

# Ordovician to Devonian stratigraphy of Nááts'ihch'oh National Park Reserve, Northwest Territories

*Sarah K. Schultz\**  
Yukon Geological Survey

*Merilie A. Reynolds*  
Northwest Territories Geological Survey

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## Abstract

The Ordovician to Devonian sedimentary deposits of Selwyn basin have been studied in some detail in localities where mineralization of certain critical minerals (e.g., zinc, nickel, vanadium, etc.) is known to occur within these deep-water, mudstone-dominated strata. The coeval shallow-water sedimentary deposits of the Mackenzie platform have not received as much attention, nor have they been correlated basinwards to understand how the evolution of paleoshoreline successions affected deposition throughout the basin. This study applies a sequence stratigraphic framework to map shallow-water sedimentary deposits, integrating geochemical and chronostratigraphic data to correlate units and link shifts in sedimentation patterns to changes in relative sea level. Importantly, understanding how occurrences of critical metals such as the MacMillan Pass and Howard's Pass zinc-lead deposits fit within a sequence stratigraphic framework will help inform future exploration strategies within these districts.

## Plain language summary

In August 2025, the Yukon Geological Survey (YGS) and the Northwest Territories Geological Survey (NTGS) began geological work in the Nááts'ihch'oh National Park Reserve investigating rocks that are approximately 486 to 359 million years old. Research on these rocks will contribute to understanding the natural history of Nááts'ihch'oh National Park Reserve, including the evolution of an ancient ocean shoreline and how mountain-building events and changing climate affected ancient ocean life. Furthermore, this information will provide an important puzzle piece for understanding why certain mineral deposits, like the MacMillan Pass and Howard's Pass zinc-lead deposits, formed where they did. This summer, three trips were made by helicopter to areas known to contain the rock intervals of interest in order to identify the most efficient way to carry out more detailed work in summer 2026.

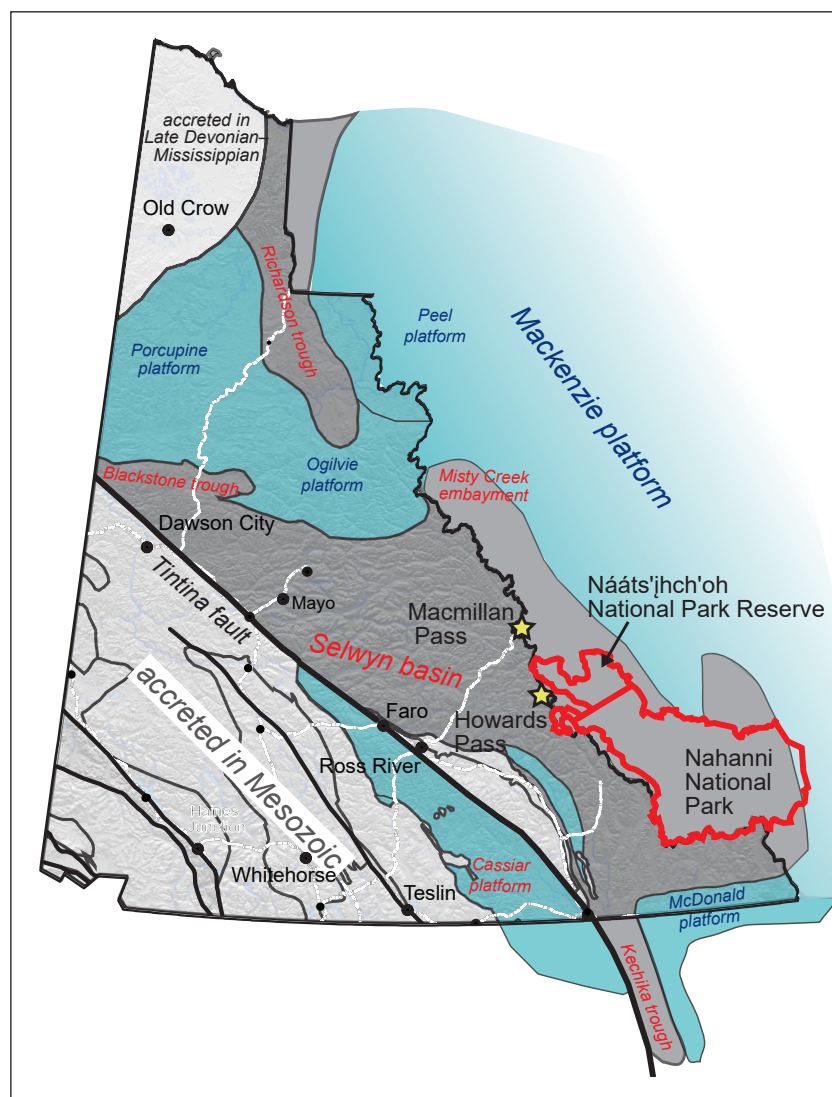
\* [sarah.schultz@yukon.ca](mailto:sarah.schultz@yukon.ca)

## Introduction

Nááts'j'ch'oh National Park Reserve contains well-exposed sections of strata that accumulated in the Mackenzie platform (shallow-water carbonate deposition) and Selwyn basin (deep-water siliciclastic deposition) during the Paleozoic (Figs. 1 and 2). Current studies at the Howard's Pass and MacMillan Pass districts are being conducted on subsurface drill core that intersects the Ordovician to Devonian strata to understand the evolution of deep-water environments throughout this time (Xu et al., 2024; Schultz et al., this volume). To establish a regionally consistent stratigraphic framework and understand the evolution

of the basin, deposition that occurs in the deep basin must be tied to its coeval shallow marine deposits. Such correlations will explain patterns in sedimentation as they relate to changes in relative sea level and tectonic events.

The goal for the first year of this project was to conduct several reconnaissance day trips to Nááts'j'ch'oh National Park Reserve and Nahanni National Park to identify appropriate locations for multiday camps in 2026 and 2027. The permit for Nahanni National Park was put on hold until 2026 and as a result, only three of the four areas were visited during the 2025 field season. The areas were selected based on information



**Figure 1.** Map illustrating the location of Selwyn basin and Mackenzie platform (after Fraser et al., 2021). The location of the park boundaries for Nááts'j'ch'oh National Park Reserve and Nahanni National Park are denoted by red outlines.

available for outcrops logged by the Geological Survey of Canada in the 1960s and 1970s. At the selected locations, the outcrops intersect the Ordovician to Late Devonian shallow-water platform and slope sedimentary deposits. The outcrop in this region is patchy and discontinuous, and can have significant structural deformation, so the reconnaissance trips were necessary to determine which outcrops at each area would be suitable for sampling and logging in future years. The study was initially anchored on the Macmillan Pass and Howard's Pass areas where extensive drill cores are available to document the stratigraphy of the deep-water sedimentary deposits. Detailed stratigraphy will be established through whole-rock geochemistry, multi-element analysis by portable x-ray fluorescence (pXRF), and organic carbon isotopic analyses. The framework developed from continuous drill core will be expanded regionally to exposed sections in outcrops to develop a regional framework. The outcrop in the region records deposition in shallower water settings and along the transition to the continental slope. By incorporating observations from outcrop, it is possible to build sections that document the down-depositional dip variability of a basin and to map paleoshorelines regionally.

