Late Wisconsinan McConnell glacial ice-flow patterns and implications for exploration in the Big Salmon Range, south central Yukon

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Introduction

Paleo-glacier ice-flow patterns were reconstructed for the Big Salmon Range as part of a multi-year project to compile the glacial history of the Pelly Mountains. This work was initiated after field studies in the Seagull Creek drainage, in the central part of the Pelly Mountains, determined that McConnell glacial ice-flow was dominantly in the up-valley direction (Kennedy and Bond, 2003). Additional mapping and field studies in the St. Cyr Range of the Pelly Mountains in 2004 confirmed that the up-valley flowing ice was a regional event that was derived from the Cassiar lobe of the Cordilleran ice sheet (Bond and Kennedy, 2004). This ice-flow history has important ramifications for mineral exploration programs that take into account dispersal trajectories of soil sediment and erratics.

Big Salmon Range Ice-flow History

A four phase ice-flow history is proposed for the Big Salmon Range (see map).

Phase 1: *Locally derived ice advance.* This period marks the initial accumulation of ice at the onset of glaciation. Geological evidence of this phase is largely inferred due to erosion of early glacial sediments during later glacial stages. The extent of the local ice accumulations was more restricted than what was documented from the Pelly Mountains further east.

Phase 2: *Cordilleran ice sheet advances NW and overtops the Big Salmon Range at glacial maximum (see map).* High elevation ice-flow indicators suggest the Cassiar lobe of the Cordilleran ice sheet moved across the range virtually unobstructed by the underlying topography (Fig 1).

Phase 3: *Retreat of the Cassiar lobe from the Big Salmon Range (see map).* With reduced ice thickness during glacial recession the Cassiar lobe became increasingly directed by underlying topography. East flowing drainages in the Big Salmon Range experienced up-valley ice-flow as the Cassiar lobe maintained a regional northwest flow trajectory. Westward oriented drainages would have been glaciated by down-valley flowing ice. Retreat of the Cassiar lobe to the east of the north trending drainage divide resulted in ponding of meltwater between the ice-front and the mountain passes. This meltwater drained westward across the divide and flowed down the recently deglaciated western drainages (Fig. 2, 3 and 4). The flow of meltwater was significant enough in some valleys to erode through the surficial deposits and into bedrock, which would have completely reworked pre-existing placer deposits.

Phase 4: *Late glacial readvance of local alpine glaciers.* This readvance was also mapped in the Pelly Mountains further east. In the Big Salmon Range, however, the glaciers are less abundant and more restricted in extent.

Implications for Mineral and Placer Exploration

Glacial sediment and float dispersion directions in the Big Salmon Range may vary with elevation. Glacial till and erratics found on high elevation surfaces were mostly deposited during glacial maximum and therefore maintain the Phase 2 transport direction (Fig. 5). Glacial material at lower elevations such as valley bottoms and some cirques was transported during the retreat phase and therefore has a valley parallel dispersion direction. For most areas the transport direction is up-valley on the east side and down-valley on the west side of the range.

The preservation of pre-glacial placer deposits is dependant upon valley orientation, glacial meltwater influences and base-level changes. The pre-McConnell Livingstone placer deposits were preserved in narrow valleys oriented transverse to ice-flow. This allowed the placer deposits to escape glacial or glaciofluvial erosion. On the other hand, drainages such as Mendocina Creek and the upper Boswell River were flushed by glacial meltwater (Fig. 3 and 4). This likely caused any pre-glacial gravel to become reworked and transported out of the erosive sections of the drainage. Future placer exploration should focus on stream reaches that had a favourable valley orientation relative to ice-flow. Streams that underwent glaciofluvial erosion may have had pre-existing placers redistributed into lower reaches of the draiange where stream energy was reduced (e.g., alluvial fans).

Figure 1: These high elevation glacially aligned landforms (see arrows), such as these in the upper Boswell River enabled the glacial maximum transport direction to be determined from air photos.

Figure 2: Meltwater channels cutting over a divide into Grey Creek, NW of Quiet Lake. As the meltwater flowed over the pass it eroded into surficial material and bedrock. The amount of incision indicates the volume and energy the water has that flowed over the divide.

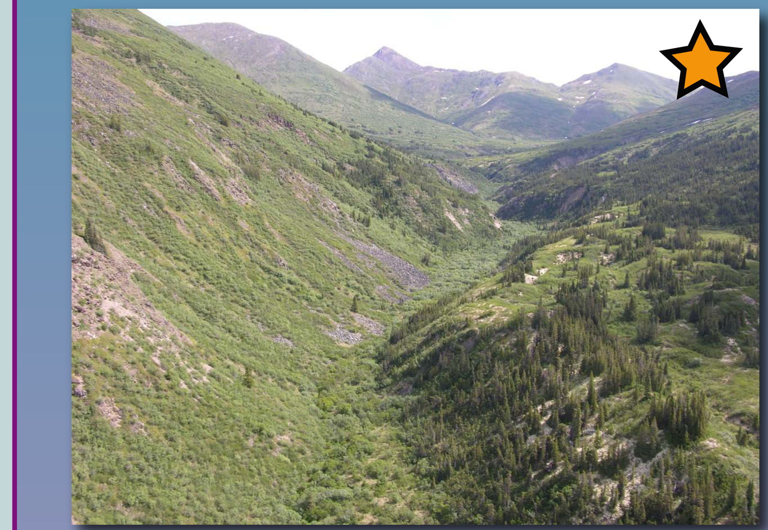


Figure 3: Large volumes of meltwater flowed over the divide between Scurvy and Mendocina creeks and cut this channel in upper Mendocina Creek.

