Table 1. – Analytical list of all the chert samples analyzed in the present study.

MNR ID	Province	Location-a	Location-b	Chert Type	Treatment	Munsell Colour
5-8		Vera Cruz	Jasper Park		None	10YR-8/1
5-5	Michigan	Charlevoix	Norwood		None	Gley 2-6/5PB
5-7	Michigan	Drummond Island		Cordell	None	Gley 2-8/5PB
5-6	Michigan	Bayport			None	2.5Y-5/1
5-10	New York	Coxakie		Normanskill	None	5Y-6/2
5-2	New York	Montgomery County	Little Falls		None	Gley 1-7/5G
5-3	New York	Montgomery County	Little Falls		None	Gley 1-7/5G
5-1	New York	Otsego County	Cherry Valley, Esospus		None	5Y-4/1
5-9	New York	Otsego County	Cherry Valley, Kalkberg		None	Gley 1-3/N
4-10	New York	Saratoga Country	Snake Hill		None	2.5Y-5/1
1-4	New York	Divers Lake	Divers Lake	Western Onondaga	None	Gley 1-3/N
1-6	New York	Divers Lake	Divers Lake	Western Onondaga	None	Gley 1-3/N
1-7	New York	Richfield Springs	Richfield Springs	Eastern Onondaga	None	Gley 1-3/N
4-9	Nth Ontario	Knife Lake Siltstone			None	Gley 1-2.5/N
5-4	Ohio	Prebble County	Four Mile Creek		None	2.5Y-8/2
1-10	Ontario	Ancaster	Highway 2	Ancaster	None	Gley 1-5/N1
4-5	Ontario	Bruce Mines		Gordon Lake	None	5Y-5/1 & 5/2
1-9	Ontario	Kettle Point	Kettle Point	Kettle Point	None	Gley 1-3/N
2-8	Ontario	Ancaster	Redeemer Site	Till	None	5Y-5/2
4-3	Ontario	Ancaster Till		Reynales	None	Gley 2-4/10B
4-2	Ontario	Ancaster Till		Reynales	None	Gley 2-4/10B
4-1	Ontario	Bruce County		Suageen	None	2.5Y-8/1
2-10	Ontario	Dry Lake Quarry		Haldimand	None	Gley 1-8/N
2-9	Ontario	Dry Lake Quarry		Haldimand	None	Gley 1-8/N
2-1	Ontario	Hamilton	Clappison's Corners	Ancaster	None	Gley 1-8/10/Y
1-1	Ontario	Joe Sherk Quarry	Wardell's Creek	Onondaga	None	Gley 1-5/N
1-2	Ontario	Joe Sherk Quarry	Wardell's Creek	Onondaga	None	Gley 1-6/N
3-2	Ontario	Lower Decewsville Quarry	Bois Blanc	Haldimand	None	Gley 1-8/N
3-1	Ontario	Lower Decewsville Quarry	Bois Blanc	Haldimand	None	Gley 1-8/N
3-10	Ontario	Manitoulin Island		Fossil Hill Formation	None	2.5Y-7/1

MNR ID	Province	Location-a	Location-b	Chert Type	Treatment	Munsell Colour
2-5	Ontario	Redwing	Redwing	Collingwood	Heated	10R-8/1
2-4	Ontario	Redwing	Redwing	Collingwood	None	7.5YR-5/6
2-7	Ontario	South Walpole Island	Sandusky Creek	Selkirk	None	7.5YR-5/2
3-5	Ontario	Bruce Peninsula		MacGregor Point	None	10R-8/1
3-3	Ontario	Bruce Peninsula		MacGregor Point	None	10R-8/1
3-4	Ontario	Bruce Peninsula		MacGregor Point	None	10R-8/1
1-3	Ontario	Bruce's Boulder Site	Edgecliff	Onondaga	None	2.5Y-4/1
1-5	Ontario	Decewsville Quarry	Decewsville	Onondaga	None	2.5Y-5/1
4-6	Ontario	Indian Point		Balsam Lake	None	Gley 2-4/10B
4-7	Ontario	Indian Point		Balsam Lake	None	Gley 2-4/10B
4-4	Ontario	Indian Point		Balsam Lake	None	Gley 2-4/10B
1-8	Ontario	Kettle Point	Kettle Point	Kettle Point	None	Gley 1-6/N
2-6	Ontario	South Walpole Island	Sandusky Creek	Selkirk	None	2.5Y-6/1
4-8	Ontario	Indian Point		Balsam Lake	None	2.5-5/2
2-3	Ontario	Lovesick Lake	Lovesick Lake	Gull River	None	Gley 1-7/N
2-2	Ontario	Simcoe Island	Simcoe Island	Gull River	None	Gley 1-3/N

Table 2. – Preliminary chemical groupings of all chert samples from Ontario, Michigan, New York and Ohio.

