

A scenic photograph of a sunset over a large body of water, likely a lake or bay. The sun is low on the horizon, creating a bright, shimmering reflection on the water's surface. The sky is a deep blue, and distant mountains are visible on the horizon. The overall mood is serene and natural.

# GEM

## **GEM Yukon Basins Project: New insights on the basin evolution and petroleum potential of Eagle Plain, Yukon**

**L.S. Lane, K.W. Jackson, K.M. Bell,  
J.C. Reyes and S. Saad**



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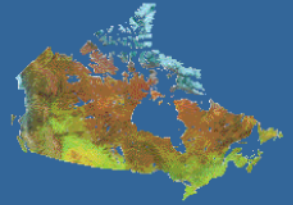
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- A new program announced by the Prime Minister in 2008
- Carried out in collaboration with the Territories and Provinces
- To produce new geoscience maps and digital datasets in support of economic growth in Canada's north





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Provide industry with improved geoscience knowledge, influencing petroleum exploration and development targets

Provide detailed regional resource assessments for the North, supported by maps and other products that identify the major geological factors controlling hydrocarbon distribution

Provide Canadian and Territorial regulatory agencies with improved geoscience knowledge for managing petroleum exploration and development

Provide training opportunities for Northerners and Canadian students





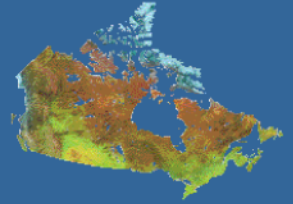
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Produce new framework geoscience maps, syntheses and energy resource assessments of sedimentary basins within and bordering the Yukon.

Provide community planners with information they need to make informed land use decisions.

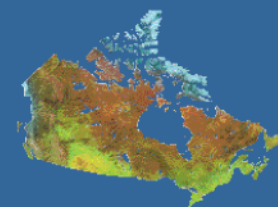
Provide the private sector with new energy plays that will focus future exploration programs, resulting in greater exploration effectiveness and less cumulative impact on fragile northern ecosystems.





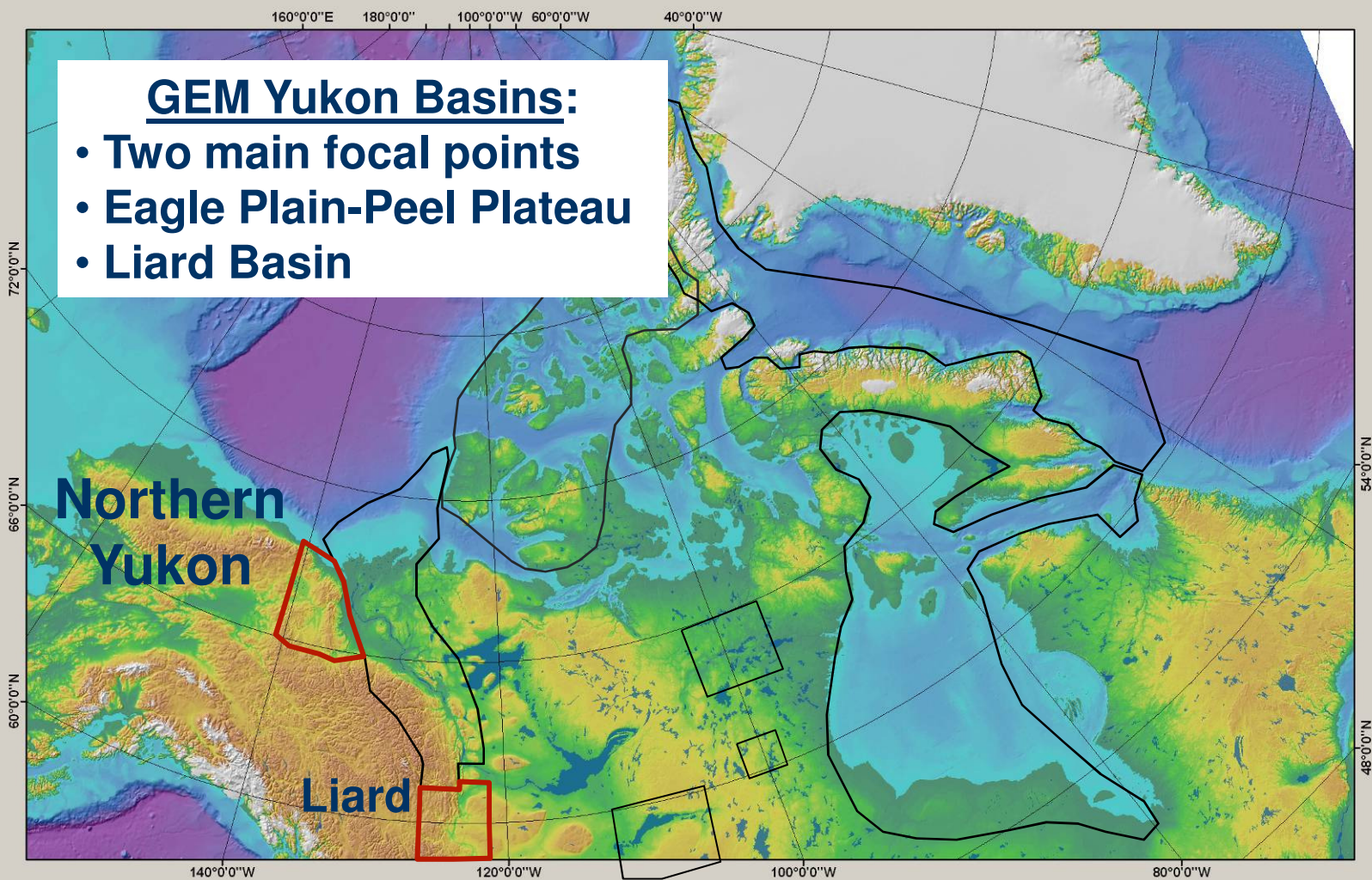
The project has benefitted from  
productive partnerships with:

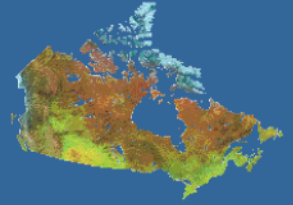
Yukon Geological Survey  
B.C. Division of Oil and Gas  
University of Calgary  
Carleton University  
University of British Columbia  
Laurentian University  
Private Sector Contractors



## GEM Yukon Basins:

- Two main focal points
- Eagle Plain-Peel Plateau
- Liard Basin





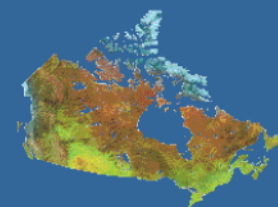
Today's talk will illustrate some highlights of the project, focused on the northern project area in Eagle Plain – Peel Plateau area.

