}0W \pm 2^{\circ}0$. M = 3.5. About 90 miles north of Ellef Ringnes Island, Queen Elizabeth Islands, N.W.T.
February 26	07:20:57. M = 1.8. 51 miles from Mould Bay, N.W.T.
February 26	09:19:57. $70^{\circ}9N \pm 1^{\circ}0$, $133^{\circ}0W \pm 2.5$. M = 4.4. Beaufort Sea about 150 miles north of Inuvik, N.W.T.
March 2	03:36:04. M = 2.4. 137 miles from Resolute, N.W.T.
March 2	18:40:51. M = 2.0. 137 miles from Resolute, N.W.T.
March 4	23:03:26. M = 1.7. 37 miles from Resolute, N.W.T.
March 6	03:24:01. M = 1.1. 37 miles from Resolute, N.W.T.
March 9	13:07:23. M = 2.2. 137 miles from Resolute, N.W.T.
March 21	04:25:18. M = 0.8. 26 miles from Resolute, N.W.T.
March 22	01:28:45. M = 1.9. 132 miles from Resolute, N.W.T.
March 25	08:43:31. $65^{\circ}0N \pm 1^{\circ}0$, $135^{\circ}7W \pm 2^{\circ}5$. M = 4.6. Between Wind River and Hart River, about 300 miles north of Whitehorse, N.W.T.

March 28 16:53:36. $80^{\circ}2'N \pm 0^{\circ}5'$, $117^{\circ}2'W \pm 2^{\circ}5'$. $M = 3.7$. About 130 miles northwest of Borden Island, Queen Elizabeth Islands, N.W.T.

March 31 20:48:55. $M = 2.5$. 258 miles from Resolute, N.W.T.

April 1 09:03:56. $M = 0.7$. 7 miles from Resolute, N.W.T.

April 14 18:40:23. $75^{\circ}3'N \pm 1^{\circ}0'$, $101^{\circ}0'W \pm 1^{\circ}0'$. Depth 25 km. $M = 2.8$. Graham Moore Bay to the south of Bathurst Island, N.W.T.

April 20 14:21:15. $76^{\circ}2'N \pm 1^{\circ}0'$, $90^{\circ}8'W \pm 2^{\circ}5'$. Depth 20 km. $M = 2.4$. Near West Fiord, Devon Island, N.W.T. or $72^{\circ}9'N \pm 1^{\circ}0'$, $97^{\circ}0'W \pm 2^{\circ}5'$. West coast of Prince of Wales Island, N.W.T. This shock was recorded only at Mould Bay and Resolute.

April 21 07:10:33. $M = 1.9$. 109 miles from Resolute, N.W.T.

April 24 17:23:55. $M = 2.2$. 123 miles from Resolute, N.W.T.

April 29 00:30:54. $M = 1.9$. 31 miles from Alert, N.W.T.

April 29 10:44:03. Depth 8 km. $M = 1.9$. 144 miles from Resolute, N.W.T.

May 2 19:45:52. $64^{\circ}7'N \pm 1^{\circ}0'$, $86^{\circ}6'W \pm 2^{\circ}0'$. $M = 4.9$. Roes Welcome Sound, about 150 miles northeast of Chesterfield Inlet, N.W.T.

May 5 11:59:32. $73^{\circ}8'N \pm 1^{\circ}0'$, $70^{\circ}6'W \pm 2^{\circ}0'$. $M = 3.5$. In Baffin Bay, about 150 miles northeast of Pond Inlet, N.W.T.

May 12 23:10:41. $71^{\circ}3'N \pm 1^{\circ}0'$, $70^{\circ}6'W \pm 2^{\circ}0'$. $M = 4.1$. In Baffin Bay near Scott Island off the northeast coast of Baffin Island, N.W.T.

May 17 08:21:04. $M = 1.5$. 37 miles from Mould Bay, N.W.T.

May 18 09:22:45. $M = 1.5$. 37 miles from Mould Bay, N.W.T.

May 20 17:11:55. $79^{\circ}5'N \pm 3^{\circ}0'$, $92^{\circ}5'W \pm 0^{\circ}7'$. $M = 3.5$. Axel Heiberg Island, N.W.T.

May 24 20:39:34. $76^{\circ}7'N \pm 0^{\circ}5'$, $91^{\circ}8'W \pm 2^{\circ}0'$. Depth 23 km. $M = 3.9$. Near the north coast of Devon Island, N.W.T.

May 30 05:16:59. $M = 2.4$. 33 miles from Resolute, N.W.T.

