

# Examining Cretaceous strata of the Taylor Creek Group in British Columbia: Potential connection of the Methow and Tyaughton basins

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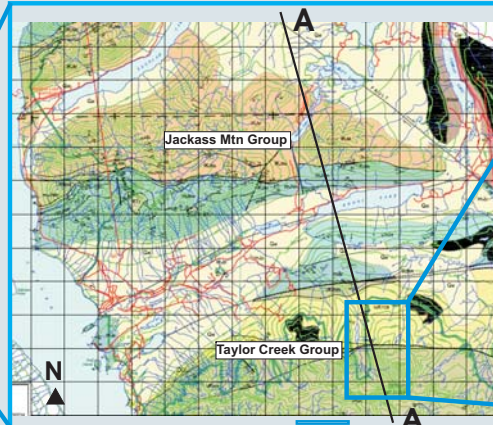
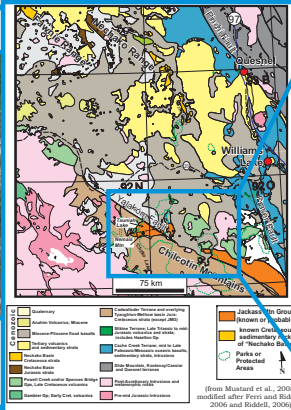


## Abstract:

Cretaceous strata around the Chilcotin Plateau of south-central British Columbia are traditionally described as occupying several distinct basins, including the Nechako, Methow and Tyaughton basins. The original geometric relationships between these basins are difficult to reconstruct due to Eocene and Neogene volcanic cover and the presence of a Tertiary dextral transpressive fault system along the southern margin of the Plateau. Reconstruction of the original basin architecture is crucial for accurate assessment of the hydrocarbon potential of Nechako basin strata in the subsurface beneath the Chilcotin Plateau. If it can be demonstrated that strata on Mt. Ts'yi-os are correlative to Jackass Mountain Group (JMG) strata located in the northern synclinorium, then a Lower Cretaceous link between the Methow and Tyaughton basins can be established. This linkage would significantly expand the known areal extent of Lower Cretaceous strata in the region, which is crucial for accurate assessment of the original basin architecture and hydrocarbon potential. Detailed sedimentologic and stratigraphic analysis are being integrated with ongoing thin section petrography, shale geochemistry (REE and isotopes), palynology, macro- and microfossil studies, and detrital zircon analyses in both these formations to test this proposed stratigraphic correlation.

## Location:

British Columbia, Canada



Location of ~1500 meter stratigraphy section



## Purpose of study:

If it can be demonstrated that strata on Mt. Ts'yi-os are correlative to JMG strata in the northern synclinorium, then a Lower Cretaceous link between the Methow and Tyaughton basins can be established. This linkage would significantly expand the known areal extent of Lower Cretaceous strata in the region, which is crucial for accurate assessment of the original basin architecture and hydrocarbon potential.

Ongoing research focuses on documenting the geochemical patterns throughout the section to interpret the change in source regions over its evolution. Detrital zircon samples were collected and are in the process of being analyzed to evaluate variations in source regions through time.

Understanding basin evolution will help constrain variations in sedimentary environment through time and allow for reconstruction of the original basin geometry, which is critical for evaluating the hydrocarbon potential of the region.

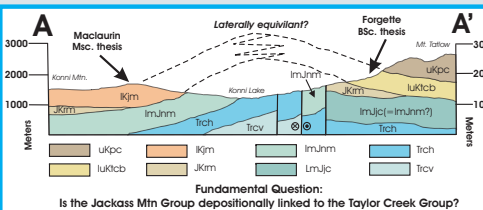
## Basin Description:

**Methow Basin:** Jackass Mountain Group (JMG)

- thick (1000's of meters)
- vertically and laterally complex system with non-marine, shallow marine and sub-wavebase marine deposits
- thick, moderately well-sorted sandstone bodies
- abundant trough and hummocky cross-stratification
- finer and lenticular bedded facies, overlain by turbidite sequences

**Tyaughton Basin:** Taylor Creek Group (TCG)

- thick successions of unknown meters
- deltaic to submarine fan deposits.
- thick package of shale
- overlain by fining up sequences that overall coarsen up into sandy shale, sandstone, and conglomerate beds that increase in frequency upward
- Conglomerate layers contain hummocky cross-stratification and possibly turbidite packages