Goals:

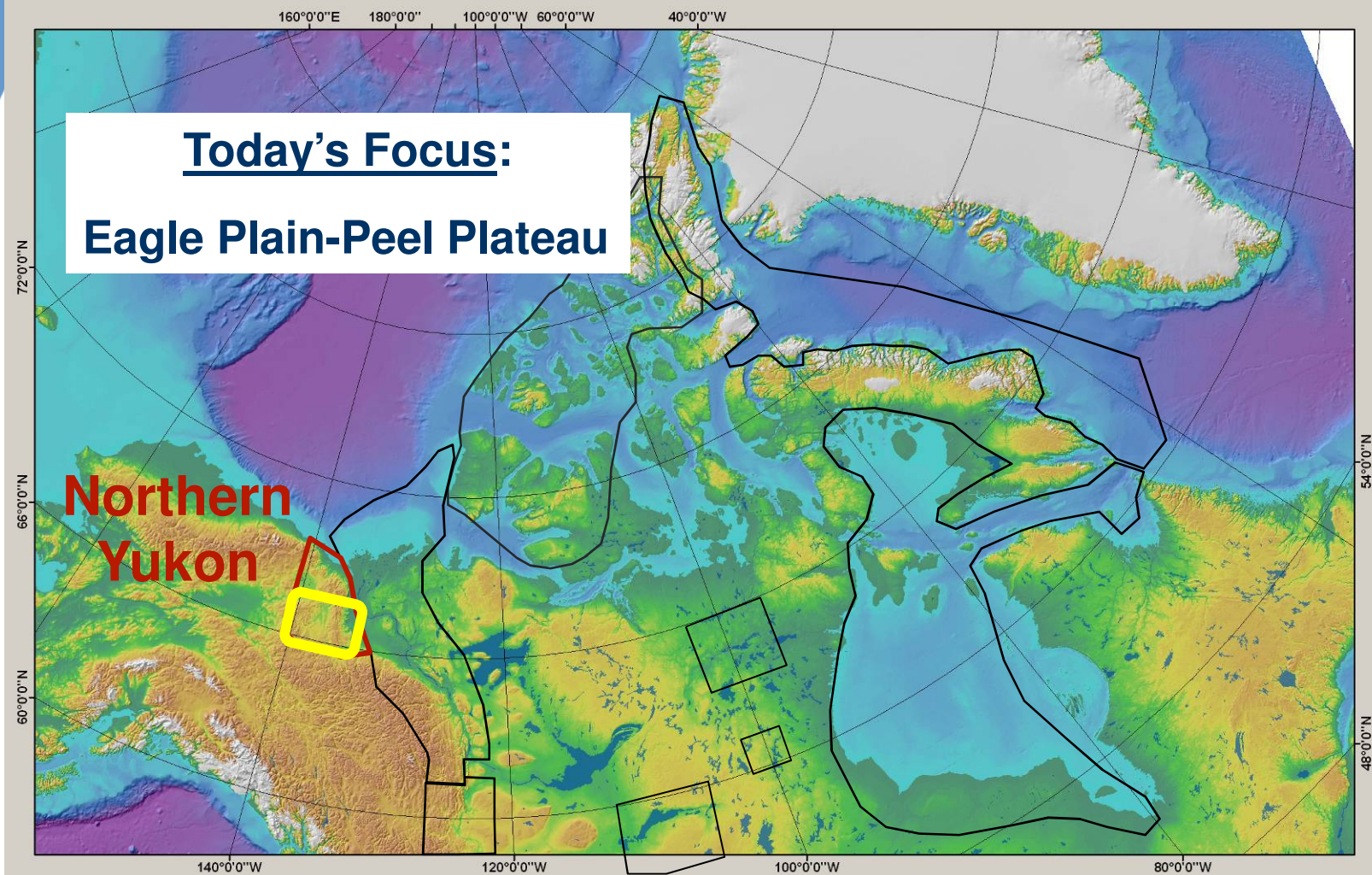
- Present a couple of examples in each of the three main components of the project
- Give an impression of the variety of activities
- Hopefully show how these activities interconnect to provide broader insights into the basin evolution and petroleum potential

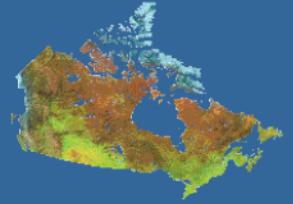
Also: See our poster for more details and additional highlights!