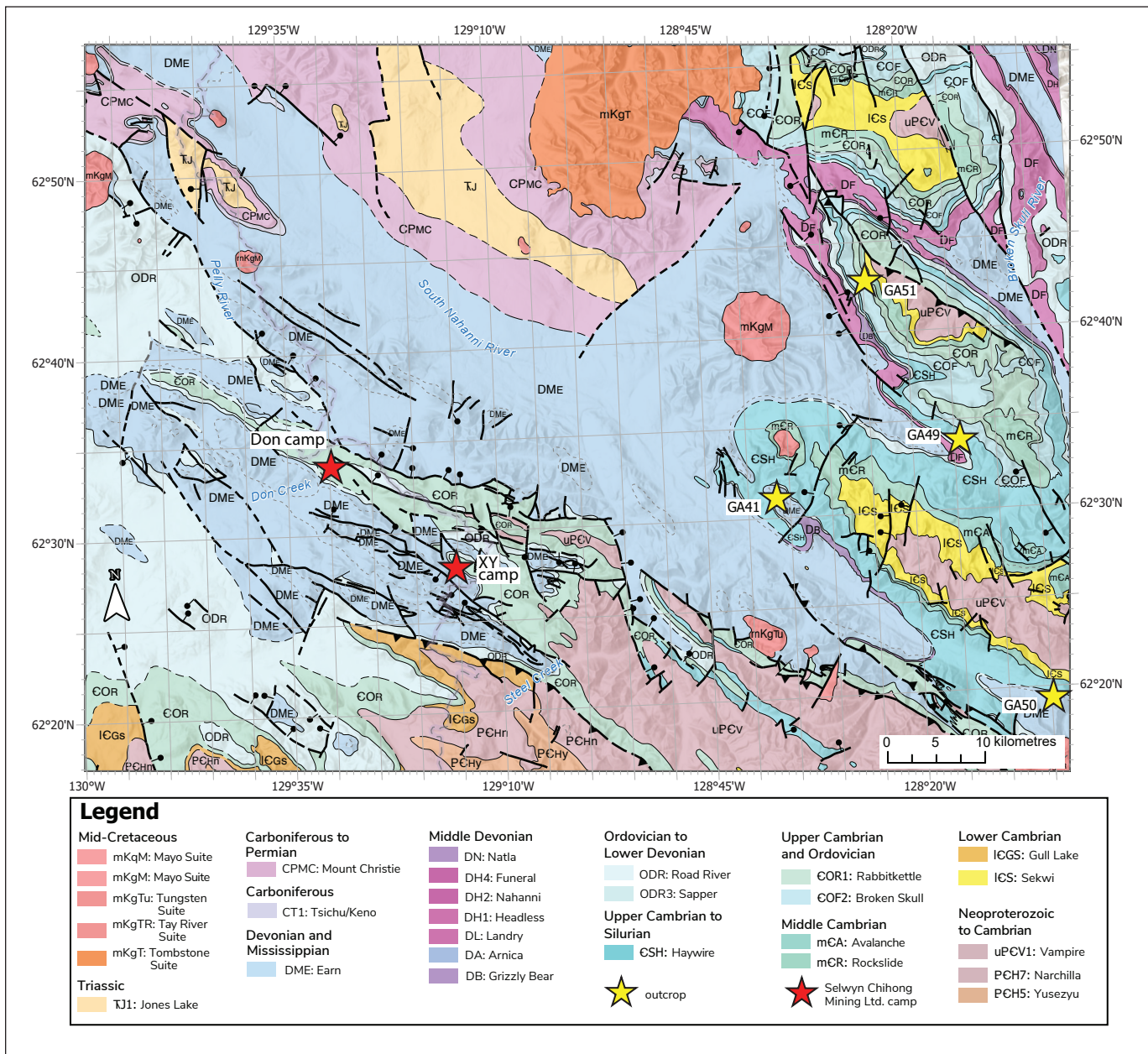


Figure 2. Bedrock geology map (NTS 105/I) covering the study area and including the distribution of Ordovician and Devonian strata. The four main outcrops that were examined in this study are also shown (GA41, GA49, GA50, GA51).

**Study area and methods**

The study area occurs within the Little Nahanni River map sheet (NTS 105/I; Fig. 2) and includes outcrops that were described in a Geological Survey of Canada report by Gordey and Anderson (1993). Areas with outcrops of sedimentary strata of the right age were selected based on that report and the areas of interest are located in Nááts'ihch'oh National Park Reserve and Nahanni National Park. The location names used in this study (e.g., GA41) refer to the section numbers used by

Gordey and Anderson (1993). The purpose of the 2025 field season was to do some initial reconnaissance to determine which outcrops would best support constructing a representative geochemical key for the shallow-water platform deposits. By doing this initial work, we can reduce the number of fly camps that would have to be set up in subsequent years, minimizing our environmental impact on the park.

Field sites were accessed by a helicopter that was based out of Selwyn Chihong Mining Ltd.'s mining

leases at the XY camp (occupied by Rackla Metals; Fig. 2). When selecting flight paths, we chose routes and landing areas that avoided wildlife corridors whenever possible. Additionally, we avoided flying during lambing season and stayed clear of known salt licks when possible.

## Basin analysis and tectonism

The bedrock underlying the Little Nahanni River map area (NTS 105/I) form a westward-thickening package of sediment that accumulated from the mid-Proterozoic to the Middle Jurassic (Gordey and Anderson, 1993). During this time, the basin periodically experienced extensional or rifting events that resulted in changes in accommodation due to subsidence and fluctuations in regional sedimentation patterns. The rocks that were initially deposited during this time were later re-incorporated into the Mesozoic fold and thrust belt during mountain-building events, re-exposing the strata along ridges. The sedimentary deposits that accumulated during the Ordovician to Late Devonian experienced differing styles of tectonism, leading to variability in the distribution and extent of sedimentary facies within the Mackenzie platform and Selwyn basin.

## Sequence stratigraphy

Sequence stratigraphy is a methodology of correlation in which changes in stratal stacking patterns of sedimentary depositional environments are tied to fluctuations in relative sea level (Catuneanu et al., 2011). In shallow marine carbonate successions, reef-building and marine organisms tend to be sensitive to changes in salinity, sedimentation, substrate consistency, and sunlight, allowing for fluctuations in relative sea level to be readily identified through abrupt changes in facies. These changes facilitate the identification of sequence stratigraphically significant horizons. In deep-water successions, variations in relative sea level are more difficult to identify due to many units being mudstone-dominated successions with limited macroscopic features (e.g., body fossils, trace fossils, sedimentary structures, etc.) to use for identifying changes in the sedimentary depositional systems. In these scenarios, whole-rock geochemistry, pXRF and organic/inorganic carbon isotopes are collected to document subtle geochemical variations that occur in relation to the position of relative sea level. These geochemical variations also occur in shallow marine successions and can be used to correlate basinward. In this study, organic and inorganic carbon isotopes, whole-rock geochemistry and pXRF will be conducted on the deposits collected from the parks.

The initial framework for the deep-water deposits that is currently being developed from continuous drill core in the Macmillan Pass and Howard's Pass mineral districts (Schultz et al., this volume) will be expanded regionally to exposed sections in outcrops.

## Previous work

The nomenclature of stratigraphic units in this study is lithostratigraphically divided into shallow water versus basinal sedimentary deposits (Fig. 3). The shallow-water stratigraphy of the platform (including the slope facies) occurs in the Mackenzie platform and follows the nomenclature proposed by Gabrielse et al. (1973) and Gordey and Anderson (1993). The stratigraphic nomenclature for the deep basin stratigraphy follows the units proposed by Cecile (1982, 2000) and Gordey and Anderson (1993). Age relationships between formations have been dated using conodont biostratigraphy, and previous work on the biostratigraphy is summarized in Gordey and Anderson (1993).

