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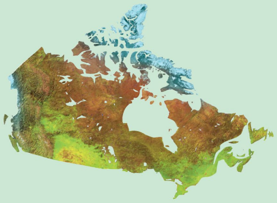

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Evolution of the Selwyn Basin region, Sheldon Lake and Tay River map areas, central Yukon

S.P. Gordey

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Cover illustration
View toward unnamed lake, Selwyn Mountains, northwest Sheldon Lake map area. Local relief of mountain in background is 360 m. As in the field of view, large parts of Sheldon Lake and Tay River areas are underlain by complexly deformed, relatively deep-water shale and chert of the Road River Group (Ordovician to Lower Devonian). The foreground outcrop exemplifies bedded chert of the Duo Lake Formation (Ordovician). Strata dip steeply to the left. Person sitting for scale (on top of outcrop, sitting height 1.4 m); NTS 105 J/13; view from 62°54.89', 131°36.49'W, looking south-southeast.

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PREFACE

The late Precambrian to Cretaceous strata and mid-Cretaceous igneous rocks of Sheldon Lake and Tay River map areas record a large segment of the evolution of the ancestral North American margin. Much of the region is underlain by shale, chert, limestone, and turbiditic sandstone that form the Selwyn Basin, well known for its stratiform shale-hosted lead-zinc deposits. The succeeding Devono-Mississippian chert-rich clastic rocks were deposited during active extensional tectonism that also led to the formation of important exhalative deposits of stratiform barite-lead-zinc-silver. Mid-Cretaceous plutonic rocks in the region are associated with gold occurrences as well as large deposits of tungsten. Hundreds of kilometres of offset along the Tintina Fault, an intracontinental transform fault, led to formation of pull-apart basins. These are filled with clastic and volcanic rocks, the latter hosting precious-metal veins.

This report presents a detailed account of the stratigraphy, structure, igneous history, and tectonic evolution of Sheldon Lake and Tay River map areas. Mineral occurrences are summarized and described in terms of their regional geological setting. Combined with a previous publication, Geological Survey of Canada Memoir 428, it forms a complete stratigraphic and structural transect across the Selwyn Basin region. The basic geological data it presents assist the appraisal of and search for mineral resources, and form the foundation for other geological studies in the region.

PRÉFACE

Les strates du Précambrien tardif au Crétacé et les roches ignées du Crétacé moyen reposant dans les régions cartographiques de Sheldon Lake et de Tay River témoignent d'une grande partie de l'évolution de la marge du protocontinent nord-américain. Le sous-sol de cette région est en grande partie composé de shales, de cherts, de calcaires et de grès turbiditiques qui composent le bassin de Selwyn, lequel est réputé pour ses gîtes de plomb-zinc stratiformes encaissés dans des shales. Les roches clastiques du Dévonien-Mississippien qui suivent sont riches en chert et se sont déposées au cours d'un épisode tectonique de distension qui a mené à la formation d'importants gîtes exhalatifs stratiformes de barite-plomb-zinc-argent. Dans la région, les roches plutoniques du Crétacé moyen sont associées à des minéralisations d'or, ainsi qu'à de gros gisements de tungstène. La présence d'un rejet transversal de centaines de kilomètres le long de la faille de Tintina, qui constitue une faille transformante intracontinentale, a mené à la formation de bassins de transtension. Ceux-ci ont été comblés par des roches clastiques ainsi que par des roches volcaniques renfermant des filons de métaux précieux.

Le présent rapport expose en détail la stratigraphie, la géologie structurale, l'histoire de l'activité ignée et l'évolution tectonique des régions cartographiques de Sheldon Lake et de Tay River. On y décrit aussi brièvement les gîtes minéraux présents dans leur contexte géologique régional. En le conjuguant à une publication antérieure, soit le Mémoire 428 de la Commission géologique du Canada, on obtient un transect stratigraphique et structural complet de la région du bassin de Selwyn. Les données géologiques fondamentales qu'il comprend facilitent l'évaluation et la recherche de ressources minérales et constituent l'assise d'autres études géologiques dans la région.

FOREWORD

More than 20 years has passed since the completion of fieldwork (1987) related to this document. Although preliminary geological maps and short reports on the Tay River and Sheldon Lake areas were published soon thereafter, it was not until 1996 that a comprehensive bulletin on the geology of this region was first submitted. Similarly, a host of intervening projects and priorities for the author delayed completion of corrections identified by this first review until 2007. Over the intervening decade many significant advances in Yukon geology demanded such extensive additional modifications that a second review was undertaken.

Despite the lapse of time, the geology within the boundaries of Tay River and Sheldon Lake map areas has seen little further work. In 2004, L. Pigage completed a synthesis of the Anvil district deposits and geology, but many aspects of his summary were already known and incorporated into the earliest version of this bulletin. The main advances in geological understanding concerned the Yukon-Tanana and Slide Mountain terranes which occupy a small part of Tay River area. These advances demanded extensive revision in nomenclature and in discussions on regional framework within the bulletin compared to the original submission. As well, the mineral deposits section was recast in terms of modern understanding. Some of the paleontological data, for Triassic conodonts in particular, has seen recent modification and these changes have been incorporated. Chemical analyses, originally done in 1986, were redone on archived sample pulps in 1996 using methods that are still current. Modern references to Yukon geology have been incorporated throughout the manuscript. The heart of the manuscript, including the rock-unit descriptions, formation nomenclature, and structural interpretations, although largely unchanged since 1996, have not previously been published and are considered current. A host of changes were completed to both maps and location data within the text and tables to correct for the change in map datum (NAD27 to NAD83) since the work was first submitted.

Therefore, although based on older fieldwork, this bulletin is ‘contemporary’ in virtually all aspects. The only exception is the use of Palmer’s 1983 DNAG geological time scale, because many paleontological determinations were referenced to it at the time, as opposed to the time scale in current use published in 2004 by F.M. Grandstein and others.

S.P. Gordey

June 3, 2008

AVANT-PROPOS

Plus de 20 ans se sont écoulés depuis la fin des travaux sur le terrain qui ont mené aux résultats livrés dans le présent document. Bien que des cartes géologiques préliminaires et de courts rapports sur les régions cartographiques de Tay River et de Sheldon Lake aient été publiés peu de temps après, ce n’est qu’en 1996 qu’un bulletin complet sur la géologie de la région a été présenté. De même, à cause de la survenue d’une série de projets et de priorités, l’auteur a dû attendre jusqu’en 2007 pour effectuer les corrections suggérées par ce premier examen. Or, au courant de la décennie, la géologie du Yukon a profité de nombreux progrès importants et les modifications qu’elles entraînaient étaient d’une telle ampleur que nous avons dû entreprendre un deuxième examen.

Malgré le temps écoulé, on a effectué peu de travail géologique à l’intérieur des limites des régions cartographiques de Tay River et de Sheldon Lake. En 2004, L. Pigage a réalisé une synthèse des gîtes minéraux et de la géologie du district d’Anvil, mais plusieurs aspects de son sommaire étaient déjà connus et avaient été intégrés à la première version de ce bulletin. Les principaux progrès sur la compréhension géologique visaient les terranes de Yukon-Tanana et de Slide Mountain qui occupent une petite portion de la région cartographique de Tay River. Ces progrès ont exigé une révision importante de la nomenclature et des discussions du cadre régional dans le bulletin par rapport à la publication originale. De plus, la partie sur les gîtes minéraux a été reformulée en tenant compte de la compréhension actuelle. Nous avons intégré les modifications récentes à certaines données paléontologiques, notamment celles sur les conodontes du Trias. Les analyses chimiques réalisées au départ en 1986 ont été refaites en 1996 à l’aide de méthodes toujours actuelles, sur des poudres d’échantillons archivées. Partout dans le manuscrit, nous avons incorporé des références actuelles à la géologie du Yukon. Les descriptions des unités lithologiques, la nomenclature des formations et les interprétations structurales qui forment le cœur du manuscrit n’ont pas fait l’objet de modifications importantes depuis 1996 et n’avaient pas été antérieurement publiées; nous les considérons comme étant courantes. Une série de corrections a été apportée aux cartes et données d’emplacement dans le texte et les tableaux pour tenir compte du changement de référentiel cartographique (du NAD27 au NAD83) depuis la première version du bulletin.

Ainsi, bien que le présent bulletin repose sur des données sur le terrain plus anciennes, presque toutes ses facettes sont « contemporaines ». La seule exception étant le recours à l’échelle des temps géologiques de Palmer utilisée dans le projet DNAG en 1983, car plusieurs déterminations paléontologiques s’y référaient à l’époque plutôt qu’à l’échelle des temps actuellement utilisée, publiée en 2004 par F.M. Grandstein et ses collaborateurs.

S.P. Gordey

Le 3 juin 2008

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Evolution of the Selwyn Basin region, Sheldon Lake and Tay River map areas, central Yukon

Abstract

Late Precambrian to Cretaceous, weakly metamorphosed strata of the ancestral North American margin comprise four sequences:

Upper Precambrian to Middle Devonian (more than 3000 m) turbiditic sandstone, deep-water limestone, shale, and chert (Selwyn Basin), flanked southwesterly in the Siluro-Devonian by shallow-water carbonate and clastic sediments (McEvoy Platform). Early Cambrian pelite hosts deposits of stratiform lead-zinc.

Upper Devonian and Mississippian turbiditic quartz-chert sandstone and chert-pebble conglomerate (2000 m) shed from elevated fault blocks of Selwyn Basin strata. Stratiform barite occurs within siliceous shale of mid- to Upper Devonian age.

Mississippian to Triassic shale, chert, limestone, minor sandstone, and siltstone (1700 m) deposited on a shallow-marine shelf; and

Lower Cretaceous clastic sediments (120+ m) derived from Jura-Cretaceous deformation and uplift.

Regional Jura-Cretaceous deformation formed décollement style, northwest-trending folds and large, shallow-dipping thrust faults. Incompetent Cambro-Ordovician to Lower Devonian strata are complexly deformed above a regional flat-lying detachment. Deformation was accompanied by obduction of oceanic ultramafite, basalt, chert, and carbonate (Slide Mountain terrane) as well as siliceous mylonite and schist (Yukon-Tanana terrane).

Granitic intrusions of the mid-Cretaceous (100 Ma) Selwyn Plutonic Suite crosscut regional structure and are responsible for small skarn and base-metal vein deposits. Coeval pyroclastic rocks of the South Fork volcanics are preserved within huge calderas.

Cretaceous-Tertiary dextral slip along Tintina Fault has offset geological elements at least 430 km and formed pull-apart basins along and near the fault. Eocene fill of fluvial clastic and bimodal volcanic rocks host epithermal precious-metal veins.

Résumé

Les strates légèrement métamorphisées du Précambrien tardif au Crétacé qui composent la marge du protocontinent nord-américain comprennent les quatre séquences suivantes.

Une succession de grès turbiditiques, de calcaires d'eau profonde, de shales et de cherts (plus de 3 000 m) couvrant l'intervalle du Précambrien supérieur au Dévonien moyen (bassin de Selwyn) bordée, au sud-ouest, par une succession de roches carbonatées et de roches sédimentaires clastiques d'eau peu profonde du Silurien-Dévonien (plate-forme de McEvoy). Des pélites du Cambrien précoce renferment des gîtes de plomb-zinc stratiformes.

Des grès à quartz-chert et des conglomérat à cailloux de chert formant une succession turbiditique du Dévonien supérieur et du Mississippien (2 000 m) dont les matériaux proviennent de blocs limités par des failles et soulevés, formés de strates du bassin de Selwyn. De la barite stratiforme est présente dans des shales siliceux du Dévonien moyen et supérieur.

Des shales, des cherts, des calcaires et des quantités mineures de grès et de siltstone du Mississippien au Trias (1 700 m) déposés dans un milieu marin peu profond de plate-forme continentale.

Des roches sédimentaires clastiques du Crétacé inférieur (120 m et plus) issus d'une déformation et d'un soulèvement au Jurassique-Crétacé.

Une déformation régionale au Jurassique-Crétacé a entraîné la formation de plis de direction nord-ouest et de grandes failles de chevauchement à faible pendage propres à une tectonique de décollement. Des strates incompétentes du Cambrien Ordovicien au Dévonien inférieur ont été déformées de manière complexe au-dessus d'une surface de décollement horizontale d'étendue régionale. La déformation a coïncidé avec l'obduction de roches ultramafiques, de basaltes, de cherts et de roches carbonatées océaniques (terrane de Slide Mountain), ainsi que de la formation de mylonites siliceuses et de schistes (terrane de Yukon-Tanana).

Des intrusions granitiques de la suite plutonique de Selwyn datant du Crétacé moyen (100 Ma) recoupent la structure régionale et sont à l'origine de petits gîtes minéraux constitués de skarns et de filons de métaux communs. Des roches pyroclastiques contemporaines des volcanites de South Fork ont été conservées dans d'immenses caldeiras.

Un glissement dextre au Crétacé-Tertiaire le long de la faille de Tintina a entraîné le rejet d'éléments géologiques sur au moins 430 km et la formation de bassins de transtension le long et à proximité de la faille. Les matériaux de remplissage de bassin de l'Éocène, constitués de roches clastiques fluviatiles et de roches volcaniques bimodales, renferment des filons épithermaux de métaux précieux.

SUMMARY

Much of Sheldon Lake and Tay River map areas is underlain by upper Plaeozoic to Cretaceous, weakly metamorphosed sedimentary rocks deposited along the ancestral North American margin, likely above unevenly rifted and thinned older strata and continental crust of the craton. Narrow belts of upper Paleozoic oceanic chert, basalt, and ultramafite as well as siliceous schist, and mylonite were obducted on this succession during Jura-Cretaceous orogeny. Post-tectonic mid-Cretaceous plutons and coeval volcanic rocks crosscut the earlier-formed compressional structures. Hundreds of kilometres of Tertiary dextral slip along the northwest-trending Tintina and possibly St. Cyr faults was accompanied by formation of small pull-apart basins.

The strata of the ancestral North American margin northeast of Tintina Fault can be subdivided into four main assemblages.

Proterozoic to Middle Devonian: Selwyn Basin and McEvoy Platform

The oldest exposed strata within Selwyn Basin consist of upper Proterozoic to Cambrian turbiditic quartz sandstone and maroon slate succeeded by a widespread Cambro-Ordovician basinal limestone and siltstone. Ordovician to Middle Devonian strata comprise shale, chert, and siltstone. The minimum aggregate thickness of this relatively deep-water assemblage, known as Selwyn Basin, is about 3000 m. A regional unconformity beneath Cambro-Ordovician strata as well as local sub-mid-Ordovician and sub-mid-Silurian unconformities suggest intermittent extension and local syndepositional faulting within the basin. In the Silurian and Devonian the Selwyn Basin was flanked to the southwest (present co-ordinates) by carbonate and clastic strata defining a relatively shallow-water platformal area, here defined as McEvoy Platform. The distribution of Lower Paleozoic chert facies within the basin suggests a topographic submarine ridge was a precursor to the platform.

Devono-Mississippian: Earn assemblage

In Late Devonian time there was an abrupt change in depositional regime. Turbiditic quartz-chert sandstone, and chert-pebble conglomerate were deposited in submarine fan complexes and shale transgressed far northeastward onto ancestral North America. The

SOMMAIRE

Le sous-sol d'une grande partie des régions cartographiques de Sheldon Lake et de Tay River se compose de roches sédimentaires légèrement métamorphisées de l'intervalle du Paléozoïque supérieur au Crétacé, qui se sont mises en place le long de la marge du protocontinent nord-américain, probablement sur des strates plus anciennes ayant été soumises à des degrés variables de fracturation par distension et d'amincissement ainsi que sur la croûte continentale du craton. D'étroites bandes de roches du Paléozoïque supérieur constituées de cherts, de basaltes et de roches ultramafiques océaniques ainsi que de mylonites et de schistes siliceux, ont été mises en place par obduction sur cette succession lors d'une orogenèse au Jurassique-Crétacé. Des plutons post-tectoniques du Crétacé moyen et des roches volcaniques du même âge recoupent les structures de compression formées plus tôt. Un glissement dextre sur des centaines de kilomètres le long de la faille de Tintina, et possiblement de la faille de Saint Cyr, deux structures de direction nord-ouest, a été accompagné de la formation de petits bassins de transtension.

Les strates de la marge du protocontinent nord-américain, au nord-est de la faille de Tintina, peuvent être subdivisées en quatre assemblages principaux.

Du Précambrien tardif au Dévonien moyen : bassin de Selwyn et plate-forme de McEvoy

Dans le bassin de Selwyn, les strates affleurantes les plus anciennes consistent en grès quartzeux turbiditiques et en ardoises de couleur marron du Protérozoïque supérieur-Cambrien, auxquels succèdent des calcaires et des siltstones de bassin répandus du Cambrien-Ordovicien. Les strates de l'Ordovicien au Dévonien moyen se composent de shales, de cherts et de siltstones. L'épaisseur totale minimale de cet assemblage d'eau relativement profonde, appelé « bassin de Selwyn », est d'environ 3 000 m. La présence d'une discordance régionale à la base des strates du Cambrien-Ordovicien, ainsi que de discordances locales à la base de l'Ordovicien moyen et du Silurien moyen, laisse supposer une déformation intermittente par distension et la formation de failles synsédimentaires à l'intérieur du bassin. Pendant le Silurien et le Dévonien, le bassin de Selwyn était bordé au sud-ouest (coordonnées actuelles) par des strates carbonatées et clastiques délimitant une zone d'eau relativement peu profonde à laquelle on donne le nom de « plate-forme de McEvoy » dans le présent document. La répartition des faciès de chert du Paléozoïque inférieur dans le bassin laisse croire qu'une crête sous-marine a été à l'origine de la plate-forme.

Dévonien-Mississippien : assemblage de Earn

Durant le Dévonien tardif, le régime sédimentaire a abruptement changé. Des grès à quartz-chert turbiditiques et des conglomérats à cailloux de chert se sont déposés dans des complexes de cônes sous-marins, et une transgression a entraîné le dépôt de shales loin vers le nord-est sur le protocontinent nord-américain. Les strates coarse clastic strata, possibly 1200 m in aggregate thickness, were derived from elevated fault blocks of Selwyn Basin strata, to the north and west of project area. In particular, most detritus was derived from late Precambrian gritty quartzose clastic rocks and Ordovician-Silurian chert. The lack of evidence of compressional deformation, the presence of local synsedimentary steep normal or reverse faults near a proposed source, and local felsic volcanic rocks, suggest an extensional or transtensional event elevated the source area. A regional unconformity occurs beneath upper Upper Devonian strata. Stratiform barite and barite-lead-zinc occurrences formed within black siliceous shale and chert-bearing clastic rocks.

Mississippian to Triassic: clastic shelf assemblage

Devono-Mississippian turbiditic clastic rocks were succeeded by lower-Mississippian mixed carbonate and siliclastic rocks likely deposited on a muddy, shallow-marine shelf. Overlying upper Paleozoic strata are dominated by thin-bedded chert and shale of uncertain water depth. Upper Triassic shale, siltstone, sandstone, and limestone resemble lower Mississippian strata and signal a return to a similar depositional environment. A regional unconformity occurs beneath Middle Triassic strata, and possibly beneath the Upper Mississippian. Aggregate thickness for this sequence is about 1700 m.