**Today's Focus:**  
**Eagle Plain-Peel Plateau**



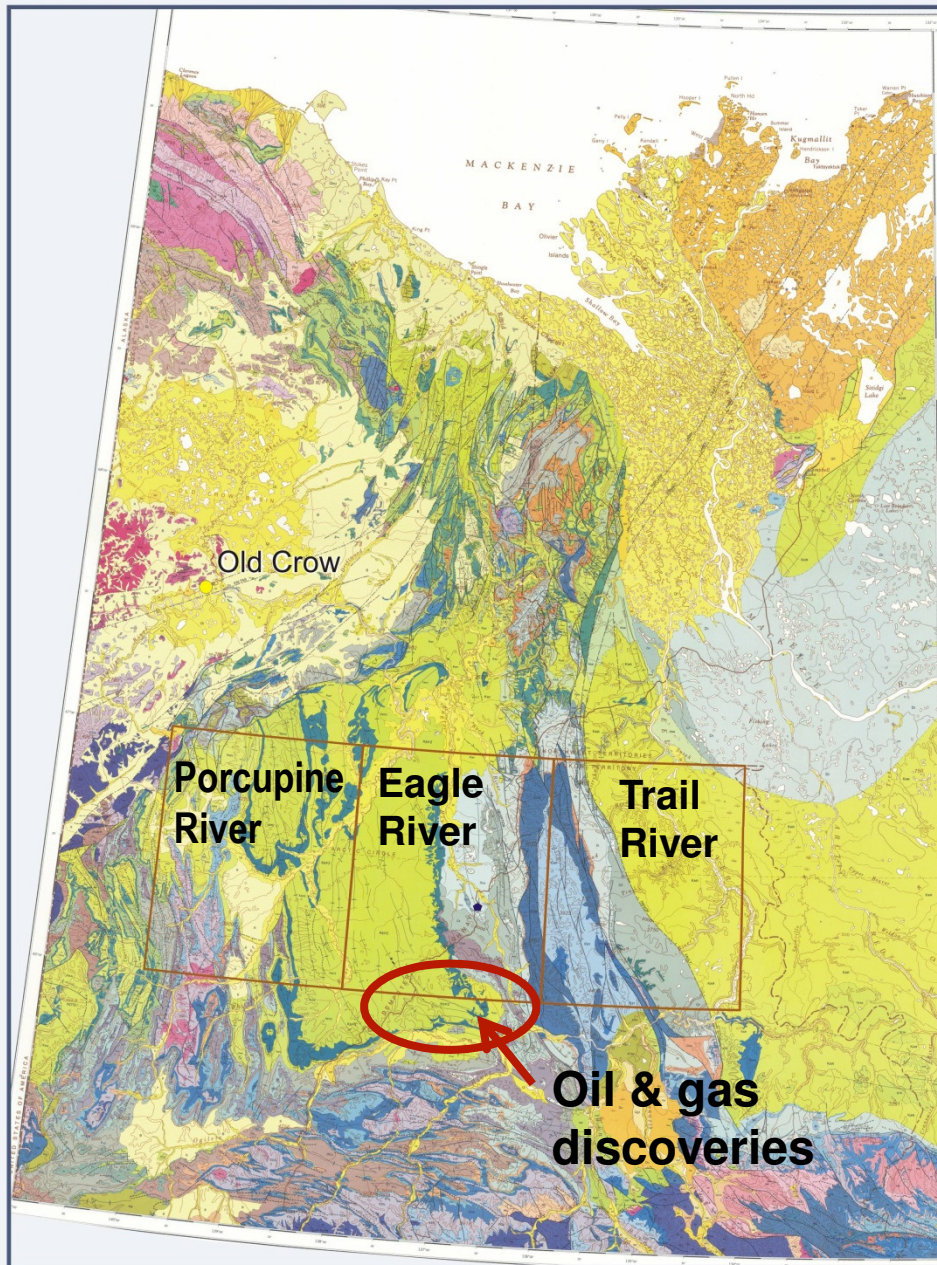


## At the outset of the project:

*Our primary focus was on an integrated suite of interdependent activities whose products would support an updated petroleum resource assessment. Some of these key activities are:*

- Thematic studies (e.g., Lithostratigraphy-Sedimentology; Biostratigraphy; subsurface analyses: well and seismic)
- Hydrocarbon systems (e.g., source rocks; thermal history, organic geochemistry)
- Bedrock mapping: I'll start with this.

## MAPPING - GEM YUKON BASINS



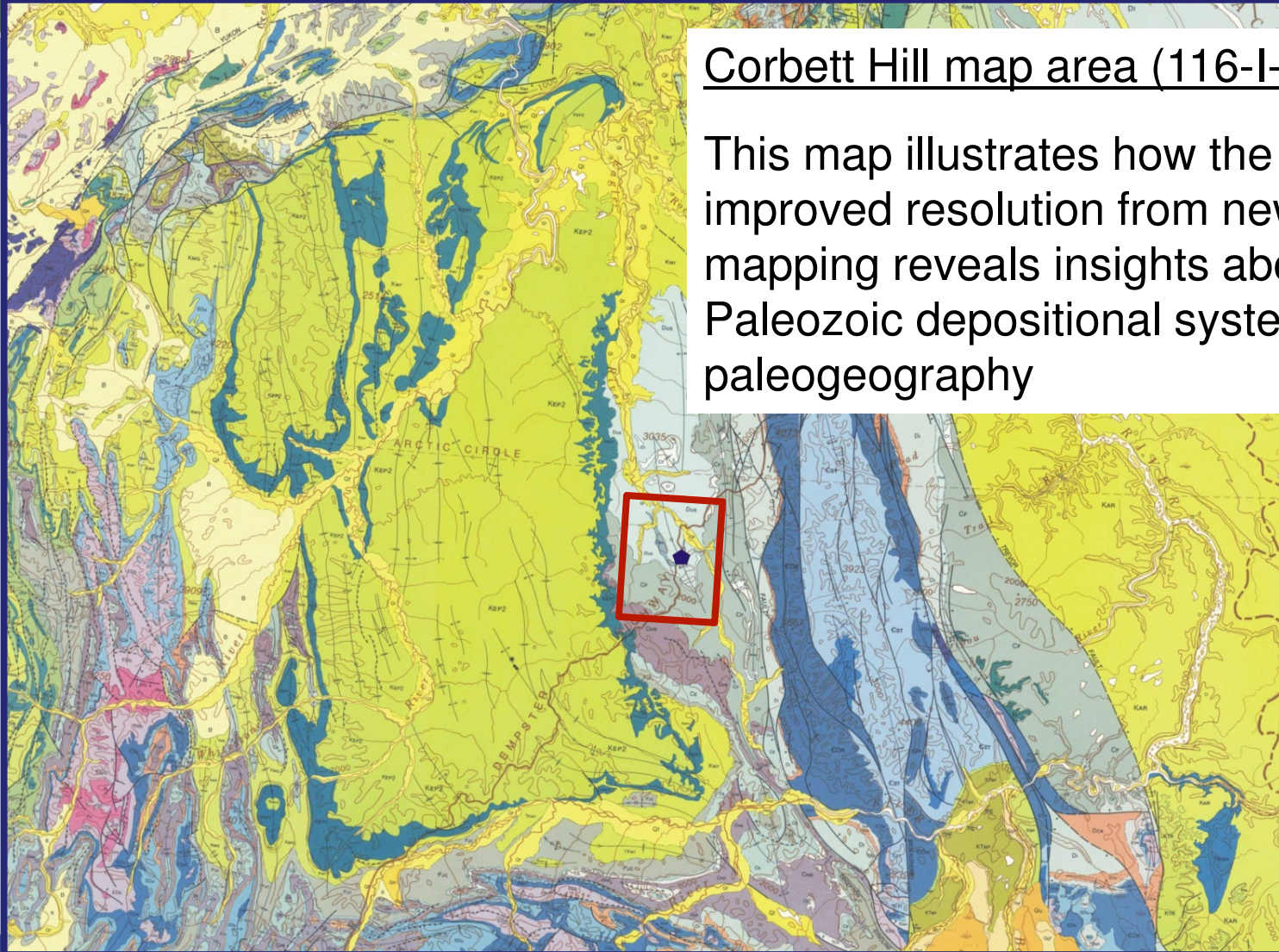
## Mapping:



During 10 weeks of fieldwork, new mapping was concentrated in eastern Eagle River where Carboniferous and Late Devonian source rocks are exposed.

