Precambrian Research Centre
VMS & Gold Short Course 2008

Jim Miller-UMD

George Hudak-UWO

Photos by Dorothy Campbell-OGS
Precambrian Research Centre
VMS & Gold Short Course 2008

Photos by Dorothy Campbell-OGS
“It Is What It Is”

Ron Morton-UMD
George Hudak-UWO

Dean Peterson-UMD

Photos by Dorothy Campbell-OGS
Hyaloclastites

- Mafic Lavas
- Typical fragment shapes with right-angle corners
Hyaloclastites
Mafic Flows

- Pillowed Flows
- In situ Hyaloclastite
- Quenched Fragmentation
Hyaloclastites
Mafic Flows

- Transported Hyaloclastite (Devonian)
- Crude Bedding
Hyaloclastites
Mafic Flows

- Timmins Peperite
- Intrusion of basalt into wet ash-sediment
- Quenched rims
Hyaloclastites
Mafic Flows

- Timmins Peperite
- Intrusion of basalt into wet ash-sediment
- Bombs
Hyaloclastites
Felsic Flows

Blocky Rhyolite Flow - Flow Top Breccia
Hyaloclastites
Felsic Flows

- Early quartz-sericite alteration of dacite
- Ansil Mine – Noranda / Quebec
Pyroclastic Rocks
Pyroclastic Rocks

- Sturgeon Lake
- Laminated to thinly bedded ash and rhyolite tuff
Pyroclastic Rocks

- Red Lake
- Welded tuff
- Fiami replaced by quartz
Pyroclastic Rocks

- Wawa
- Ash Flow
Pyroclastic Rocks

Sturgeon Lake

Basalt Lapilli Tuff
- Silicfied and carbonate altered scoria
- Dark green chorite – iron carbonate – chloritoid bearing matrix
Pyroclastic Rocks

- Basalt Lapilli Tuff – silicified and carbonate altered scoria
Pyroclastic Rocks

- Sturgeon Lake
- Lapilli Tuff / Tuff Breccia
- Rhyolite Lapilli
- Altered matrix – Chlorite
- Biotite
Pyroclastic Rocks

- Sturgeon Lake – Altered rhyolite tuff
- Intense adalusite alteration
Pyroclastic Rocks

- Sturgeon Lake – Alteration
- Intense adalusite altered rhyolite
- Aluminum and silica rich
Pyroclastic Rocks

- Sturgeon Lake - Alteration
- Pyrophyllite crystals
Pyroclastic Rocks

- Sturgeon Lake – Altered Tuff
  - Early silicification
  - Andalusite alteration
  - Chloritoid alteration - x-cutting Magnesium Chlorite
On the road to Canada
Jose & Marc “McGiver”
On the road to Canada
Lisa “Miss Hawaii” & Emille “Vive La France”
On the road to Canada

Andy – making new friends wherever he goes!
On the road to Canada
Thunder Bay
Sturgeon Lake

Total Production in the Sturgeon Lake area - 1972-1991
19.82 M Tons 1.06% Cu, 8.50% Zn, 0.91% Pb, 119.7 g/t Ag, 3.85 g/t Au
Sturgeon Lake
F-Group Trench – Stop #1

Figure 2. Geological map of the western one-third of the Sturgeon Lake Caldera Complex (modified after Morton et al., 1999). Lines A – A' and B – B' correlate to stratigraphic sections in Figure 5.
Mattabi Succession
silicified tuffs & ash - act
as a cap for
Replacement-type mineralization (F-Group Deposit) in High Level Succession crystal tuffs and breccias

Guide Book Stop F-3 (p.42) Map (p. 12 & 39)
Sturgeon Lake
F-Group Trench – Stop #1

Replacement-type mineralization of pyrite +/- sphalerite

Guide Book Stop F-3 (p.42) Map (p. 12 & 39)
Sturgeon Lake
F-Group Pit – Stop #1

F-Group deposit is hosted by High Level Succession Polymictic Breccias and Tuffs.
F-Group Deposit (340,000 Tons 0.64% Cu, 9.51% Zn, 0.64% Pb, 60.4 g/t Ag, 2.13 g/t Au)
Sturgeon Lake – Stop #3
High Level Lake Heterolithic Breccia (Mesobreccia)

