

INTRODUCTION

Paleo-glacial 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 glacial history is also reflected in the Big Salmon Range and has important ramifications for mineral exploration programs that take into account dispersal trajectories of surficial 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 (red arrows).

This period marks the initial accumulation of ice at the onset of glaciation. Geological evidence of this phase is either eroded or buried by later glacial phases. General zones of ice accumulation are inferred from well developed cirques. Stratigraphic evidence from Brown Creek suggests that local ice may not have extended beyond the mountain valleys prior to the invasion of the Cassiar lobe of the Cordilleran ice sheet. This contrasts with the southern flanks of the Pelly Mountains further east where local ice advanced out of the mountains prior to the Cassiar lobe arriving (Bond and Kennedy, 2005).

Phase 2: Cordilleran ice sheet advances northwest and overtops the Big Salmon Range at glacial maximum (purple arrows).

High-elevation ice-flow indicators suggest the Cassiar lobe of the Cordilleran ice sheet moved across the range virtually unobstructed by the underlying topography.

Phase 3: Retreat of the Cassiar lobe from the Big Salmon Range (yellow arrows).

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-south trending drainage divide resulted in ponding of meltwater in the eastern drainages. This meltwater drained westward across mountain passes and flowed down the western drainages shortly after these were deglaciated. Meltwater erosion was significant enough in some valleys to erode through the surficial deposits and into bedrock, which would have completely reworked pre-existing placer deposits. A good example of this history is evident on the mid- to upper reaches of Mendocina Creek.

Phase 4: Late glacial readvance of local alpine glaciers (advance too limited, arrows not shown).

This readvance was also mapped in the Pelly Mountains further east. In the Big Salmon Range, however, the glaciers are less abundant and generally restricted to less than 1km 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. Glacial material, at lower elevations such as valley bottoms and in cirques, was transported during the retreat phases 3 or 4 and therefore has a valley-parallel dispersion direction. For most areas, the deglacial transport direction is up-valley on the east side of the Big Salmon Range 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. The valley orientation resulted in ponding of glacial meltwater and deposition of glacial lake sediments during ice advance. The combination of a protective blanket of glacial lake sediment and a favourable valley orientation relative to ice flow allowed the placer deposits to escape glacial or glaciofluvial erosion (Levson, 1992). In contrast, drainages such as Mendocina Creek and the upper Boswell River were flushed by glacial meltwater during ice retreat (phase 3). In these areas affected by intense meltwater erosion, it is unlikely that any pre-glacial gravel was preserved. Future placer exploration should focus on stream reaches that had a favourable valley orientation relative to ice-flow. In addition, it is beneficial if the valley bottom stratigraphy shows evidence of a protective glaciolacustrine unit overlying the pay gravel, as is observed at Livingstone Creek. Streams that underwent glaciofluvial erosion may have had pre-existing placer deposits redistributed into lower reaches of the drainage where stream energy was reduced (e.g., alluvial fans).

LEGEND

McConnell Ice-Flow Phases

- Phase 1 → defined
- - - - - → inferred
- Phase 2 → defined
- - - - - → inferred
- Phase 3 → defined
- - - - - → inferred
- Phase 4 → limited advance - not shown

Glacial Landforms

- meltwater channel → this study
- - - - - Jackson, 1993
- moraine - - - - - this study
- - - - - Jackson, 1993
- glacially aligned landform ● this study
- Jackson, 1993

Placer Activity

- previous significant mechanized placer mining ⊗
- previous exploration and/or small-scale placer mining ⊗
- placer potential ⊗

Symbol Legend

- lake ☪
- stream ~
- topographical contour ~
- road/trail/cutline ~

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RECOMMENDED CITATION

Bond, J.D. and Church, A., 2006. McConnell ice-flow and placer activity map, Big Salmon Range, Yukon (1:100 000 scale). Yukon Geological Survey, Open File 2006-20.

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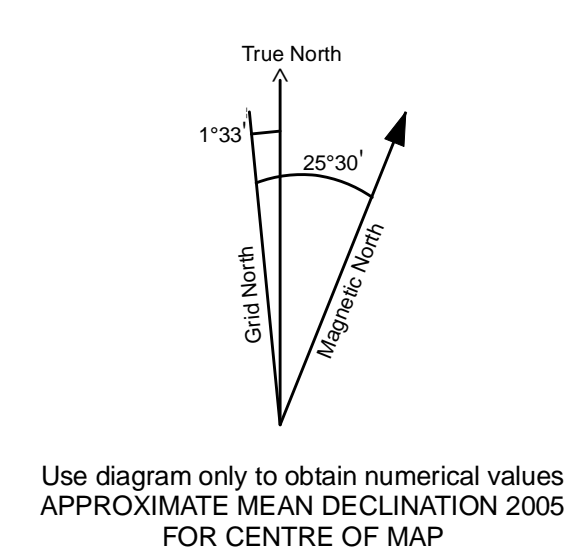
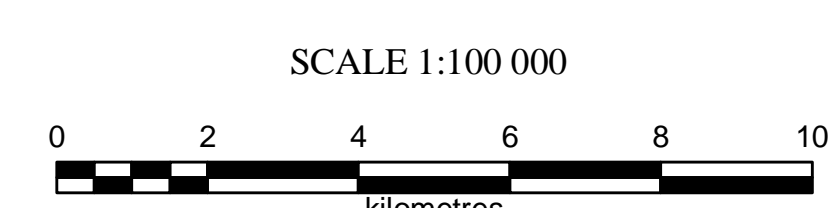
**McConnell ice-flow and placer activity map
Big Salmon Range, Yukon
(1:100 000 scale)**

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1:250 000 scale topographic base data provided by
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Zone 8
CONTOUR INTERVAL 20 METRES
Elevations in metres above Mean Sea Level

**MCCONNELL ICE-FLOW AND PLACER ACTIVITY MAP
BIG SALMON RANGE
YUKON**



105E	105F
LABERGE	QUIET LAKE
105D	105C
WHITEHORSE	TESLIN