The Late Devonian depositional system is poorly understood.

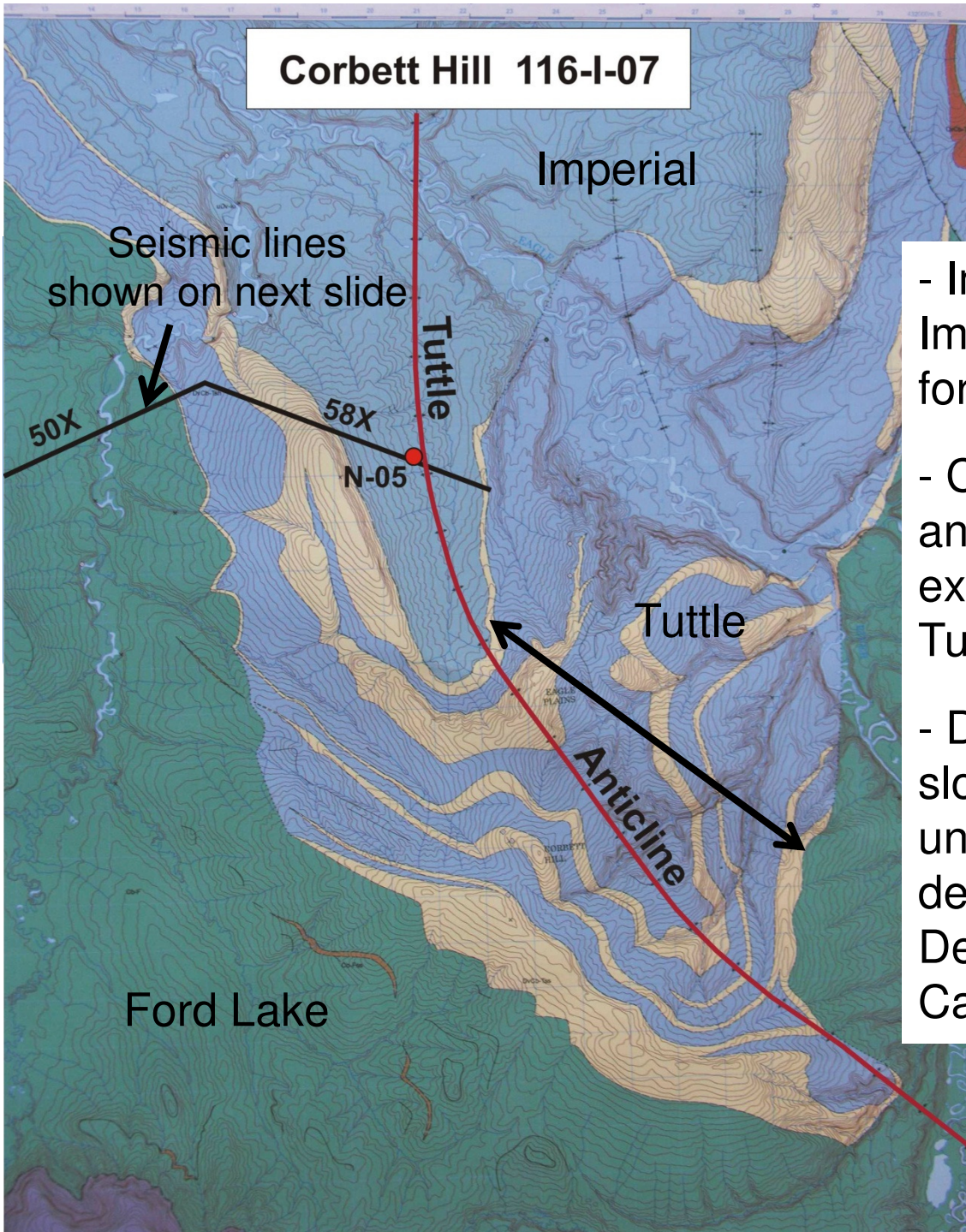
The known oil and gas deposits in the basin are in reservoirs of the Carboniferous Chance Member, Hart River Formation, southern Eagle Plain.



## Corbett Hill map area (116-I-07)

This map illustrates how the improved resolution from new mapping reveals insights about mid-Paleozoic depositional systems and paleogeography