## Structure complexities:

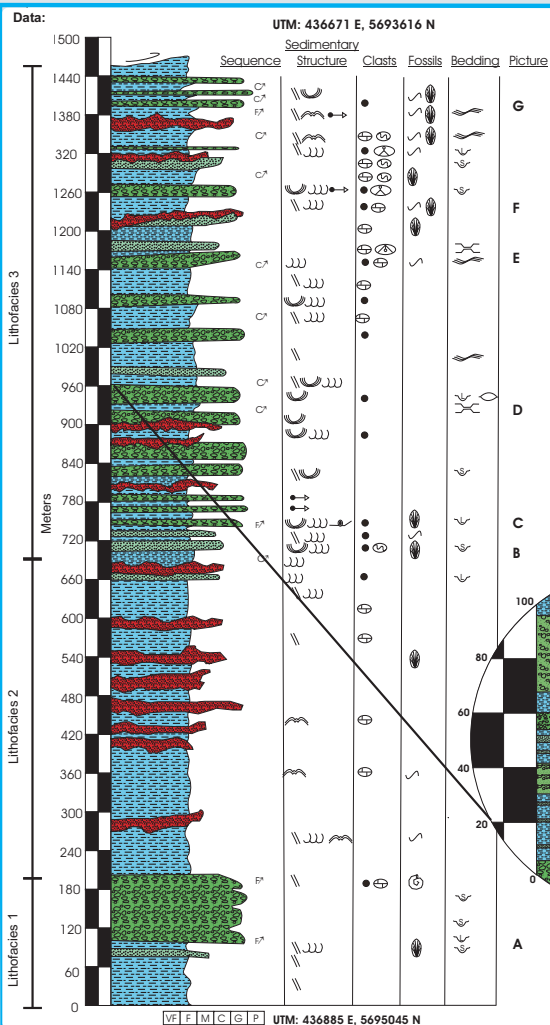
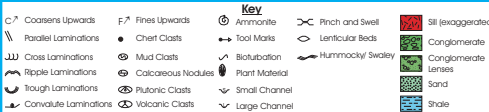
In the Chilco Lakes-Nemasa Valley area, Cretaceous strata of the Methow and Tyaughton basins south of the Yalakom fault are separated by Tertiary high-angle dextral faults of unknown displacement. North of the field area a major, gently southeast-plunging synclinorium is cored by JMG strata of the Methow basin. South of the synclinorium, the JMG strata are truncated by a series of high-angle dextral faults that appear to structurally disrupt a major anticlinorium centered on the Nemasa Valley. Southeast of these faults, a succession of lithologically similar strata currently assigned to the TCG of the Tyaughton basin is exposed on the flanks of Mt Ts'yi-os.

## Unit description:

**Lithofacies 1 (200 m):** Basal 100 metres consists of a dark grey shale intercalated with thin-bedded cross to parallel laminated micaceous chert lithic arenite. Plant material and small channelled beds are noted locally. This unit is overlain by an organized, massively bedded, pebble to cobble chert rich conglomerate forming nested channel sets composed of abundant, overlapping, lenticular, crudely stratified channels. This lithofacies is interpreted as an incised channel in a marginal marine, probably deltaic setting, and is believed to be correlative to the Dash Formation of the Taylor Creek Group.

**Lithofacies 2 (500 m):** Lithofacies is dominated by recessive dark grey, bioturbated shale with minor parallel to cross laminated calcareous lithic feldspathic arenite. Rare ammonites indicate a marine setting. Section is inflated by numerous andesite porphyry sills. Lithofacies 2 is interpreted as a subwave-base marine unit, possibly pro-delta muds or distal submarine fan. This unit is interpreted as correlative with the Lizard Formation of the Taylor Creek Group (Schiarezza et al., 1997).

**Lithofacies 3 (700+ m):** A coarsening upward succession of chert pebble conglomerate and associated sandstone intercalated with siltstone and shale that gradually overlies Lithofacies 3. Lithofacies 3 is dominated by a series of 50-100 m thick coarsening upward megasequences that internally contain 5-15 m fining-upward sections of conglomerate, lithic arenite, siltstone and mudstone. Erosive bases, channels, and trough cross-stratification are common in the lower delta plain distributary system, and is interpreted to be correlative with the Silverquick Formation associated with the Taylor Creek Group.



## Stratigraphy Pictures:



G. Leaf fossil preserved in shale sequence.



E. Hummocky cross strata in sandy shale packages.



F. Cross lamination disrupted by bioturbation.



D. Typical coarsening up sequence starting with shale to sandy shale to sand to conglomerate.



C. Cross and parallel bedding within the conglomerate bed



B2. Limestone clasts within the conglomerate



B1. Massive pebble conglomerate beds.



A. View of 500+ meters of shale below the contact between Lithofacies 2 and 3.

## Ongoing Research:

The 30 samples collected ranged from shale to sandy shale to sandstone to conglomerate. We are currently conducting complimentary research activities which will characterize our compiled stratigraphic section. These ongoing research activities include:

- Major and trace element geochemistry
- Loss On Ignition (LOI's)
- Rare Earth Elements (REE's)
- Detrital zircon analysis
- Radiolarian and Palynology analysis
- Total Organic Carbon
- Porosity/permeability analyses

References  
 Forst, P. and Roddick, J. (2006) The Nechako Basin project: new insights from the southern Nechako Basin. BC Ministry of Energy, Mines and Petroleum Resources Summary of Activities 2006, 89-124.  
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