Early Cretaceous: Foreland Basin

Rare occurrences of Lower Cretaceous chert-bearing clastic strata (more than 120 m) are the earliest signal of uplift related to Jura-Cretaceous orogeny. They disconformably overlie Upper Triassic strata.

Ancestral North American margin strata southwest of Tintina Fault comprise two distinct successions separated by the northwest-trending St. Cyr Fault. On the southwest, the Pelly Mountains assemblage (3500 m) consists of relatively deep-water, late Proterozoic to Silurian fine clastic and carbonate strata, succeeded by shallow-water, Siluro-Devonian carbonate and clastic rocks (Cassiar Platform), in turn overlain by Devono-Mississippian shale and chert-bearing sandstone. The Devono-Mississippian strata are analogous in tectonic affinity to the Earn assemblage northeast of Tintina Fault. Unconformities occur at the base of the upper Upper Devonian and Lower Silurian. In the narrow belt between St. Cyr and Tintina faults, the St. Cyr assemblage (more than 1600 m) differs from the Pelly Mountains assemblage in the lack of Paleozoic shallow-water clastic or carbonate strata, as well as in the presence of a unique

clastiques grossières, d'une épaisseur totale pouvant atteindre 1 200 m, proviennent de blocs soulevés, limités par des failles, constitués de strates du bassin de Selwyn, au nord et à l'ouest de la région du projet. Plus précisément, la majeure partie des débris provient de roches clastiques quartzeuses à gros grain du Précambrien tardif et de chert de l'Ordovicien-Silurien. Le manque d'indices de déformation par compression, la présence locale de failles normales ou inverses abruptes de formation synsédimentaire près d'une source proposée, ainsi que celle de roches volcaniques felsiques, laisse supposer qu'un épisode de déformation par distension ou de transtension a soulevé la région source. Une discordance régionale marque la base des strates de la partie supérieure du Dévonien supérieur. Des concentrations stratiformes de barite et de barite-plomb-zinc se sont formées dans shales noirs siliceux et des roches clatiques à chert.

Du Mississippien au Trias : assemblage clastique de plate-forme continentale

Aux roches clastiques turbiditiques du Dévonien-Mississippien ont succédé des roches carbonatées et silicoclastiques mélangées du Mississippien inférieur, qui se sont probablement déposées dans un milieu marin peu profond de plate-forme continentale boueuse. Les strates sus-jacentes du Paléozoïque supérieur sont principalement composées de shales et de cherts finement stratifiés déposés en eau d'une profondeur incertaine. Les shales, siltstones, grès et calcaires du Trias supérieur ressemblent à ceux des strates du Mississippien inférieur et témoignent d'un retour à un milieu de dépôt similaire. Une discordance régionale est présente à la base des strates du Trias moyen et, peut-être, de celles du Mississippien supérieur. L'épaisseur totale de cette séquence est d'environ 1 700 m.

Crétacé précoce : bassin d'avant-pays

De rares strates clastiques à chert du Crétacé inférieur (plus de 120 m), qui reposent en disconformité sur des strates du Trias supérieur, constituent le premier indice d'un soulèvement rattaché à une orogenèse au Jurassique-Crétacé.

Les strates de la marge du protocontinent nord-américain, au sud-ouest de la faille de Tintina, comprennent deux successions distinctes séparées par la faille de St. Cyr de direction nord-ouest. Au sud-ouest, l'assemblage de Pelly Mountains (3 500 m) se compose de strates clastiques à grain fin et de strates carbonatées d'eau relativement profonde du Protérozoïque tardif au Silurien, qui sont surmontées de roches carbonatées et de roches clastiques d'eau peu profonde du Silurien-Dévonien (plate-forme de Cassiar), à leur tour surmontées de shales et de grès à chert du Dévonien-Mississippien. Les strates dévono-mississippiennes sont analogues sur le plan des affinités tectoniques à celles de l'assemblage de Earn, au nord-est de la faille de Tintina. Des discordances se trouvent à la base de la partie supérieure du Dévonien supérieur et du Silurien inférieur. Dans l'étroite bande s'étendant entre les failles de St. Cyr et de Tintina, l'assemblage de St. Cyr (plus de 1 600 m) se distingue de celui de Pelly Mountains par l'absence de roches clastiques ou carbonatées d'eau peu profonde du Paléozoïque et par la présence d'une unité unique et mystérieuse de calcaire-phyllade and enigmatic unit of Late Devonian limestone-phyllite. Cambro-Ordovician to Devonian strata consist chiefly of fine-grained pelitic and carbonate rocks of probable deep-water origin. Scattered remnants of Carboniferous to Triassic strata include chert, siltstone, carbonate, and shale that resemble equivalent strata southwest of St. Cyr Fault.

In the Early Cretaceous, the entire project area was subject to northeast-southwest compression leading to the development of northwest-trending, regional-scale folds and large, shallow-dipping thrust sheets. Incompetent Ordovician to Devonian shale and chert are complexly deformed above a regional, flat-lying, buried detachment. The degree of shortening in Cambro-Ordovician to Devonian strata is at least 50%, indicating that the paleogeographic width of the Selwyn Basin was twice as much as is currently preserved. Folds and faults in this region, by analogy with similar structures in the northern and southern Canadian Rocky Mountains, ultimately root in a basal detachment that extends beneath the project area and across the entire deformed belt. Upper Paleozoic oceanic ultramafite, basalt, and chert of the Slide Mountain terrane, as well as siliceous mylonite, schist, and conglomerate of the Yukon-Tanana terrane, were emplaced above ancestral North American margin strata during the Jura-Cretaceous.

Granite and granodiorite intrusions of the mid-Cretaceous Selwyn Plutonic Suite underlie about 8% of the project area. Circular to elongate in plan, and from less than 1 km to 58 km long, they intrude and metamorphose strata as young as Triassic. As well, they crosscut regional folds and faults. Mineral K-Ar and Ar-Ar ages for the suite range from 105 Ma to 75 Ma, but dominantly fall between 100 Ma and 90 Ma. Fewer, but more precise U-Pb ages range from 101–97 Ma. All plutons typically contain biotite, but two main pluton types are contrasted based on the presence or absence of hornblende. Tungsten-copper skarn, base-metal vein, and rare porphyry occurrences are related to the mid-Cretaceous plutonism. Thick dacitic pyroclastic deposits of the coeval South Fork volcanics, preserved within subcircular calderas ranging from 3 km to 55 km in diameter, are the extrusive equivalents of hornblende-bearing plutons. Mineral K-Ar and Ar-Ar ages range from 111 Ma to 88 Ma, but dominantly fall between 100 Ma and 92 Ma. Uranium-lead ages cluster around 97 Ma. Elevated initial strontium ratios indicate a significant contribution of old, radiogenic, metasedimentary sialic crust in the petrogeneses of plutons and volcanic rocks.

Regional metamorphic grade is subgreenschist facies. Conodont colour alteration indices typically are about 5 and indicate maximum temperatures of about 300°C, probably associated with heat flow related to Cretaceous deformation and intrusion. Some of the

remontant au Dévonien tardif. Les strates du Cambrien-Ordovicien au Dévonien consistent principalement en roches pélitiques à grain fin et en roches carbonatées probablement déposées en eau profonde. Des vestiges dispersés de strates du Carbonifère au Trias comprennent des cherts, des siltstones, des roches carbonatées et des shales ressemblant à des strates équivalentes situées au sud-ouest de la faille de St. Cyr.

Au cours du Crétacé précoce, toute la région du projet a été soumise à une compression dirigée du nord-est au sud-ouest, ce qui a entraîné la formation de plis régionaux de direction nord-ouest ainsi que de vastes nappes de charriage à faible pendage. Les cherts et les shales incompétents de l'Ordovicien au Dévonien sont déformés de manière complexe au-dessus d'une surface enfouie de décollement horizontale d'étendue régionale. Le taux de raccourcissement des strates allant du Cambrien-Ordovicien au Dévonien atteint au moins 50 %, ce qui montre que la paléolargeur géographique du bassin de Selwyn était deux fois supérieure à sa largeur actuelle. À l'instar de structures similaires situées dans le nord et le sud des Rocheuses canadiennes, les plis et les failles dans la région se rattachent en profondeur à une surface de décollement basale qui s'étend sous la région du projet et à toute la zone de déformation. Les roches ultramafiques, les basaltes et les cherts océaniques du Paléozoïque supérieur du terrane de Slide Mountain, ainsi que les conglomérats, les schistes et les mylonites siliceuses du terrane de Yukon-Tanana, ont été mis en place sur les strates de la marge du protocontinent nord-américain au Jurassique-Crétacé.

Les intrusions de granite et de granodiorite de la suite plutonique de Selwyn du Crétacé moyen s'étendent à quelque 8 % de la région du projet. Elles sont circulaires à allongées, en plan, et mesurent de moins de 1 km à 58 km de longueur, et elles ont recoupé et métamorphisé des strates aussi récentes que celles du Trias. De plus, elles recoupent des failles et des plis régionaux. Les âges K-Ar et Ar-Ar sur minéraux de la suite se situent dans l'intervalle de 105 à 75 Ma, mais se concentrent surtout entre 100 et 90 Ma. Des âges U-Pb plus précis mais moins nombreux se situent entre 101 et 97 Ma. Les plutons contiennent généralement de la biotite, mais deux principaux types de plutons ont été établis selon la présence ou l'absence de hornblende. Des skarns à tungstène-cuivre, des filons de métaux communs et de rares occurrences de minéralisation porphyrique sont rattachés au plutonisme du Crétacé moyen. Les épais dépôts pyroclastiques de composition dacitique des volcanites de South Fork du même âge sont conservés dans des caldeiras subcirculaires de 3 à 55 km de diamètres et constituent les équivalents effusifs des plutons à hornblende. Les âges K-Ar et Ar-Ar sur minéraux varient de 111 à 88 Ma, mais se situent surtout entre 100 et 92 Ma. Des âges U-Pb se concentrent autour de 97 Ma. Des rapports isotopiques du strontium initialement élevés témoignent d'une importante contribution d'une ancienne croûte sialique radiogénique de caractère métasédimentaire dans la pétrogenèse des plutons et des roches volcaniques.

Le degré de métamorphisme à l'échelle régionale est inférieur à celui du faciès des schistes verts. Les indices d'altération de la couleur des conodontes se situent généralement à 5 environ et indiquent des températures maximales de quelque 300 °C, ce qui est probablement lié au flux thermique rattaché à la déformation et larger plutons are surrounded by extensive aureoles of biotite-muscovite-quartz schist carrying garnet, staurolite, and sillimanite, which indicate peak temperatures of about 600–620°C and pressures of about 3 kbar.

Tertiary dextral slip along Tintina fault zone amounted to at least 430 km and juxtaposed originally widely separated elements of ancestral North American margin stratigraphy, Cretaceous igneous rocks, and allochthonous terranes. Eocene pull-apart basins formed along the fault zone, in which accumulated fluvial strata, as well as mafic and felsic volcanic rocks. Eocene beds were themselves tilted and folded through fault-bend compression during continued slip. Epithermal, precious-metal veins are the main exploration targets in this setting.

à la mise en place des intrusions au Crétacé. Certains des plutons les plus vastes sont entourés de grandes auréoles de schistes à biotite-muscovite-quartz renfermant des grenats, de la staurotide et de la sillimanite, ce qui témoignent de températures d'environ 600-620 °C et de pressions de quelque 3 kbar (Smith et Erdmer,1990).

Un glissement dextre le long de la zone de la faille de Tintina au Tertiaire a atteint au moins 430 km et juxtaposé des éléments largement séparés à l'origine de la stratigraphie de la marge du protocontinent nord-américain, des roches ignées du Crétacé et des terranes allochtones. Des bassins de transtension se sont formés à l'Éocène le long de la zone de failles, dans lesquels se sont accumulées des strates fluviatiles ainsi que des roches volcaniques mafiques et felsiques. Des couches éocènes ont d'elles-même basculé et plié sous l'effet de la compression associée aux courbes dans la zone de failles lors du glissement continu. Dans ce cadre, l'exploration minérale vise principalement à trouver des filons de métaux précieux de nature épithermale.

INTRODUCTION

More than 20 years has passed since the completion of fieldwork (1987) related to this document. Although preliminary geological maps and short reports on the Tay River and Sheldon Lake areas were published soon thereafter, it was not until 1996 that a comprehensive bulletin on the geology of this region was first submitted. Similarly, a host of intervening projects and priorities for the author delayed completion of corrections identified by this first review until 2007. Over the intervening decade many significant advances in Yukon geology demanded such extensive additional modifications that a second review was undertaken.

Despite the lapse of time, the geology within the boundaries of Tay River and Sheldon Lake map areas has seen little further work. In 2004 L.C. Pigage completed a synthesis of the Anvil district deposits and geology, but many aspects of his summary were already known and incorporated into the earliest version of this bulletin. The main advances in geological understanding concerned the Yukon-Tanana and Slide Mountain terranes which occupy a small part of Tay River area. These advances demanded extensive revision in nomenclature and in discussions on regional framework within the bulletin compared to the original submission. As well, the mineral deposits section was recast in terms of modern understanding. Some of the paleontological data, for Triassic conodonts in particular, has seen recent modification and these changes have been incorporated. Chemical analyses, originally done in 1986, were redone on archived sample pulps in 1996 using methods that are still current. Modern references to Yukon geology have been incorporated throughout the manuscript. The heart of the manuscript including the rock unit descriptions, formation nomenclature, and structural interpretations, although largely unchanged since 1996, have not previously been published and are considered current. A host of changes were completed to both maps and location data within the text and tables to correct for the change in map datum (NAD27 to NAD83) since the work was first submitted.

Therefore, although based on older fieldwork, this bulletin is ‘contemporary’ in virtually all aspects. An exception is the use of Palmer’s (1983) DNAG geological time scale, because many paleontological determinations were referenced to it at the time, as opposed to the time scale in current use published in 2004 by F.M. Grandstein and others.

Sheldon Lake and Tay River map areas (latitude 62–63°N, longitude 130–134°W) encompass about 22 964 km^2 of east-central Yukon. Upper Proterozoic to Tertiary sedimentary, and lesser plutonic and volcanic rocks are represented that compose a long-lived record of the evolution of northwestern North America. Previously the stratigraphy of the region was only vaguely known and its structural evolution poorly understood. The mapped area includes the Selwyn Basin and Earn clastic assemblage which host strata of high potential for stratiform zinc-lead and zinc-lead-silver deposits, as well as Cretaceous granitic rocks that have adjacent skarn mineralization, and their unique and previously little-known coeval volcanic rocks. This bulletin documents the distribution, stratigraphy, and correlations for forty-four rock units, three of them newly defined, and outlines the sedimentary, structural, and tectonic development of this part of the Cordilleran Orogen.

Location, access, and physiography

Sheldon Lake and Tay River map areas stretch from the central Yukon from west of the town of Faro, eastward to near the Yukon-Northwest Territories border (Fig. 1). Access to the southwest part of the area is provided by all-season gravel road (Campbell Highway) that extends from Carmacks to Watson Lake. A gravel road maintained during summer months (Canol Road) extends from the Alaska Highway to Macmillan Pass; its northern portion (North Canol Road) provides access to the eastern part of the region. Float-equipped aircraft may land on many of the lakes in the area. The Pelly and South Macmillan rivers (Fig. 2) are navigable by small boat, but stretches of white water hinder navigation on the Ross and Tay rivers except to experienced canoeists. For most of the area the only rapid access is by helicopter. Ridge landings and travel by foot are generally unimpeded, but below treeline (elevation about 1370 m (4500 ft.)) there is a paucity of landing spots as well as outcrop. During the present study, the town of Ross River was used as a base for supplies, communications, and aircraft charter.

The region exhibits a varied physiography, and includes parts of the Selwyn Mountains, Yukon Plateau, Tintina Trench, and Pelly Mountains (Fig. 3). The Selwyn Mountains (average elevation 1680 m (5500 ft.)) are underlain largely by recessive clastic strata and chert that weather to round-shouldered, scree-covered ridges and slopes, punctuated by scattered outcrop. A gradational boundary separates the Selwyn Mountains from the Yukon Plateau to the west. The latter is underlain by similar rock types, but is of lower elevation (less than 1375 m (4500 ft.)) and relief. High areas that stand above the plateau, including the Anvil and South Fork ranges (up to 2135 m (7000 ft.)), are cored by resistant granitic and volcanic rocks. The southwest part of the area is transected by Tintina Trench, a linear depression that crosses central Yukon. Tintina Trench is a physiographically young feature, developed as a result of Pliocene normal faulting along the Cretaceous-Tertiary dextral Tintina Fault (Tempelman-Kluit, 1980). Carbonate strata form the resistant backbone of the Pelly Mountains (elevations about 1680 m (5500 ft.)) that border Tintina Trench on the southwest. The lowest elevation in the region is along the Pelly River, which is incised down to about 760 m (2500 ft.) above sea level; valley bottoms of larger streams in other areas range from this up to 1070 m (3500 ft.) above sea level. The Wisconsinan McConnell glaciation produced a cover of till, glacial-lake deposits, and outwash in low-lying areas as well as diverse glacial features, including eskers and kame terraces

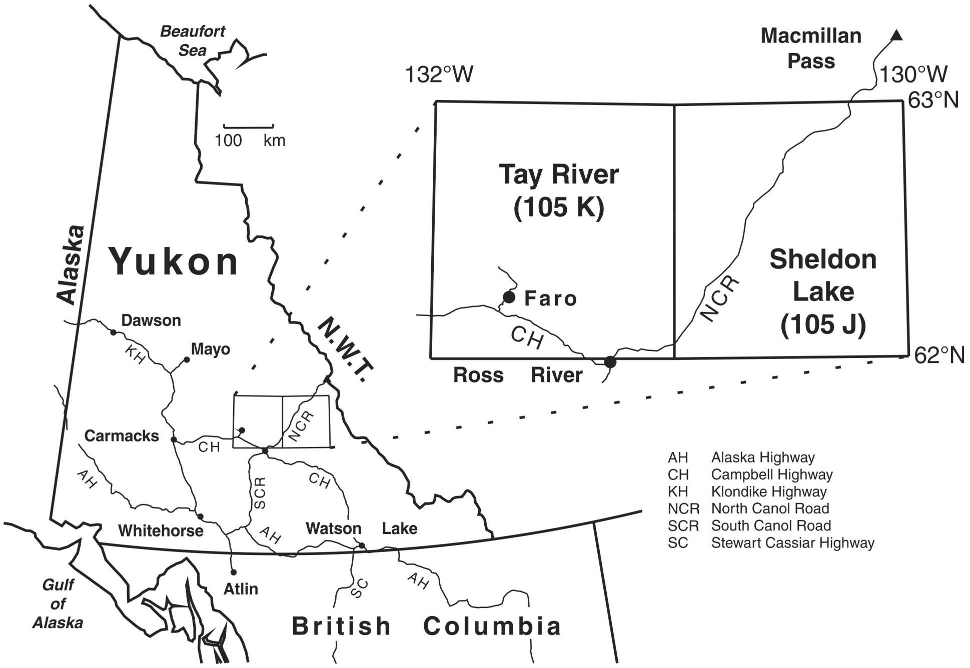


Figure 1. Location and access of Sheldon Lake and Tay River map areas.

in many of the large valleys, meltwater channels, and streamlined bedrock ridges (Jackson and Morrison, 1984; Jackson, 1986). Summit heights decrease from above 1890 m (6200 ft.) in the eastern half of the area to 1550 m (5085 ft.) near the west boundary of the area. They formed nunataks during maximum ice advance about 20 000 years ago (Jackson et al., 1991).