MNR ID	Chemical Groupings	Province	Location-a	Location-b	Chert Type	Munsell Colour
1-10	High Al - clean others	Ontario	Ancaster	Highway 2	Ancaster	Gley 1-5/N
5-10	High Al (+ Ca) - dirty others	New York	Coxakie		Normanskill	2.5Y-5/1
5-2	High Al (+ Ca) - dirty others	New York	Montgomery County	Little Falls		5Y-4/1
5-3	High Al (+ Ca) - dirty others	New York	Montgomery County	Little Falls		5Y-6/2
5-1	High Al (+ Ca) - dirty others	New York	Otsego County	herry Valley, Esospus		Gley 1-7/5G
5-9	High Al (+ Ca) - dirty others	New York	Otsego County	herry Valley, Kalkberg		Gley 1-7/5G
4-10	High Al (+ Ca) - dirty others	New York	Saratoga Country	Snake Hill		Gley 1-3/N
4-9	High Al (+ Ca) - dirty others	Nth Ontario	Knife Lake Siltstone			Gley 1-2.5/N
4-5	High Al (+ Ca) - dirty others	Ontario	Bruce Mines		Gordon Lake	5Y-5/1 & 5/2
1-4	High Cl	New York	Divers Lake	Divers Lake	Western Onondaga	Gley 1-3/N
1-9	High Cl	Ontario	Kettle Point	Kettle Point	Kettle Point	Gley 1-3/N
5-8	High Mn		Vera Cruz	Jasper Park		10YR-8/1
5-5	Low Ca + Al leftovers	Michigan	Charlevoix	Norwood		Gley 2-6/5PB
5-7	Low Ca + Al leftovers	Michigan	Drummond Island		Cordell	Gley 2-8/5PB
5-4	Low Ca + Al leftovers	Ohio	Prebble County	Four Mile Creek		2.5Y-8/2
2-8	Low Ca + Al leftovers	Ontario	Ancaster	Redeemer Site	Till	Gley 1-5/N
4-3	Low Ca + Al leftovers	Ontario	Ancaster Till		Reynales	Gley 1-6/N
4-2	Low Ca + Al leftovers	Ontario	Ancaster Till		Reynales	Gley 1-8/10/Y
4-1	Low Ca + Al leftovers	Ontario	Bruce County		Suageen	Gley 1-8/N
2-10	Low Ca + Al leftovers	Ontario	Dry Lake Quarry		Haldimand	7.5YR-5/6
2-9	Low Ca + Al leftovers	Ontario	Dry Lake Quarry		Haldimand	10R-8/1
2-1	Low Ca + Al leftovers	Ontario	Hamilton	Clappison's Corners	Ancaster	7.5YR-5/2
1-1	Low Ca + Al leftovers	Ontario	Joe Sherk Quarry	Wardell's Creek	Onondaga	5Y-5/2
1-2	Low Ca + Al leftovers	Ontario	Joe Sherk Quarry	Wardell's Creek	Onondaga	Gley 1-8/N
3-2	Low Ca + Al leftovers	Ontario	wer Decewsville Quarry	Bois Blanc	Haldimand	Gley 1-8/N
3-1	Low Ca + Al leftovers	Ontario	wer Decewsville Quarry	Bois Blanc	Haldimand	2.5Y-7/1
3-10	Low Ca + Al leftovers	Ontario	Manitoulin Island		Fossil Hill Formation	Gley 1-8/N
3-7	Low Ca + Al leftovers	Ontario	Manitoulin Island		Fossil Hill Formation	2.5Y-7/1
3-8	Low Ca + Al leftovers	Ontario	Manitoulin Island		Fossil Hill Formation	2.5Y-7/1
3-9	Low Ca + Al leftovers	Ontario	Manitoulin Island		Fossil Hill Formation	2.5-7/1
3-6	Low Ca + Al leftovers	Ontario	Manitoulin Island		Fossil Hill Formation	2.5Y-7/1

MNR ID	Chemical Groupings	Province	Location-a	Location-b	Chert Type	Munsell Colour
2-5	Low Ca + Al leftovers	Ontario	Redwing	Redwing	Collingwood	2.5Y-8/1
2-4	Low Ca + Al leftovers	Ontario	Redwing	Redwing	Collingwood	Gley 2-4/10B
2-7	Low Ca + Al leftovers	Ontario	South Walpole Island	Sandusky Creek	Selkirk	Gley 2-4/10B
5-6	Medium Ca	Michigan	Bayport			2.5Y-5/1
1-6	Medium Ca	New York	Divers Lake	Divers Lake	Western Onondaga	Gley 1-3/N
1-7	Medium Ca	New York	Richfield Springs	Richfield Springs	Eastern Onondaga	Gley 1-3/N
3-5	Medium Ca	Ontario	Bruce Peninsula		MacGregor Point	2.5Y-4/1
3-3	Medium Ca	Ontario	Bruce Peninsula		MacGregor Point	2.5Y-5/1
3-4	Medium Ca	Ontario	Bruce Peninsula		MacGregor Point	Gley 1-6/N
1-3	Medium Ca	Ontario	Bruce's Boulder Site	Edgecliff	Onondaga	2.5Y-6/1
1-5	Medium Ca	Ontario	Decewsville Quarry	Decewsville	Onondaga	10R-8/1
4-6	Medium Ca	Ontario	Indian Point		Balsam Lake	10R-8/1
4-7	Medium Ca	Ontario	Indian Point		Balsam Lake	10R-8/1
4-4	Medium Ca	Ontario	Indian Point		Balsam Lake	Gley 2-4/10B
1-8	Medium Ca	Ontario	Kettle Point	Kettle Point	Kettle Point	Gley 2-4/10B
2-6	Medium Ca	Ontario	South Walpole Island	Sandusky Creek	Selkirk	Gley 2-4/10B
4-8	Very high Ca	Ontario	Indian Point		Balsam Lake	Gley 1-3/N
2-3	Very high Ca	Ontario	Lovesick Lake	Lovesick Lake	Gull River	Gley 1-7/N
2-2	Very high Ca	Ontario	Simcoe Island	Simcoe Island	Gull River	2.5-5/2

Table 3 – Elemental concentrations for all chert samples from Ontario, Michigan, New York and Ohio.