June 3 19:14:43. $78^{\circ}7'N \pm 2^{\circ}0'$, $110^{\circ}9'W \pm 0^{\circ}4'$. $M = 3.4$. Near the north coast of Borden Island, N.W.T.

June 11	01:07:41. $71^{\circ}0N \pm 1^{\circ}0$, $135^{\circ}0W \pm 2^{\circ}5$. $M = 4.1$. In the Beaufort Sea about 170 miles north of Inuvik, N.W.T.
June 21	01:23:52. $M = 2.0$. 36 miles from Mould Bay, N.W.T.
July 2	09:32:53. $M = 1.5$. 28 miles from Resolute, N.W.T.
July 15	03:30:15. $68^{\circ}4N \pm 1^{\circ}5$, $72^{\circ}9W \pm 2^{\circ}5$. $M = 4.4$. In Baffin Bay 150 miles east of Bylot Island, N.W.T.
July 18	11:21:44. $62^{\circ}5N \pm 1^{\circ}0$, $65^{\circ}0W \pm 2^{\circ}0$. $M = 4.9$. In Frobisher Bay near Loks Land, N.W.T.
August 6	06:32:39. $M = 2.4$. 106 miles from Alert, N.W.T.
August 7	10:57:48. Depth about 8 km. $M = 3.6$. 230 miles from Alert, N.W.T.
August 12	14:33:26. $M = 2.5$. 112 miles from Resolute, N.W.T.
August 14	03:33:59. $M = 2.6$. 61 miles from Resolute, N.W.T.
August 20	14:34:20 $76^{\circ}2 N \pm 0^{\circ}5$, $93^{\circ}9 W \pm 2^{\circ}0$. $M = 4.1$. Off south coast of Grinnell Peninsula, Devon Island, N.W.T.
August 26	06:50:52. $M = 2.9$. 158 miles from Alert, N.W.T.
August 26	07:17:42. $M = 2.9$. 163 miles from Alert, N.W.T.
September 20	02:29:37. $M = 2.0$. 51 miles from Resolute, N.W.T.
September 25	14:03:38. $M = 1.8$. 33 miles from Mould Bay, N.W.T.
October 3	03:47:22. $75^{\circ}9N \pm 1^{\circ}0$, $106^{\circ}4W \pm 2^{\circ}0$. Depth 10 km. $M = 3.1$. Near the northeast coast of Melville Island, N.W.T.
October 3	07:40:27. $66^{\circ}2N \pm 1^{\circ}0$, $132^{\circ}6W \pm 3^{\circ}0$. $M = 4.7$. About 150 miles south of Inuvik, N.W.T.
October 4	15:07:24. $M = 1.7$. 51 miles from Mould Bay, N.W.T.
October 22	18:04:17. $73^{\circ}8N \pm 0^{\circ}5$, $97^{\circ}5W \pm 2^{\circ}0$. Depth 30.5 km. $M = 3.4$. Near the east coast of Prince of Wales Island, N.W.T.
October 26	10:29:20. $60^{\circ}8N \pm 1^{\circ}0$, $57^{\circ}5W \pm 2^{\circ}0$. $M = 5.0$. Davis Strait, about 250 miles east of Resolution Island, N.W.T.
October 27	09:57:17. $65^{\circ}0N \pm 2^{\circ}0$, $135^{\circ}0W \pm 4^{\circ}5$. $M = 4.6$. Peel River watershed, Yukon, N.W.T.