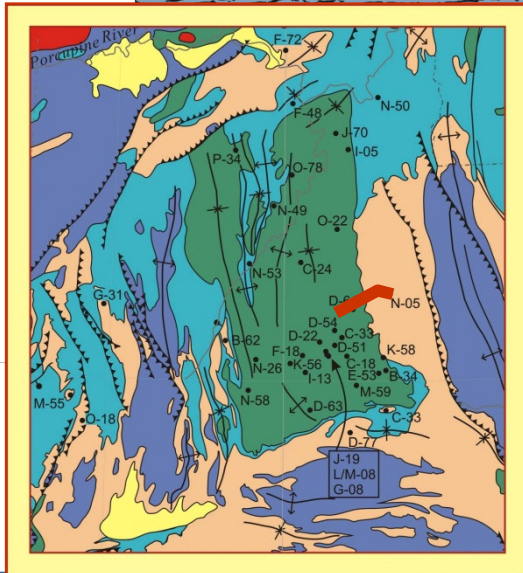
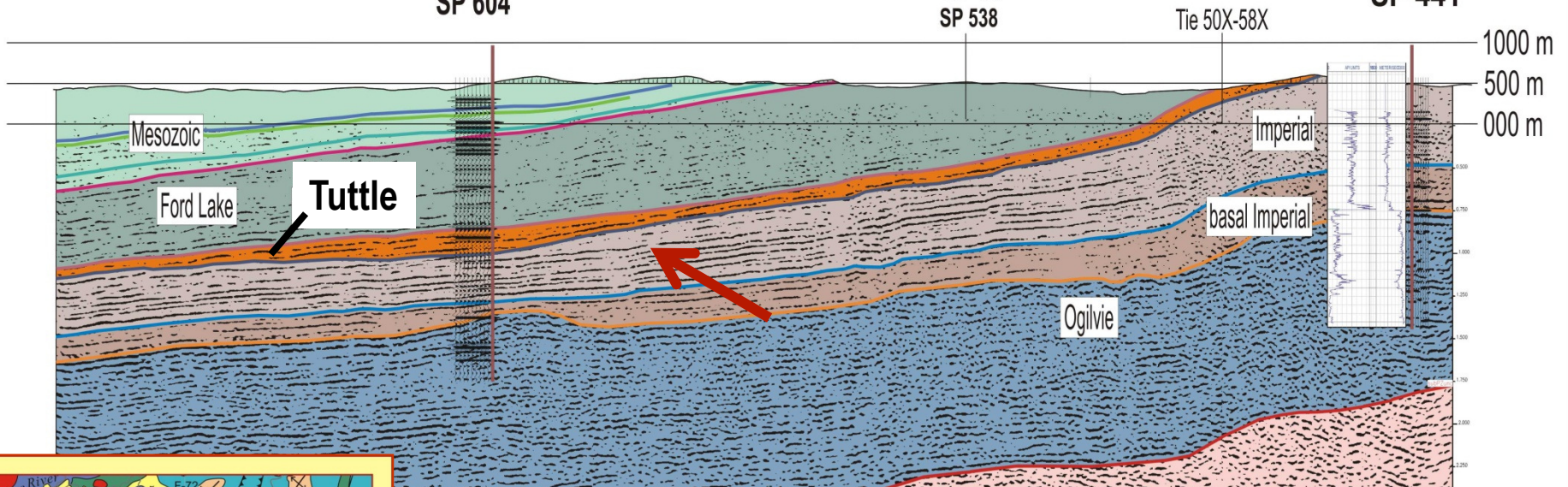
- Improved definition of the upper Imperial, Tuttle and Ford Lake formations.
- Channels of Tuttle conglomerate and sandstone with limited lateral extent can be mapped around the Tuttle Anticline.
- Definition of these channelized slope deposits, changes our understanding of the Tuttle depositional system in Late Devonian and Early Carboniferous time.

well D-61  
proj. 1.2 km  
SP 604

## Cross-Section 50X - 58X

137° at  
SP 538

well  
N-05  
SP 441



In the subsurface, the Tuttle shows localized thickening and clear evidence of downcutting through the underlying Imperial, consistent with its surface expression.

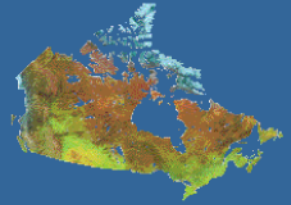
*Knowing what to look for improves our ability to correlate seismic sequences.*



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*Lithostratigraphic and biostratigraphic studies dominated in this area  
(a few key examples):*

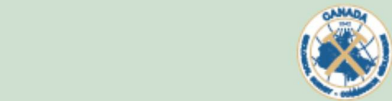
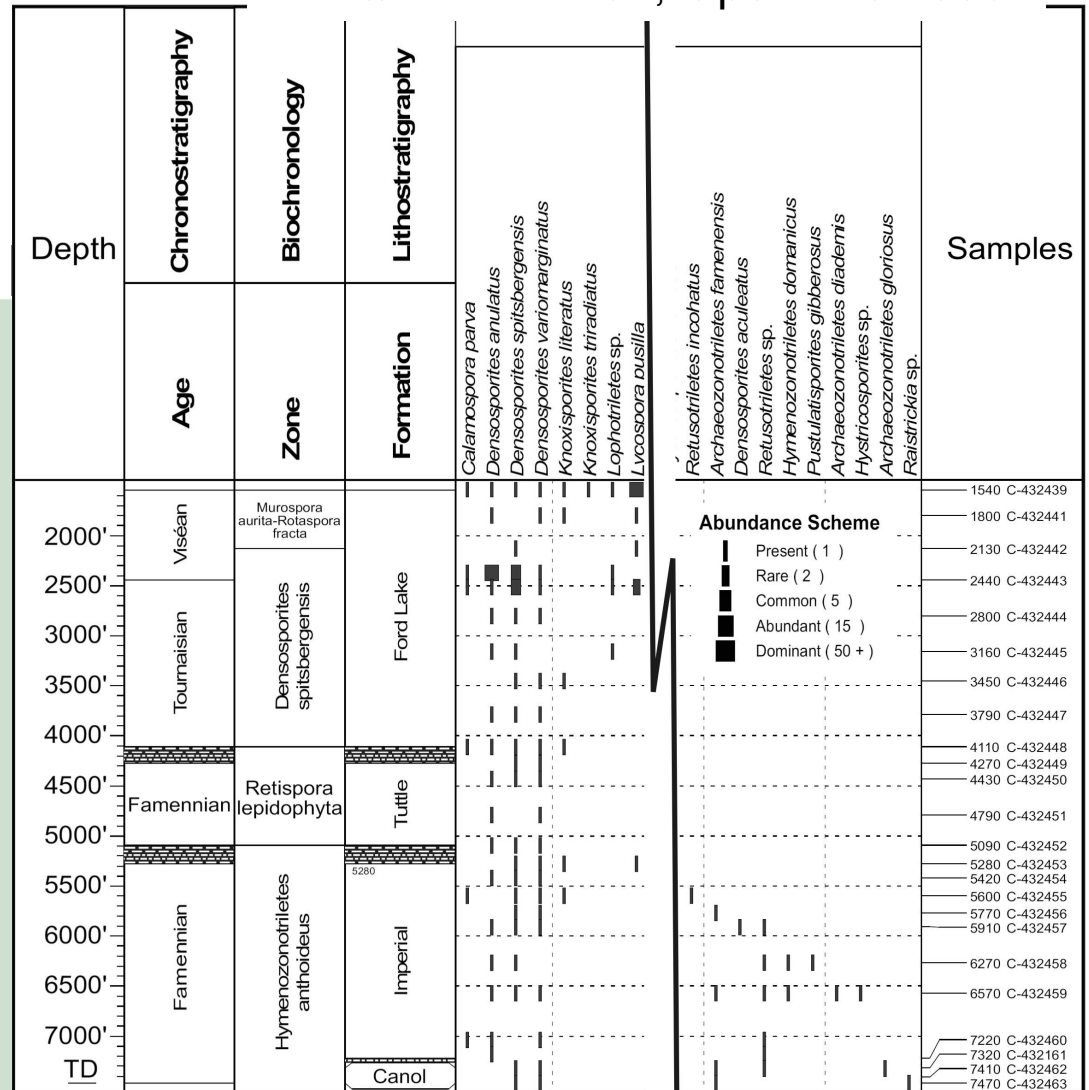
- University of Calgary students studied Cretaceous Eagle Plain Group sedimentology, petrography and palynology;
- Carleton University's Claudia Schroder-Adams and students are working on Cretaceous foraminiferal biostratigraphy;
- YGS' Tammy Allen and Tiffani Fraser continued their studies of Late Devonian and Carboniferous lithostratigraphy and petroleum potential;
- Multiple paleontologists reported on all stratigraphic levels and a wide variety of faunal types.
- Seismic study of Peel Plateau subsurface by Kristin Rohr provides a new framework for understanding interplay between depositional facies, deformation history and petroleum potential.