MNR ID	Chemical Groupings	Sm ppm	Eu ppm	Sr ppm	La ppm	Mn ppm	K ppm	Na ppm	Co ppm	U ppm	Dy ppm	Ba ppm	Ti ppm	V ppm	Cl ppm	S ppm	Mg %	Al %	Ca %
1-10	High Al - clean others	0.4	0.1	2500	1.1	216.8	950	654.3	2.5	0.2	1.3	125	228	1.1	1717	0	0	6.1	7.7
5-10	High Al (+ Ca) - dirty others	2.8	0.6	7950	9.6	630	8205	7136	8	1.3	2.4	398	1400	37	31.4	0	0.4	3.7	0.1
5-2	High Al (+ Ca) - dirty others	1.5	0.3	500	5.8	58.4	17800	301.4	0.1	0.4	0.7	94.2	818	15	81.5	0	0.1	1.6	2.8
5-3	High Al (+ Ca) - dirty others	0.4	0.1	0	1.6	12.18	19200	309.4	0.3	0.4	0.4	1266	723	17	72.7	0	0.1	2	0.4
5-1	High Al (+ Ca) - dirty others	2.3	0.5	3000	6.3	90	4140	1787	0	0.3	2.8	184	1072	21	1020	0	0.1	1.5	6.9
5-9	High Al (+ Ca) - dirty others	0.9	0.4	1269	1.5	48.05	1170	2452	2.2	1	2.8	8590	1176	19	2855	0	0.3	1.6	12
4-10	High Al (+ Ca) - dirty others	5.1	1.1	4760	27	1142	2808	11304	50	3.4	4.3	0	2683	91	97.7	0	0.7	4.6	0
4-9	High Al (+ Ca) - dirty others	4.5	0.6	52528	6.7	133.3	25323	16150	11	1.2	1.6	403	1001	17	74.9	0	0.7	8.9	2
4-5	High Al (+ Ca) - dirty others	6.4	2	1666	52	148	55216	7127	4.3	1.4	6.2	841	3383	47	584	0	0.9	12	0.2
1-4	High Cl	0.2	0.2	700	0.7	14.56	840	1106	3.2	1.3	0.7	63.3	268	4.7	2123	2674	0.1	0.3	1.1
1-9	High Cl	0.4	0.5	252.8	1.9	54.68	1651	1063	0	0.7	0.6	64.7	205	10	2541	308	0.1	0.6	0.5
5-8	High Mn	0.6	0.1	100	0.8	336	430	89.49	3.2	3.4	0.5	70.2	224	6.3	22.6	0	0	0.1	0
5-5	Low Ca + Al leftovers	0.1	0	2400	0.6	4.8	522	534	0.5	0.3	0	78.9	54.5	0.8	797	0	0	0.1	0.1
5-7	Low Ca + Al leftovers	0.1	0	600	0.1	5.52	484	390.6	0.5	0.5	0	3.56	15.5	1	963	3208	0.2	0.1	0.7
5-4	Low Ca + Al leftovers	0.1	0	1400	0.9	4	760	352	0.2	0.3	0.1	47.7	65.9	0.9	463	53.47	0	0.1	0.7
2-8	Low Ca + Al leftovers	0.2	0.1	2552	1.8	37.6	1930	415.9	0.4	0.2	0.3	43	181	4.7	1023	0	0.2	0.3	1.3
4-3	Low Ca + Al leftovers	0.1	0	339	0.9	6.138	390	387.3	0.6	0	0	12.6	52	1.1	1317	500	0	0.1	0.5
4-2	Low Ca + Al leftovers	0	0	201	0.6	3.906	270.4	333.7	0.6	0.4	0	22	41	0	1058	1600	0	0.1	0.3

MNR ID	Chemical Groupings	Sm ppm	Eu ppm	Sr ppm	La ppm	Mn ppm	K ppm	Na ppm	Co ppm	U ppm	Dy ppm	Ba ppm	Ti ppm	V ppm	Cl ppm	S ppm	Mg %	Al %	Ca %
4-1	Low Ca + Al leftovers	0.5	0.1	900	3.2	79.2	5490	293.2	0.6	1.3	0.4	12.3	524	12	491	0	0.3	0.7	0.9
2-10	Low Ca + Al leftovers	0.5	0.2	195	1.4	8.215	1323	205.9	1	0.6	0.3	8.6	186	5.6	658	0	0	0.3	0.1
2-9	Low Ca + Al leftovers	0.2	0.1	199	0.3	1.864	860	295.9	1	0.4	0.2	7.63	73.1	4.2	1276	0	0	0.3	0.1
2-1	Low Ca + Al leftovers	0.6	0.1	0	1.8	56	1800	438.7	0	0	0.3	7.98	57	1.6	809	0	0.2	0.2	0.8
1-1	Low Ca + Al leftovers	0.5	0.1	343.5	0.5	9	1200	408.8	1	0.4	0.2	3.34	113	4.1	795	3583	0.1	0.3	0.6
1-2	Low Ca + Al leftovers	0.3	0	600	1.7	15.68	1140	380	0.5	0.3	0.2	14.9	405	2.1	856	0	0	0.1	0.3
3-2	Low Ca + Al leftovers	0.3	0.1	139.5	0.4	3.828	703.5	240.5	1	0.3	0.1	14.2	110	3.1	973	0	0	0.2	0.1
3-1	Low Ca + Al leftovers	0.2	0.1	370	0.9	2.24	606	260.9	0	0.2	0.2	9.96	48.2	1.6	861	213.9	0	0	0.1
3-10	Low Ca + Al leftovers	0.4	0.7	213	0.4	27.59	1976	318.3	0.3	1.6	0.3	27	410	11	630	0	0.1	0.5	0.3
3-7	Low Ca + Al leftovers	0.2	0.1	243	1.1	22.01	1134	266.1	0.8	1.3	0.2	18	196	6.1	562	0	0.1	0.3	0.4
3-8	Low Ca + Al leftovers	0.3	0.1	219	0.7	31	1269	252.5	0.7	0.9	0.3	16	176	6.9	560	0	0.1	0.3	0.5
3-9	Low Ca + Al leftovers	0.4	0.1	900	1.5	22.72	1450	282	0.8	1.3	0.3	20	231	6.2	574	0	0.1	0.2	0.6
3-6	Low Ca + Al leftovers	1.2	0.2	0	3.6	8	1470	303.5	0.5	1	0.6	9.31	184	6.2	630	0	0.1	0.3	0.3
2-5	Low Ca + Al leftovers	0	0	1100	0.1	3.12	391	280.7	0	0.3	0	2.84	17.3	0.3	1069	0	0	0	0.1
2-4	Low Ca + Al leftovers	0.1	0	1400	1	11.04	760	341.6	0	0.4	0.1	17.3	39.1	1.2	1312	0	0.1	0.1	0.3
2-7	Low Ca + Al leftovers	0.3	0.2	157.5	0.4	120.9	1642	414.1	1.4	0.6	0.2	50.8	262	12	678	0	0.1	0.5	0.7
5-6	Medium Ca	0.3	0	0	1.2	8.56	900	620.5	0.5	2.8	0.1	4.92	107	4.2	1016	300	0	0.2	2.3
1-6	Medium Ca	0.6	0.4	633	1.2	46.81	704.6	644.1	2.3	0.8	0.8	4	80	4.9	1119	0	0.2	0.3	4.7
1-7	Medium Ca	0	0.3	381	2	35.34	1864	561.9	0.3	0.5	0.5	0	464	9.5	1383	1848	0.2	0.6	2.6
3-5	Medium Ca	0.3	0.1	1100	1.8	14.96	1120	214.1	0.7	0.6	0.3	17.1	148	4.9	483	0	0.4	0.2	2.7
3-3	Medium Ca	0.5	0.1	1500	2.3	22.64	1220	165.8	0.6	0.3	0.2	10.7	90.9	3	267	0	0.2	0.1	2.1
3-4	Medium Ca	0.4	0.3	780	2	14.64	1160	233.7	0.6	0.5	0.3	16.2	152	6.2	505	895.8	0.5	0.2	3.3
1-3	Medium	0.1	0.2	292.5	0.1	8.88	1425	517.5	1.6	0.9	0.4	49	256	6.6	1367	0	0.2	0.5	5.7