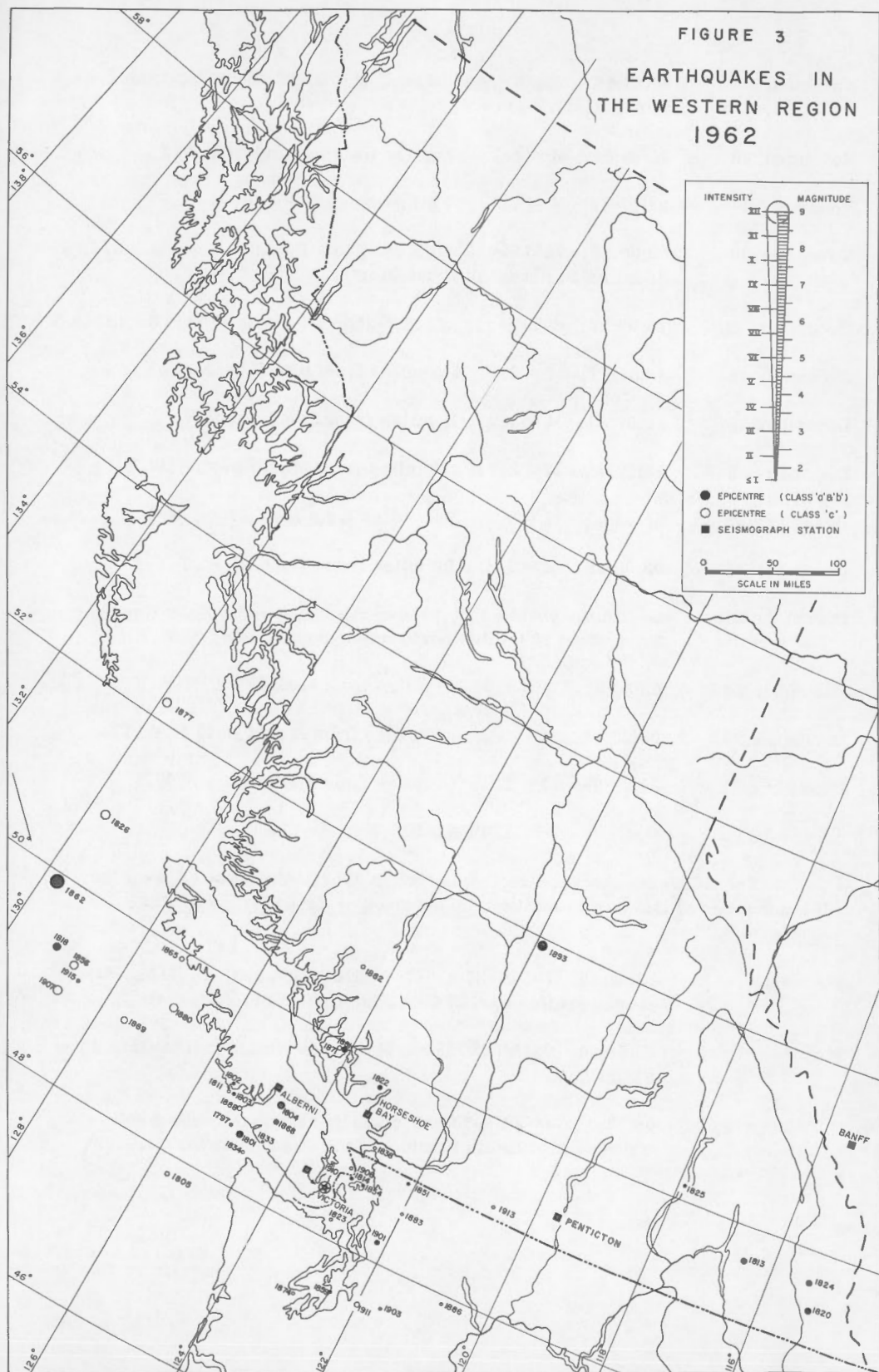
November 5	09:01:28. Depth about 16 km. M = 2.6. 205 miles from Resolute, N.W.T.
November 18	11:40:55. M = 2.1. 89 miles from Resolute, N.W.T.
November 24	21:17:41. M = 1.8. 25 miles from Resolute, N.W.T.
November 30	09:39:29. $74^{\circ}7'N \pm 2^{\circ}0'$, $103^{\circ}5'W \pm 2^{\circ}0'$. Depth 34 km. M = 3.4. 35 miles southeast of Byam Martin Island, N.W.T.
December 2	14:00:57. $60^{\circ}9'N \pm 1^{\circ}0'$, $58^{\circ}3'W \pm 2^{\circ}0'$. M = 4.5. Davis Strait.
December 11	13:19:47. M = 3.9. 413 miles from Resolute, N.W.T.
December 18	10:37:44. M = 2.2. 41 miles from Resolute, N.W.T.
December 23	15:50:11. M = 2.7. 238 miles from Mould Bay, N.W.T.
December 23	21:41:53. M = 3.3. 388 miles from Mould Bay, N.W.T.
December 25	03:46:08. M = 2.4. 92 miles from Alert, N.W.T.
December 27	04:57:26. $65^{\circ}6'N \pm 0^{\circ}5'$, $89^{\circ}4'W \pm 1^{\circ}0'$. M = 4.7. Near Wager Bay, about 200 miles northeast of Baker Lake, N.W.T.
December 28	05:36:03. M = 1.6. 68 miles from Mould Bay, N.W.T.
December 29	04:20:31. M = 4.2. 824 miles from Mould Bay, N.W.T.
December 31	21:09:25. M = 1.3. 61 miles from Mould Bay, N.W.T.

ADDENDUM

The following shocks, which occurred in 1957, were omitted from the 1961-2 number of this series entitled Earthquakes of the Canadian Arctic 1956-1959.