The deep-water Ordovician strata in the region have been extensively studied in drill core in the Howard's Pass mineral district (Morganti, 1979; Jonasson and Goodfellow, 1986; Gadd et al., 2016a; Slack et al., 2017; Kamal and Hickey, 2020; Xu et al., 2024). In this area, the basinal strata host lead-zinc deposits within mudstone-dominated successions of the Duo Lake Formation. The Devonian strata in this region contain only minor zinc-lead mineralization (Gadd et al., 2016b) and have received limited attention in the literature to date, particularly from a sedimentological viewpoint. In the study by Xu et al. (2024), pXRF data have been collected from numerous drill core that intersects the Duo Lake Formation. This study is creating a geochemical key for the Ordovician to Silurian deep-water sedimentary deposits that can be used in stratigraphic correlations elsewhere in the basin.

Gordey and Anderson (1993) conducted a study in the Little Nahanni River map sheet (NTS 105/I) and detailed the initial geological results from logging outcrop along exposed ridges in the region. A more detailed account and analysis of the sedimentology has not been conducted to date on many of these formations. This is an important area that links deep-water and shallow-water depositional trends; therefore, mapping the sedimentary facies and how they change throughout the area will be important for understanding the evolution of paleoshorelines.

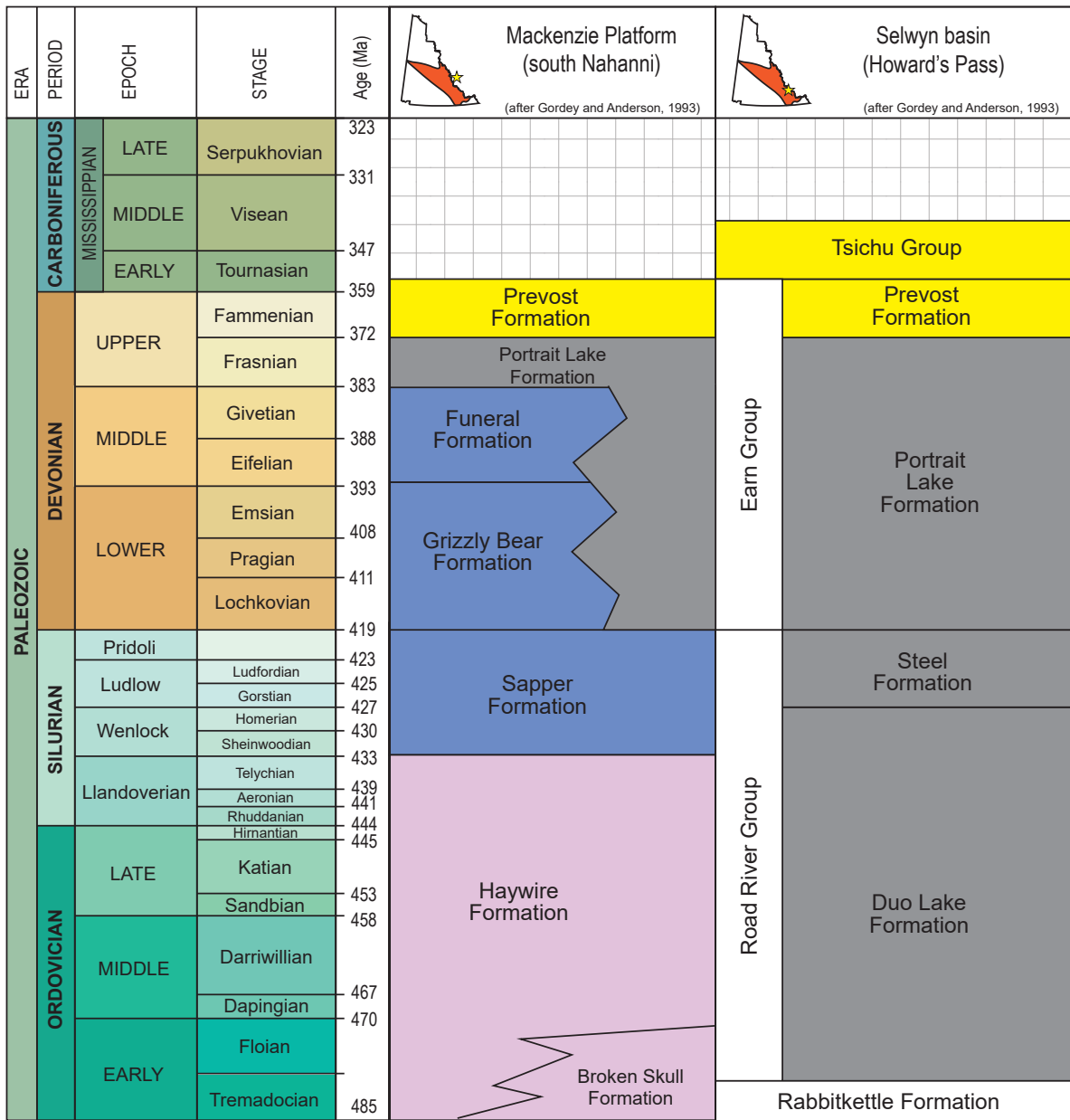


Figure 3. Table of formations for the strata at Howard's Pass and the Mackenzie Mountains (after Gordey and Anderson, 1993).

**Platform stratigraphy**

In the Mackenzie platform between the South Nahanni and Broken Skull rivers, the Paleozoic strata is composed of variable dolostone and limestone units that contain subordinate amounts of shale and sand (Figs. 2, 3). This reflects deposition along a carbonate platform and/or ramp, and the gradual transition to deeper, continental slope strata.

*Haywire Formation*

The Ordovician to Early Silurian Haywire Formation was first described and proposed as a formation by Gordey and Anderson (1993). This unit is comprised of dolostone that weathers white to light grey in colour and contains a variable amount of chert. The facies associated with the Haywire Formation are variable between outcrop localities. At the type-section of GA40, the unit is 639 m thick and is defined as a lithologically distinct unit from the underlying

Avalanche Formation based on the incorporation of sandstone into the Haywire Formation deposits. The upper contact at the type-section is faulted, and the section at GA41 is proposed as the type-contact for the transition from the Haywire Formation into the Sapper Formation. Gabrielse et al. (1973) suggested that the base of the Haywire Formation represents a significant regional unconformity across the basin. Some outcrops contain fossil material, which include crinoids, corals, brachiopods and disarticulated shelly debris (Gordey and Anderson, 1993).

It is suggested that the Haywire Formation records deposition in a shallow subtidal to intertidal environment (Gordey and Anderson, 1993). It is the outer shelf equivalent to the reefal units of the Rabbitkettle, Broken Skull and Sunblood formations (see Gabrielse et al., 1973; Gordey and Anderson, 1993).

### **Sapper Formation**

The Sapper Formation is Silurian in age and was first described and proposed as a formation by Gordey and Anderson (1993). It is mapped as two distinctive informal members across the study area. The lowermost member is commonly referred to as the limestone member and is composed of light-grey weathering, thinly bedded limestone. The uppermost member is the silty member, which is comprised of limestone to dolostone that weathers to a distinctive tan-orange colour. At type-section GA51, the unit is 362 m thick. There, the basal 107 m is well preserved, and the remainder of the unit overlying this exposure is preserved as patchy outcrop.

