New insights into the geology of the Lac du Sauvage area, NWT.

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Metamorphic Assemblages in Metagreywackes:

Mineral assemblages within pelitic beds at Lac du Sauvage consist of biotite + cordierite + andalusite + quartz + feldspar ± sillimanite. Some porphyroblasts are strongly flattened within the main foliation (S_2; see below), whereas others are euhedral and wrapped gently by S_2. Porphyroblasts with the latter texture locally contain relict andalusite or cordierite in their cores. Sillimanite, where present, occurs as fine needles of fibrolite overgrowing cordierite and andalusite.

We interpret these textures to indicate two thermal events: 1) an early event (M_1) that pre-dated or accompanied the early stages of deformation, in which cordierites and andalusites grew and were subsequently flattened; and 2) a later event (M_2) that coincided with the latest stages of shortening. Cordierite, andalusite and sillimanite grew during M_2, overprinting the earlier assemblage and locally preserving relict M_1 phases as inclusions. Pressure conditions during both events are constrained to below the aluminosilicate triple point (ca. 4 kbar); temperature during M_2 reached the sillimanite stability field (~650-700°C), and was slightly lower (sub-sillimanite) during M_1.

Left: garnet-bearing concretion in psammitic layer.

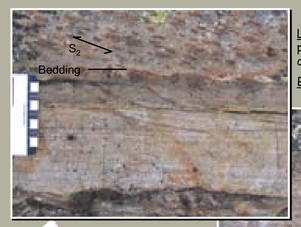
Botton Left: cordierite porphyroblast with relict andalusite grain in core.

Below: outcrop contains early andalusite (A) flattened along S_2 and late euhedral cordierite (C) rimmed by fine sillimanite (S).

Structural Elements:

Mid-amphibolite facies greywackes are well-exposed on the southwest side of Lac du Sauvage. They consist of psammitic to pelitic beds 2-20cm thick, and preserve primary features such as graded bedding, scours, cross beds, and rare concretions. Beds in most outcrops young steeply northeast, although locally southwest-younging bedding attests to asymmetric (S) folds. Associated with these folds is a subvertical foliation defined by aligned micas and flattened porphyroblasts. Reversals in younging direction correspond to reversals in the angular relationship between bedding and foliation, suggesting the foliation is axial planar to the folds.

In a number of outcrops, aligned inclusions of mica ± quartz are preserved inside cordierite, and less commonly, andalusite porphyroblasts. Where observed, this fabric is oriented at high angles to the main foliation in the matrix, and is therefore interpreted to pre-date it. The internal foliation is designated S_1, and the main foliation and associated folds are designated S_2 and F_2, respectively.

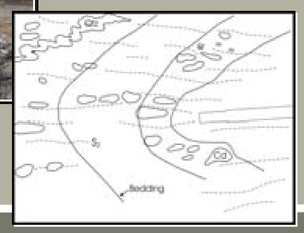


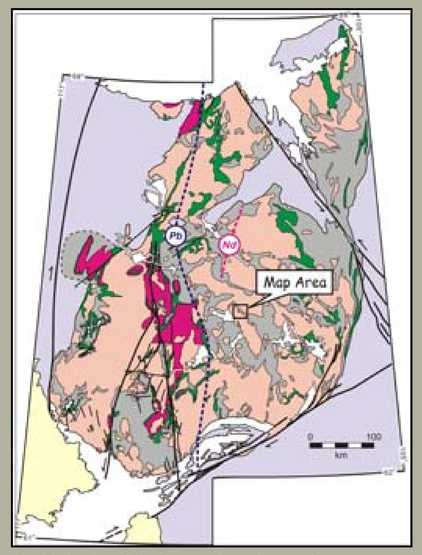
Left: cross beds in psammite (younging toward top of photo). S_2 defined by cordierite porphyroblasts (above cross-bedded layer) oriented clockwise from bedding.

Below: graded beds (younging toward top of photo).

Left: F_2 fold of bedding about S_2.

Right: Sketch of outcrop to left, illustrating bedding/S_2 relationship.





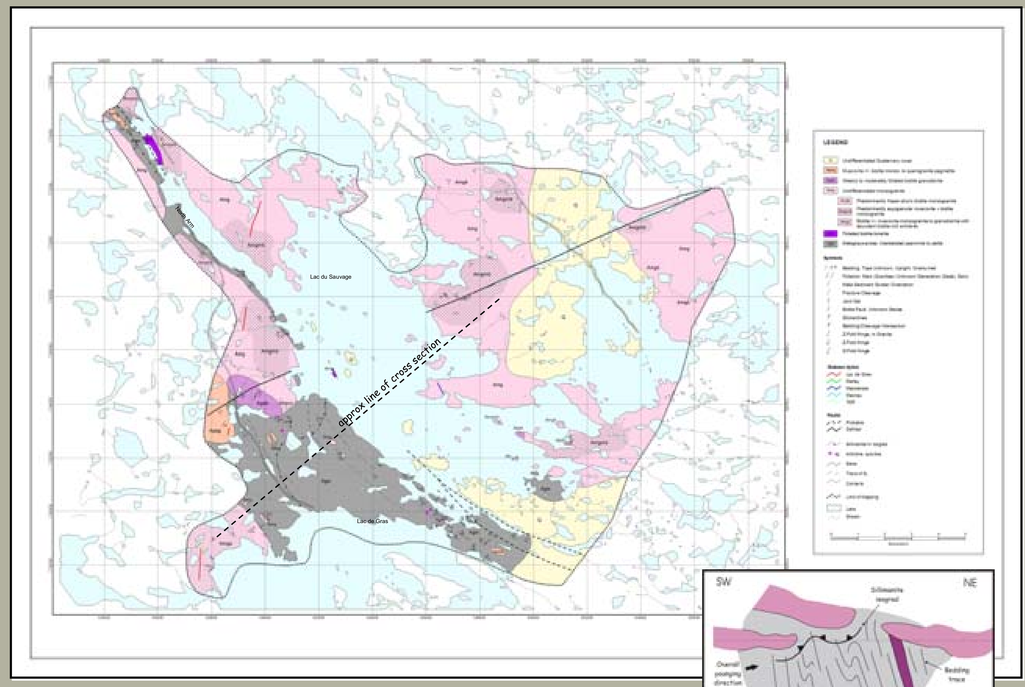
Simplified geology of Slave Province showing location of map area.