**Biostratigraphy** – provides vital input in support of all aspects of the project for:

- age control
- environments of deposition
- thermal alteration history

This biostrat chart from John Utting underpins new summary of N. Parkin YT D-61, Open File 7050



GEOLOGICAL SURVEY OF CANADA  
OPEN FILE 7050

SUMMARY OF CURRENT GEOCHEMICAL, GEOPHYSICAL  
AND BIOSTRATIGRAPHIC DATA FOR CHEVRON SOBC WM  
N. PARKIN YT D-61 (UWI 300D616630137000), EAGLE PLAIN,  
YUKON

L.S. Lane, A. Hayman, J. Utting, and A.R. Sweet

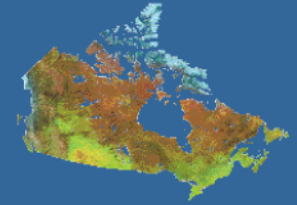


2012

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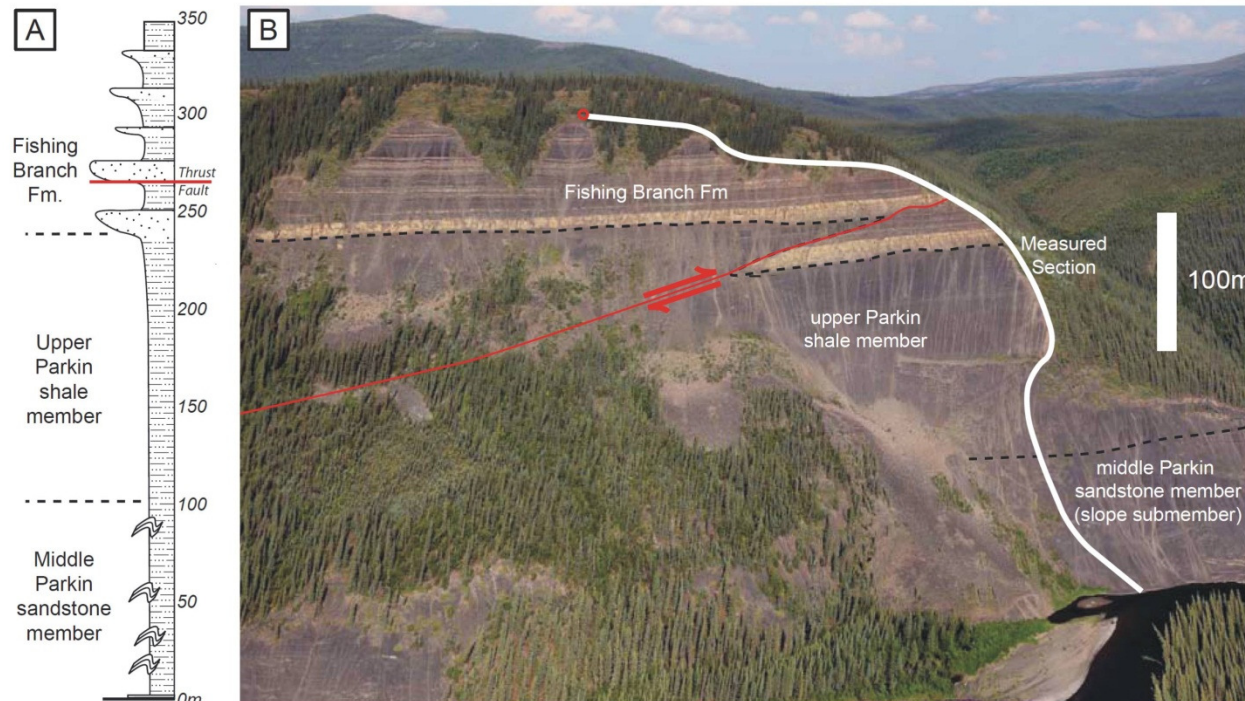
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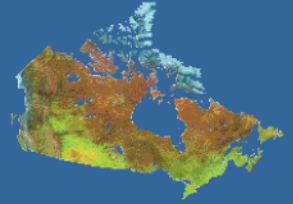
## Kevin Jackson MSc project:

- Defines new facies and members in the Parkin Formation (Eagle Plain Group)
- Significantly revises the age ranges of the formations;
- Defines new petroleum play types.