March 23	19:42:56. $70^{\circ}6'N \pm 2^{\circ}0'$, $65^{\circ}0'W \pm 5^{\circ}0'$. M = 5.9. In Baffin Bay, about 70 miles east of Clyde Inlet, N.W.T.
May 2	03:55:34. $72^{\circ}0'N$, $67^{\circ}5'W$. M = $6 \frac{1}{4}$ - $6 \frac{1}{2}$. (USCGS). In Baffin Bay.
July 21	08:53:31. $68^{\circ}9'N \pm 2^{\circ}0'$, $59^{\circ}4'W \pm 5^{\circ}0'$. M = 5.7. About 200 miles east of Baffin Island, N.W.T., in Davis Strait.

FIGURE 3
EARTHQUAKES IN
THE WESTERN REGION
1962



WESTERN CANADA

(West of 113°W, South of 60°N)

In 1962 earthquakes of the Western region have been assigned numbers and listed in Table III. Disturbances of magnitude two or less, which were recorded at one station only, have been omitted following a policy initiated in Canadian Earthquakes 1961. Known epicentres are plotted as circles on the map in Figure 3. The character of the circle is a qualitative indication of the precision of the epicentral determination - closed circles for qualities "a" and "b", open circles for quality "c".*

Three earthquakes were felt during the year. The first occurred in January and was centred near Alberni. The second was in August and was felt around Lac la Hache, an area in which our past records do not show any large earthquakes. The third was in November, and although felt sharply, it affected a very limited area of southeast Victoria. There has been a noticeable decrease in the number of local earthquakes in the last half of 1962.

It is always possible that commercial blasting or the testing of explosives by military groups might be included in the list of earthquakes. In the Victoria area most events that originate near blasting areas are compared with the records of the companies involved. When the Penticton station was added to the network, new series of disturbances were recorded which had a pattern indicative of blasting operations. In 1961 temporary seismographs were installed east of Penticton, and a number of these events were identified. A similar program was continued in 1962 in an area west of Penticton.

M.D. Macdonald and C.D. Hemmings carried out the 1962 field program near Merritt from June 22 to July 19. A Willmore station occupied a site 7.3 km from a large quarry operated by Craigmont Mines Ltd. During the month 15 large explosions were recorded on the Merritt and Penticton seismographs. The recording at Penticton proved to have definite characteristics such as: an S-P time of 19.2 to 19.7 sec; a small amplitude but high-frequency P-phase; a phase following S sinusoidal in nature with a 1-sec period; and a time of occurrence between 3 and 4 p.m. Thus there is now a set of criteria for use in eliminating these blasts from the earthquake lists, even without a recorder at the quarry site.

In addition to supplying rules for reading the Penticton records, the 1962 program provided an accurate travel time for the Merritt-Penticton line. P-wave travel time for the 135.8-km distance from Merritt to Penticton was 22.2 sec. P-wave travel time for the average of three of these blasts which recorded at Victoria ($\Delta = 260.9$ km) was 39.7 sec. These travel times afford two observations for incorporation into a continuing program designed to study the Earth's crust in central British Columbia. With this in mind, a detailed study was made of the travel times between the Merritt seismograph and the quarry. The blasts, which sometimes use 25,000 lb of explosives, will provide a source of energy.

*These qualities are described in detail on page 5 of: Milne, W.G., and Lucas, K.A. 1961, Seismic Activity in Western Canada 1955 to 1959 inclusive: Dom. Obs. Pub., Ottawa, v. 26, no. 1, 1-23.

Observations made during the last two years indicate that, provided all the stations at Alberni, Victoria, Penticton, and Banff are operating, magnitude 2.5 or greater earthquakes in southern British Columbia will be recorded. The addition of the Port Hardy station, and the plans for future stations should soon provide the same coverage for the whole western region.

TABLE III

EARTHQUAKES IN WESTERN CANADA AND ADJACENT AREAS

(Universal time is used throughout)

(M = magnitude)