It is proposed that the Sapper Formation was deposited along a shallow carbonate shelf below fairweather wave base (Gordey and Anderson, 1993). Fossils in this unit include graptolites, conodonts and other disarticulated shelly debris.

### *Grizzly Bear Formation*

The Early Devonian Grizzly Bear Formation was first described by Gabrielse et al. (1973) as a distinct bioclastic limestone unit that can be used as a marker unit throughout the Little Nahanni River map sheet (NTS 105/I). In this area, the formation reaches a maximum thickness of approximately 200 m (Gabrielse et al., 1973; Gordey and Anderson, 1993). The formation unconformably overlies the Sapper Formation and is unconformably overlain by the Funeral Formation. The Grizzly Bear Formation is biostratigraphically constrained quite precisely by the presence of twin

axial canal crinoid ossicles that are present at the base of the section (Gordey and Anderson, 1993). The Grizzly Bear Formation reflects deposition in a shallow marine setting near fairweather wave base to an offshore setting in a shoal depocentre along a carbonate platform. The correlative deep-basin strata is the Portrait Lake Formation.

### *Funeral Formation*

The Middle Devonian Funeral Formation was first described by Douglas and Norris (1961) and was later redefined by Gabrielse et al. (1973). The formation is an orange-weathering, shaly to thinly bedded limestone succession. Like the Grizzly Bear Formation, the Funeral Formation is a lateral equivalent of the Portrait Lake Formation. No definitive depositional environment was proposed by Gordey and Anderson (1993) for the unit in the Nahanni map sheet; however, based on its stratigraphic position and sedimentology, it is likely that the unit was deposited between the offshore zone of the continental shelf to the continental slope.

### **Basin stratigraphy**

Deep-water stratigraphy in the region records deposition as hemipelagic sedimentation, turbidites, and mass transport deposits (Schultz et al., this volume). At Howard's Pass, the deep-water sedimentary deposits are mudstone-dominated, making the delineation of stratigraphic units challenging without the addition of geochemical, biostratigraphic or organic carbon isotope studies.

### *Duo Lake Formation*

The Ordovician to Silurian Duo Lake Formation was defined by Cecile (1982) and comprises of siliceous shale that preserves graptolites, chert and limestone nodules. The Duo Lake Formation contains significant Pb-Zn mineralization at Howard's Pass and has been studied extensively at that location for its potential to host base metal deposits (e.g., Morganti, 1979; Jonasson and Goodfellow, 1986; Xu et al., 2024). The Duo Lake Formation was deposited in a deep-water setting through hemipelagic sedimentation, contourites, or as the distal depositional extent of a turbidite lobe.

At Howard's Pass, the Duo Lake Formation also contains intervals with phosphorite beds or laminated fine-grained apatite (Gadd et al., 2016a; Slack et al., 2017). This, along with bulk rock geochemical data from Howard's Pass, led Slack et al. (2017) to reinterpret the Duo Lake Formation to have formed first

in a marginal basin that may have become increasingly restricted over time and later in an upper slope or outer shelf setting.

#### *Steel Formation*

The Late Silurian Steel Formation was defined by Gordey and Anderson (1993) at the GA14 type-section. At this section, the unit is approximately 143 m thick and comprised of siliceous mudstone beds that contain a varying degree of bioturbation. Bioturbation is observed as wispy laminae in outcrop. In core, trace fossils such as Zoophycos, Phycosiphon and Helminthopsis have been observed. The Steel Formation was deposited in an offshore to slope environment below fairweather wave base (Gordey and Anderson, 1993). The age of the unit is constrained based on the biostratigraphy of the underlying Duo Lake Formation and the overlying Portrait Lake Formation.

#### *Portrait Lake Formation*

The Devonian Portrait Lake Formation was defined by Gordey and Anderson (1993) at an outcrop in the Macmillan Pass region of the Nidderly Lake map sheet (NTS 105/O). The unit is comprised of siliceous mudstone, chert, sandstone and conglomerate intervals. The conglomerate is prevalent in the Macmillan Pass region and is less predominant in the Howard's Pass region. The Portrait Lake Formation records deposition in a deep-water setting, and deposition occurred through hemipelagic sedimentation, turbidites and mass transport deposits (Gordey and Anderson, 1993; Schultz et al., this volume).

#### *Prevost Formation*

The Late Devonian Prevost Formation was defined by Gordey and Anderson (1993) at the type-section GA15. The section reaches thicknesses of up to 555 m; however, throughout much of the map area, the unit is not preserved. The Prevost Formation is separated lithologically into informal members that include a basal sandstone, a middle member that is siltstone and shale-dominated, and an upper member of sandstone and conglomerate. The Prevost Formation was deposited in a sand-rich turbidite succession through gravity-driven processes.

## Results

The initial results of this study include rudimentary observations on the stratigraphic section. Each location below marks the start of the stratigraphic sections and is named based on the mapping by Gordey and Anderson (1993).

### **Section GA41 – 62.53167°N, 128.60833°W**

This is the reference section for the basal contact of the Prevost Formation with the underlying Portrait Lake Formation and the contact between the Sapper and Haywire formations. In this interval, 330 m of Late Devonian rocks were logged along a ridge that was previously mapped by Gordey and Anderson (1993; Figs. 4 and 5). At this outcrop, the Haywire Formation was not included in the original logged section despite being exposed below the Sapper Formation. Additionally, below the ridge within the valley, a well-exposed outcrop of the Haywire Formation is preserved. A composite section is proposed to be created at this location in order to intersect a more continuous section of strata and include the basal units of the Haywire Formation.

The top of the Haywire Formation is well-exposed at this site (Fig. 6). At GA41, the Haywire Formation is a wavy-bedded, white-grey dolostone with thin carbonaceous laminae lining bedding plane surfaces; local discontinuous pyritic laminae and nodules were also observed. There is an increasing amount of chert toward the top of the unit. The chert is irregularly shaped and may preserve or replace fossil material or trace fossils (Fig. 7).

The Sapper Formation has patchy exposure at this section. The basal contact was inferred based on a colour change in the scree from the white to grey of the Haywire Formation to the darker grey of the limestone beds of the Sapper Formation (Fig. 7). The uppermost section of the Sapper Formation records a colour change to tan-orange strata that is poorly exposed in the scree. The upper contact with the Portrait Lake is preserved in scree and was inferred based on the change in colour from tan-orange to grey (Fig. 6).

The Portrait Lake Formation is preserved along the length of the ridge (Fig. 6). The exposure is patchy just above the contact with the Sapper Formation, but farther up the section there are more continuous intervals of outcrop inferred to be in place. Normally graded beds and chert-rich mudstone are observed in this unit.

The contact between the Portrait Lake Formation and the Prevost Formation is distinct at this section (Fig. 6). A few metres past this contact, the outcrop becomes unsafe to walk on. It was noted that the ridge to the north contained a similar section of strata that would be worth investigating during the proposed fly camp for this site to determine whether a composite section could be constructed through the upper units.