MNR ID	Chemical Groupings	Sm ppm	Eu ppm	Sr ppm	La ppm	Mn ppm	K ppm	Na ppm	Co ppm	U ppm	Dy ppm	Ba ppm	Ti ppm	V ppm	Cl ppm	S ppm	Mg %	Al %	Ca %
	Ca																		
1-5	Medium Ca	0.3	0.1	1700	1.2	17.2	1130	363.9	0.5	0.4	0.3	20	96.9	2.5	819	1100	0	0.1	4.8
4-6	Medium Ca	0.1	0	987	0	36.27	330.2	473.5	0.9	0.3	0.1	497	0	0.8	1720	0	0	0.1	5.3
4-7	Medium Ca	0.2	0	1400	0.1	19.28	495	604.4	0	0.2	0.1	26.6	7.86	0.2	1918	0	0	0.1	2.2
4-4	Medium Ca	0.1	0	1038	0.1	15.81	252.2	463.7	0.4	0.3	0.1	76	20	0.6	1490	0	0	0.2	4.4
1-8	Medium Ca	1.2	0.3	0	0.9	280	960	775.2	0	0.1	2.2	71.4	38	1.3	1444	0	0.3	0.4	3.9
2-6	Medium Ca	0.3	0	300	0.9	128.8	800	364.8	0.9	0.2	0.3	12.3	134	4.6	693	2310	0.3	0.1	2.1
4-8	Very high Ca	0.6	0.3	3963	2.8	263.7	1417	246.2	0.9	0.1	0.1	0	274	6	326	0	0.2	0.6	41
2-3	Very high Ca	0	0	893.8	1	120.3	185.5	723.4	0.5	0	0	67.1	0	0.8	2245	22358	0	0.2	15
2-2	Very high Ca	0	0.1	255.2	0.3	185.9	296.6	326.4	0	0	0	0	0	1.2	710	2399	0.1	0.1	29

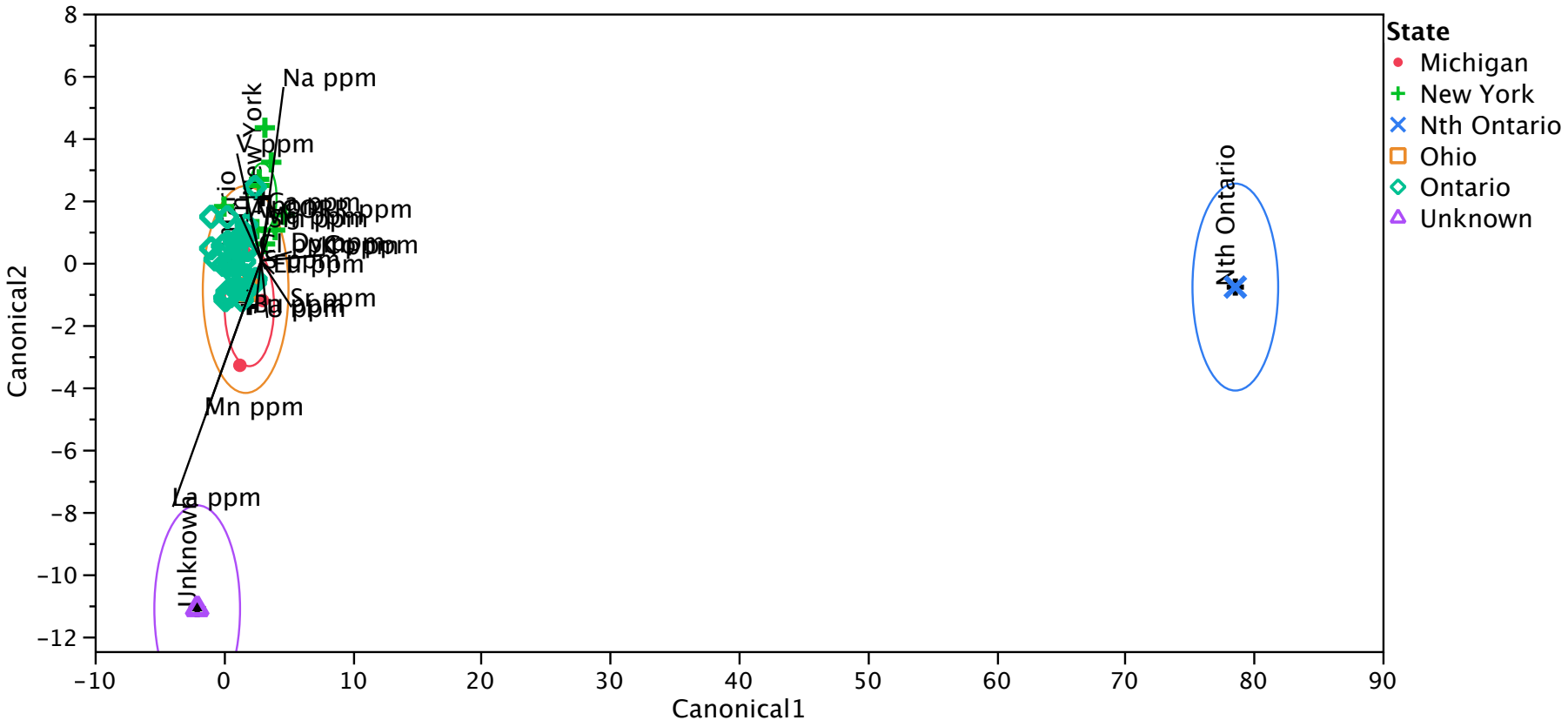

Figure 1. Discriminant analysis of all the samples, using all the elements in ppm, grouped by State.