Lac du Sauvage Area:

The Lac du Sauvage map area is located in the east-central Slave Province, about 300 km northeast of Yellowknife. Most of the map area is underlain by monzogranite, which can be subdivided into a number of sub-units based on accessory mineral assemblages and texture. The southern part of the area comprises a steep northwest-striking panel of tightly folded metagreywackes, which narrows northwestward along what we informally call the North Arm of Lac du Sauvage.

Field data (rock type, sample descriptions, photographs, structural measurements) were collected using Pocket PC's, and were downloaded nightly into an ArcView project. The evolving map and digital photographs were viewed together each evening, to compare geology between adjacent traverses and to correlate units and structures.

This poster presents a draft version of the map, and describes the rock units and structural elements observed in the area.



Preliminary geologic map and schematic cross section of the Lac du Sauvage study area.

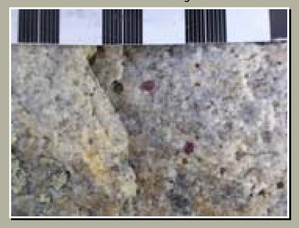
Granitoid rocks:

Granitoid rocks in the area were subdivided into four units, the most predominant of which is a massive to weakly foliated biotite ± muscovite monzogranite with local K-spar phenocrysts (*Amg*). It consists of at least two phases (bio >> mu Kspar-phyric and 2-mica equigranular) that were injected as flat-lying, undulating sheets. Extensive till cover and low topographic relief make mapping between these phases difficult; as a result, they are grouped as a single map unit, although areas dominated by one or the other phase are indicated on the map.

The other three units are less abundant, but are locally extensive enough to be represented at the scale of the map. The oldest is a strongly foliated biotite tonalite (*Atn*) which is poorly exposed, but appears to define a subvertical sheet that parallels foliation (S_2) in the metagreywackes. The other two units consist of leucocratic biotite granodiorite (*Agdb*) sills within the monzogranite, and monzo- to syenogranite pegmatite (*Apeg*), also associated with the monzogranite. The pegmatite occurs both as cross-cutting veins and as patches in gradational contact with the host granite.

Biotite-rich schlieren are locally abundant in the monzogranite, particularly along the north shore of Lac de Gras (SW part of study area). The schlieren dip gently, parallel to the spaced foliation in the host monzogranite. It is unclear whether the schieren are relict paleosomes derived from anatectically melted metagreywacke enclaves, or if they're inherited from enclaves of strongly foliated to gneissic granite.

Undulating, subhorizontal spaced foliation in monzogranite. Fabric is interpreted to correspond to contacts between individual granite sheets.



Accessory minerals in the monzogranite include rare garnet, tourmaline, sillimanite and apatite. Shown above are pink garnets in muscovite-bearing pegmatitic monzogranite.

Subhorizontal biotite-rich schlieren in 2-mica monzogranite.

Evidence for faulting:

A subvertical, east-northeast-striking brittle fault transects the central part of the map area. Where it cuts the granite north of Lac du Sauvage, it is marked by a series of elongate lakes; west of Lac du Sauvage it was observed in outcrop in one location, where it defines a cliff. Slickenlines on the fault face are subhorizontal, and mineral fibres indicate dextral displacement. Conjugate fractures are locally developed along the fault, and contain slickenlines with sinistral asymmetry.

A second fault was mapped along the north arm of Lac du Sauvage, extending SE along the shoreline to the south shore of the lake. It is inferred based largely on its topographic expression; however, in a few outcrops, evidence for faulting was observed. Fault features include pseudotachylite veins and asymmetrically pulled apart quartz boudins.

Below: chlorite-rich fault breccia in monzogranite. Brick red alteration is typical of fault face.

Above: quartz slickenlines on ENE-striking dextral fault.

Diabase Dykes:

Diabase dykes in the study area are divided into 5 swarms based on orientation. These dykes are the subject of a B.Sc. study by Patterson, and are described in more detail on the adjacent poster.

Below: asymmetric quartz boudins in metagreywacke on island adjacent to NW-striking fault.

Above: grey pseudotachylite vein in metagreywacke near inferred NW-striking fault.

Left: chilled contact of a MacKay diabase dyke against biotite monzogranite.