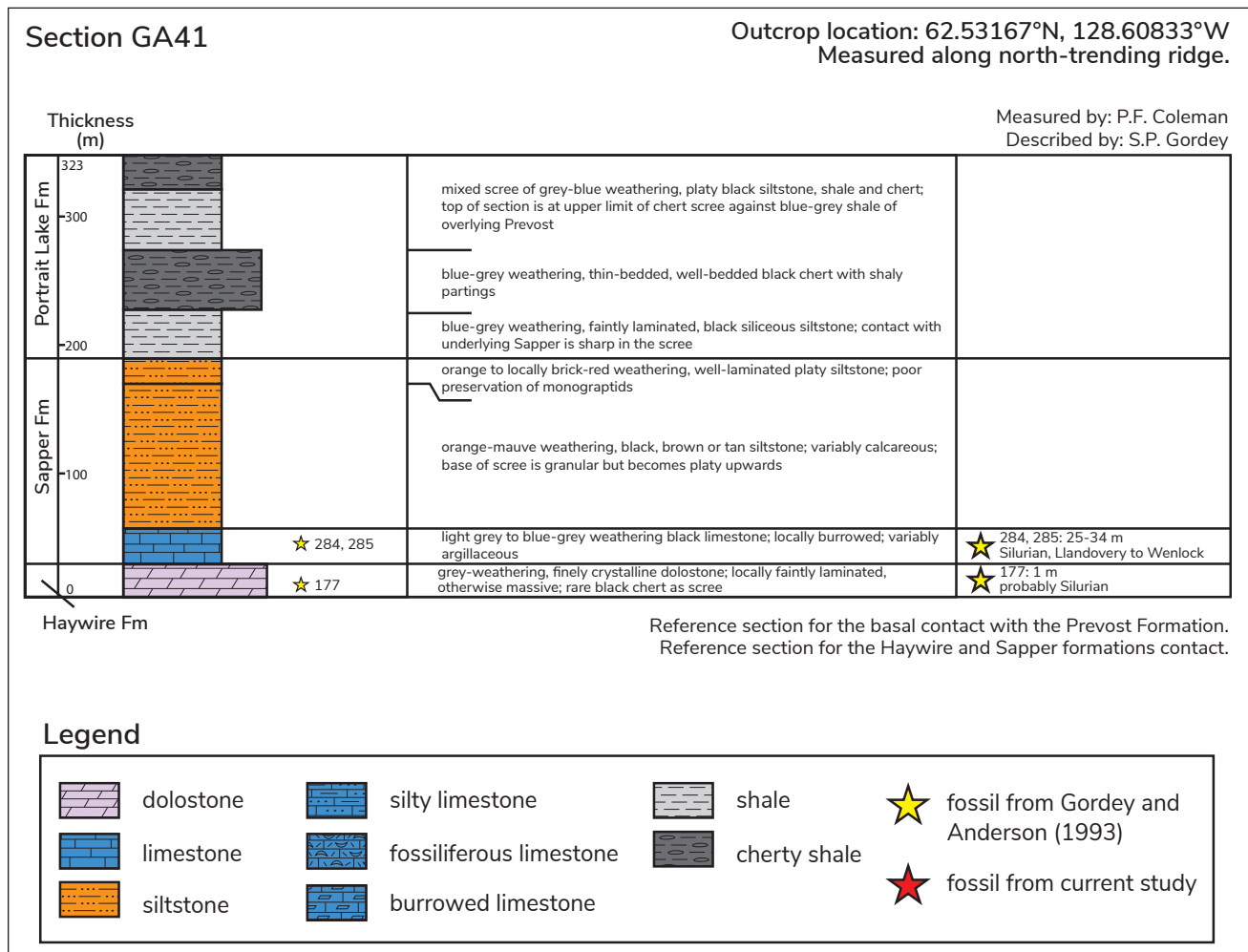


Figure 4. Outcrop log from Gordey and Anderson (1993) for sections GA41. Fm – Formation.

**Section GA49 – 62.55°N, 128.29167°W**

The GA49 section was visited due to multiple ridges in the area that preserve the Haywire, Portrait Lake and Funeral formations. The proposed future fly camp is situated lower down in the valley in an area that would be central to accessing the multiple surrounding ridges (Fig. 8a). Along these ridges, the exposure is patchy (e.g., Fig. 8b) and a composite section for the area would need to be constructed in order to detail a continuous section of strata.

During the reconnaissance day, the area that was covered at the GA49 section was more extensive than at locations GA41 and GA51. The visit allowed us to confirm that sufficient outcrop was present to warrant more work; however, more detailed preliminary observations about the formations were not documented due to time constraints. The locations of the most well-exposed outcrops were marked on the

map to be revisited in 2026. These locations include sections logged by Gordey and Anderson (1993) as well as sections that preserve the Grizzly Bear and Haywire formations that may not have been visited during the initial study.

**Section GA50 – 62.31833°N, 128.00333°W**

This outcrop section was not visited in the 2025 field season as it is located outside of the area that was included in the permit issued by Parks Canada (Fig. 2). The Nahanni National Park area will be included in the 2026 or 2027 permit application to allow for further extensions of stratigraphic correlations in the region.

The strata at GA50 are preserved along a northwest-trending ridge. The basal contact between the Grizzly Bear and Portrait Lake formations is preserved in this area (Fig. 9; Gordey and Anderson, 1993). A fossil sample was taken by Gordey and Anderson (1993) in