January 2 1797	01:22:45. 48°4N, 125°2W. Q = b. M = 2.1. In the entrance to the Strait of Juan de Fuca.
January 9 1798	21:09:28. M = 2.4. 70 miles from Alberni, B.C.
January 12 1799	10:05:50. M = 2.1. Probably south of Puget Sound, U.S.A.
January 16 1800	21:00:29. M = 2.1. 35 miles from Alberni, B.C.
January 17 1801	19:27:26. 48°33'N, 124°58'W. Q = a. M = 3.3. Near the entrance to the Strait of Juan de Fuca.
January 23 1802	01:58:08. 49°0N, 125°5W. Q = b. M = 2.0. In the Barkley Sound region.
January 25 1803	20:55:54. 48°9N, 125°4W. Q = b. M = 2.2. The preceding epicentre and this one seem to be in the same area, and perhaps are related to number 1804 which was felt.
January 29 1804	21:49:24. 49°02'N, 124°37'W. Q = a. M = 3.5. The instrumentally determined epicentre of this shock is south of Alberni on Vancouver Island. The earthquake was felt over the interior of the Island. Questionnaire forms were distributed throughout the area of interest. At Alberni and Bamfield the intensity reached III-IV. Intensity II-III was experienced at Powell River, Parkesville, Merville, Union Bay, and Courtney. The earthquake was not felt at Gibsons, Gabriola, Campbell River, Irvines Landing, Denman, Cassiday, Lund, Hornby and Lasqueti. The earthquake was felt over a long narrow area extending northeast from the epicentre. It is interesting to note that the same distribution of intensities occurred in the June 23, 1946 earthquake when the epicentre was at the northeast end of the pattern (<u>see Figure 4</u>).

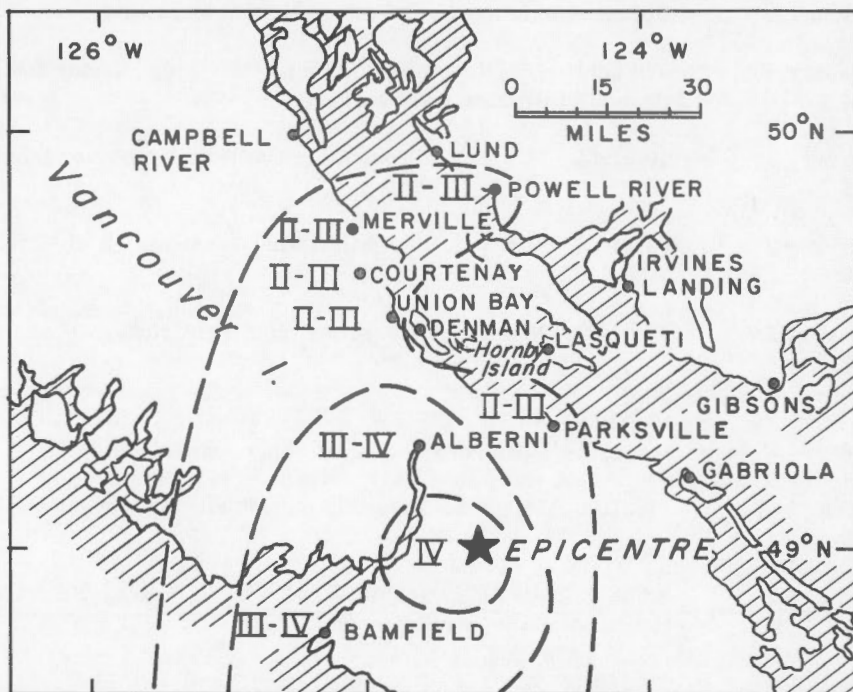


FIGURE 4. Earthquake January 29, 1962

January 31 1805	04:22:47. 47°8N, 125°7W. Q = c. M = 2.5. West of Washington, U.S.A.
February 2 1806	07:40:17. M = 2.4. 175 miles from Penticton, B.C.
February 2 1807	12:01:18. M = 2.6. 178 miles from Penticton, B.C.
February 2 1808	14:12:59. M = 2.1. 169 miles from Penticton, B.C.
February 2 1809	16:23:52. M = 2.1. 162 miles from Penticton, B.C.
February 2 1810	16:53:14. M = 2.3. 120 miles from Penticton, B.C.
February 2 1811	22:42:46. 48°9N, 125°5W. Q = c. M = 2.2. In the Barkley Sound region.
February 12 1812	02:23:23. M = 2.1. 33 miles from Alberni, B.C.