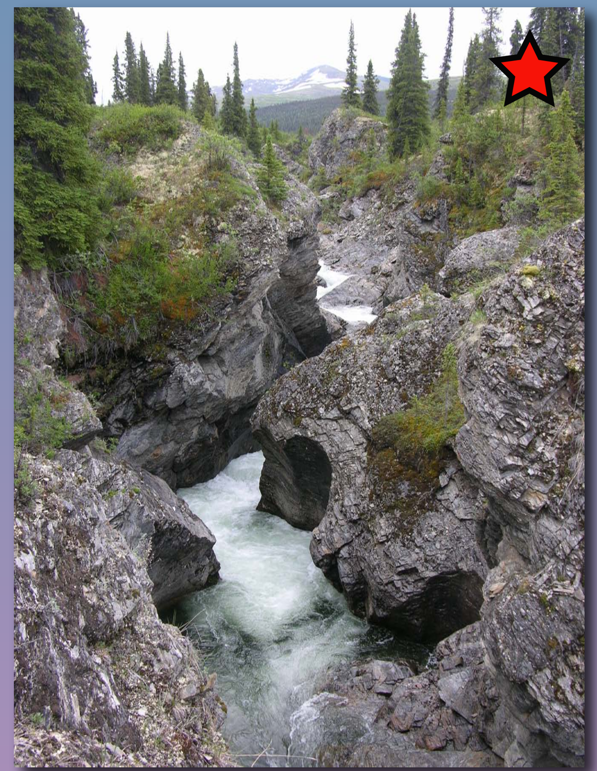
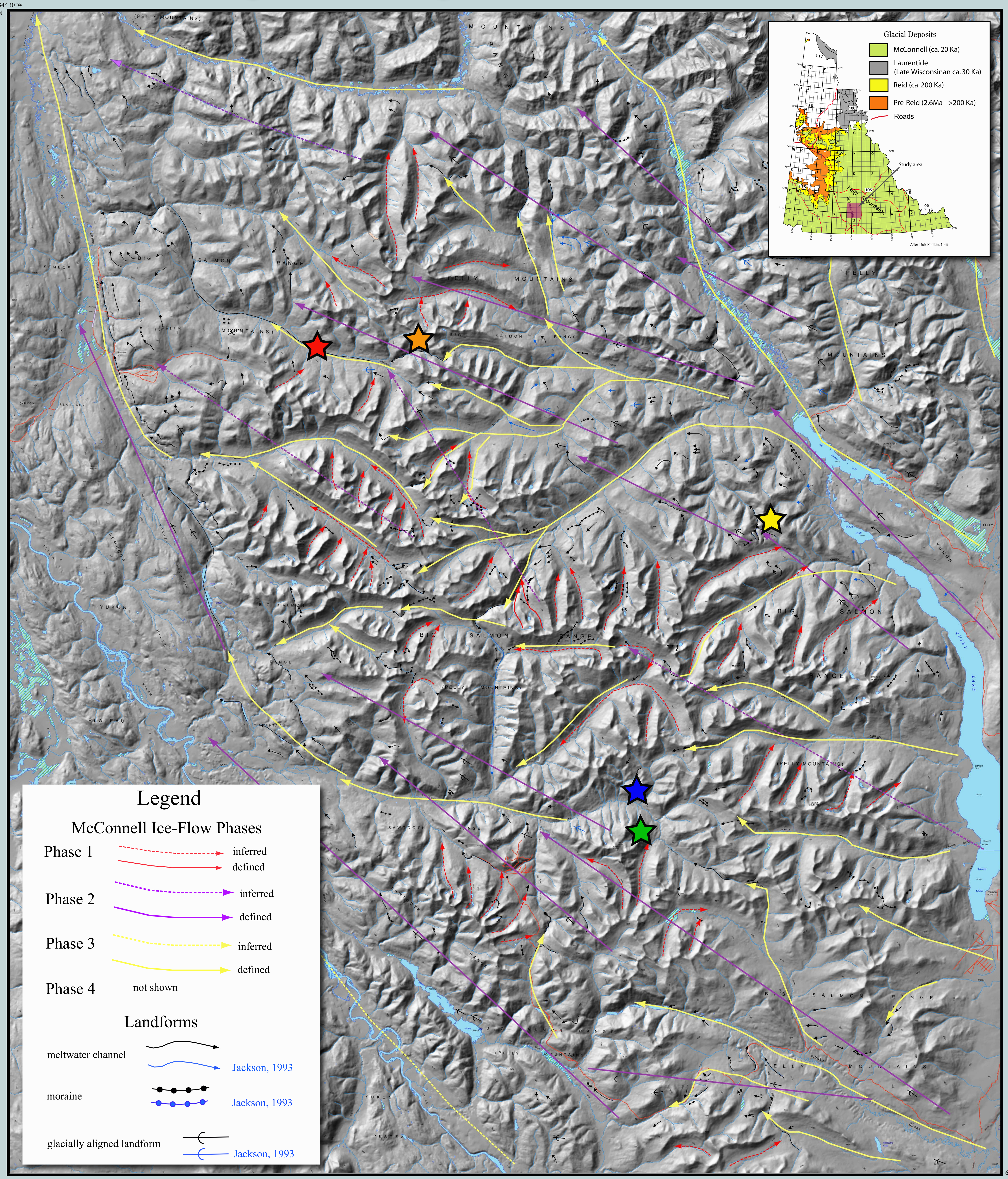


Figure 4: The effects of meltwater erosion in Mendocina Creek are visible well downstream from the glacial source.

Figure 5: Erratics like these boulders were transported and deposited during the waning stages of the glaciation.



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