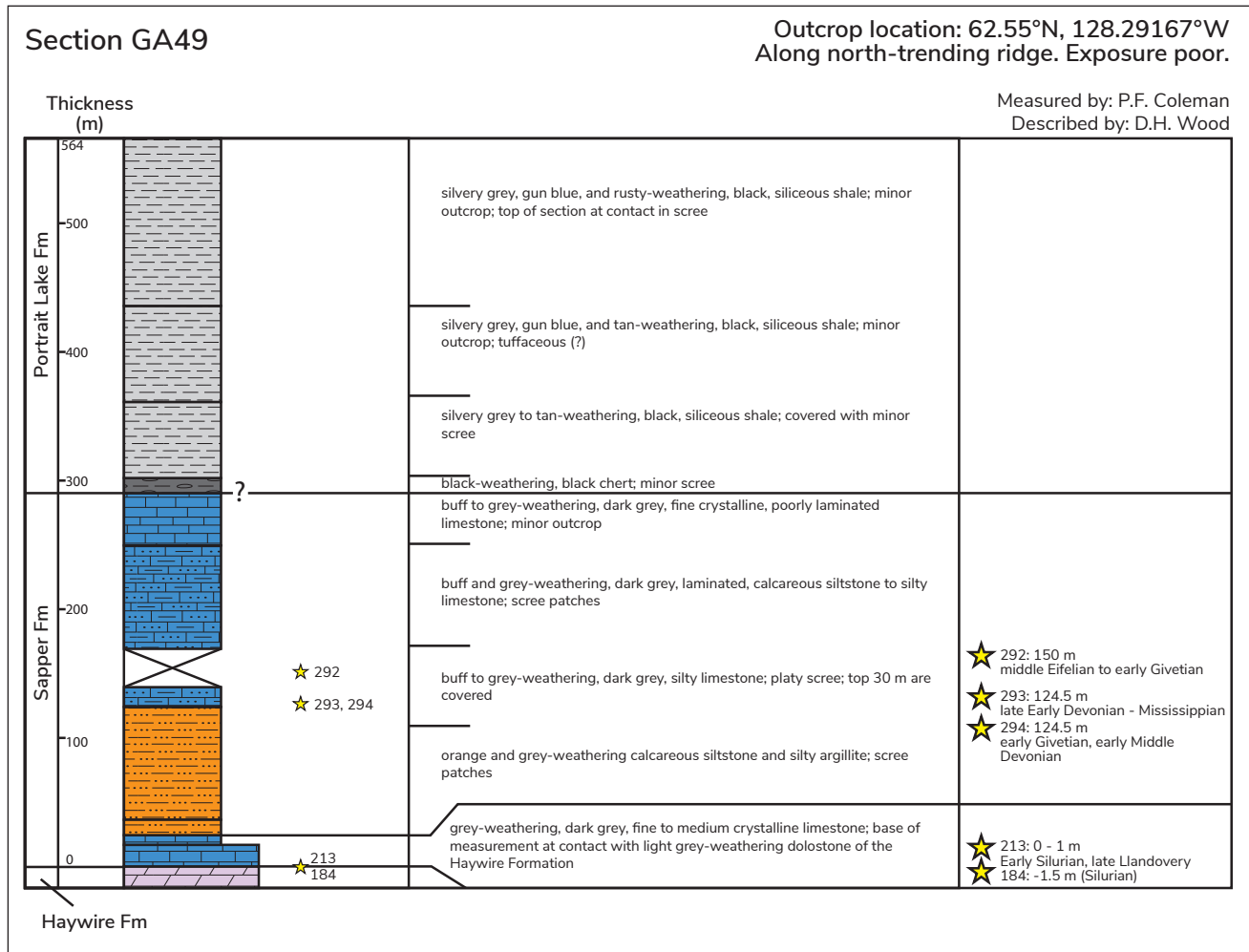


Figure 5. Outcrop log from Gordey and Anderson (1993) for section GA49; Fm – Formation. See Figure 4 for legend.

the Sapper Formation, but no additional fossil material was collected to refine the age relationships of the upper formations. It was noted by Gordey and Anderson (1993) that this section had a patchy distribution of outcrop, and detailed sampling through this section may be challenging.

**Section GA51 – 62.7042°N, 128.43476°W**

The GA51 section is the type-section for the Sapper Formation. The overlying Grizzly and Funeral formations are exposed along the top of a ridge. The Haywire and Broken Skull formations are preserved underlying the Sapper Formation.

At this field site, the Haywire Formation was not included in the log by Gordey and Anderson (1993; Fig. 9). From the reconnaissance trip, it was apparent that a significant amount of well-exposed outcrop preserves a continuous section of the Ordovician to

Silurian Haywire Formation, including the contact with the overlying Sapper Formation. Based on previous mapping at this site, we estimate the thickness of the beds to be approximately 250 m.

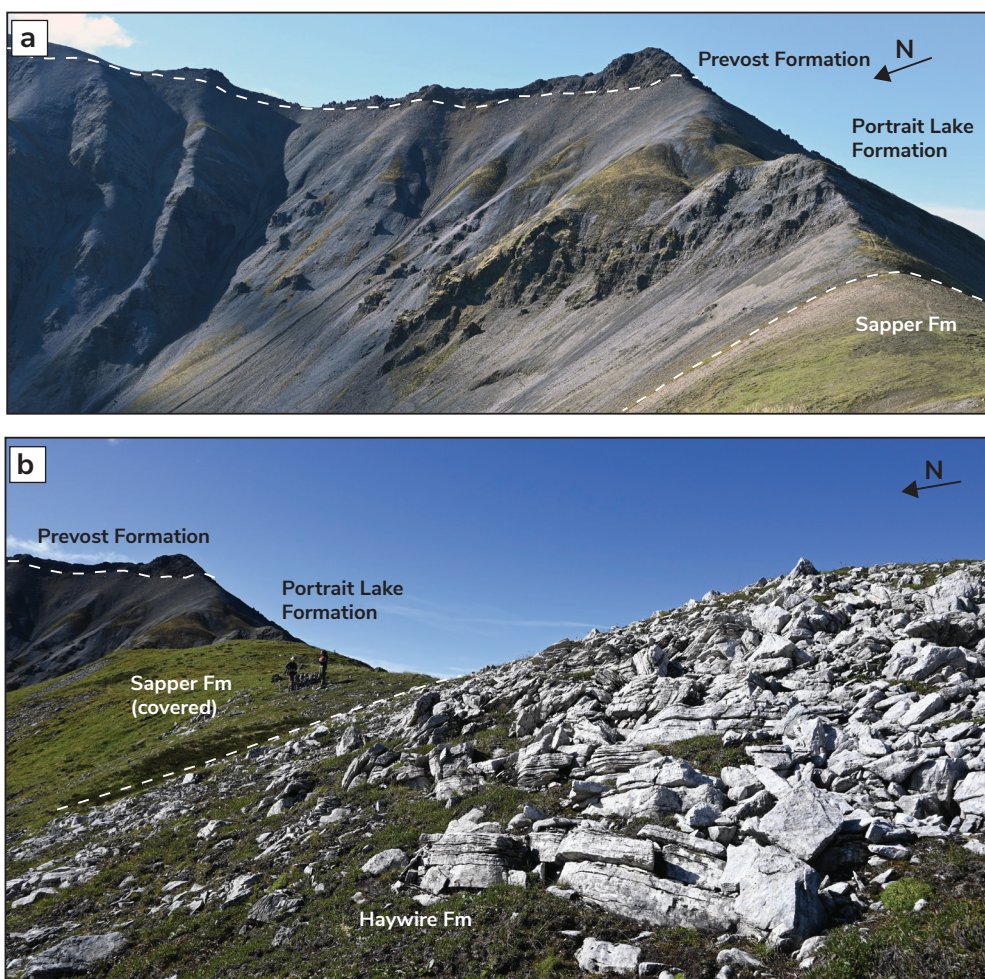
Although this is the type-section for the Sapper Formation, it is noted that the top of the unit is poorly exposed due to cover by vegetation and scree. Along a ridge about 1–2 km to the southeast (Fig. 10a), there may be additional sections that could be logged to build a composite section for the Sapper Formation. The beds that are exposed weather light grey, and have a similar appearance to the lower limestone beds of the Sapper Formation that were observed at GA41.

The fossil material that was observed in the Grizzly Bear Formation and documented by Gordey and Anderson (1993) included stromatoporoids and disarticulated crinoid ossicles. The crinoids with twin axial canals suggest an age of approximately Emsian