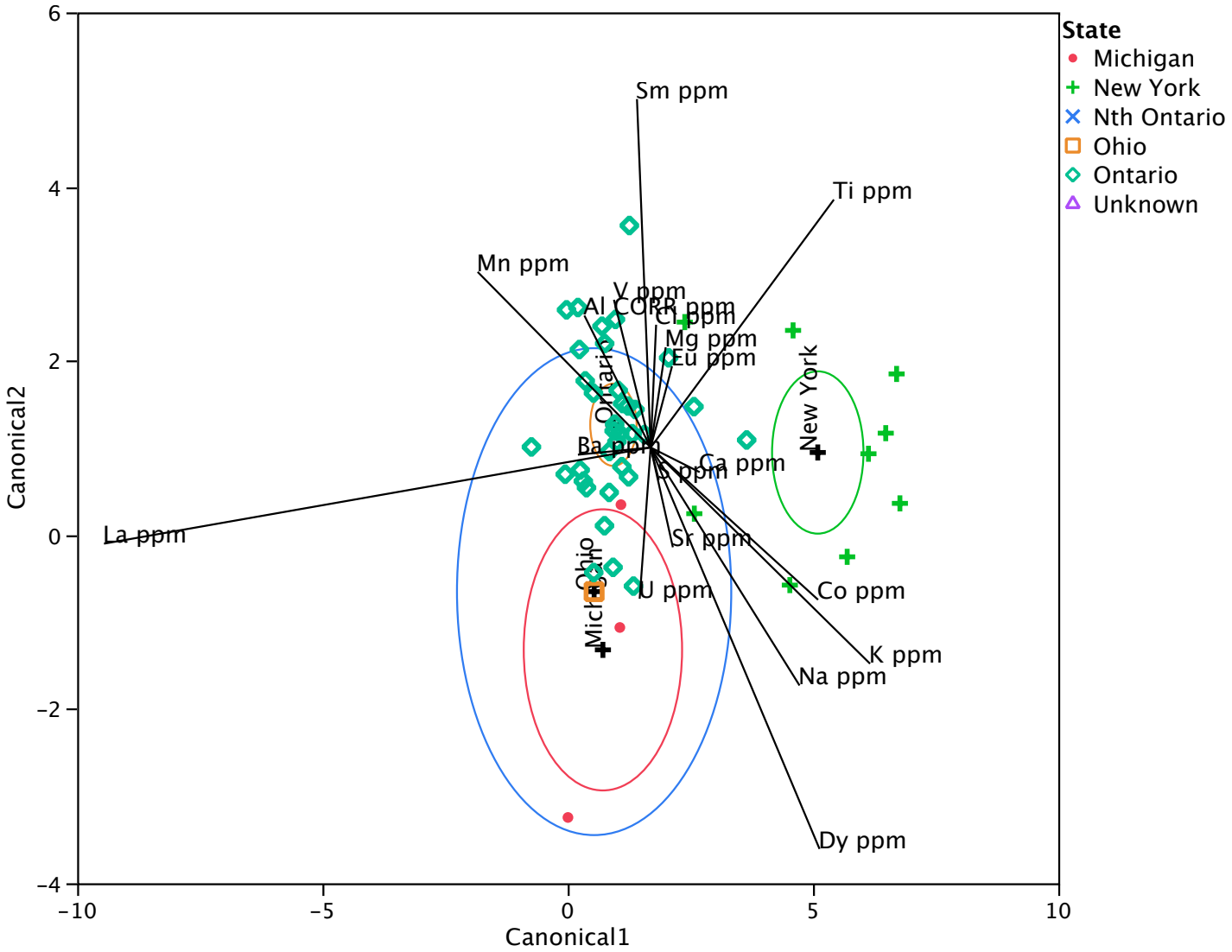

Figure 2. Discriminant analysis of all the samples, except those from Northern Ontario and Vera Cruz, Jasper Park. All elements are used in ppm, and the samples are grouped by State.