Climate during June, July, and August is pleasant, with daytime temperatures in the low 20s (°C) and moderate precipitation. Temperatures at night may go below freezing in early June. By early to mid-June snow cover has receded to allow work in many parts of the area, and by late June snow ceases to be a hindrance. Cold spells with light snowfall may occur in August, but usually do not impede field operations for more than a few days. Fieldwork may continue into early, and rarely late September, after which snow and cold are a hindrance.

Previous geological work

The earliest recorded geological work in the region is that of G.M. Dawson (Dawson, 1889), who in 1887 descended the Pelly River to its mouth, having portaged from the Francis River drainage. In 1902 R.G. McConnell explored the Macmillan River, including its south fork as far upstream as the upper part of Riddell River (Fig. 2; McConnell, 1903). J. Keele in 1907–1908 made a reconnaissance of the Ross and Gravel (now Keele) rivers (Keele, 1910). These early explorations included observations on topography, glaciation, fauna, flora, history, and culture, as well as geological notes of the routes traversed. The first geological map of part of the region was by Cockfield who in 1928 mapped his traverse along the drainage of Little Salmon River, Little Salmon Lake, and Magundy River at a scale of 1 inch to 4 miles (Cockfield, 1929). In 1935 J.R. Johnson made a geological map at a scale of 1 inch to 8 miles, along the course of the Pelly River between Hoole Canyon and the mouth of the Macmillan River (Johnson, 1936). This includes that stretch of the Pelly River within Tay River map area. In 1944, E.D. Kindle mapped the geology of an eight- to sixteen-mile wide corridor along the South and North Canol roads at a scale of 1 inch to 4 miles (Kindle, 1945).

The first systematic geological mapping of the region was begun in 1958 by J.A. Roddick and completed in 1960 by J.A. Roddick and L.H. Green as part of the Geological Survey of Canada's ‘Operation Pelly’. Their work led to publication of geological maps of the Sheldon Lake (NTS 105 J) and Tay River (NTS 105 K) map areas at a scale of 1 inch to 4 miles (Roddick and Green 1961a, b; Fig. 4). These maps portrayed the regional geological framework and acted as a firm foundation for the present project. In 1967 and 1968, D.J. Tempelman-Kluit mapped the geology of the Anvil Range at a scale of 1:125 000 as part of his report on the setting of the Faro, Vangorda, and Swim zinc-lead deposits (Tempelman-Kluit, 1972). Much of his findings have been compiled directly into the maps produced for the current report. Geological maps at 1:250 000 scale that are published for areas surrounding the Sheldon Lake and Tay River region are referenced in Figure 4. Geological maps at 1:50 000 scale were published for all of the Niddery Lake area (Fig. 4; Cecile 1984a, b, 1986a, b). Reports and 1:50 000 scale maps by Abbott (1983) and Abbott and Turner (1990) described the setting of the lead-zinc-silver deposits at Macmillan Pass (southeast Niddery Lake area), and bear on interpretations of the geology within the current map areas.

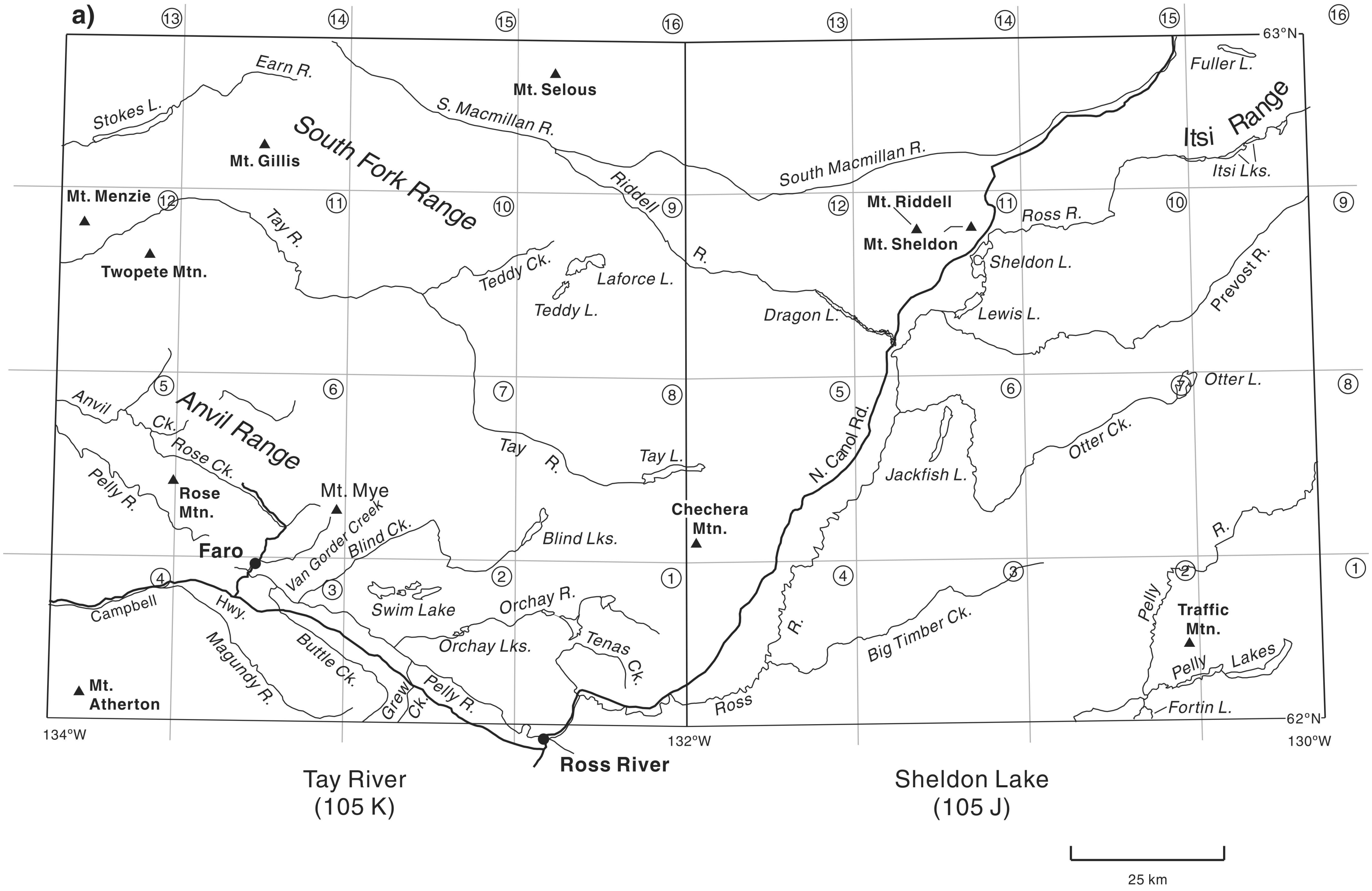
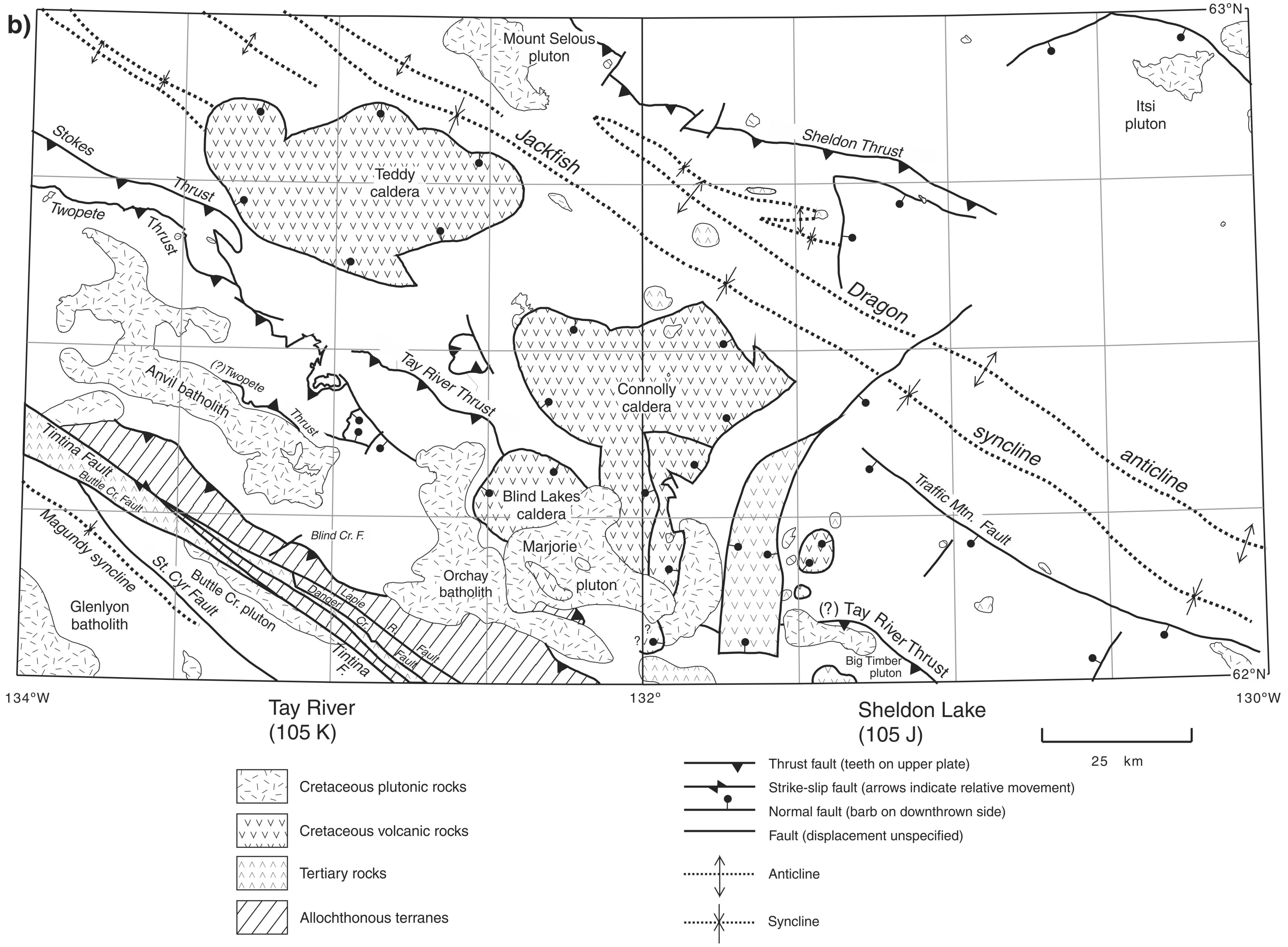


Figure 2. Commonly referred to features: **a)** physiographic (1:50 000 NTS grid also shown), **b)** geological.



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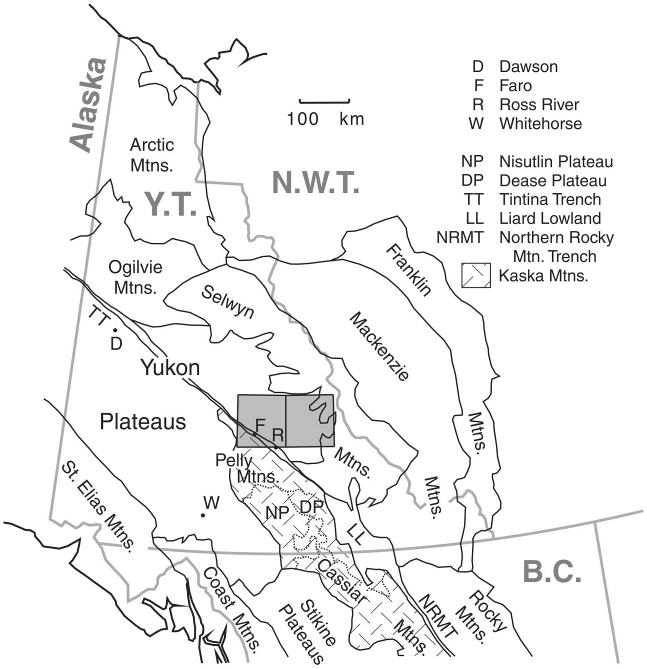

Figure 3. Physiographic regions of the northern Cordillera (Mathews, 1986). Sheldon Lake and Tay River areas are indicated by shading.

Other important geological studies include accounts of the mineral deposits of the Anvil Range Zn-Pb-Ag district (Jennings and Jilson, 1986; Pigage, 1990) and a geochronological and petrographic study of the plutonic rocks within the same area (Pigage and Anderson, 1985). Smith and Erdmer (1990) documented metamorphic conditions during emplacement of the Anvil batholith. Pride (1988) mapped and described the chemistry of Tertiary bimodal volcanic rocks exposed along Tintina Trench. Duke and Godwin (1986) and Duke (1990) reported on the Grew Creek epithermal gold deposit hosted within these volcanic rocks. Tempelman-Kluit (1979b) and Mortensen and Jilson (1985) provided regional overviews on the evolution of allochthonous terranes, which underlie a small part of Tay River map area. Late Paleozoic isotopic ages on blueschist samples were reported by Erdmer and Armstrong (1988) for rocks from this belt northwest of Ross River.

Current geological work

This report is based on five seasons encompassing thirty-nine weeks of fieldwork. For the first three seasons, including 1982 (seven weeks), 1983 (ten weeks), and 1985 (eight weeks) the mode of operation was a two-person camp moved every three to seven days by helicopter chartered from Ross River. In 1986 (ten weeks), the mapping was accelerated

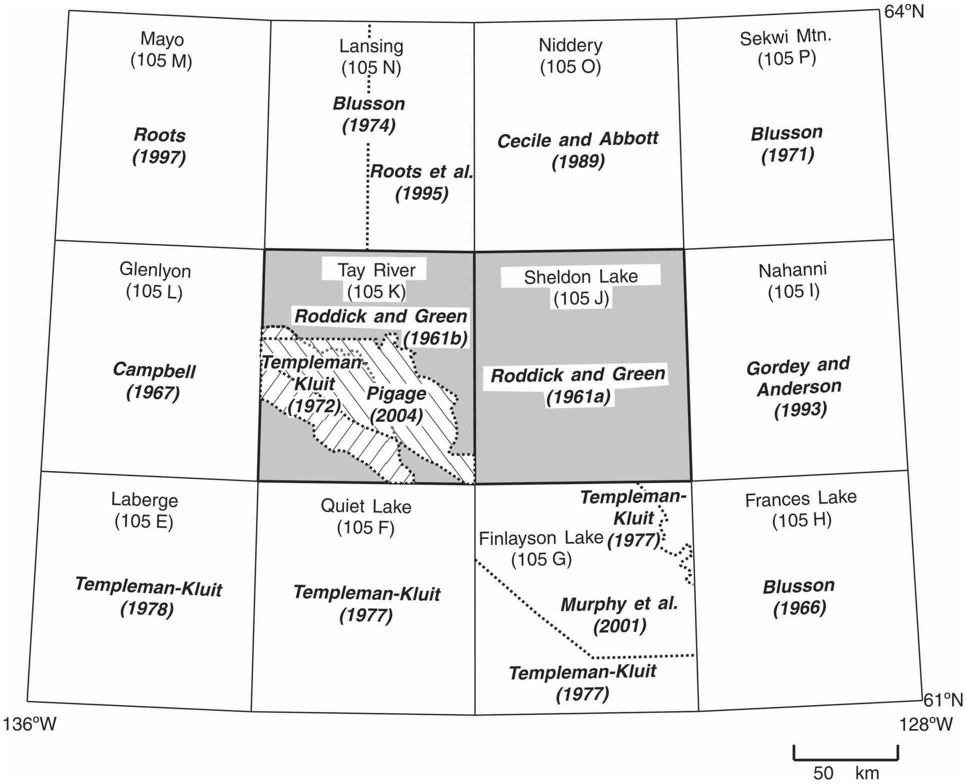

Figure 4. Index map to previous work in Sheldon Lake and Tay river map areas and to regional geological maps for adjoining areas.

with the help of three field assistants, and accomplished by a combination of daily, helicopter-supported traverses from Ross River, helicopter landings at isolated outcrops, and several two-person camps in more remote areas. The final season in 1987 (four weeks) filled in remaining gaps in map coverage through a two-person camp moved by helicopter and float-equipped airplane from Ross River.

Measured stratigraphic sections in this report are scant because true and complete stratigraphic thicknesses are not exposed; complex folding and imbrication are pervasive and even in mountainous terrane, sections are poorly exposed and commonly scree-covered. About two hundred and twenty fossil determinations, including an additional thirty-six from adjacent Glenlyon (NTS 105 L) map area to the northwest provide control on age and correlation. These include localities reported by earlier workers (Roddick and Green, 1961a, b; Tempelman-Kluit, 1972), which have been accurately replotted by reference to original field notes and annotated air photographs. Figure 5 shows the traverse routes and visited localities that provide ground control for the geological maps.

Interim reports of the present work include those of Gordey (1983, 1988, 1990a, b, c), Jackson et al. (1986), and Gordey and Irwin (1987).

Acknowledgments

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SETTING

Regional setting: evolution of the Northern Cordilleran craton margin

Sheldon Lake and Tay River map areas are underlain by unmetamorphosed strata that form part of the Cordilleran miogeocline, the westward-thickening wedge of mid-Proterozoic to mid-Jurassic sedimentary rocks deposited along the continental margin of western North America. The western limit of preservation of the miogeocline is a structural boundary defined by the eastern edge of allochthonous terranes accreted in the Mesozoic. During this accretion or earlier, the distal part of the miogeocline was either removed or made unrecognizable by structural disruption and incorporation into the allochthonous terranes.

At about 750 Ma rifting of the craton margin led to dyke intrusion, synsedimentary faulting, and the progradation of a thick wedge of clastic rocks, the Windermere Supergroup (Eisbacher, 1981). At this time the Cordilleran margin showed the first clear indication along most of its length of a consistent westward-deepening basin polarity. This rifting event was preceded by at least two periods of epicratonic sedimentation of about 400 Ma each, separated by major regional deformation (Eisbacher, 1981). Deposition during these earlier periods (Wernecke assemblage (more than 12 km) (Delaney, 1981); Pinguicula Group of Mackenzie Mountains Supergroup (more than 5–7 km) (Young et al., 1979; Eisbacher, 1981)), each probably initiated by (an) extension event(s), may have been in intracratonic basins rather than along a continental margin. The distribution of the older strata and the Windermere rift assemblage beneath much of the Selwyn Basin region, including the project area, remains unknown.