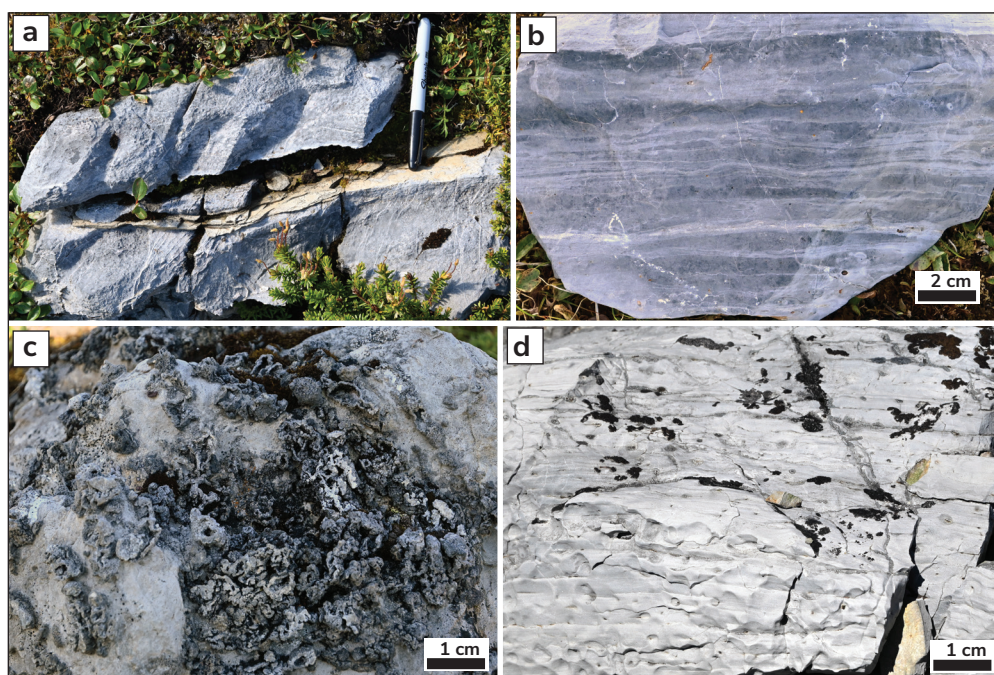
to Eifelian (408–388 Ma). This section was visited at the end of the reconnaissance trip, and less time was available to look through the scree and outcrop material. It was noted however that a significant amount of the section remains in place along the ridge leading up to the summit of a mountain to the southwest (Fig. 10b). Transects along the southeastern and northeastern ridge will be completed to create a composite stratigraphic section that includes all strata from the Ordovician to Late Devonian.

## Proposed research for 2026 and 2027

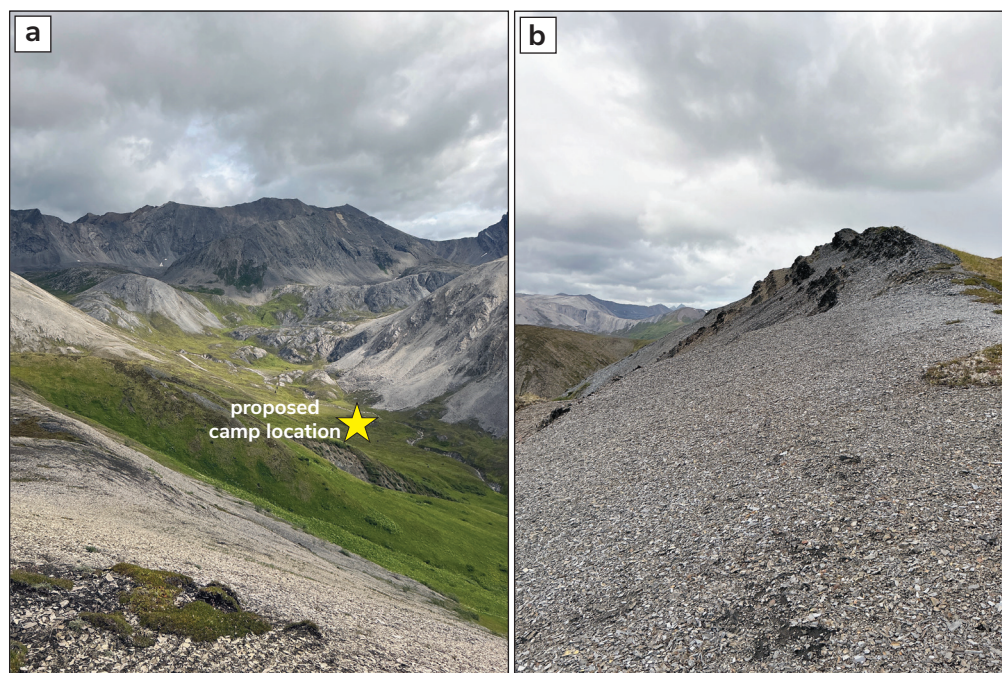
Fly camps will be established in 2026 at GA41, GA49 and GA51 for six to eight-day stays. At each study location, the most extensive and continuous outcrop will be logged and sampled at a 1 or 2 m interval. Samples weighing approximately 200 g will be collected at each interval and will be used for the geochemical study. Whole-rock and carbon isotope analyses tend to be destructive analytical methods, so only a small portion of the sample will be used for this



**Figure 6.** Outcrop photos showing the location of formation contacts at section GA41. **(a)** The location of the contact between the Sapper and Portrait Lake formations is located at the transition from the tan-orange weathering scree into the overlying grey-weathering scree. The Portrait Lake Formation has chert-rich intervals that are well exposed along the ridge. The upper contact with the Prevost Formation is sharp in outcrop; however, the strata of the Prevost Formation form steep outcrop sections which will make them difficult to sample. **(b)** The Haywire Formation weathers white to light grey at this section. The upper contact with the Sapper Formation is not distinct as the lower beds of the Sapper Formation are covered at this section.



**Figure 7.** Outcrop photos at GA41 section. **(a)** A bed of the Sapper Formation in place, near the base of the unit. **(b)** Limestone sample of the Sapper Formation near the base of the unit. **(c)** Nodular chert near the top of the Haywire Formation. **(d)** Wavy beds in the Haywire Formation containing preserved thin carbonaceous laminae.



**Figure 8.** Local area to GA49 section. **(a)** The proposed fly camp location is noted by the yellow star. The strata surrounding this camp is the Haywire Formation. View is to the northeast. **(b)** Portrait Lake Formation outcrop.