February 17 1813	16:36:09. 49°37'N, 116°31'W. Q = b. M = 2.6. East of Kootenay Lake, in southeastern British Columbia.
February 20 1814	07:28:23. 48°7'N, 123°0'W. Q = b. M = 2.0. Among the islands of the Strait of Georgia.
February 23 1815	20:09:14. M = 2.0. Probably in southern Vancouver Island.
February 24 1816	04:21:54. M = 2.5. 172 miles from Penticton, B.C.
February 24 1817	07:06:32. M = 2.8. 158 miles from Penticton, B.C.
February 25 1818	06:05:45. 49°3'N, 129°2'W. Q = a. M = 3.5. The USCGS has located this earthquake west of Vancouver Island.
March 3 1819	00:31:06. M = 2.2. Probably on southern Vancouver Island.
March 4 1820	22:58:32. 49°21'N, 115°12'W. Q = b. M = 3.2. Near the Kootenay River, east of Fernie, B.C.
March 9 1821	22:41:37. M = 2.4. 103 miles from Penticton, B.C.
March 12 1822	01:20:06. 49°43'N, 123°17'W. Q = a. M = 2.4. On the mainland, northwest of Squamish, B.C.
March 18 1823	04:09:42. 48°2'N, 123°0'W. Q = c. M = 2.1. At the south end of Puget Sound, U.S.A.
March 20 1824	04:41:46. 49°38'N, 115°21'W. Q = b. M = 2.8. East of Cranbrook, B.C.
March 20 1825	09:16:05. 50°09'N, 117°54'W. Q = b. M = 1.8. Between the Upper and Lower Arrow Lakes in south-central, B.C.
March 20 1826	16:31:48. 50°8'N, 129°7'W. Q = c. M = 4.5. Northwest of Vancouver Island.
March 26 1827	05:18:02. M = 2.3. 178 miles from Penticton, B.C.
March 26 1828	11:10:24. M = 2.5. 173 miles from Penticton, B.C.
March 26 1829	11:41:31. M = 2.6. 173 miles from Penticton, B.C.

March 28 1830	18:11:27. M = 2.2. 46 miles from Alberni, B.C.
March 29 1831	03:07:02. 58°6N, 137°4W. Epicentre in the vicinity of Lituya Bay, Alaska.
March 30 1832	00:12:17. M = 2.1. 42 miles from Alberni, B.C.
March 30 1833	22:00:19. 48°6N, 124°6W. Q = c. M = 1.5. On southern Vancouver Island.
April 2 1834	15:34:51. 48°4N, 124°8W. Q = c. M = 2.2. Near Cape Flattery, U.S.A.
April 10 1835	20:32:19. 49°1N, 128°5W. This epicentre, west of Vancouver Island, was determined by the USCGS.
April 11 1836	22:38:03. M = 2.5. 97 miles from Alberni, B.C.
April 11 1837	22:43:52. M = 2.5. 85 miles from Alberni, B.C.
April 12 1838	03:39:12. 49°1N, 122°9W. Q = c. M = 2.0. In Boundary Bay.
April 14 1839	01:20:14. M = 2.1. 93 miles from Albernie, B.C., and 37 miles from Victoria, B.C.
April 15 1840	01:28:35. M = 2.2. 174 miles from Penticton, B.C.
April 15 1841	02:35:30. M = 2.4. 170 miles from Penticton, B.C.
April 16 1842	20:02:00. M = 2.2. 45 miles from Alberni, B.C.
April 18 1843	22:09:43. M = 1.6. 18 miles from Victoria, B.C. and 70 miles from Alberni, B.C.
April 18 1844	23:40:07. M = 2.4. 94 miles from Alberni, B.C.
April 27 1845	17:57:30. M = 2.6. 146 miles from Penticton, B.C.

May 1 1846	21:58:01. M = 1.9. 125 miles from Penticton, B.C., and 80 miles from Victoria, B.C.
May 2 1847	18:59:54. M = 2.4. 179 miles from Penticton, B.C.
May 3 1848	00:48:49. M = 2.2. 173 miles from Penticton, B.C.
May 4 1849	04:54:36. M = 2.3. 170 miles from Penticton, B.C.
May 14 1850	19:26:17. M = 2.6. 195 miles from Penticton, B.C.
May 15 1851	09:55:24. 48°56'N, 122°08'W. Q = a. M = 1.8. Near Mount Baker, Washington, U.S.A.
May 15 1852	13:53:17. M = 2.7. 246 miles from Penticton, B.C., and 66 miles from Banff, Alta. Probably the epicentre is along the Alberta-British Columbia boundary between Banff and the 49th parallel.
May 16 1853	23:44:16. M = 2.3. 152 miles from Penticton, B.C.
May 20 1854	04:41:03. 48°41'N, 122°48'W. Q = a. M = 2.3. Near San Juan Island in the southern Strait of Georgia.
May 22 1855	18:48:43. M = 2.5. 181 miles from Penticton, B.C.
May 24 1856	01:24:52. 49°2N, 128°8W. Q = c. M = 3.7. West of Vancouver Island.
May 24 1857	14:10:28. This appears to be a small aftershock of the previous earthquake.
May 29 1858	21:11:59. M = 2.0. 19 miles from Victoria, B.C., and 75 miles from Alberni, B.C.
May 30 1859	03:36:23. 47.5N, 122.5W. Q = b. M = 2.2. South of Puget Sound, U.S.A.
May 31 1860	23:37:14. M = 2.1. 167 miles from Penticton, B.C.
June 2 1861	11:49:49. 50°2N, 129°1W. West of Vancouver Island.