Extension in the latest Proterozoic led to an irregular distribution of shelf and off-shelf facies that persisted until Middle Devonian time. On the north and east developed a broad expanse of shallow-water carbonate and clastic rocks comprising a shallow, unevenly subsiding shelf called the Mackenzie Platform (Lenz, 1972) (Fig. 6). South and west of Mackenzie Platform are successions of shale, basinal limestone, chert, and turbiditic clastic rocks deposited in areas of relatively deeper water called the Selwyn Basin (Gabrielse, 1967a, 1976; Gabrielse et al., 1973;

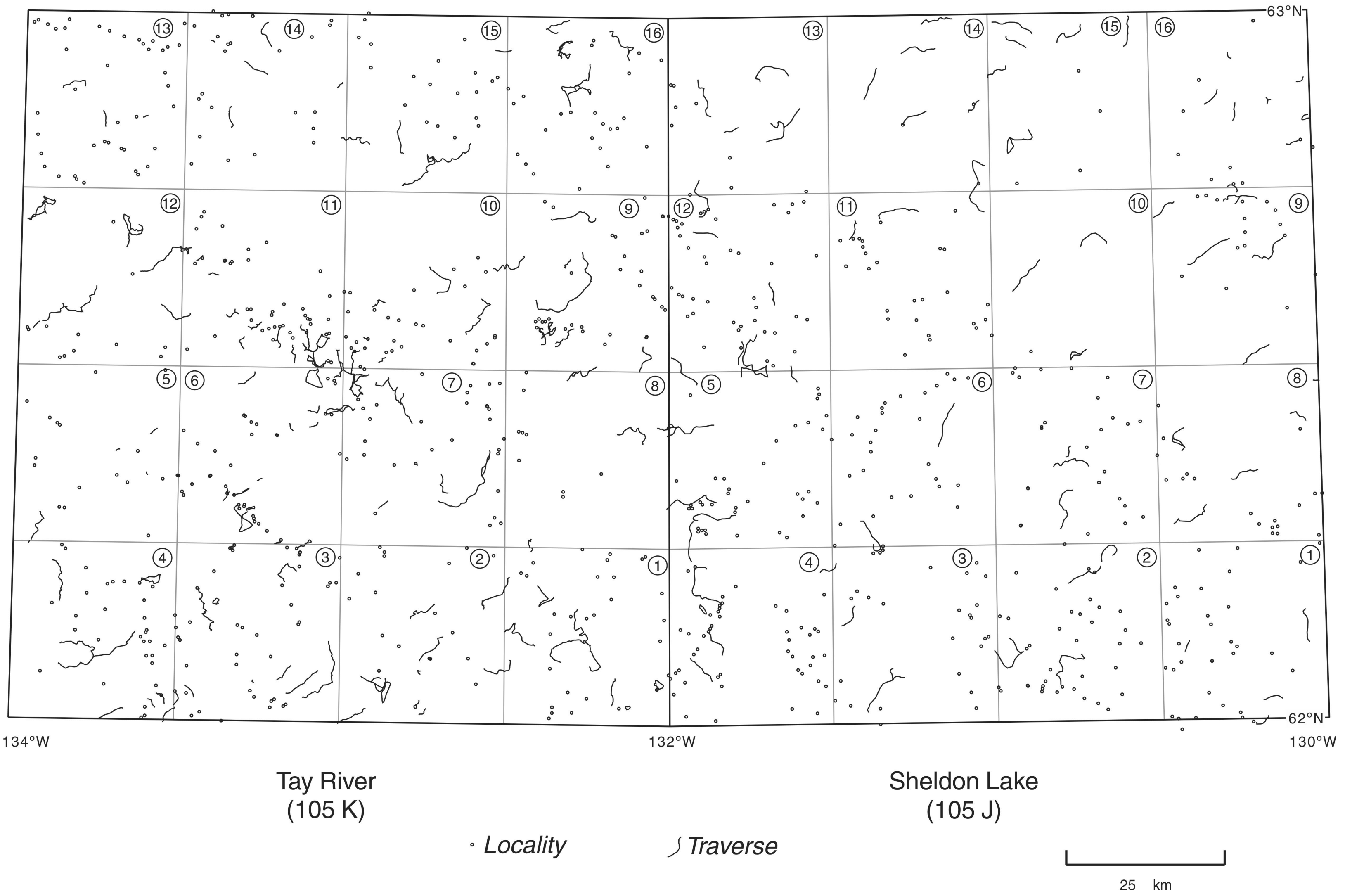


Figure 5. Traverse routes and localities visited during the present work.

Tempelman-Kluit, 1981; Gordey and Anderson, 1993) and Richardson Trough (Jackson and Lenz, 1962; Lenz, 1972; Cecile, 1982). The McEvoy Platform, a shallow-water carbonate-clastic succession developed along the southwest side (present-day co-ordinates) of Selwyn Basin in the Late Silurian to Middle Devonian. Cassiar Platform, which lies southwest of the Cretaceous-Tertiary Tintina Fault, also includes Siluro-Devonian shallow-water clastic and carbonate strata. The latest Proterozoic (?)rift sequence at the base of the Selwyn Basin succession comprise the oldest strata exposed in central Yukon. These clastic strata, called the Hyland Group, comprise at least 3 km of gritty turbiditic sandstone of uncertain, but possibly western derivation. Broadly contemporaneous, easterly derived, thick quartz sandstone (Backbone Ranges Formation) forms the basal strata of much of western Mackenzie Platform (Gordey and Anderson, 1993).

The sedimentary facies boundary separating Selwyn Basin and Mackenzie Platform migrated laterally through its history over a few tens of kilometres. The sharp margins of Misty Creek Embayment (Cecile, 1982) and Richardson Trough, and the abrupt change to an easterly facies trend in southeast Yukon (Fig. 6) may have resulted from fault offset of basement. Whether faults directly controlled the position of this boundary elsewhere is uncertain.

The facies distribution defining Mackenzie Platform, Selwyn Basin, Richardson Trough, and McEvoy Platform was destroyed in the Late Devonian. A sudden influx of marine turbiditic, chert-rich clastic sediments spread to the south- and eastward from a source area in northern Yukon, and eastward from uplifted western portions of the Selwyn Basin (Fig. 7). In south-central and southeastern Yukon coarse turbiditic clastic rocks occur as far east as the old platform-basin boundary; shale spread toward the continental interior. Their source area in northernmost Yukon was uplifted during the Ellesmerian Orogeny, a compressional event that in that area produced pre-Early Mississippian folding, a marked Early Mississippian angular unconformity, and granitic intrusions of broadly Devonian age (Bell, 1973; Norris and Yorath, 1981; Gordey, 1991). Uplift of source areas in central Yukon and more southern portions of the Canadian Cordillera was related to a rift event that spawned local block faulting, local felsic volcanism, and widespread barite and barite-lead-zinc mineralization (Gordey et al., 1987; Gordey, 1991).

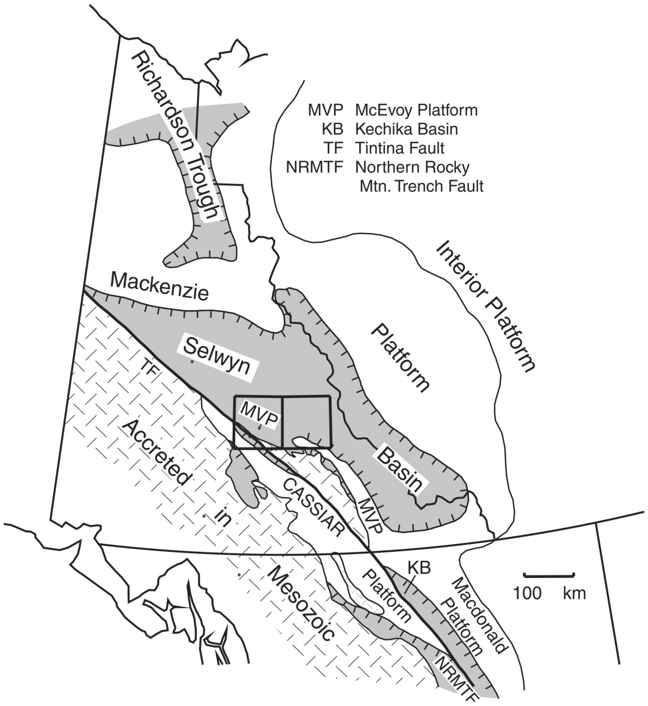


Figure 6. Location of Sheldon Lake and Tay River map areas with reference to regional late Precambrian to Middle Devonian tectonic and depositional elements of the northern Cordilleran miogeocline (*after* Gordey and Anderson, 1993).

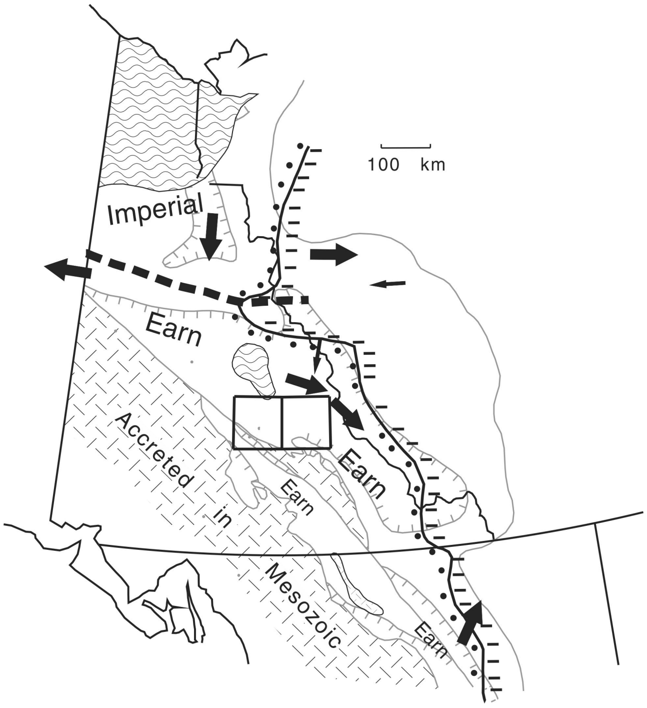


Figure 7. Regional distribution of coarse and fine clastic strata of Devono-Mississippian age in Yukon and Northwest Territories and northern British Columbia (Gordey et al., 1987). Sheldon Lake and Tay River map areas are indicated by boxes. The thick dashed line subdivides the clastic rocks into those derived from northern Yukon, largely the Imperial Formation, and those derived from the west, largely the Earn Group. The facies line (labelled coarse (circles) to fine (dashes)) shows the eastern limit of sandstone and conglomerate. Large arrows indicate regional paleoflow from noncratonal source areas (wavy line pattern). Small arrows show local paleoflow, possibly from the east or northeast cratonal source. Older Paleozoic tectonic elements are shown in subdued tone (*see* Fig. 6). Tertiary dextral offset along Tintina Fault (about 430 km) (Roddick, 1967; Tempelman-Kluit, 1979b; Gabrielse, 1985; Gabrielse et al., 2006) is not restored.

Following the influx of Devono-Mississippian clastic strata, normal marine-shelf sedimentation resumed across the old platform-basin transition and as far to the west as the miogeocline is preserved. In the late Paleozoic to Late Triassic of northern British Columbia and southern Yukon clastic rocks dominate the sedimentary record (Bamber et al., 1968; Gibson, 1975, 1991; Bamber and Mamet, 1978), but in northern Yukon carbonate strata are also abundant (Bamber and Waterhouse, 1971; Graham, 1973). In both regions important unconformities occur within the succession, beneath which large parts of the stratigraphic record are missing. Because of this and recent erosion, preservation of late Paleozoic and Triassic strata is regionally fragmentary. Lower Jurassic strata in the miogeocline of the northern Cordillera are unknown except for shale and sandstone in northernmost Yukon (Poulton et al., 1982). Middle and (?) Upper Jurassic clastic rocks occur in this same area and in a narrow belt across central Yukon (Tempelman-Kluit, 1970a).

The close of continental margin sedimentation and the beginning of widespread compressional deformation was signaled by collision of a Mesozoic island arc with the miogeocline in the mid-Jurassic (Tempelman-Kluit, 1979b). The outer or western part of the miogeocline was overthrust by allochthons of mylonitic, ophiolitic, and granitic rocks and was itself imbricated and folded during décollement-style deformation. Widespread mid-Cretaceous granitic rocks and their local extrusive equivalents (South Fork volcanics), possibly formed by crustal thickening and heating as a result of collision, intruded and erupted over the already deformed strata of the outer miogeocline. Deformation of the inner miogeocline in eastern and northern Mackenzie Mountains occurred later as it involves molasse as young as Late Cretaceous (Turonian; Aitken et al. (1982)). Right-lateral transcurrent movement along Tintina Fault, Northern Rocky Mountain Trench Fault, and related structures in Eocene time amounted to 430 km (Gabrielse et al., 2006).

Structural style has been greatly influenced by the distribution of lower and middle Paleozoic facies. Incompetent strata in the area of Selwyn Basin are intensely folded, locally closely imbricated, and have well developed slaty cleavage (Selwyn fold belt) (Fig. 8). In contrast, the competent strata in the region of Mackenzie Platform are disrupted by large thrust faults, lack slaty cleavage, and are thrown into relatively open folds (Mackenzie fold belt). Structural trends vary from north-south to east-west around a great arc defined by Mackenzie and Ogilvie mountains that parallels Paleozoic facies boundaries. The structural style of Selwyn and Mackenzie fold belts, by analogy with the northern (Thompson, 1979) and southern (Price, 1981) Canadian Rocky Mountains, have been interpreted as thin-skinned detachment terranes (Norris, 1972; Gordey, 1981a; Gordey and Anderson, 1993). Thrust faults and folds are presumed to root into or die out above a basal décollement, below which the basement and/or underlying strata remain undeformed.

Local setting

Strata exposed within the project area record the latest Proterozoic to Triassic evolution of the outermost preserved part of the miogeocline. The Cretaceous-Tertiary Tintina and St. Cyr faults divide the pre-Tertiary rocks of the region into three main panels (Fig. 9; Table of Formations). Most of the northeast part of the region is underlain by strata that have undergone little latitudinal displacement relative to the North American continental margin, and include an Eocambrian (?)rift sequence and overlying starved basin assemblage (Selwyn Basin; Fig. 6, 9), a Siluro-Devonian carbonate platform (McEvoy Platform), a thick Devono-Mississippian rift succession (Earn assemblage), and a late Paleozoic to Late Triassic clastic shelf sequence. Original depositional relations can be inferred despite easterly translation and telescoping of facies during Mesozoic contraction. These strata are overthrust by oceanic and mylonitic rocks (accreted terranes) that form a narrow panel northeast of Tintina Fault.

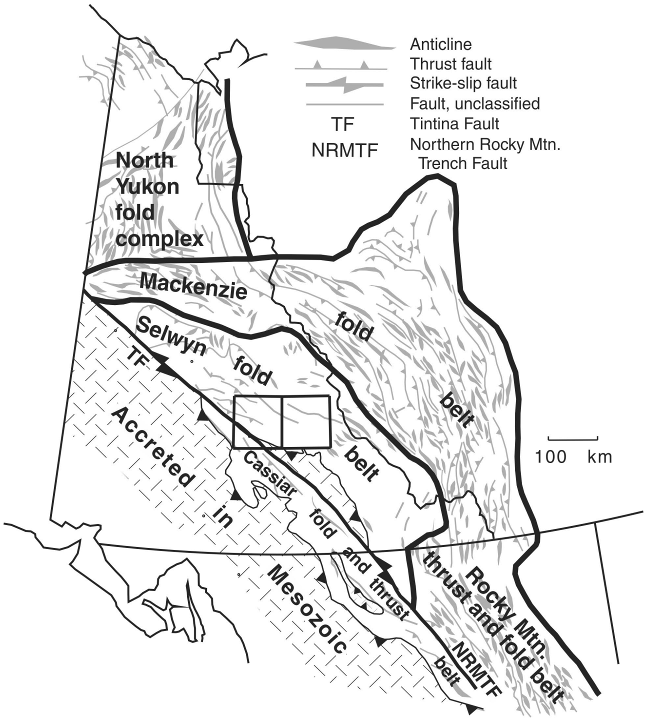


Figure 8. Location of Sheldon Lake and Tay River map areas with respect to regional structural domains of the northern Canadian Cordillera (*modified from* Gabrielse, 1976; Gordey and Anderson, 1993). Mackenzie fold belt (and contiguous Northern Rocky Mountain thrust and fold belt) is an area of thrust faults, and concentric folds, lacks slaty cleavage, and corresponds largely to competent strata of Mackenzie Platform (Fig. 6). Selwyn fold belt is characterized by slaty cleavage, thrust faults, and tight folds. It represents the largely incompetent strata of Selwyn Basin. Tertiary dextral offset along Tintina Fault (about 430 km) (Roddick, 1967; Tempelman-Kluit, 1979b; Gabrielse, 1985; Gabrielse et al., 2006) is not restored.

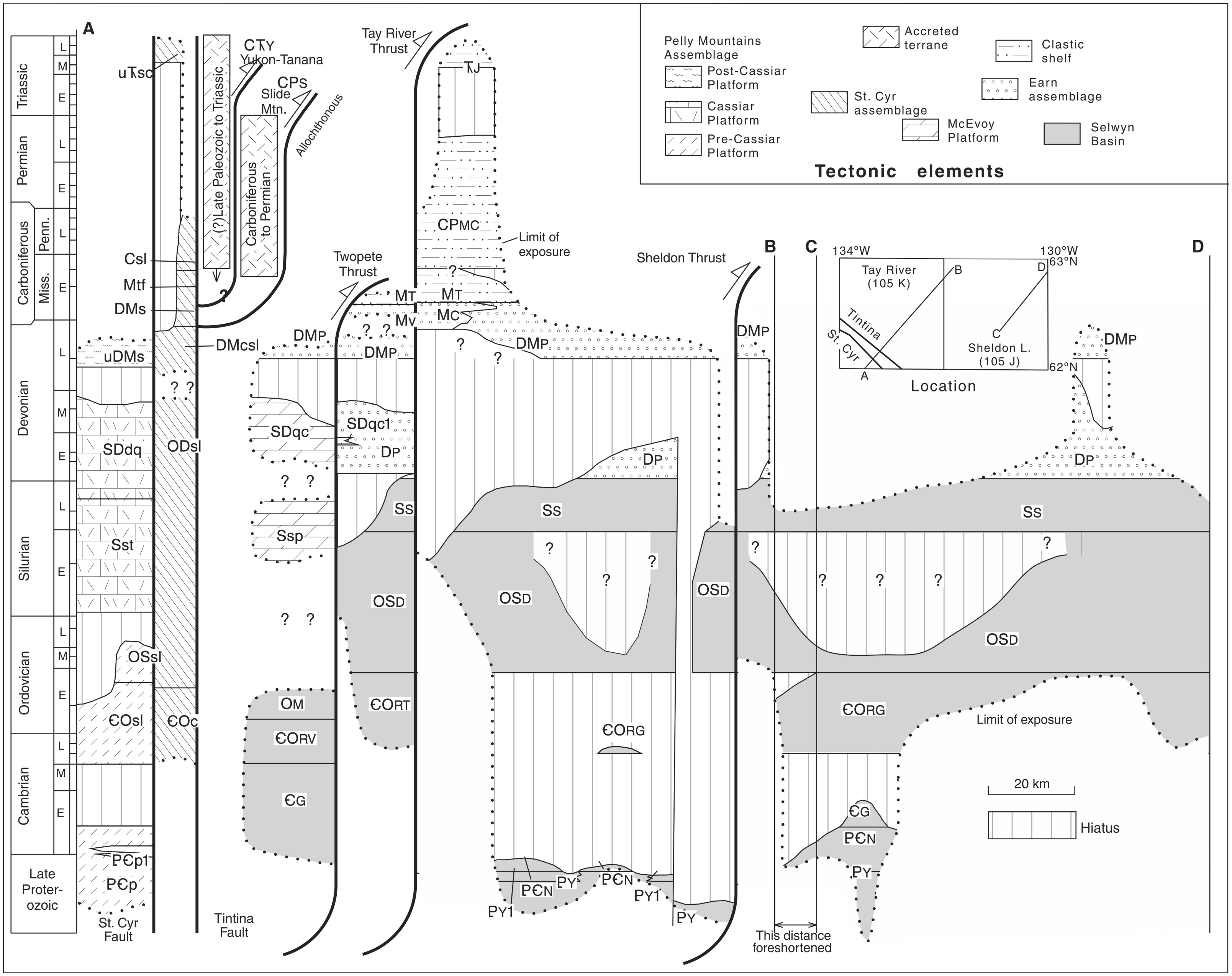


Figure 9. Time stratigraphic section across Sheldon Lake and Tay River map areas.