K.W. Jackson, 2012

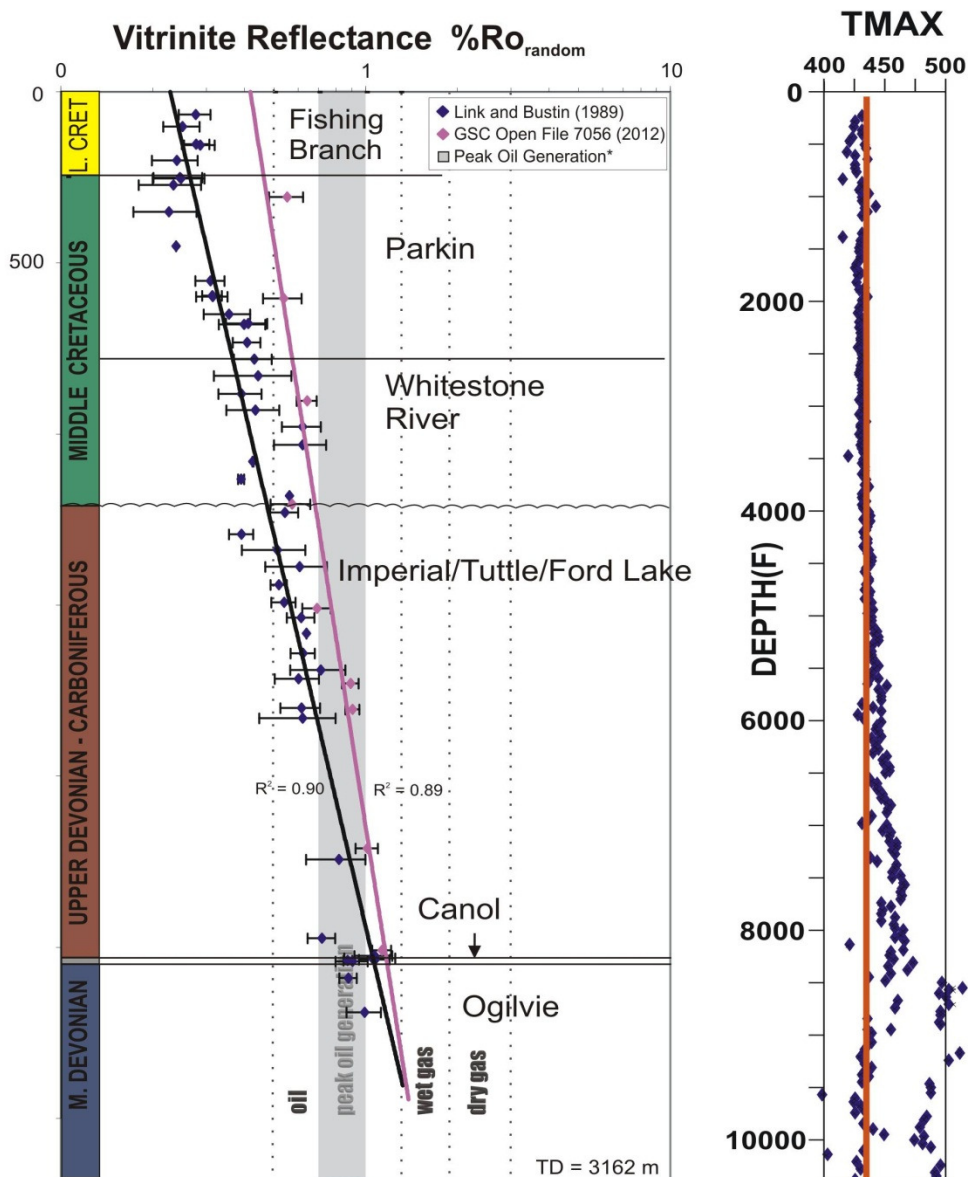




Petroleum Systems Analyses integrate the geology, biostratigraphy, sedimentology, structural evolution and geochemistry to assess whether these basic criteria are satisfied: source rock; reservoir; trap; and HC generation. If these conditions are met in the proper sequence, a petroleum system exists.

In Eagle Plain, we know a conventional petroleum system exists in the late Paleozoic rocks in the south. But can we determine if it extends beyond the limits of current discoveries? Accordingly, organic geochemistry and thermal maturation studies are a major component the project in Paleozoic source rocks across the basin.

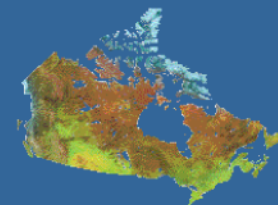
## Shaeffer Creek O-22



Reyes et al., OF 7056

Hydrocarbon  
Maturation threshold

# For example...

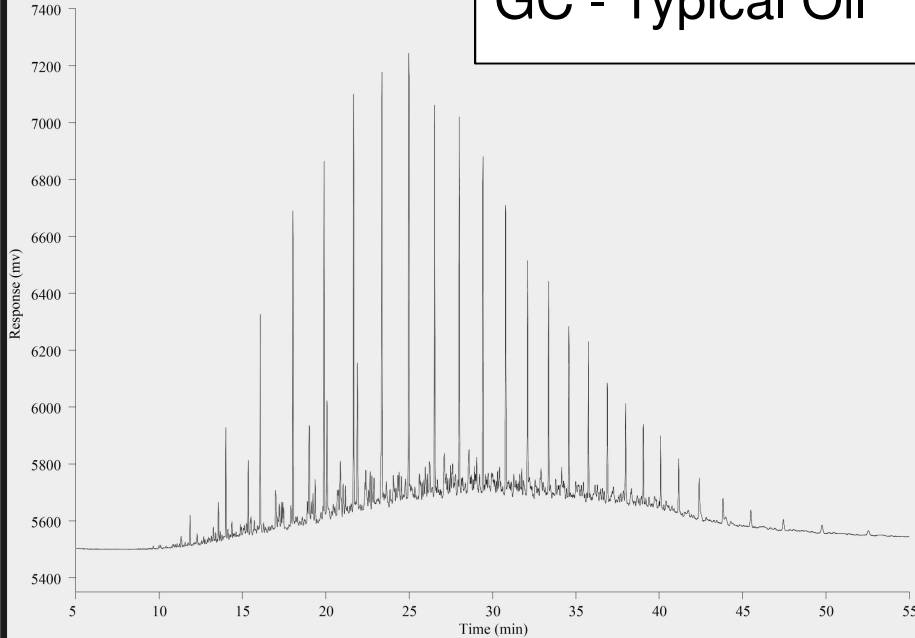


Here, vitrinite reflectance values (%Ro) in Shaeffer Creek O-22 are compared to Rock-Eval pyrolysis Tmax results.

Older published data show a lower Ro maturity trend when compared to newer data. The newer data are more consistent with the Tmax results – both enter the hydrocarbon maturation window near ~4000 ft depth.