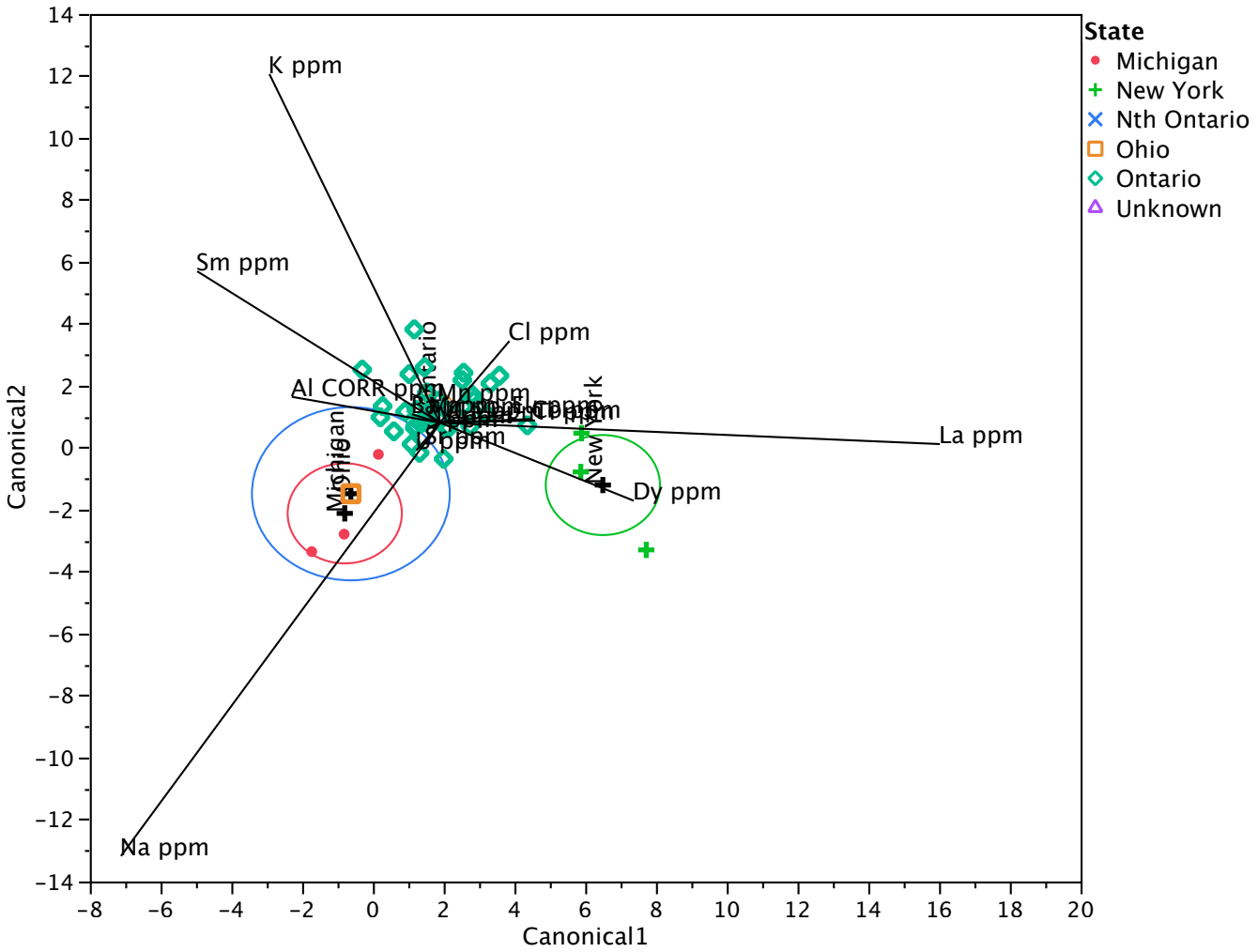

Figure 3. Discriminant analysis of all the samples, except those from Northern Ontario, Vera Cruz-Jasper Park and the non-clear chert New York ones. All elements are used in ppm and the samples are grouped by State.

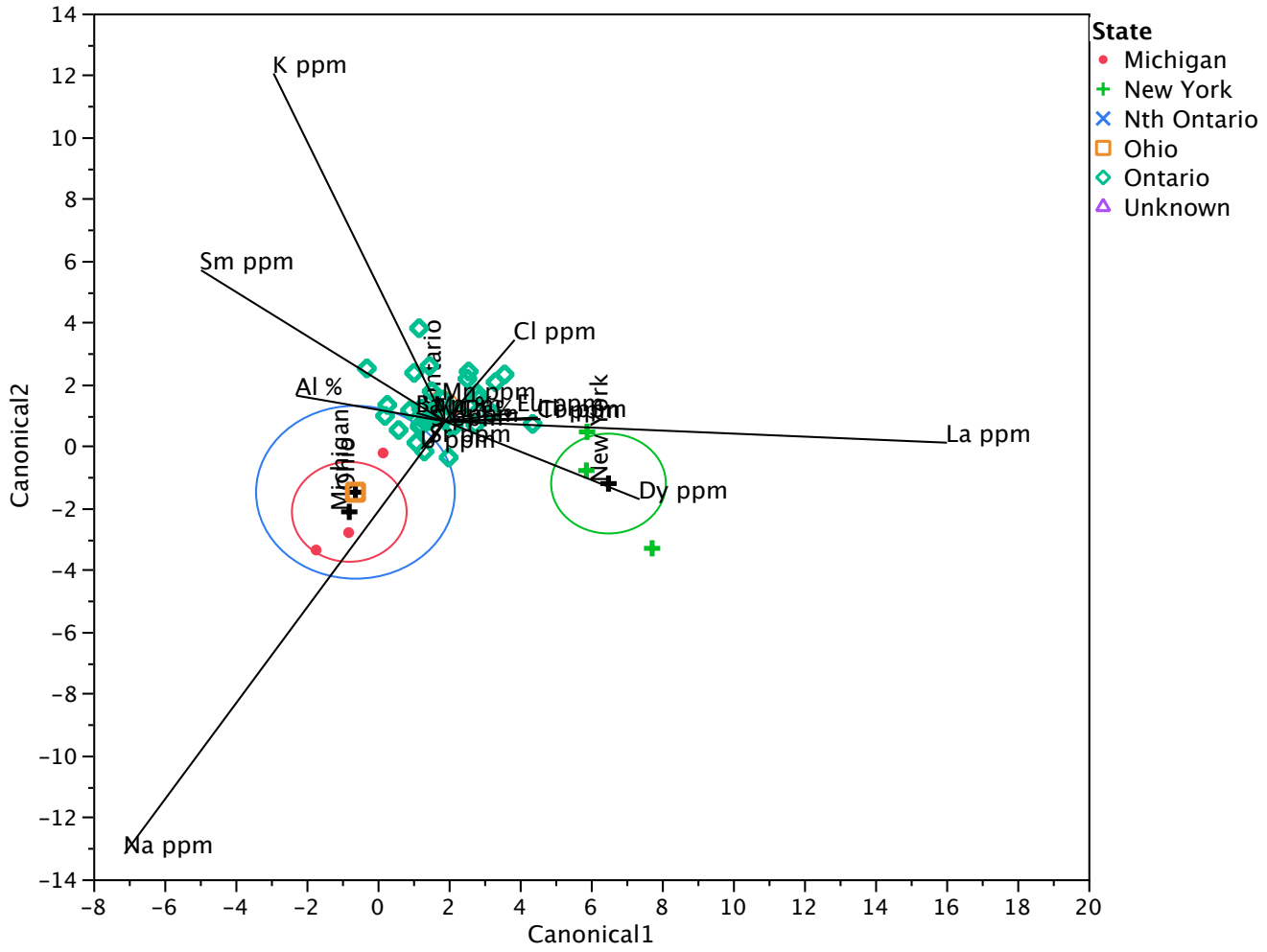

Figure 4. Discriminant analysis of all the samples, except those from Northern Ontario, Vera Cruz-Jasper Park and the non-clear chert New York ones. All elements are used in ppm, except for Al, Mg and Ca, which are considered in %weight. The samples are grouped by State.