TABLE OF FORMATIONS

Period/Epoch	Formation	Map unit	Lithology	Thickness (m)
Tertiary	Bimodal volcanic unit	Tv	Undivided Tv1, Tv2, Tv3	?
		Tv1	Acid volcanic plugs	
		Tv2	Acid ash-flow tuffs and flows	
		Tv3	Basalt flows *Intrusive (Tv1) or unconformable on Paleozoic units; faulted against Ts*	
	Alluvial clastic unit	Ts	Sandstone, conglomerate, shale *faulted contacts; likely unconformable on various Paleozoic units*	200(?)+
	Limestone conglomerate unit	Tcg	Limestone conglomerate *faulted contacts, stratigraphic relations unclear*	400+
PRE-TERTIARY ROCKS NORTHEAST OF TINTINA FAULT				
Cretaceous	South Fork volcanics	KSF	biotite-quartz-hornblende-feldspar crystal tuff *unconformable; extrusive equivalent of KS*	950+
	Selwyn Plutonic Suite	KS	Granite, quartz monzonite, granodiorite	
		KS1	Biotite ± muscovite-bearing plutons	
		KS2	Biotite + hornblende-bearing plutons	
		KS3	Porphyritic biotite-hornblende granite	
		KS4	Mafic-free granite *intrusive*	
ALLOCHTHONOUS TERRANE (UPPER PALEOZOIC)				
Carboniferous and Permian	**Slide Mountain terrane (CPSv, CPSt, CPSl, CPSub)**			
	Basalt unit	CPSv	Basalt *conformable and interfingers with CPSt, other contacts faulted*	1000±
	Chert unit	CPSt	Chert *interfingers with CPSv, other contacts faulted*	1000±
	Limestone unit	CPSl	Limestone *faulted contacts*	100+
	Ultramafic unit	CPSub	Serpentinite, peridotite *faulted contacts*	---
Carboniferous to Triassic	**Yukon-Tanana terrane (CT̄Ycg, CT̄Ym)**			
	Conglomerate unit	CT̄Ycg	Conglomerate *faulted contacts*	600+
	Schist unit	CT̄Ym	Muscovite-biotite schist, micaceous quartzite, eclogite, blueschist *faulted contacts*	?
Allochthonous terranes emplaced in the Jura-Cretaceous				
FORELAND BASIN (CRETACEOUS)				
Lower Cretaceous	Big Timber Formation	KB	Shale, chert-pebble conglomerate *unconformable on T̄J*	120+
CLASTIC SHELF ASSEMBLAGE (MID-MISSISSIPPIAN TO TRIASSIC)				
Triassic	Jones Lake Formation	T̄J	Shale, siltstone, sandstone, limestone *unconformable on CPMC*	400+
Carboniferous to Permian	Mount Christie Formation	CPMC	Chert, shale *unconformable on MT*	200–700
Mississippian	Tay Formation	MT	Shale, siltstone, limestone, sandstone	310+
		MT1	Limestone *(?)conformable on DME*	400
EARN CLASTIC ASSEMBLAGE (TURBIDITE BASIN: DEVONIAN TO MID-MISSISSIPPIAN)				
Devonian and Mississippian	EARN GROUP	DME	MC, DMP, DP, Mv; map unit DME includes MC, DMP, DP undivided	
Mississippian	Felsic volcanic unit	Mv	Felsic volcanic and/or subvolcanic	300
	Crystal Peak Formation	MC	Conglomerate, shale *lateral equivalent, in part, to DMP*	1000
Devono-Mississippian	Prevost Formation	DMP	Shale, sandstone, conglomerate	500+
		DMP1	Shale, limestone *(?)unconformable*	
Lower to Upper Devonian	Portrait Lake Formation	DP	Shale, chert, sandstone, conglomerate *conformable on SS*	200
McEVOY PLATFORM (SHELF FACIES: SILURO-DEVONIAN)				
Devonian and (?)Silurian	Carbonate-sandstone unit	SDc	SDc1, SDc2 undivided	200(?)
		SDc1	Quartz sandstone	
		SDc2	Limestone, dolostone *(?)conformable; lateral equivalent of lower DP*	
Silurian	Siltstone unit	Ssp	Siltstone *base not exposed*	180(?)

TABLE OF FORMATIONS

Period/Epoch	Formation	Map unit	Lithology	Thickness (m)
SELWYN BASIN (OFFSHELF FACIES: LATE PROTEROZOIC TO MIDDLE DEVONIAN)				
Ordovician and Silurian	ROAD RIVER GROUP	OSR	SS, OSD	
	Steel Formation	SS	Siltstone, mudstone *(?)locally unconformable*	250
	Duo Lake Formation	OSD	Chert, shale *conformable on* ЄORG, ЄORT*; locally unconformable on* ⱣЄH	175–200
Cambro-Ordovician	Menzie Creek Formation	OM	Basalt, tuff *interfingers with* ЄORT*, conformable on* ЄORV	430+
	Rabbitkettle Formation	ЄORG	Gold Creek facies: siltstone, limestone *interfingers with* ЄORT*; unconformable on* ЄG, ⱣЄH	270
		ЄORT	Twopete facies: siltstone *interfingers with* ЄORG,OM*; conformable on* ЄG	600–800(?)
		ЄORV	Vangorda facies: calcareous phyllite *conformable on* ЄG	500
Lower Cambrian	Gull Lake Formation	ЄG	Shale, siltstone, limestone; mica schist *conformable on* ⱣЄN	0–400
Proterozoic and Lower Cambrian	HYLAND GROUP	ⱣЄH	ⱣЄN, ⱣY	
	Narchilla Formation	ⱣЄN	Shale, sandstone *conformable*	0–630
	Yusezyu Formation	ⱣY ⱣY1	Shale, sandstone, quartz-pebble conglomerate, minor limestone limestone; *base not exposed*	500+ 0–250
PRE-TERTIARY ROCKS SOUTHWEST OF TINTINA FAULT				
Cretaceous	Cassiar Plutonic Suite	KC	Biotite quartz monzonite intrusive into strata on both sides of St. Cyr Fault	
BETWEEN ST. CYR AND TINTINA FAULTS				
ST. CYR ASSEMBLAGE (OFFSHELF AND SHELF FACIES: CAMBRIAN TO TRIASSIC)				
Triassic	Shale-limestone unit	uTRsc	Shale, siltstone, sandstone, limestone *(?)unconformable*	100+
Carboniferous	Limy clastic unit	Csl	Shale, siltstone, limestone *conformable*	150?
	Argillite-chert unit	Mtf	Chert, slate *conformable*	150?
Devono-Mississippian	Black argillite unit	DMs	Shale, sandstone, chert conglomerate *(?)unconformable*	150?
	Limestone-phyllite unit	DMcsl DMcsl1	Phyllite, limestone; minor siltstone, black slate, and quartz arenite Limestone *(?)conformable on* ODsl	200? 30?
Ordovician to Devonian	Black slate unit	ODsl	Black pyritic slate *(?)comformable*	400+
Cambro-Ordovician	Silty limestone unit	ЄOc	Shale and silty limestone *base not exposed*	400+
SOUTHWEST OF ST. CYR FAULT				
POST-CASSIAR PLATFORM (TURBIDITE BASIN: DEVONO-MISSISSIPPIAN)				
Devono-Mississippian	Black clastic unit	DMs	Shale, sandstone *(?)unconformable*	600+
CASSIAR PLATFORM (SHELF FACIES: SILURO-DEVONIAN)				
Siluro-Devonian	Dolostone unit	SDdq	Dolomite, dolomitic sandstone *conformable*	1000
Silurian	Platy siltstone unit	Sst	Dolomitic siltstone *unconformable*	400
PRE-CASSIAR PLATFORM (OFFSHELF FACIES: LATE PROTEROZOIC TO MID-SILURIAN)				
Cambro-Ordovician to Silurian	Black shale unit	OSsl	Slate *conformable*	0–40
	Phyllite unit	ЄOsl	Calcareous phyllite, limestone *(?)unconformable*	450
Proterozoic to Cambrian	Slate unit	ⱣЄp ⱣЄp1	Slate, quartz sandstone Phyllitic limestone, siltstone *base not exposed*	1000 + 0–350

Strata southwest of Tintina Fault were deposited at least 430 km, and perhaps as much as 650 km to the southeast of correlative strata now facing them on the northeast (Gabrielse, 1985; Gabrielse et al., 2006). Those southwest of St. Cyr Fault (Pelly Mountains assemblage) are upper Proterozoic to Devonian. These strata include a thick Siluro-Devonian carbonate platform (Cassiar Platform; Fig. 6, 9) underlain by continental margin strata of off-shelf affinity (pre-Cassiar Platform succession) and overlain by a Devono-Mississippian rift succession (post-Cassiar Platform succession).

Strata between St. Cyr and Tintina faults (St. Cyr assemblage; Fig. 9) form a Cambrian to Carboniferous off-shelf succession that contrasts in facies with parautochthonous strata both to the northeast and southwest, indicating possible transcurrent displacement along St. Cyr Fault in addition to that documented along the Tintina Fault.

Diverse structural styles produced during Mesozoic contraction and intrusive bodies of the mid-Cretaceous Selwyn Plutonic Suite and contemporaneous extrusive South Fork volcanic rocks are well displayed in the mapped area. Locally preserved Tertiary volcanic and sedimentary rocks suggest extension and coincident dextral displacement along Tintina Fault.

The rock-unit descriptions that follow are grouped into the major tectonic assemblages described above. Lithological descriptions and environmental interpretations are largely field based; supplementary petrographic work was done only for a few selected map units. Appendices contain paleontological identifications with a geological time chart indicating conodont and graptolite faunal zones, a key to map area names mentioned in the text, as well as tables of isotopic dates and mineral occurrences. (The geological time chart is not the current standard (e.g. Gradstein et al., 2004), but reflects usage current with the paleontological determinations.)

PRE-TERTIARY STRATIGRAPHY: NORTHEAST OF TINTINA FAULT

Selwyn Basin: late Proterozoic to mid-Devonian

Selwyn Basin strata within the project area consist of shale, limestone, mafic volcanic rocks, chert, sandstone, and grit. They were deposited in relatively deep water, west of equivalent shallow-water sediments of Mackenzie Platform and east of shallow-water carbonate and quartz sandstone of the Siluro-Devonian McEvoy Platform. Selwyn Basin units include the Precambrian-Lower Cambrian Hyland Group, consisting of the Yusezyu and Narchilla formations, the Lower Cambrian Gull Lake Formation, the Cambro-Ordovician Rabbitkettle and Menzie Creek formations, and the Ordovician-Silurian Road River Group, including the Duo Lake and Steel formations. Lower and Middle Devonian chert and shale (basal Portrait Lake Formation) are depositionally a part of the Selwyn Basin, but because they form part of an indivisible succession including upper Devonian strata of the Earn assemblage, they are described under that heading.

Hyland Group (PꞒH)

Gritty clastic rocks and carbonate of the Yusezyu Formation and overlying maroon shale and minor sandstone of the Narchilla Formation compose the Hyland Group (Gordey and Anderson, 1993). These rocks form the core of Dragon anticline, a regional-scale fold that trends northwest through the central part of Sheldon Lake map area into northeast Tay River map area. Other exposures are found in structural culminations north and east of Stokes Lake and south of Teddy Lake.

Yusezyu Formation (PY)

The Yusezyu Formation is a thick succession of sandstone and interbedded siltstone and shale capped by a locally prominent limestone member. Regionally, it is the oldest unit exposed in the Selwyn Basin. It is overlain sharply and conformably by the Narchilla Formation, or unconformably by lower to upper Paleozoic units. At least 600 m of strata are exposed within the project area. Coarse clastic beds typically weather grey, tan-buff, or orange and are composed of medium grey, fine- to very coarse-grained, quartzose sandstone. Locally the sand is pebbly, with rounded quartz pebbles reaching 1–2 cm across. Sandstone beds are typically 1 m thick, but may reach up to 4 m thick and are commonly massive, or rarely laminated. Some beds display graded bedding and many contain scattered intraclasts of dark shale to a few centimetres across. Grey- or rust-weathering laminated siltstone and shale are interbedded with the sandstone on a scale of less than 1 m to several metres. On fresh surface, the fine clastic rocks are light apple-green to dark greenish-grey, and less commonly dark blue-grey. The proportion of coarse- to fine-grained clastic rocks varies from place to place, but typically at least half of any given section or exposure is fine- to coarse-grained sandstone.

Quartz is the predominant constituent of the sandstone, and many of the coarse grains are opalescent blue. Petrographic study shows the sand to be composed of well rounded to subrounded mono- and polycrystalline quartz (80%), rounded feldspar (<10%), detrital white mica (1%), and tourmaline (trace), amidst a matrix (10%) of finely intergrown felsic minerals and white mica. Silica cement as overgrowths was noted on some grains. Blebby secondary opaque mineral(s) account for less than 1% of the rock. The feldspar framework grains are fresh and include dominant plaid-twinned microcline and perthitic K-feldspar, as well as lesser twinned albite.

The Yusezyu Formation is capped by a member of light grey- to white-weathering carbonate (limestone member; PY1) that ranges from 0 m to as much as 250 m in thickness. It is most widely exposed and thickest in northwestern Sheldon Lake map area between Riddell and South Macmillan rivers where it comprises light to dark grey, very fine crystalline limestone in thick, massive beds. At one locality, the carbonate contains black chert lenses up to 20 cm thick and 3 m in length. At this same location the nearest exposed underlying beds, separated about 30 m stratigraphically, consist of fine-grained quartzose sandstone.

An estimated 40–50 m of limestone is exposed 14 km south of the outlet of Dragon Lake. There it is comprised mostly of very fine crystalline, white limestone that shows planar lamination and locally ripple crosslamination. Beds are typically about 0.2 m thick, but range up to 0.6 m. Bedding is well defined as parting surfaces between carbonate beds and also by interbeds of maroon and locally green slate to 0.1 m thick. The top of the exposed succession comprises at least 1 m of limestone conglomerate made of tabular to rounded clasts to 0.4 m in diameter of white, very fine crystalline limestone in a matrix of calcareous quartz sandstone. The basal contact of the member is not exposed, but the nearest exposed underlying strata, separated about 40 m stratigraphically, consist of orange-weathering, planar-laminated calcareous quartz sandstone with rare, thick interbeds of graded, medium-grained sandstone.

The limestone member also occurs at two localities south of Teddy Lake. About 12 km south-southwest of the lake it forms a mappable band of grey-weathering, grey, very fine crystalline massive limestone that strongly resembles the member west of Mount Riddell. Its base and top are not exposed, and its attitude uncertain, but an estimate of 75 m of exposed thickness may not be unreasonable. About 7 km south-southeast of Teddy Lake the member comprises light grey-weathering, massive recrystallized limestone of uncertain thickness. There its basal contact is covered, and structure is complex, but it apparently rests above coarse quartz-pebble conglomerate and interbedded, very well laminated grey-green siliceous argillite.

East of Mount Selous, the member comprises light grey-weathering, white to medium-grey, massive limestone that at one locality is apparently underlain by quartz-pebble conglomerate. In the area 9 km southeast of Mount Selous, grey-white-weathering, dark grey, fine crystalline limestone is about 120 m thick. Its argillaceous character and strong lamination contrast with the limestone member elsewhere; however, its stratigraphic position beneath at least 450 m of maroon to purple, green, and buff slate typical of the Narchilla Formation suggests it to be stratigraphically equivalent.

Narchilla Formation (PЄN)

The Narchilla Formation (Gordey and Anderson, 1993) is mainly exposed along Dragon anticline southeast of the Ross River, where it comprises up to 630 m of recessive maroon-weathering shale. It rests sharply and conformably above grey-brown-weathering coarse clastic rocks or white-weathering carbonate of the Yusezyu Formation and similarly underlies buff-brown-weathering shale of the Gull Lake Formation. Northwest of the Ross River it has been largely removed by erosion beneath the Rabbitkettle Formation and/or Road River Group. Its maroon-weathering colour is distinctive, making the formation easily recognized from a distance.

The Narchilla Formation consists mostly of maroon shale and slate punctuated by sharply defined interbeds of green slate or green quartzose siltstone up to 10 cm thick (Fig. 10). The maroon beds are typically less than 1 m thick and display internal thin beds or laminations defined by light to dark shades of colour. Locally, green slate occurs in intervals to 10 m thick or more that are generally devoid of maroon slate. The Narchilla Formation is dominated by fine clastic rocks. Rarely it contains thin to thick beds of medium- to coarse-grained quartzose sandstone, resembling that of the underlying Yusezyu Formation.

Northwest of the Ross River are only scattered occurrences of the Narchilla Formation. Southeast of Mount Selous as much as 450 m of well banded maroon to purple, green, and brown slate assigned to the Narchilla Formation overlie laminated limestone of the Yusezyu Formation limestone member. About 13 km south-southwest of Teddy Lake, rare outcrops of maroon slate apparently overlie the Yusezyu Formation carbonate, although the contact is covered.

Figure 10. Strikingly banded maroon argillite (dark) and light greenish-grey siltstone (light) diagnostic of the Narchilla Formation (105 J/07; 62°25.94'N, 130°50.10'W). Rock hammer for scale (34 cm long). Photograph by S. Gordey. 2012-098

Age and correlation of Hyland Group

No fossils were found within the Hyland Group in the project area, but based on trace fossils found in Nahanni map area and elsewhere, Fritz et al. (1983) and Gordey and Anderson (1993) suggested the Precambrian–Cambrian boundary occurs within the lower part of the Narchilla Formation. Regionally the formation contains the diagnostic Early Cambrian trace fossil *Oldhamia radiata* (Hofmann and Cecile, 1981) that is generally preserved in the absence of slaty cleavage, and rarely where cleavage is parallel to bedding. The coarse clastic Yusezyu Formation may be entirely latest Proterozoic as suggested by its conformable contact with the overlying Narchilla Formation and the likelihood that the turbiditic Yusezyu Formation beds were rapidly deposited.