Figure 3. Geological map of the central one-third of the Sturgeon Lake Caldera Complex (modified after Morton et al., 1999). Line C – C’ correlates to stratigraphic section in Figure 5.
Sturgeon Lake – Stop #3
High Level Lake Heterolithic Breccia (Mesobreccia)

**Heterolithic fragments:**
- Darkwater Rhyolites & Basalts
- Jackpot Lake
- Scoria

F-Group Deposit is hosted by High Level Succession Polymictic Breccias and Tuffs

Guide Book Stop M-1a (p.44) Map (p. 13 & 46)
Sturgeon Lake – Stop #3

High Level Lake Succession - Basal Surge Deposit - Subaerial

Guide Book Stop M-1 (p.44) Map (p. 13 & 46)
Sturgeon Lake – Stop #3

High Level Lake Sucession - Tuff Breccia
Sturgeon Lake - Stop #2
Middle ‘L’ Tuff Breccia - Block & Ash Flow

Figure 4. Geological map of the eastern one-third of the Sturgeon Lake Caldera Complex (modified after Morton et al., 1999). Lines D – D’ and E–E’ correlate to stratigraphic sections in Figure 5.
Sturgeon Lake Deposit & Mattabi Ore Lens ‘A’ are hosted by Middle ‘L’ Tuff Breccias & Tuffs.
Sturgeon Lake Deposit (2.07 M Tons 2.55% Cu, 9.17% Zn, 1.21% Pb, 164.2 g/t Ag, 5.79 g/t Au)

Guide Book Stop L-1b (p.52) Map (p.14 & 53)
Sturgeon Lake – Stop #2b
Middle ‘L’ Ryholitic Tuffs & Ash

- Highly altered rhyolite tuffs & ash
  - Silicified
  - Aluminum Silicate altered - Andalusite ($\text{Al}_2\text{SiO}_5$)
  - Chloritoid – anastomosing veins

Sturgeon Lake Deposit & Mattabi Ore Lens ‘A’ are hosted by Middle ‘L’ Tuff Breccias & Tuffs
Sturgeon Lake – Stop #4
Mattabi Ash & Tuffs

Figure 3. Geological map of the central one-third of the Sturgeon Lake Caldera Complex (modified after Morton et al., 1999). Line C – C’ correlates to stratigraphic section in Figure 5.
Sturgeon Lake – Stop #4
Mattabi Pit

Mattabi deposit produced 12.55 M Tons 0.74% Cu, 8.28 % Zn, 0.85% Pb, 104.0 g/t Ag, 3.67 g/tAu

Guide Book Stop M-2 (p.48) Map (p. 13 & 45)
Highly altered Ash & Tuff units
- Silicified
- Aluminosilicates: andalusite & pyrophyllite
- Chloritoid – anastomosing veins

Mattabi Deposit is hosted by Mattabi Ash & Tuffs

Guide Book Stop M-2 (p.48) Map (p. 13 & 45)
Highly altered Ash & Tuff units

- Silicified
- Aluminosilicates: andalusite & pyrophyllite
- Chloritoid – anastomosing veins

Mattabi Deposit is hosted by Mattabi Ash & Tuffs

Guide Book Stop M-2 (p.48) Map (p. 13 & 45)
Sturgeon Lake Stop #4
Mattabi - Adalusite vein

Guide Book Stop M-2 (p.48) Map (p. 45)
Highly altered Ash & Tuff units with spherulites
Sturgeon Lake - Stop #5
No Name Lake Succession - Peperites

Figure 3. Geological map of the central one-third of the Sturgeon Lake Caldera Complex (modified after Morton et al., 1999). Line C – C' correlates to stratigraphic section in Figure 5.
Andesite & basalts intruding wet interflow sediments

Guide Book Stop M-3 (p.49)
Sturgeon Lake - Stop #5

No Name Lake Succession - Peperites

Andesites & basalts intruding wet interflow sediments
Sturgeon Lake - Stop #5
Pillowed Andesite flows

Pillows with thick selvages indicating proximity to a vent
Rainy River Resources
Wally Rayner
Rainy River Resources
## Rainy River Resources
Resource Estimate (NI 43-101 compliant), News Release Feb 26, 2008