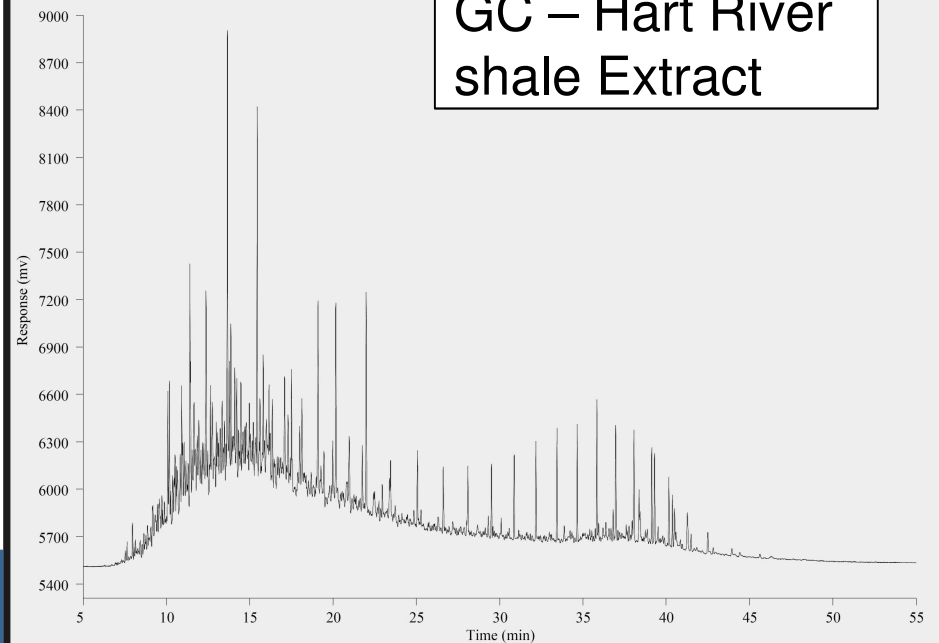
## GC - Typical Oil



Hydrocarbon extract analyses are in progress. Geochemical fingerprints gleaned from the organic matter help to determine various organic characteristics of the source rocks that may be correlatable to the produced oils.

Fortunately we have geochemists who can figure out what these things mean !!

## GC – Hart River shale Extract



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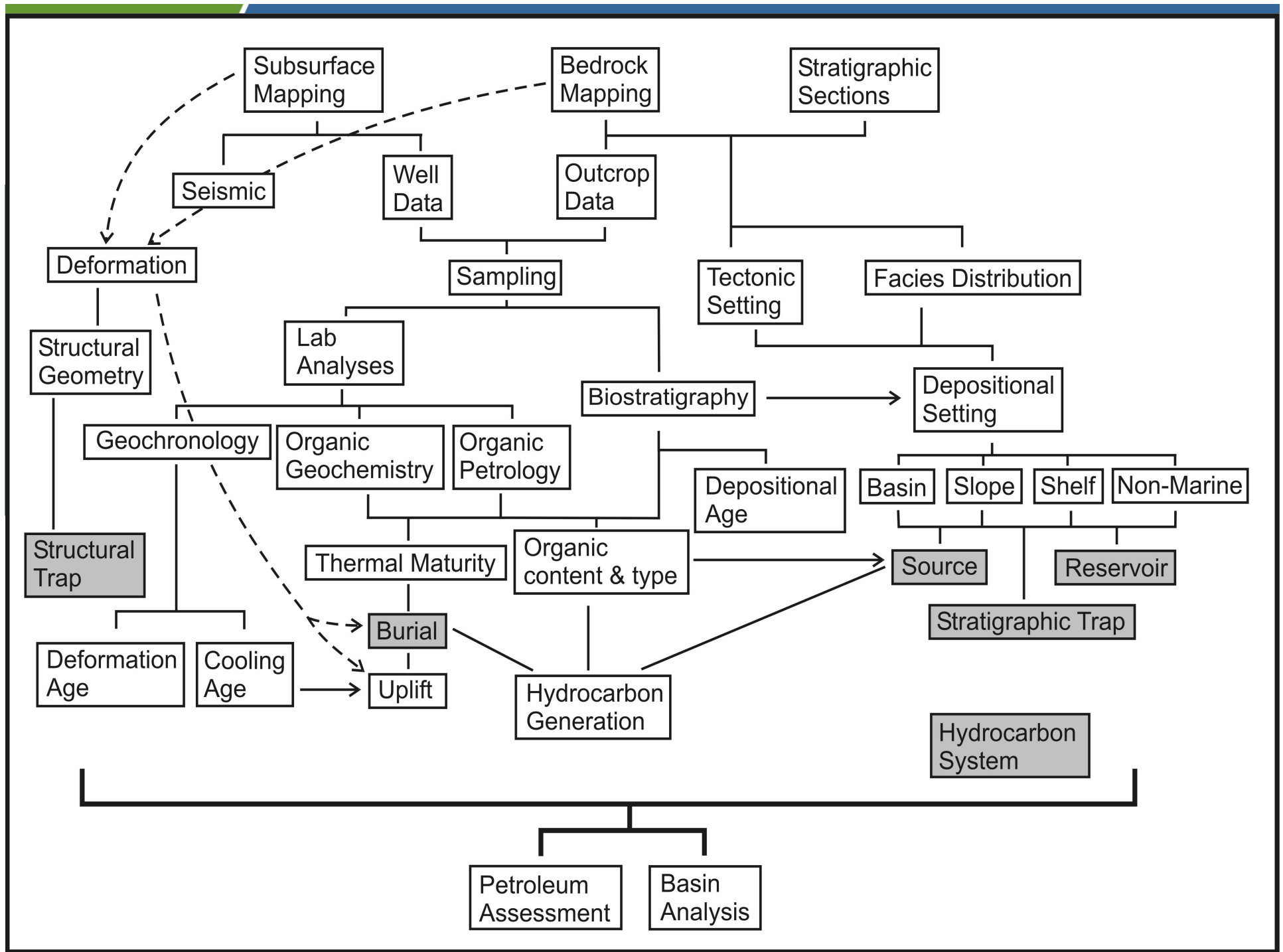
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Current Status:

- Multiple **maps** are in production, with more in compilation
- Various **synthesis** papers on aspects of the stratigraphy and geochemistry are in preparation or in review
- Open Files** on analytical data are in preparation
- Geochemistry (oil-source) interpretations are in progress
- Probably also an updated resource assessment

So, the project may seem like an array of disjointed activities, but they do all link together.....





Thank you!



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