Strata previously known as the informal 'grit unit' are equivalent to the Hyland Group. They outcrop widely over the Selwyn Basin region where they constitute the oldest exposed strata. In many areas, although not subdivided, they are characterized by gritty quartzose clastic rocks with maroon shale in their upper part. These rocks have been described from Flat River ('Grit Unit' of Gabrielse et al. (1973)), and Dawson, Larsen Creek, and Nash Creek (unit 3 of Green (1972, p. 20)) map areas. The last region, in west-central Yukon, contains a succession like that in Nahanni map area, consisting of gritty quartzose clastic rocks capped by a light-grey- to white-weathering limestone member (Yusezyu Formation equivalent), and overlain by maroon shale (Narchilla Formation equivalent) (Thompson and Roots, 1982, p. 409). Largely undivided Hyland Group clastic rocks are also widespread in Frances Lake (unit 1, Roots et al. (1966)), Bonnet Plume Lake, Nadaleen River, Niddery Lake, Lansing (unit Hs, Blusson (1974)), Mayo (units 1 to 9, Bostock (1947)), and McQuesten (unit 4, Bostock (1964)) map areas.

Cecile ((1981); units Hls, HCg1, and HCg2) and Cecile ((1984a, b); units Hq, Hl, HCa, and Hma) described strata in Niddery Lake map area that are here considered part of the Hyland Group. His limestone unit (Hls, Hl; Algae Lake Formation in Cecile (2000)) may correspond to the limestone member at the top of the Yusezyu Formation.

On the basis of trace fossils and stratigraphic position, Fritz et al. (1983) correlated the Yusezyu Formation with the Backbone Ranges Formation in Mackenzie Mountains (Gabrielse et al., 1973), and the limestone member with the middle carbonate member of the Backbone Ranges Formation. The Narchilla Formation is correlative with the Vampire Formation (Fritz, 1982) in the eastern part of Nahanni map area.

Gull Lake Formation (ЄG)

Brown- to grey-weathering strata of the Gull Lake Formation (Gordey and Anderson, 1993) occur in three widely separated areas. The formation underlies extensive areas of the Anvil Range where it comprises the oldest exposed strata and is conformably overlain by grey-weathering calcareous phyllite of the Rabbitkettle Formation. At scattered exposures along and near the southeast part of Dragon anticline it conformably overlies maroon slate of the Narchilla Formation and is overlain unconformably by white-weathering carbonate of the Rabbitkettle Formation. Thirdly, isolated occurrences of quartz-muscovite-biotite schist to noncalcareous phyllite flanking the southeast end of Big Timber Pluton are tentatively assigned to the Gull Lake Formation.

In the Anvil Range the formation comprises grey-brown- to rust-weathering, dark blue-grey to lustrous-grey phyllite, quartz-muscovite-biotite schist, minor marble and calc-silicate, and rare amphibolite. Sillimanite, staurolite, andalusite, garnet, and biotite porphyroblasts occur in the schist, with rocks of higher metamorphic grade flanking the mid-Cretaceous Anvil and Orchay batholiths (Tempelman-Kluit, 1972; Smith and Erdmer, 1990). Dark grey to black carbonaceous quartz, muscovite, and chiastolite phyllite and schist constitute about 10% of the formation as interbands in its upper 200 m and are important because of their association with the Anvil district sulphide deposits (Jennings and Jilson, 1986). Scattered lenses of light grey marble and thinly banded calc-silicate generally a few tens of metres thick are equally abundant (Jennings and Jilson, 1986). The largest body, up to (?)280 m thick, forms prominent grey-white-weathering bluffs northwest of the headwaters of Blind Creek comprising recrystallized and transposed marble containing layers and folia of mica schist.

The dominant layering in the pelitic rocks of the formation in the Anvil Range is a crenulation foliation on which an older planar structure is transposed. Folia bounding the resultant microlithons tend to become closer spaced with increasing metamorphic rank. The generally noncalcareous nature of the pelitic strata of the Gull Lake Formation distinguishes them from locally similar, but calcareous rocks of the overlying Rabbitkettle Formation. Excellent detailed descriptions of the mineralogy and chemistry of Gull Lake Formation pelite, carbonate, and amphibolite-greenstone in the Anvil Range were reported by Jennings and Jilson ((1986); their Mount Mye formation).

Flanking Otter Creek along the southwest limb of Dragon anticline the Gull Lake Formation comprises an estimated 400 m of rusty-brown-weathering, laminated and locally burrow-mottled, blue-grey to black slate. To the southeast near Pelly Lakes, isolated exposures comprise orange-weathering, burrowed, green argillite and well laminated greenish and rusty-weathering pale to dark grey siltstone.

The age of the Gull Lake Formation is constrained in its type area in Nahanni map area as Early and (?)Middle Cambrian. There a thin basal carbonate conglomerate contains Early Cambrian archaeocyathid clasts; its upper age is constrained by the Late Cambrian age of the unconformably overlying Rabbitkettle Formation. A similar age range is likely for unfossiliferous exposures along and near Dragon anticline; however, in the Anvil Range the lower Rabbitkettle Formation appears to interdigitate with, and therefore conformably overlie Gull Lake Formation strata (Jennings and Jilson, 1986). Although fossil control is lacking in the Anvil Range, an Early and (?)Middle Cambrian age for most of the formation there seems likely on the basis of strong regional lithological correlation. It is unclear whether lowermost beds in the range could be correlative with parts of the Hyland Group elsewhere.

In a description of the sulphide deposits of the Anvil Range, Tempelman-Kluit's (1972) unit 3, excluding the upper calcareous part of that unit, correlates with the Gull Lake Formation. Subsequently, Jennings and Jilson (1986) have mapped and described strata herein assigned to the Gull Lake as the informal Mount Mye formation. The Gull Lake Formation also correlates with similar strata in northern Niddery Lake (105-O) map area (unit lЄa, Cecile (1981); unit Єa and tЄa, Cecile (1984a)). There, Gull Lake Formation equivalents are interstratified with abundant mafic volcanic and volcaniclastic rocks. Abbot (1977) mapped phyllite like that of the Gull Lake Formation in Watson Lake map area containing lenses of Lower Cambrian archaeocyathid-bearing limestone.

The extent of lower Cambrian shale facies over much of the Selwyn Basin is unclear. As demonstrated in Sheldon Lake map area, Gull Lake Formation strata in many places may have been removed by erosion before the Late Cambrian and possibly before the mid-Ordovician. The Gull Lake Formation is probably largely equivalent to the Lower Cambrian Sekwi Formation of Mackenzie Platform, the Gull Lake slate representing off-shelf equivalents of the upper clastic-rich member of the Sekwi Formation (Gordey and Anderson, 1993); however, partial equivalence with the Middle Cambrian Rockslide and Avalanche formations of Mackenzie Platform cannot be excluded.

Rabbitkettle Formation (ЄOR)

The Rabbitkettle Formation (Gabrielse et al., 1973; Gordey and Anderson, 1993) comprises from 200 m to possibly 800 m of white- to buff-weathering strata dominated by argillaceous limestone and siltstone. Three laterally equivalent informal facies are designated. The Gold Creek facies is a heterolithic assemblage of limestone, shale, siltstone, chert, and minor sandstone found south of Itsi Lakes, north of the South Macmillan River, and along Dragon anticline and Jackfish syncline. To the southwest, the siltstone-dominated Twopete facies forms a northwest-trending belt on the northeast side of the Anvil Range and at Traffic Mountain. The Vangorda facies, found southwest of the Twopete facies and immediately flanking the Anvil Range, consists of phyllitic argillaceous limestone. With two exceptions (*see* 'Twopete facies ЄORT' below), the three facies are geographically separate.

The Rabbitkettle Formation forms an easily recognizable unit separating dark-weathering, noncalcareous, fine clastic strata of the underlying Gull Lake and Narchilla formations and overlying chert and shale of the Road River Group. Except in the Anvil Range, an unconformity at the base of the formation (Gordey and Anderson, 1993) accounts for regionally variable preservation of underlying Gull Lake and Narchilla formations (e.g. along Dragon anticline). Relations with the overlying Road River Group range from conformable to unconformable.

Gold Creek facies (ЄORG)

The Gold Creek facies (Fig. 11) is characterized by lithological variability, but limestone and shale predominate. Lateral stratigraphic relations among its component rock types are obscured by complex deformation and small size of exposures. Localities northeast of Dragon anticline and south of South Macmillan River feature beds up to 5 cm thick of fine- to medium-crystalline, grey-weathering grey limestone that alternate evenly with black, locally burrowed shale. Some silty limestone beds contain limestone nodules to 3 cm across that preserve ripple crosslamination internally. Silty shale commonly reveals striking white to black, tan, and grey lamination. Locally, the limestone is absent, and thin to medium beds of ripple crosslaminated, orange-brown-weathering calcareous quartz siltstone occur scattered within brown- to black-weathering black shale and siltstone. Along the southwest limb of Jackfish syncline northwest of Pelly River and along both limbs of this fold southwest of Dragon Lake are calcareous phyllitic shale with lenses and pods of limestone, as well as laminated argillaceous limestone. North of South Macmillan River exposures feature green, black, or tan argillite and lesser planar and ripple crosslaminated, tan-brown-weathering siltstone to sandstone and silty limestone. Locally the limestone occurs either as thin, even interbeds or in units up to 18 m thick. In the latter case, the limestone is light grey-weathering, black, fine crystalline, and arranged in irregular beds 10–30 cm thick. Conchoidally fracturing, grey-green to black chert evenly interbedded with grey-green argillite is also found in this area. North of Mount Gillis, poor exposures of grey-buff-weathering, medium to dark grey, very fine crystalline argillaceous limestone and calcareous phyllite are tentatively assigned to the Gold Creek facies.

At several localities limestone conglomerate beds are found within the Gold Creek facies. Along a ridge 8.0 km south of the outlet of Itsi Lakes, the clasts are subangular and consist of platy, fine- to medium-crystalline limestone to 5 cm across and 18–20 cm long, randomly oriented within

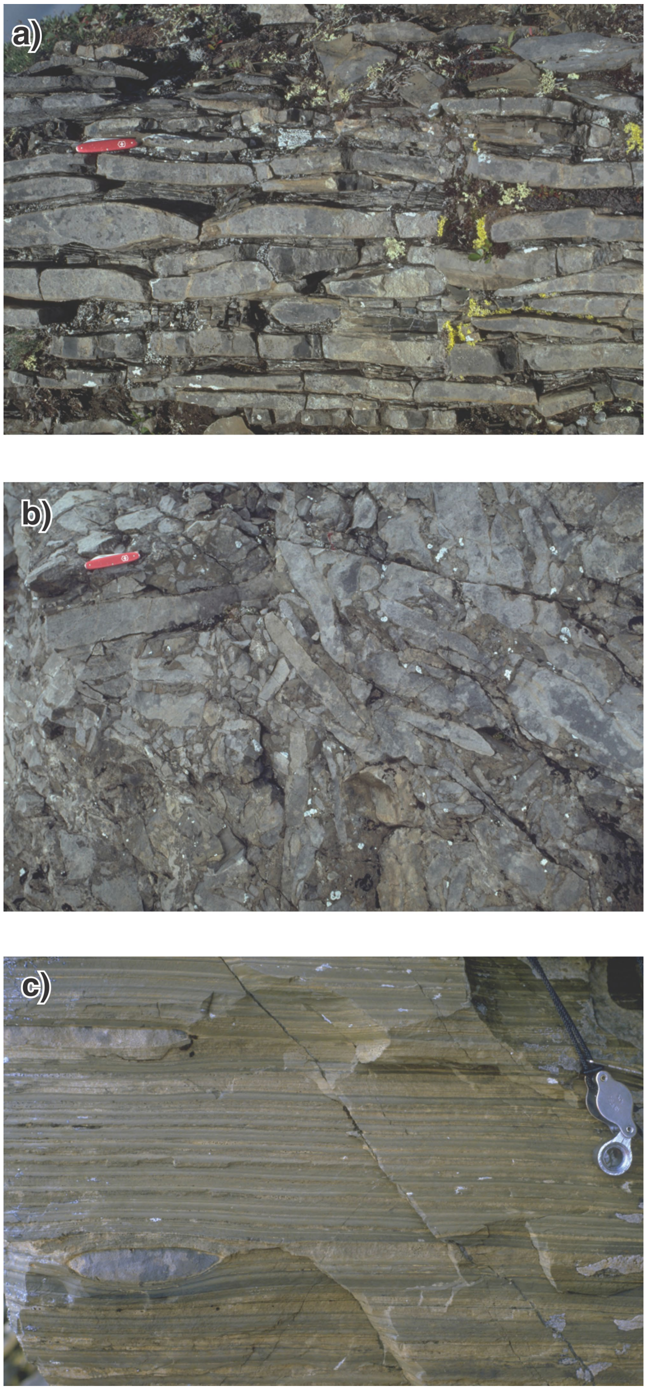


Figure 11. Rabbitkettle Formation (Gold Creek facies); **a)** lenticular bedded, well bedded limestone and shale of the Gold Creek facies, northeast Sheldon Lake area (105 J/16; 62°45.22'N, 130°16.35'W); pen knife for scale (upper left; 9 cm long); 2012-127; **b)** limestone conglomerate of the Gold Creek facies, northeast Sheldon Lake area (105 J/16; 62°45.22'N, 130°16.35'W); pen knife for scale (upper left; 9 cm long); 2012-111; **c)** well laminated calcareous siltstone with nodules of grey limestone of the Gold Creek facies (105 J/09; 60°56.88'N, 130°8.12'W); hand lens for scale (diameter of eyepiece 2 cm); 2012-119; photographs by S. Gordey.

an orangy, silty limestone matrix. At another exposure 10.7 km south-southeast of the outlet of Itsi Lakes a 4 m thick bed includes clasts that are generally tabular, angular to rounded, grey-weathering, grey to black fine crystalline limestone up to 3–4 cm thick and 30 cm long. The clast interstices are filled with brown-weathering mud. Locally the tabular clasts are stacked in parallel fashion so there is very little matrix between them. Another large exposure of conglomerate 23.8 km northwest of Mount Sheldon contains scattered rounded, equant limestone and very fine-grained quartz sandstone clasts to 40 cm across, matrix supported, within a scaly shale groundmass.

The Gold Creek facies is on the order of 270 m thick along Dragon anticline. In other areas thicknesses are uncertain because of incomplete exposure.

Twopete facies (ЄORT)

The Twopete facies (Fig. 12) consists of generally resistant, light- to dark-grey-weathering laminated argillite, siltstone, and lesser sandstone. The rock is well indurated so that talus and felsenmeer form large angular blocks. At many localities fresh and weathered surfaces are characterized by even, sharply bounded, parallel lamination in shades of dark grey, black, greenish-grey, white, and purplish-grey. At other places, lamination is indicated by slight differences in weathering texture rather than colour; fresh surfaces are massive, and dark grey to black. Most of the member is of very fine sand size or finer grained, but locally laminae include medium-grained sand. In a few places, medium-grained, clean, well sorted quartz arenite is several metres thick. Abundant small-scale folds, some perhaps of soft-sediment origin, occur locally. Other sedimentary structures are scarce and include bioturbation and rarely crosslamination. Bedding on a scale larger than lamination is characteristically absent.

Twopete facies strata adjacent to the southwest margin of Anvil batholith are composed of grey-white-weathering, very well indurated siliceous rock, laminated in shades of grey, green, white, and purple. Strata on the immediate northeast flank of the batholith are less typical of the Twopete facies and are only tentatively included within it. Rock types there include laminated medium- to coarse-crystalline limestone, laminated green and purple very fine-grained siliceous rock, and lesser quartzose biotite-muscovite schist.

At Traffic Mountain, strata typical of the Twopete and Gold Creek facies are found together. The crest and northeast slope seem dominated by the former, including siliceous argillite to siltstone containing rare, fine- to medium-grained quartz arenite. The siliceous fine-grained clastic rocks are strikingly and evenly laminated in shades of grey, green, white, and pink. The southwest part of Traffic Mountain is dominated by silty limestone and platy calcareous siltstone more typical of the Gold Creek facies. These calcareous rocks feature thin beds, lenses, and nodules of grey-weathering,

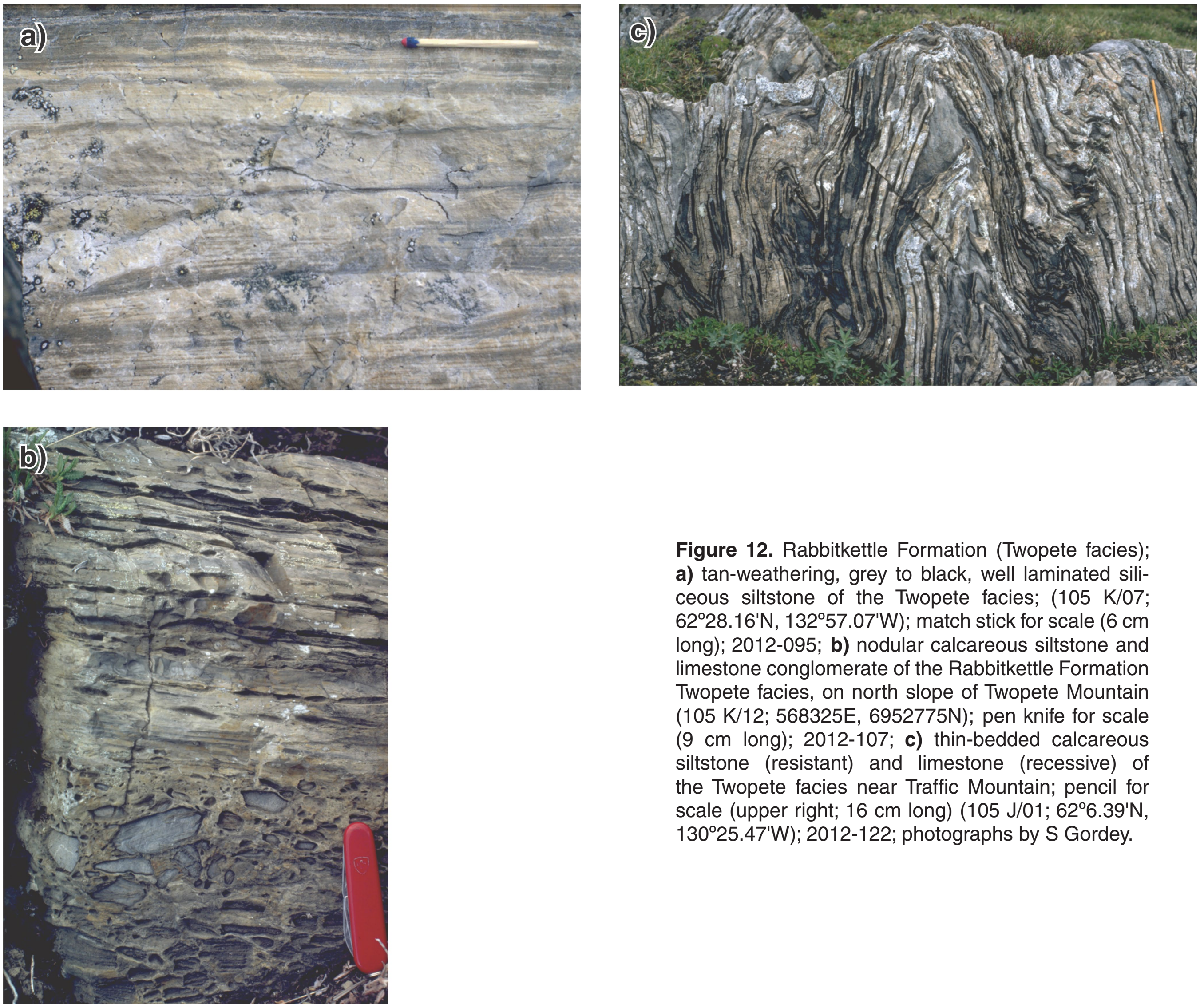


Figure 12. Rabbitkettle Formation (Twopete facies); **a)** tan-weathering, grey to black, well laminated siliceous siltstone of the Twopete facies; (105 K/07; 62°28.16'N, 132°57.07'W); match stick for scale (6 cm long); 2012-095; **b)** nodular calcareous siltstone and limestone conglomerate of the Rabbitkettle Formation Twopete facies, on north slope of Twopete Mountain (105 K/12; 568325E, 6952775N); pen knife for scale (9 cm long); 2012-107; **c)** thin-bedded calcareous siltstone (resistant) and limestone (recessive) of the Twopete facies near Traffic Mountain; pencil for scale (upper right; 16 cm long) (105 J/01; 62°6.39'N, 130°25.47'W); 2012-122; photographs by S Gordey.

fine crystalline limestone that weather out preferentially within a siliceous, silty matrix. The complex structure, as indicated by steep dips and local ubiquitous minor folds, combined with the brief examination of this area, renders the mapped distribution of facies as tentative. The relations of the two facies, whether in part structurally juxtaposed or in original stratigraphic continuity, are likewise unclear.