### 0.3 g Au/t block cut-off:

<table>
<thead>
<tr>
<th>Category</th>
<th>Tonnnes</th>
<th>Au (g/t)</th>
<th>oz. Au</th>
<th>Ag (g/t)</th>
<th>oz. Ag</th>
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<tbody>
<tr>
<td>Indicated</td>
<td>37,761,000</td>
<td>1.18</td>
<td>1,436,000</td>
<td>2.60</td>
<td>3,159,000</td>
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<td>Inferred</td>
<td>79,654,000</td>
<td>0.94</td>
<td>2,400,000</td>
<td>2.31</td>
<td>5,923,000</td>
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### 0.5 g Au/t block cut-off:

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<th>oz. Au</th>
<th>Ag (g/t)</th>
<th>oz. Ag</th>
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<tbody>
<tr>
<td>Indicated</td>
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<td>1.26</td>
<td>1,386,000</td>
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<td>2,896,000</td>
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<tr>
<td>Inferred</td>
<td>67,564,000</td>
<td>1.03</td>
<td>2,233,000</td>
<td>2.35</td>
<td>5,109,000</td>
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### 0.7 g Au/t block cut-off:

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<th>oz. Au</th>
<th>Ag (g/t)</th>
<th>oz. Ag</th>
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<td>Indicated</td>
<td>24,959,000</td>
<td>1.50</td>
<td>1,206,000</td>
<td>2.63</td>
<td>2,106,000</td>
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<tr>
<td>Inferred</td>
<td>44,391,000</td>
<td>1.25</td>
<td>1,787,000</td>
<td>2.28</td>
<td>3,257,000</td>
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</table>
Rainy River Resources

http://www.rainyriverresources.com/s/Photos.asp
Rainy River Resources

High Ti Gabbro - Dimensions Largely Defined by Magnetics
Large Volume
Possible Relationship to 34 Zone

High Aluminum
High Zinc
High Copper
High Gold
High Silver

High Potassium
High Manganese
Anomalous Copper and Zinc

High Barium

Zone 1

Stop #3

Stop #1

Stop #2

Stop #4

Nuinsco Resources Limited
Alteration Zone 1
Rainy River District, Northwestern Ontario

Black Hawk Stock
Rainy River Resources - Stop #1
Black Hawk Stock - 2699 - Sanukatoid
Rainy River Resources - Stop #2
Dacitic Metavolcanics - 2720
Rainy River Resources - Stop #3
Pillows
Rainy River Resources - Stop #3
Pillows
Rainy River Resources - Stop #4
Autoclastites
Rainy River Resources - Stop #4
Autoclastites
Rainy River Resources-Core Shack

NR06-117 Visible Gold - 17 Zone
Rainy River Resources-Core Shack
Mineralized Ultra Mafic Body “The Tube”
X-cutting 17-Zone
Rainy River Resources-Core Shack
Mineralized (pentlandtite & chalcopyrite) in Ultra Mafic Body x-cutting 17-Zone Mineralization
Rainy River Resources-Core Shack
Vermillion District – Stop #1

Wide-spread alteration in Lower Member - Ely Greenstone Belt
Actinolite-Quartz-Epidote Altered Pillows
Vermillion District – Stop #2

Vecicular pillows indicating Shallow water environment

Guide Book Stop 1-4 (p.153-156)
Vermillion District – Stop #2
Pillow with multiple selvages

Guide Book Stop 1-4 (p.153-156)
Vermillion District – Stop #3
Pillowed dykes indicating synvolcanic structure

Guide Book Stop 1-5 (p.156-158)
Vermillion District – Stop #3
Blocky Peperite – Basalt-andesite intruding scoria tuff (wet-sediment)

Guide Book Stop 1-5 (p.156-158)
Vermillion District – Stop #4
Scoria Lapilli Tuff

Guide Book Stop 1-7 (p.161-163)
Vermillion District – Stop #4
Exhalite
Vermillion District – Stop #5
Hyaloclastites

Guide Book Stop 1-10 (p.167-168)
Vermillion District
Mud Creek Shear Zone
Vermillion District
Au bearing Quartz-Sericite Schist
Vermillion District
Bruce “Indiana Jones”

Ankerite altered pillow basalts
Vermillion District

Tom’s outcrop - Quartz veining hosted by gabbroic sill
Vermillion District
Mikes Outcrop
Joe “Montana” & Kaesy
“There are only two ways to live your life. One is as though nothing is a miracle. The other is as though everything is a miracle.” Albert Einstein