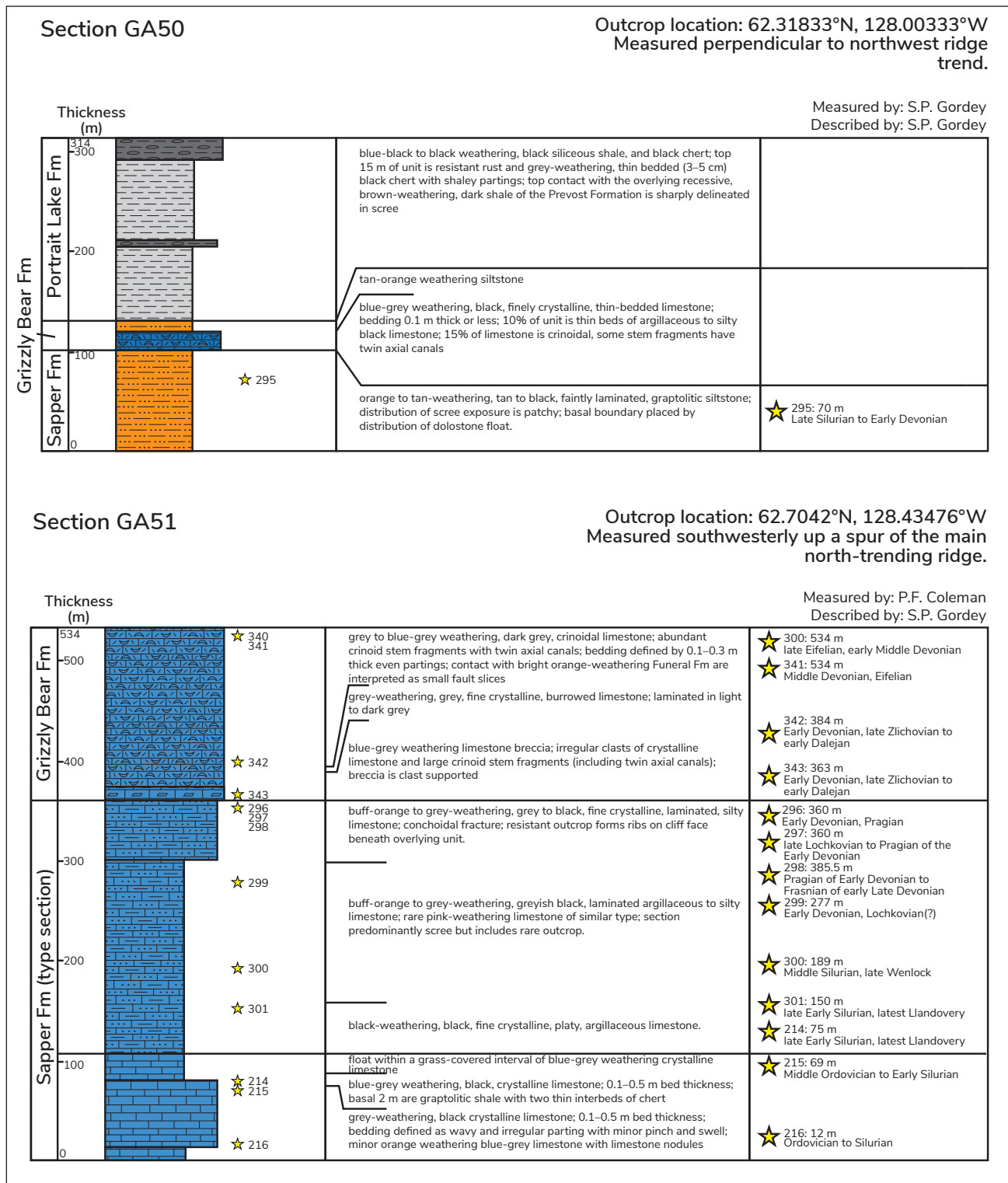
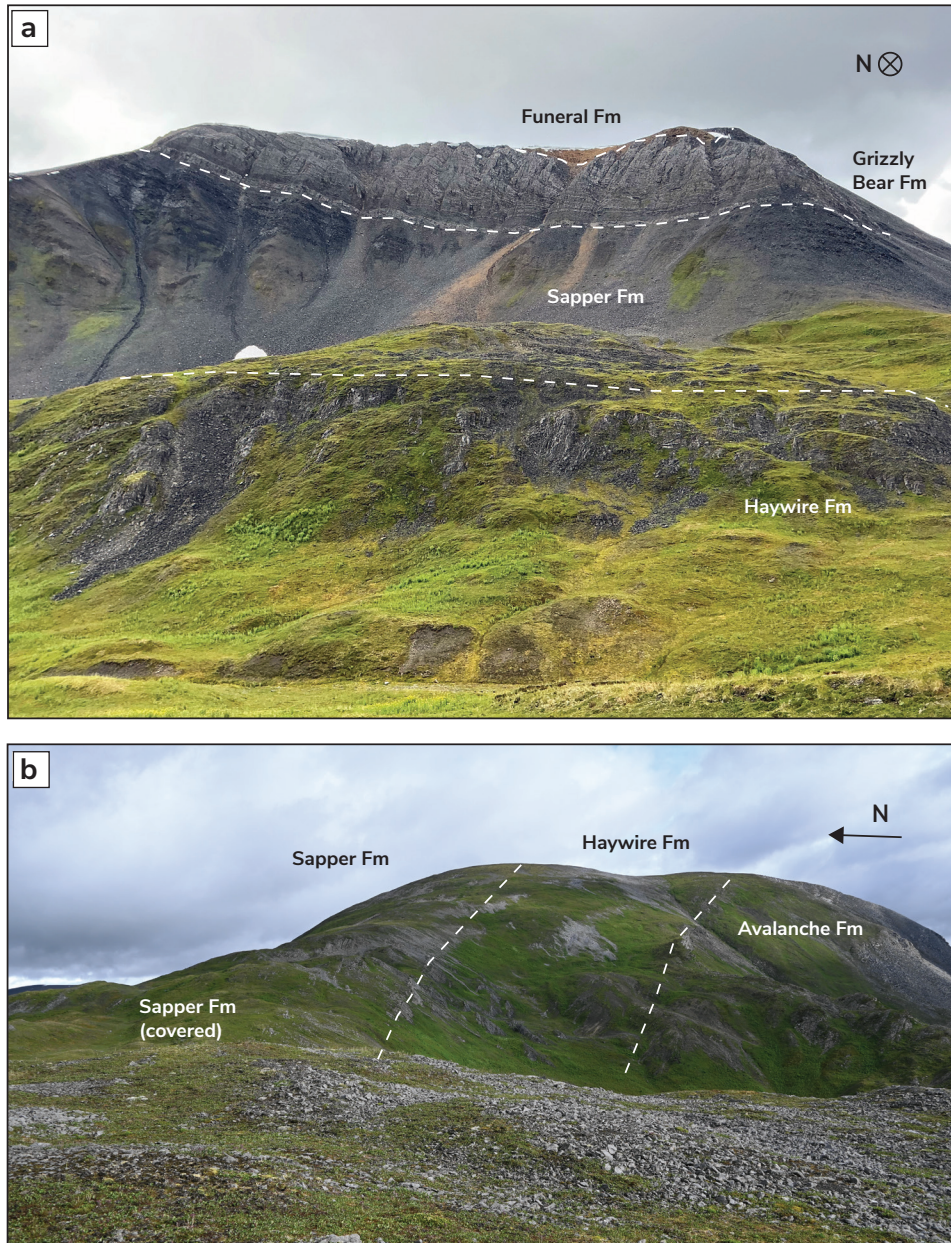


Figure 9. Outcrop logs from Gordey and Anderson (1993) for sections GA50 and GA51; Fm – Formation. See Figure 4 for legend.



**Figure 10.** Field photos of GA51 section. **(a)** Contacts between the Haywire, Sapper, Grizzly Bear and Funeral formations. The Grizzly Bear Formation forms cliffs at this section, with large boulders found in the scree at the base of the slope. It is possible that by walking along the ridge to the west that the unit will be able to be investigated further. The Funeral Formation is preserved as a thin orange unit that overlies the Grizzly Bear Formation. Outcrop locations to the southwest and northeast preserve thicker successions of this unit for building a composite stratigraphic section. **(b)** Contacts between the Avalanche, Haywire and Sapper formations. At this section, the basal 100 m of the Sapper Formation are exposed in outcrop. The rest of the unit is generally covered with a patchy distribution of outcrop. To the northeast and southwest of this location (within a few kilometres) there are other exposures of the unit that may be used to build a composite section.

purpose. The remainder of the samples will be retained at the H.S. Bostock Core Library in an archive to be used in future studies.

Section GA40 is the representative type-section for the Haywire Formation and it may be included on the revised permit application that will be submitted to Parks Canada. If time permits, section GA50 will be visited for a reconnaissance trip. If there is not a significant amount of section exposed, it is possible that this site will be visited by one or two helicopter-supported day trips to compile less detailed stratigraphic columns that document the changes in sedimentology and the position of stratigraphic contacts.

In 2027, the YGS and NTGS may revisit the region to complete work that may not be accomplished in 2026. It is anticipated that this part of the research will take less than three weeks to complete. The results from this work will be published in subsequent Yukon Exploration Geology reports, in an MSc project, and in journal publications.

## Acknowledgments

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