On the north slope of Twopete Mountain, the lowermost exposures include a possibly 30 m thick tongue of silty limestone and limestone conglomerate assigned to the Gold Creek facies. The silty limestone is buff-grey-weathering, calcareous, and laminated, with interbeds up to 5 cm thick of darker weathering, dark blue-grey fine crystalline limestone. The conglomerate is clast supported and composed of angular clasts of very fine crystalline, laminated, dark blue-grey limestone and rare oolitic limestone generally less than 5 cm, but rarely as large as 10 cm across.

About 8 km north-northwest of the north end of Blind Lakes a lens of greenstone less than 50 m thick occurs within the Twopete facies. It is a pale grey-green andesite-basalt with up to 30% amygdales of calcite, similar to volcanic rocks of the Menzie Creek Formation.

Over much of its exposure, the Twopete facies is not distant from mid-Cretaceous plutonic rocks, either at depth or laterally. Petrographic examination shows many samples from this facies to be hornfelsed. In coarser grained laminae, quartz silt and sand grain boundaries have become sutured. Originally fine-grained laminae have been altered to an intergrowth of very fine-grained, low-birefringent minerals (mostly (?)quartz, white mica, tremolite, epidote, and locally phlogopite); locally tremolite forms large irregular patches and subeuhedral porphyroblasts. The contact metamorphism has contributed to the strong induration of the unit, and to the conchoidal fracture pattern and flinty aspect of these rocks.

The degree of internal deformation of the Twopete facies is not understood. Its aggregate thickness calculated from map and cross-section is on the order of 600 m in central Tay River map area. Near Twopete Mountain it may be as much as 800 m.

Vangorda facies (ЄORV)

The Vangorda facies (Fig. 13) consists largely of lustrous, silver-grey, calcareous phyllite, typically cut by centimetre-sized quartz-carbonate pods and calcite veins. The rock may be uniformly pelitic in composition, or consist of thin alternating laminae of carbonate and pelite. On the northeast flank of Anvil batholith a secondary lithology includes grey-green parallel-laminated siltstone, containing lenses of limestone up to 15 cm long and up to 5 cm thick. Where strongly laminated the siltstone parts into plates and thin sheets along bedding. On the southwest flank of the batholith, the dominant fissility is a crenulation cleavage that is axial planar to ubiquitous small-scale folds. In this area also, the Vangorda facies includes (?)sills of light grey-green pyritic greenstone and diorite 1–100 m thick, as well as units of green-grey chloritic tuffaceous phyllite. The greenstone may amount to 50% of the upper part of the facies (e.g. Jennings and Jilson, 1986). The Vangorda facies is described in detail by Jennings and Jilson ((1986); their informal Vangorda formation), who also reported chemical analyses of Vangorda phyllite, calc-silicate, and metavolcanic rocks.

The Vangorda facies is on the order of 500 m thick on the northeast side of the Anvil batholith. About 1000 m are suggested by Jennings and Jilsen (1986) for its thickness on the southwest side of the batholith.

Menzie Creek Formation (OM)

The Menzie Creek Formation comprises dark-weathering, basaltic volcanic rocks exposed in the central part of Tay River map area northeast of the Anvil Range, for similar strata south of Mount Menzie, and for small exposures of volcanic strata on the southwest flank of the Anvil Range. It conformably overlies calcareous phyllite or siliceous siltstone of the Rabbitkettle Formation (Vangorda and Twopete members). Its top is not exposed. The formation is named after Menzie Creek (mouth of creek at 62°45'N, 134°32'W), a stream that is 10–15 km distant from the nearest exposures of the formation examined in this study. Despite this geographic separation, the name is used to conform to well known, although informal nomenclature previously established in the Anvil Range area (Jennings and Jilson, 1986). Furthermore, exposures of little studied, but similar and likely correlative volcanic rocks are found within the Menzie Creek drainage in eastern Glenlyon map area.

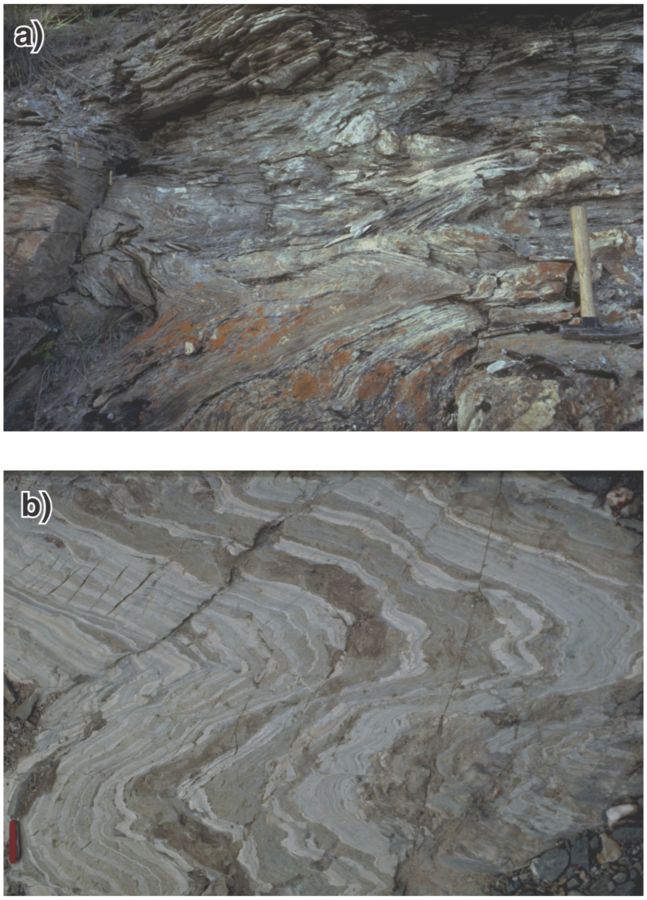


Figure 13. Rabbitkettle Formation (Vangorda facies); **a)** recumbently folded calcareous phyllite of the Vangorda facies (105 K/03; 62°14.23'N, 133°7.61'W); rock hammer for scale (34 cm long); 2012-124; **b)** (?)tuffaceous laminae are well displayed on glacially smoothed outcrop surface of greenish phyllite of the Vangorda facies (105K/03; 62°11.84'N, 133°1.92'W); pen knife for scale (lower left; 9 cm long); 2012-096; photographs by S. Gordey.

Type section (62°28.555'N, 133°19.439'W; UTM zone 8, 586406E, 6928321N)

The type locality represents the thickest and best exposed succession known in the region, totaling 437 m. The top of the formation is not exposed; the highest measured beds are at the top of a peak (6608 ft.; 2014 m). The line of measurement is down the northeast slope leading from this peak. Bedding is subhorizontal. The section was examined in reconnaissance using an altimeter to measure thickness.

The type section is divisible into three members. The lower (169 m thick) and upper (204 m thick) members consist of dark-weathering, massive, light- to medium-green aphanitic andesite-basalt and breccia. Clasts range up to 1.5 m in diameter, are typically subrounded, and rarely are clast supported. Most are composed of aphanitic green volcanic rock similar to the matrix, but others are highly vesicular or amygdaloidal. These two members are sharply separated by a middle member (64 m thick) of fine-grained volcanic tuff that is strikingly laminated in shades of green, purple, and brown. The base of the formation is poorly exposed, but appears to rest sharply and conformably above calcareous phyllite and laminated shale and limestone of the Rabbitkettle Formation (Vangorda facies). It is defined at the uppermost beds of the Rabbitkettle Formation beneath a substantial thickness of volcanic strata. Within its upper part, the Rabbitkettle Formation contains scattered tongues or lentils of Menzie Creek Formation consisting of grey-green aphanitic andesite-basalt pillow lava, the lateral extent and thickness of which are uncertain. The lava is highly vesicular with vesicles elongate outward toward the edges of the pillow margins. Pillows range up to 0.5 m in diameter.

Elsewhere the formation comprises massive aphyric andesite-basalt and from 30% to 80% breccia (Fig. 14). The breccia is composed of angular fragments to fist-size, but generally 3–4 cm in diameter, of predominantly aphanitic green volcanic rock. The proportion of vesicular or amygdaloidal fragments varies locally. The very fine-grained matrix is dark greenish-grey. Both clast- and matrix-supported breccia are common. Locally, breccia is cut by coarse crystalline carbonate veins and pods. Minor occurrences of fine-grained tuff are distinguished by an orange-weathering colour as opposed to the dark grey typical of other rock types of the formation. The flow rocks are dense, locally pillowed, and amygdaloidal with calcite- and chlorite-filled amygdales up to 1 cm across. Lenses of fine crystalline, light grey limestone occur rarely.

The formation directly south of Mount Menzie was not examined in detail; however, it appears to comprise mostly dark grey-green, blocky, massive, and well indurated aphanitic greenstone resting above dark green-grey, very well laminated and strongly folded strata of the Rabbitkettle Formation (Twopete facies). As the contact is approached from below, the laminated strata darken in colour and the lamination becomes thicker and less distinct. Some of the dark laminae within the Twopete facies are probably tuffaceous in origin. Rare outcrops of thin-bedded, silty limestone, a rock type diagnostic of the Rabbitkettle Formation, are found locally beneath the laminated succession.

Southwest of Anvil batholith scattered outcrops tentatively assigned to the Menzie Creek Formation include massive, light greyish-green, pyritic greenstone. Whether these represent volcanic tongues or lentils of Menzie Creek Formation as seen elsewhere within the upper part of the Rabbitkettle Formation (Vangorda facies), or an incompletely preserved, once-continuous thick succession of Menzie Creek Formation strata is unclear.

Age and correlation of Rabbitkettle and Menzie Creek formations

The Gold Creek facies contains conodont and graptolite fauna ranging from Late Cambrian to earliest Middle Ordovician (early Llanvirn) (Appendix B). The age of the Twopete facies is poorly known, but appears to coincide with that of the Gold Creek facies. A single long-ranging graptolite found within the Twopete facies, and graptolites from overlying Duo Lake strata indicate its uppermost beds are (?)early Middle Ordovician. Its lower beds, like those of the Gold Creek, rest above probable Lower or Middle Cambrian strata (Gull Lake Formation). Fossils have not been recovered from the Vangorda facies; however, a Cambro-Ordovician age is suggested by similarity in lithology and stratigraphic position to Rabbitkettle Formation strata of this age elsewhere in Selwyn Basin. An Early Ordovician (Tremadocian) age for the overlying Menzie Creek Formation is indicated by a single conodont locality (K06-1) collected from a limestone lens. A lens of black slate (assigned to the Duo Lake Formation) at another locality (K06-2) within or overlying the volcanic rocks yielded a graptolite of late Early (Arenigian) to early Middle (Llanvirnian) Ordovician age.

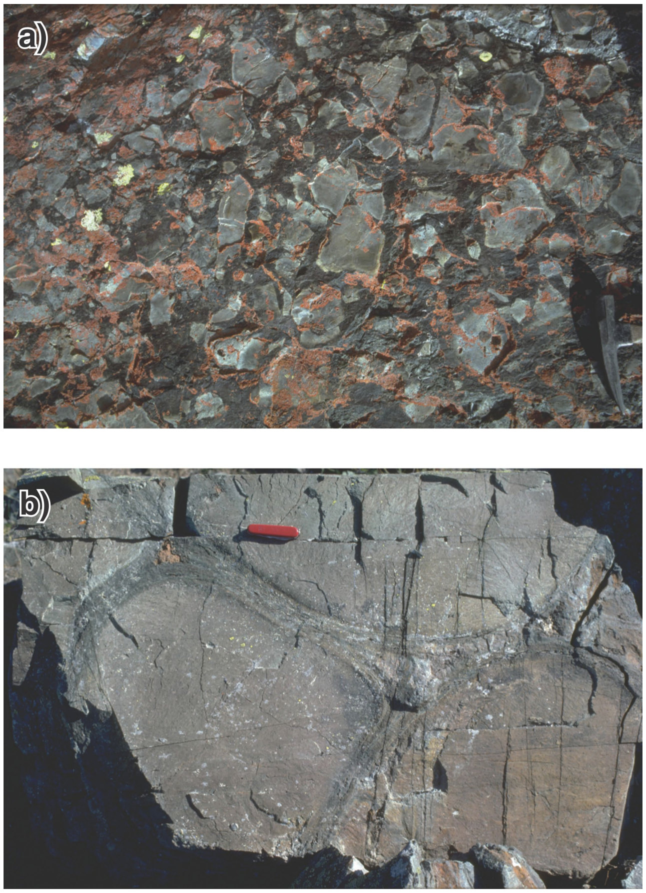


Figure 14. Menzie Creek Formation; **a)** volcanic breccia with aphanitic 'bleached' volcanic clasts in fine-grained matrix. (105 K/07; 62°26.85'N, 132°59.22'W); rock hammer (pick-end) for scale (lower right; 17 cm long); 2012-100; **b)** fragment of pillow lava showing chilled pillow margins (105 K/06; 62°25.87'N, 133°0.48'W approximately); pen knife for scale (9 cm long); 2012-103; photographs by S. Gordey.

Cambro-Ordovician basinal limestone is widespread in the northern Cordillera. The Rabbitkettle Formation is widely recognized over the Selwyn Basin including Nahanni (Gordey and Anderson, 1993), Flat River, and Glacier Lake map areas (Gabrielse et al., 1973), and in Niddery Lake, Sekwi Mountain, Mount Eduni, and Bonnet Plume Lake (NTS 106 B) map areas (Cecile, 1982). Abbott (1977) described Cambro-Ordovician calcareous, thinly laminated or nodular phyllite in Watson Lake map area, similar to that in Anvil Range. In the Richardson Mountains, the basal part of the Cambrian to Devonian Road River Formation is lithologically similar to the Rabbitkettle Formation (Cecile et al., 1982). Cambro-Ordovician basinal strata in Cassiar (Kechika Group of Gabrielse (1963, 1998)) and Pelly (Kechika Group of Gordey (1981b)) mountains comprise calcareous phyllite to limestone. In many of the above areas basic volcanic tuffs, flows, and volcaniclastic rocks similar to the Menzie Creek Formation occur as laterally discontinuous units ranging in thickness from a few metres to several tens of metres (Cecile, 1982). Thick accumulations of Ordovician mafic volcanic rocks have been mapped elsewhere in Selwyn Basin (Cecile (1982): Marmot Formation) as well as southwest of Tintina Fault in the Pelly Mountains (Gordey (1981b) unit uЄOv; Tempelman-Kluit (1977), unit ЄOvb).

The Menzie Creek Formation corresponds to parts of the Anvil Range Group as mapped by Tempelman-Kluit ((1972), unit 8b). Tempelman-Kluit did not realize the rocks he included within the Anvil Range Group contained similar-looking Permian and Ordovician volcanic rocks of quite different tectonic affinities. For this and other reasons indicated below (*see* section 'Slide Mountain Terrane') use of the term Anvil Range Group has been discontinued.

Road River Group (OSR)

The Road River Group (Gordey and Anderson, 1993) consists of light- to dark-weathering shale and chert of the Duo Lake Formation and overlying, dominantly orange-weathering mudstone, siltstone, and chert of the Steel Formation. The upper limit of white- to dark-grey-weathering carbonate and siltstone or green shale of the Rabbitkettle Formation marks its base. The group is overlain by the Portrait Lake Formation (basal Earn Group), which is an indivisible sequence of Lower to Upper Devonian black shale and chert.

The Road River Group underlies extensive areas of central and northeastern Sheldon Lake map area, northern Tay River map area, and areas near Laforce Lake and south of Tay River. Its constituent formations can be recognized throughout this region, even though complex deformation in many areas did not permit them to be separately shown at the scale of mapping. Over wide areas, structurally imbricated or folded Duo Lake and Steel formations form alternating bands that are on the order of 50–100 m thick.

Duo Lake Formation (OSD)

In the central part of Sheldon Lake and in northern Tay River map areas the Duo Lake Formation (Fig. 15) consists mostly of light to dark grey conchoidal-fracturing chert in nonlaminated beds from 5 cm to up to 30 cm thick in exposures that weather black, light grey, or orange. Black, grey-green, and white varieties of chert are less common and conspicuous apple green to turquoise chert locally occurs northwest of Mount Riddell. Bedding is generally defined by an irregular parting, in places accompanied by thin shaly seams. Exhumed bedding surfaces are wavy and knobby rather than smooth and planar. Some surface irregularities reflect bioturbation as does local vague wispy lamination. Visible radiolaria compose up to 10–15% of some hand samples, but in most the siliceous tests are not seen. Distinctive ribs of bedded chert up to 100 m thick can be traced over several kilometres in the northern part of Sheldon Lake map area. In other areas the chert is probably of similar or lesser thickness, but its topographic expression is less distinct. The topmost part of the formation comprises recessive black- to blue-black-weathering, black siliceous shale and thin-bedded chert. This commonly graptolitic interval may be up to 75 m thick, but in most places is thinner or absent beneath the overlying Steel Formation.

Southeast of Laforce Lake, poorly exposed graptolitic beds of the possible upper part of the formation consist of rust-brown-weathering, dark blue-grey shale that contain 10% medium to thick beds of calcareous, medium-grained, clean quartz sandstone. West of Laforce Lake rare exposures of massive, blue-grey-weathering grey chert may represent the lower chert member of the formation seen elsewhere.