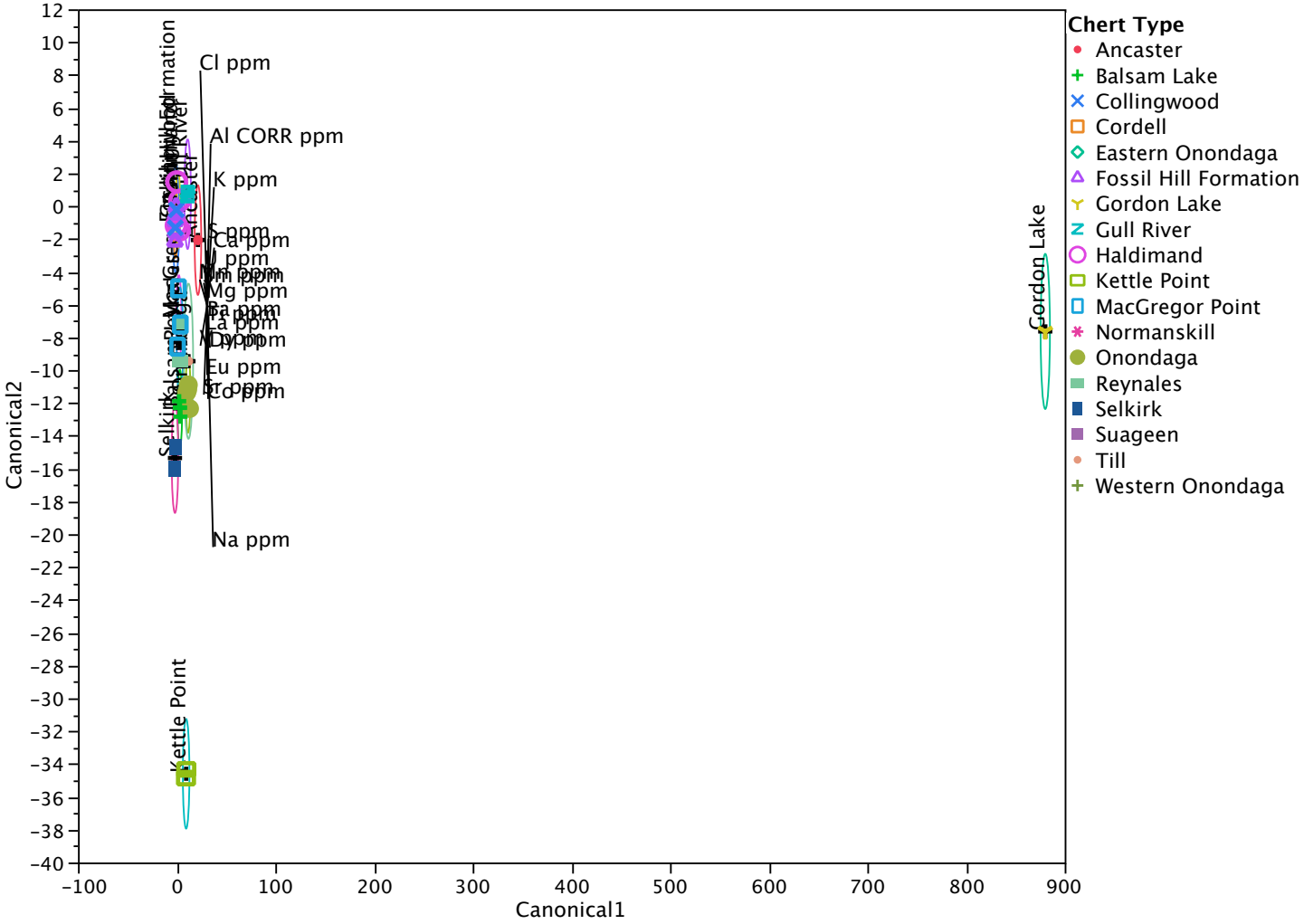

Figure 5. Discriminant analysis of all the Ontario samples, using all the elements in ppm, grouped by Chert Type.

