Mapping the Lake Three Troctolite of the Duluth Complex

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Objectives For the Lake Three Troctolite

- Determine the extent of the Lake Three Troctolite
- Establish the contacts with the Anorthositic Series
- Determine rock types in contact zones
- Determine the internal structure and lithologic variations within the Lake Three Troctolite
THE CREW

Jack

Sara

Sarah

Ann

Jim

Jordan
Paddling to the “Sea of Troctolite”

6.54 miles in to our campsite.

6.5 Miles of Canoeing
Life At Camp

Sarah
Pondering life over a mosquito
The Lake Three mapping area is located within the Duluth Complex where the Anorthositic Series has been intruded by the Troctolitic Series.
Modes of Transport
“A Walk in the Park” – Dr. James D. Miller Jr. PhD

Jordan
At The Outcrops
Out of the Field Day 1
Out of the Field Day 2
Out of the Field Day 3
Out of the Field Day 4

The Clean One
Out of the Field Day 5

Before

After
Rocks of the Lake Three Troctolite
Duluth Complex

Anorthositic Series

Med. to coarse grained, moderately to well foliated PP/PPo. Ranges from 80-95% with varying amounts of olivine and dark mafics. Locally ophitic/poikilitic and occurs as intrusions throughout the troctolitic series.

Fig. 1: Anorthosite

Fig. 2: Anorthosite with olivine oikocrysts
Gabbroic Anorthosite

Fig. 2: Anorthosite Layering
Troctolite

Light to dark gray/brown, fine to medium-coarse grained, locally modally layered and foliated, subpoikilitic to poikilitic, plagioclase pheric troctolite. Troctolitic series grades from well layered melatroctolite to leucotroctolite based on olivine mode with augite bearing troctolite found locally.
Features within the Troctolite

Fig. 1: Very orthogonal Inclusion of Anorthosite

Fig. 2: Contact between Troctolite and Anorthosite

Fig. 3: Clotting of Pyroxene and Oxides

Fig. 4: Modal Layering
Augite Troctolite

Light gray to dark gray, medium grained, poorly to moderately foliated, subophitic to ophitic, augite troctolite. Unit varies from augite leucotroctolite to olivine gabbroic augite troctolite with well layered outcrops found locally. Generally found in the interior portion of the Lake Three troctolite bordered by the nonophitic, pyroxene-poor troctolite.

Fig. 1: Inclusion of Anorthositic Olivine Oxide Gabbro
Fig. 2: Ophitic Texture within the Augite Troctolite
Fig. 3: Layering within the Augite Troctolite
North Shore Volcanics

**Olivine Gabbro**

Dark gray fine to medium-fine grained moderately foliated, grano-blastic, olivine gabbro. Primarily homogenous with local areas of coarse grained oxides and cross-bedding features. Interpreted to be highly thermally metamorphosed basalt of the North Shore Volcanic Group.

Fig. 1: Fine grained Olivine gabbro contacting med grained Troctolite

Fig. 2: Fine grained Olivine gabbro contacting med grained Troctolite

Fig. 3: Fine grained, equigranular, Olivine gabbro
Interpretations

- Synformal structure
- Anorthosite/Troctolite
- Augite troctolite contact
- Lack of four phase cumulate
- Faults inferred by topography
THE CROSSING
Out of bugspray...

Time to go home!!

Thanks to all that helped...

Jim, Sam, Sarah, Adam, Jasper and everyone else who helped us throughout field camp.