June 2 1862	12:26:09.6. 49°9N, 129°8W. Q = a. M = 5 3/4. This epicentre which has been computed by the USCGS, is west of Vancouver Island.
June 2 1863	12:35:48. 49°8N, 129°8W. This appears to be an aftershock of the previous earthquake.
June 3 1864	10:41:45. M = 2.2. 164 miles from Penticton, B.C.
June 9 1865	06:15:37. 49°9N, 127°3W. Q = c. M = 2.7. Near Esperanze Inlet on the west coast of Vancouver Island.
June 11 1866	00:52:47. 49°7N, 129°3W. West of Vancouver Island.
June 14 1867	21:54:00. M = 2.4. Probably in the Strait of Juan de Fuca.
June 17 1868	00:18:49. 48°52'N, 124°34'W. Q = b. M = 2.5. On southwest Vancouver Island.
June 19 1869	01:58:14. 49°0N, 127°6W. Q = c. M = 3.1. West of Vancouver Island.
June 19 1870	07:23:27. M = 2.1. 61 miles from Victoria, B.C., and 39 miles from Alberni, B.C.
June 21 1871	14:29:05. 49°9N, 124°2W. Q = c. M = 2.5. Near Jarvis Inlet.
June 21 1872	22:03:35. M = 2.2. 195 miles from Penticton, B.C.
June 22 1873	01:08:10. M = 2.4. 175 miles from Penticton, B.C.
July 5 1874	03:16:02. 47°3N, 123°0W. Q = c. M = 1.9. In the eastern Olympic Mountains, U.S.A.
July 6 1875	23:04:22. M = 2.1. 162 miles from Penticton, B.C.
July 12 1876	22:43:06. M = 2.6. 222 miles from Penticton, B.C., and 200 miles from Victoria, B.C.
July 13 1877	20:09:47. 52.2N, 129.9W. Q = c. M = 4.2. Southeast of Queen Charlotte Islands.
July 20 1878	17:06:07. M = 2.6. 177 miles from Penticton, B.C.

July 20 1879	20:40:31. M = 2.5. 148 miles from Penticton, B.C.
July 26 1880	16:44:34. 49.4N, 127.0W. Q = c. M = 3.5. Just west of Vancouver Island.
July 29 1881	05:32:10. 49.9N, 124.1W. Q = b. M = 2.7. Near Jervis Inlet.
July 29 1882	06:55:12. 50°8N, 124°5W. Q = c. M = 2.4. Near Bute Inlet.
August 1 1883	20:59:35. 48.6N, 122.0W. Q = c. M = 1.7. Near Mount Baker, U.S.A.
August 2 1884	22:22:30. M = 2.1. 143 miles from Penticton, B.C., and 71 miles from Victoria, B.C.
August 3 1885	22:00:27. M = 2.5. 155 miles from Penticton, B.C.
August 3 1886	22:06:15. 47°8N, 120°9W. Q = c. M = 1.8. Southeast of Seattle, U.S.A.
August 10 1887	10:59:41. M = 2.5. This epicentre appears to be near the junction of the boundaries of Alberta, British Columbia and Montana, U.S.A.
August 11 1888	01:10:15. 48.8N, 125.2W. Q = c. M = 2.6. In Barkley Sound.
August 13 1889	23:32:28. M = 2.7. 221 miles from Penticton, B.C.
August 18 1890	19:59:40. M = 2.2. 165 miles from Penticton, B.C.
August 19 1891	06:28:39. 50°6N, 129°5W. West of Vancouver Island.
August 23 1892	14:12:56. M = 2.4. 206 miles from Penticton, B.C.
August 28 1893	19:19:59. 51.7N, 121.9W. Q = b. M = 4.3. This earthquake was felt in the Cariboo region of British Columbia. The instrumental location of the epicentre is near Lac la Hache. Replies to questionnaires that were sent out following the earthquake indicated intensities as follows: Intensity IV - Lac la Hache, Alkali Lake; Intensity III - Williams Lake, Marguerite, Soda Creek, Riske Creek; Not felt - Quesnel, Alexis Creek, Dog Creek, 100 mile House, 150 Mile House,

Horsefly, and places at greater distances. A small map (Figure 5) indicates the location of the above mentioned places.