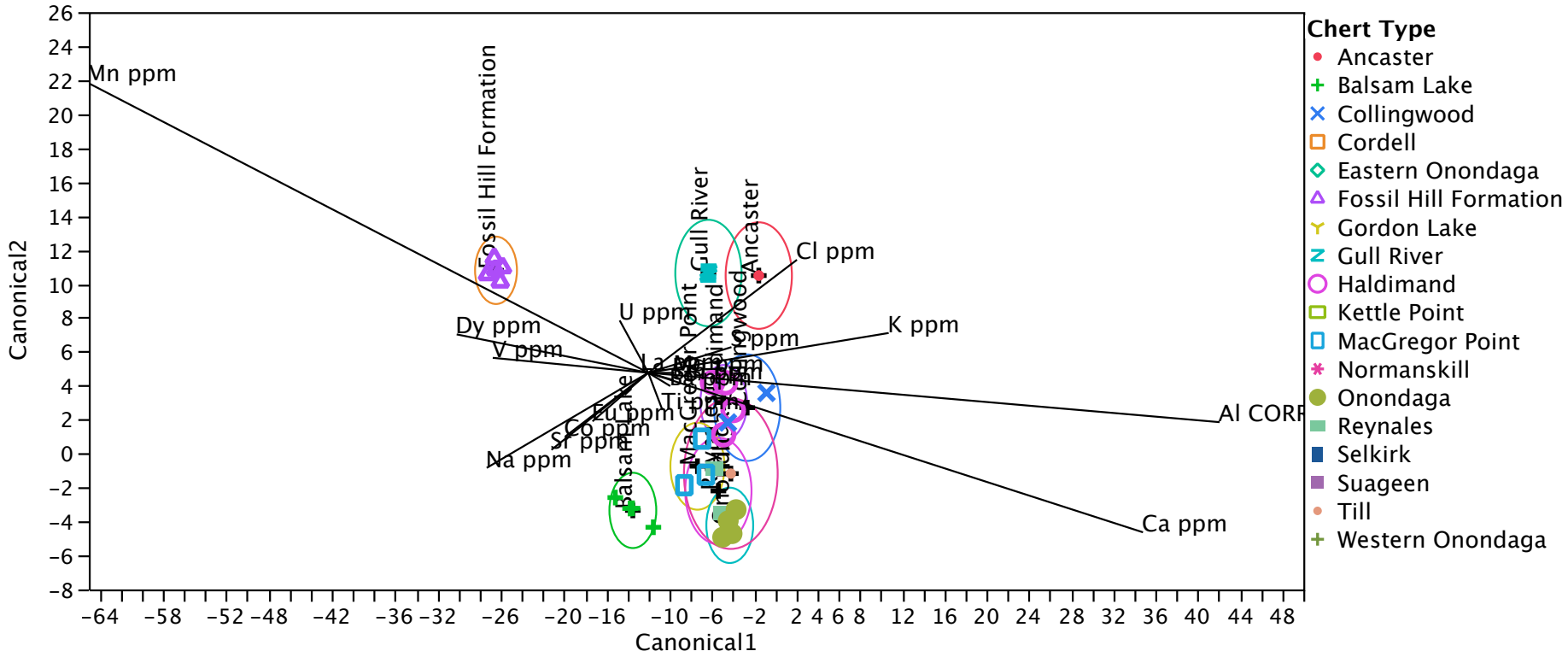

Figure 6. Discriminant analysis of Ontario samples, after removing the outliers of Figure 5 (Kettle Point and Gordon Lake). All elements in ppm, grouped by Chert Type.

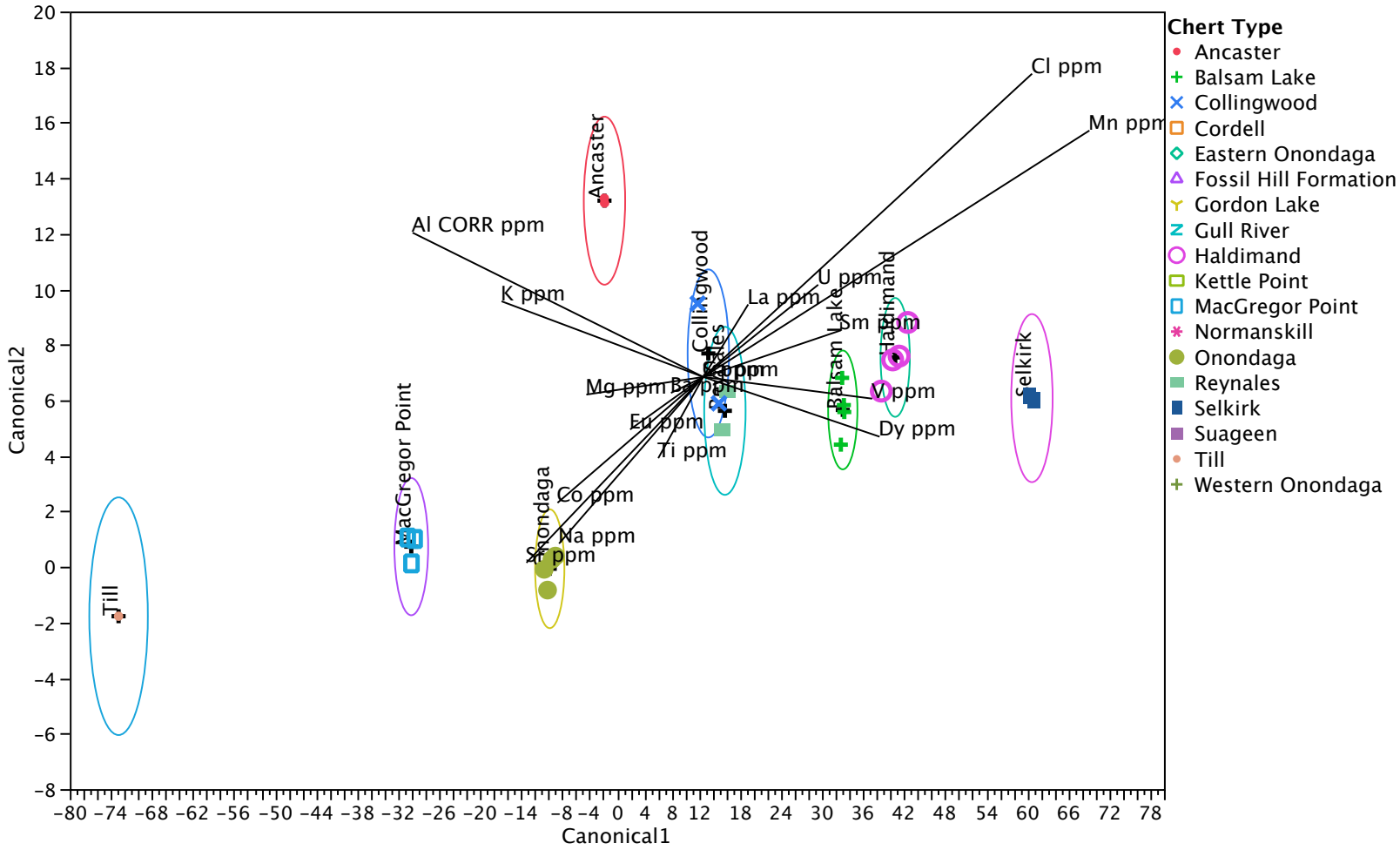

Figure 7. Discriminant analysis of Ontario samples, after removing the outliers of Figure 5 and 6 (Kettle Point, Gordon Lake and Fossil Hill Formation). All elements in ppm, grouped by Chert Type.