August 29 1894	02:44:54. M = 2.1. 167 miles from Penticton, B.C.
September 12 1895	23:11:59. M = 2.5. 258 miles from Penticton, B.C., and 124 miles from Victoria, B.C.
September 19 1896	20:33:42. M = 2.2. 14 miles west of Victoria, B.C.
September 26 1897	03:06:52. M = 2.1. 115 miles from Penticton, B.C.
September 29 1898	22:32:12. M = 2.6. 203 miles from Penticton, B.C.
October 4 1899	01:54:00. M = 2.3. 147 miles from Penticton, B.C., and 197 miles from Victoria, B.C.
October 5 1900	05:11:42. M = 2.8. 111 miles from Victoria, B.C., and 347 miles from Penticton, B.C.

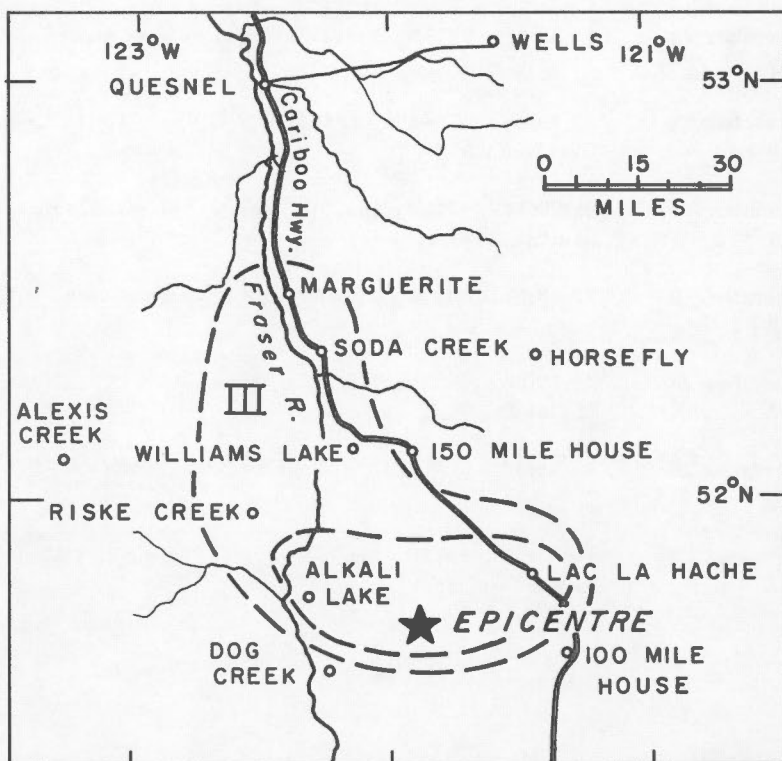


FIGURE 5. Earthquake August 28, 1962

October 5 1901	21:51:44. 48°12'N, 122°09'W. Q = b. M = 2.6. North of Seattle, U.S.A.
October 14 1902	01:11:23. M = 2.5. 137 miles from Penticton, B.C.
October 17 1903	16:58:32. 48°34'N, 121°40'W. Q = b. M = 1.8. East of Bellingham, U.S.A.
November 3 1904	06:34:48. M = 1.5. This epicentre seems to be under the south end of Haw Street on the basis of Victoria and Longmere data. It was felt over a limited area of south east Victoria, B.C.
November 3 1905	23:27:20. M = 2.5. 247 miles from Penticton, B.C.
November 4 1906	15:48:24. M = 2.3. 166 miles from Penticton, B.C.
November 11 1907	21:45:20. 48.9N, 128.8W. Q = c. M = 4.2. West of Vancouver Island.
November 20 1908	04:20:48. 48°48'N, 123°06'W. Q = c. M = 1.9. In the Gulf Islands.
November 22 1909	13:53:08. 50°7N, 129°1W. West of Vancouver Island.
November 28 1910	22:39:46. 48°44'N, 123°22'W. Q = c. M = 1.3. In the Gulf Islands.
December 5 1911	09:29:14. 47°5N, 122°0W. Q = c. M = 2.8. East of Seattle, U.S.A.
December 9 1912	10:08:57. M = 2.8. 177 miles from Penticton, B.C.
December 13 1913	16:35:08. 49°1N, 120°7W. Q = c. M = 2.1. Near Copper Mountain, B.C.
December 19 1914	04:48:34. M = 2.3. 166 miles from Penticton, B.C.
December 28 1915	05:33:52. 49°1N, 128°6 W. Q = a. M = 2.0. West of Vancouver Island.

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