In central Tay River map area, the Duo Lake Formation is about 200 m thick and consists entirely of recessive, dark-grey- to blue-black-weathering, black siliceous shale and thin-bedded black chert. The resistant thin- to medium-bedded chert member recognized elsewhere is not developed. Furthermore, the overlying Steel Formation in this area is locally absent, so that beds mapped as Road River Group include indistinguishable Lower Devonian thin-bedded black siliceous shale and chert that would otherwise be mapped as Portrait Lake Formation. Several occurrences of quartz arenite within these Lower Devonian beds are noteworthy. One occurrence (62°26.16'N, 133°3.16'W) 7 km south-southwest of a high peak at 6667 ft. (2032 m) consists of at least two very thick (2 m) beds of blue-grey, fine-grained, quartz arenite separated and underlain by platy tan-brown-weathering siliceous siltstone and well laminated black chert scree. About 7 km west-northwest of the same peak are three other occurrences (62°30.61'N, 133°2.78'W; 62°30.36'N, 133°9.06'W; 62°31.74'N, 133°11.60'W) of fine- to medium-grained quartz arenite felsenmeer and poor outcrop, that probably represent beds less than 3 m thick within black siliceous shale, argillite, and chert. Found among scree of siliceous shale and chert in the same vicinity (62°31.17'N, 133°9.36'W) were numerous pieces of silica-replaced

Figure 15. Duo Lake Formation; **a)** grey- to black-weathering, resistant, medium-bedded, grey chert forms a prominent rib in northern Sheldon Lake map area (105J/14; 62°54.51'N, 131°21.31'W); Jacob staff for scale (0.5 m intervals); 2012-090; **b)** thin- to medium-bedded, grey to black laminated chert, south-central Sheldon Lake area (105 J/07; 62°16.16'N, 130°43.12'W); hand lens for scale, lower left (diameter of eyepiece 2 cm); 2012-115; photographs by S. Gordey.

carbonate with well preserved molds of crinoid ossicles, many with twin-axial canals. These double-holed crinoid stems indicate derivation from a late-Early to early-Middle Devonian age limestone (cf. Gordey and Anderson, 1993). The quartz arenite and crinoid-bearing beds are lateral equivalents of the sandstone-carbonate unit.

The distribution of predominantly thin- to thick-bedded chert of the Duo Lake Formation is shown on Figure 16. Stratigraphically equivalent black siliceous shale with minor chert flanks this central chert 'corridor'.

The Duo Lake Formation rests with presumed conformity above the Rabbitkettle Formation in most areas. Eight kilometres west-southwest of Mount Riddell, however, well bedded, thin- to medium-bedded, light grey chert of the formation rests above limestone of the Hyland Group. Both the upper Hyland Group (Narchilla Formation) and Rabbitkettle Formation are missing at this locality. The thin, localized occurrences of Rabbitkettle Formation strata in the northern poorly exposed part of Tay River map area may also result from an unconformity beneath the Duo Lake Formation. The maximum amount of missing section directly attributable to erosion prior to Duo Lake Formation is uncertain because the total hiatus may also reflect some erosion predating the Rabbitkettle Formation.

Graptolitic shale of the upper part of the Duo Lake Formation is thin to absent in parts of northern Sheldon Lake map area, which may result from an unconformity beneath the overlying Steel Formation.

Steel Formation (SS)

The orange- to rust-weathering Steel Formation (Gordey and Anderson, 1993) forms an easily mapped marker unit between the dark-weathering black shale and chert of over- and underlying Portrait Lake and Duo Lake formations. The dominant rock type is massive to even-bedded, pale green to blue-grey pyritic argillite to siltstone (Fig. 17). In some places the pyrite is finely disseminated, in others it forms millimetre-sized cubes. Highly siliceous varieties are resistant and blocky weathering, whereas less siliceous types form a recessive splintery scree. Where not massive, beds typically range from 2–10 cm in thickness. Thin-bedded, green and grey-green conchoidally fracturing chert is the dominant rock type in some places. Lamination in shades of grey to orange is common in both argillite and chert, but is typically disrupted by burrowing to form a characteristic wispy pattern. Laminated black chert in beds 2–10 cm thick is another common, but minor constituent. Thin beds and concretions of orange-weathering, blue-grey dolostone and limestone occur rarely. Rare beds of black shale, less than 1 m thick are the only rock type from which graptolites have been recovered.

Complex structure and poor exposure render thickness estimates for the formation uncertain. Apparent thicknesses of Steel Formation within homoclinal, structurally imbricated zones vary from less than 50 m to as much as 250 m. The latter thickness is a reasonable maximum for the formation, whereas the former likely represents an incomplete section. In central Tay River map area the thickness abruptly decreases across a fault with probable Late Silurian and/or Early Devonian displacement to less than 30 m (*see* 'Structural geology and tectonics' section; *see* fault labelled D on Fig. 41). Locally in this region the formation is absent

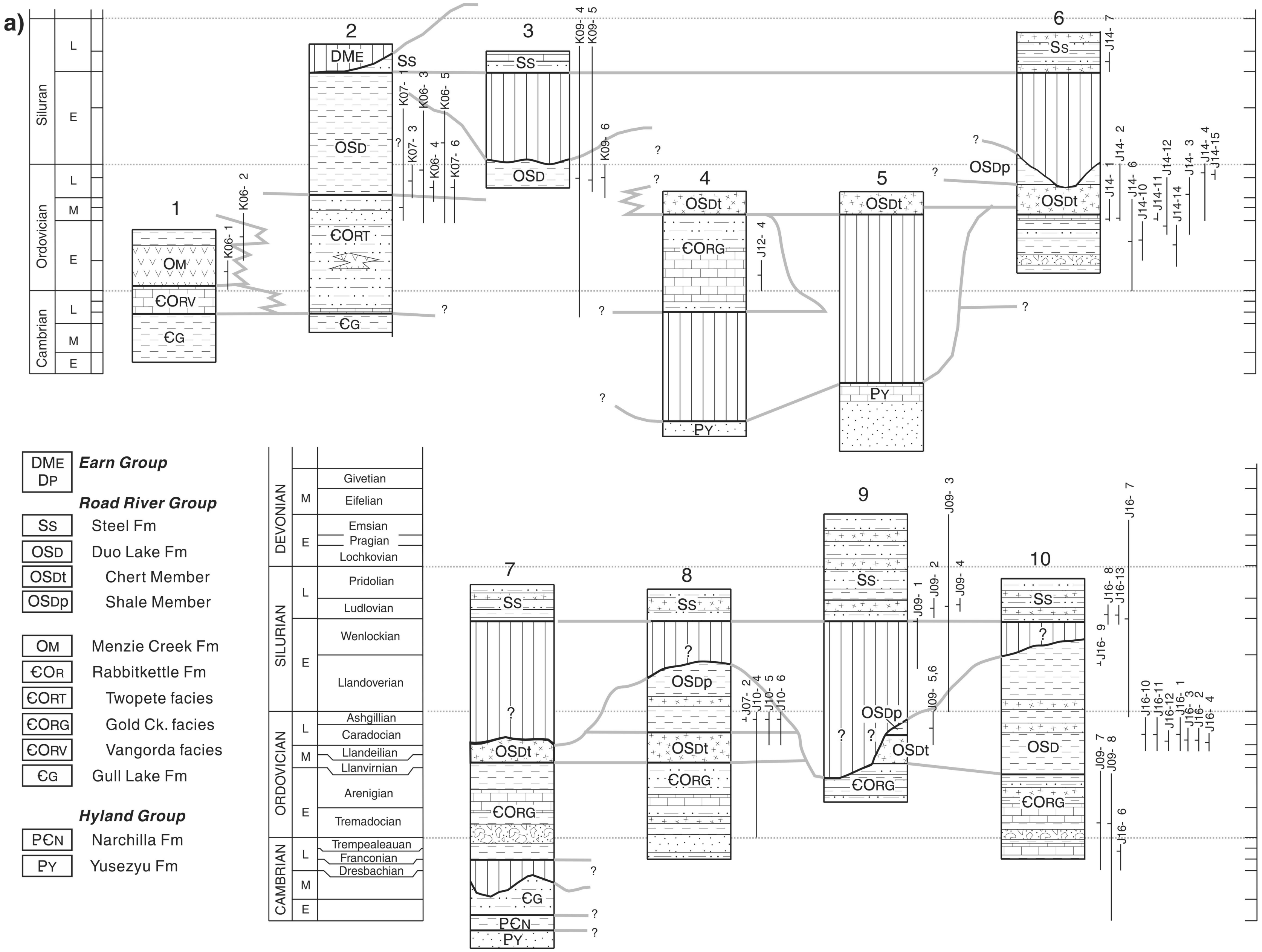


Figure 16. Three time-stratigraphic transects illustrating stratigraphic relationships and rock types for Selwyn Basin strata. Rock types and proportions are based on traverses and observations in the areas shown in the inset. The age range of pertinent fossil collections from the different stratigraphic units is also shown.

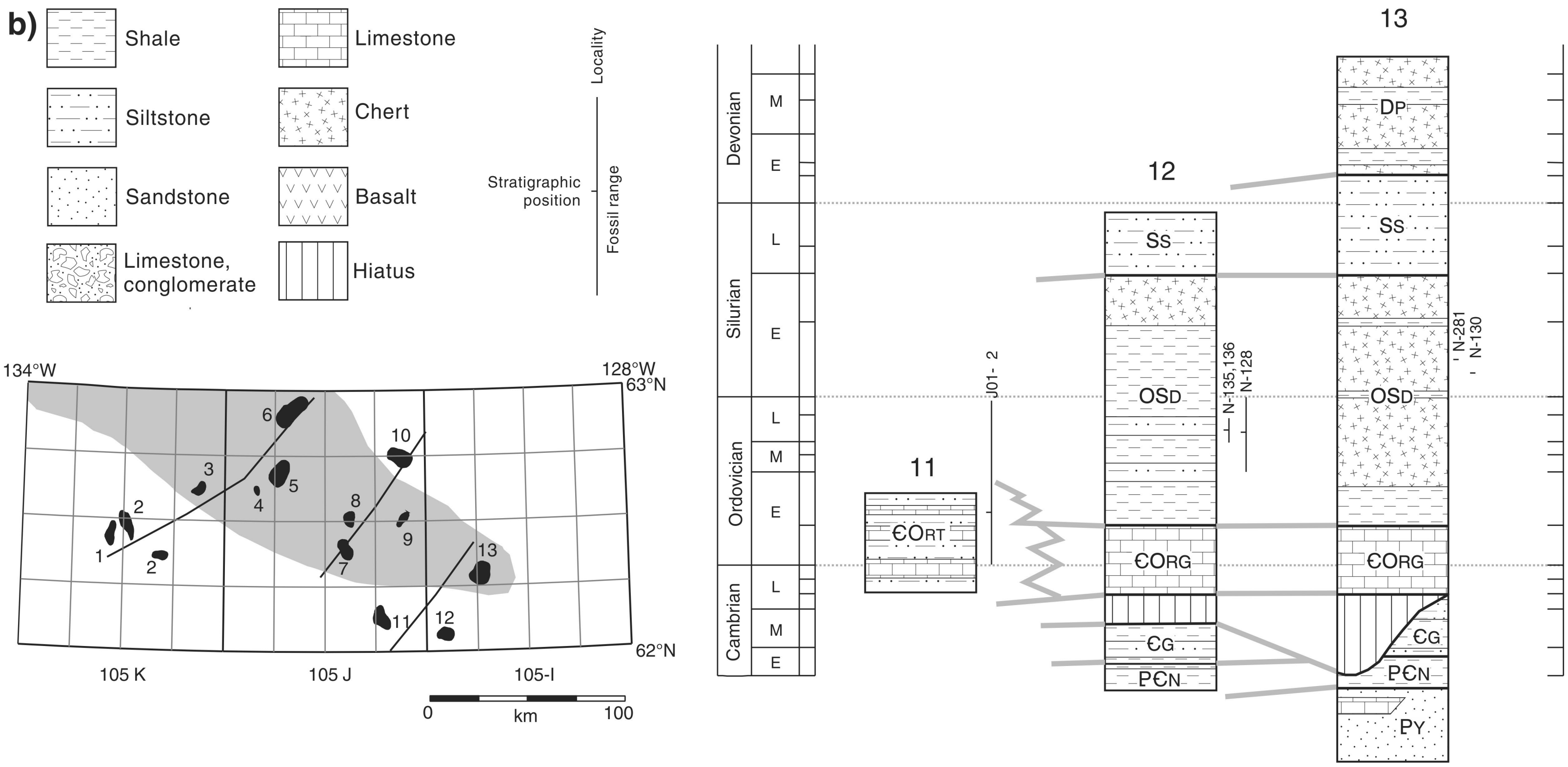


Figure 16. (cont.)

so that Early Devonian black shale and chert may rest above and be included within similar rock types of the Duo Lake Formation in apparent undivided succession.

In northern and central Sheldon Lake map area, an unconformity is indicated at the base of the Steel Formation by the absence of the upper graptolitic shale of the Duo Lake Formation. The basal contact of the Steel Formation, however, was not seen in outcrop and the lateral extent and continuity of this erosion surface are uncertain. In contrast, the basal contact appears conformable in Nahanni map area to the east (Gordey and Anderson, 1993). The Steel Formation is overlain conformably to unconformably by Early Devonian strata.

Age and correlation of Road River Group

The Duo Lake Formation is Middle Ordovician to Early Silurian (Llanvirnian to Llandoverian). The lower chert member is bracketed by graptolite faunas as Middle to early Late Ordovician (Llanvirnian to Caradocian). Graptolites collected from overlying black shale and chert that form the top of the formation are dominantly Ashgillian. Early Silurian fossils are notably sparse; however, two short-ranged collections, from beds closely underlying the Steel Formation, are latest Early Silurian (latest Llandoverian).

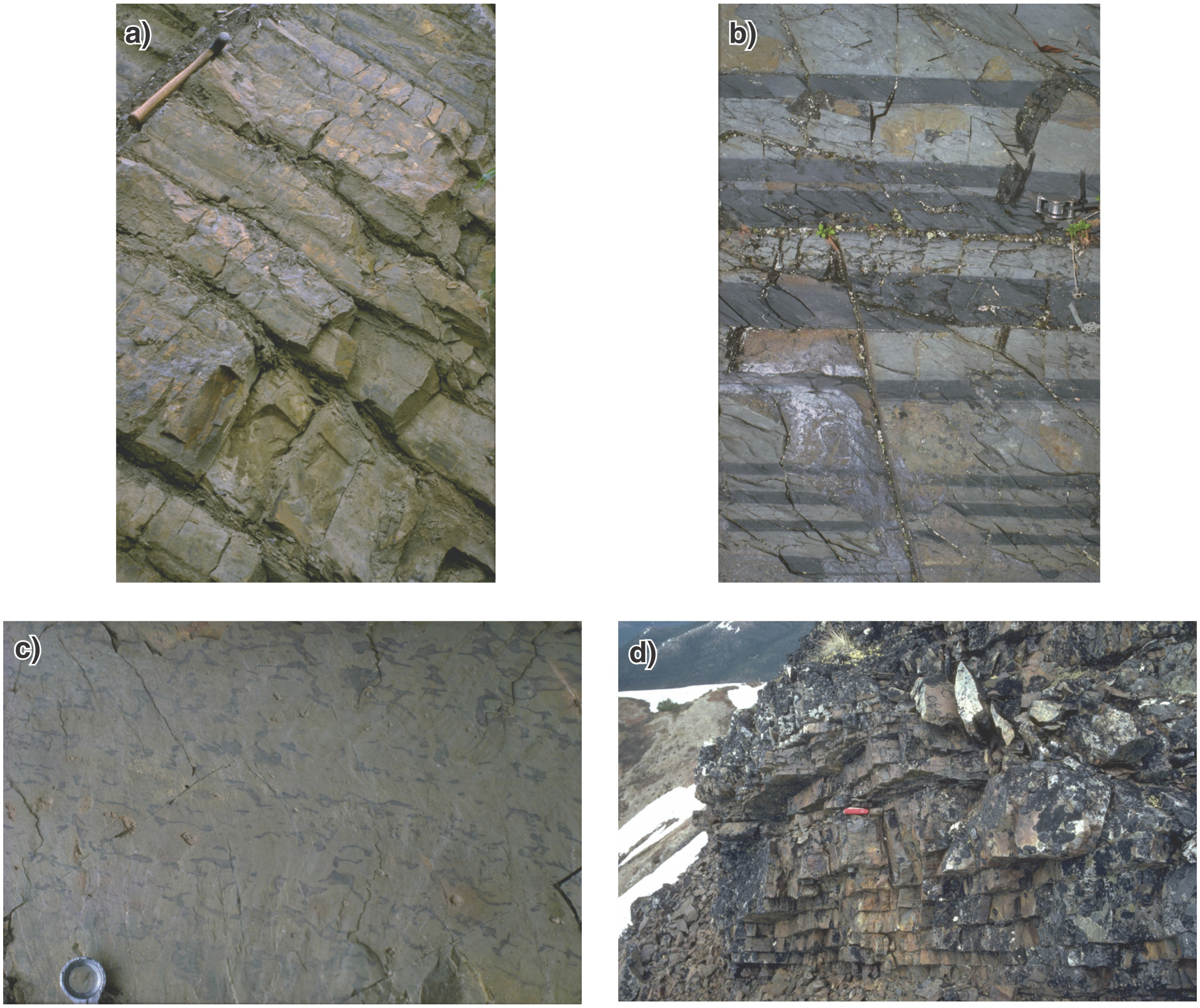


Figure 17. Steel Formation; **a)** dark green siliceous argillite in 10–30 cm thick beds (105 K/14; 62°53.84'N, 133°1.63'W); rock hammer for scale (34 cm long); 2012-106; **b)** rusty-orange-weathering, burrowed, well bedded, grey-green and black argillite (105 J/07; 62°22.56'N, 130°47.15'W); hand lens for scale (length of case 3.5 cm); 2012-102; **c)** orange-weathering, burrowed, siliceous to dolomitic siltstone diagnostic of the formation (105 K/09; 62°37.69'N, 132°14.35'W); hand lens for scale, lower left (diameter of eyepiece 2 cm); 2012-110; **d)** rust-weathering, thin-bedded, well bedded, pale grey-green, wispy laminated chert (105 J/14; 62°57.34'N, 131°13.43'W); pen knife for scale (centre; 9 cm long); 2012-113; photographs by S. Gordey.

The age of the Steel Formation is not well constrained, but is likely Late Silurian (Ludlovian to Pridolian). The youngest recognized beds of the (?)unconformably underlying Duo Lake Formation are latest Llandoverian (*see* above). Several short-ranged graptolite faunas within the formation are early Late Silurian (Ludlovian). In Nahanni map area to the east, the base of the formation is well constrained to be oldest (Ludlovian) (Gordey and Anderson, 1993). The top of the Steel Formation may range into the earliest Devonian. A single graptolite collection from beds assigned to the overlying Portrait Lake Formation is early Devonian (Lochkovian).

Ordovician-Silurian strata of shale and chert facies typical of the Road River Group are found west of Mackenzie and Macdonald platforms (Fig. 6) over most of the northern Cordillera. Cecile (1982) described the Duo Lake Formation at its type section in Bonnet Plume Lake, and in adjacent Sekwi Mountain, Mount Eduni, and Niddery Lake map areas. In the Yukon, strata similar in age and lithology to the Duo Lake Formation have been mapped or described in Nahanni (Gordey and Anderson, 1993), Flat River, and Glacier Lake (Road River Formation; Gabrielse et al. (1973)) and Dawson, Larsen, and Nash map areas (Thompson and Roots, 1982).

Mid- to Late Silurian strata that can be assigned to the Steel Formation are found in Nahanni (Gordey and Anderson, 1993) and Niddery Lake (unit Sa, Cecile (1981, 1984a); unit Sp, Abbott (1983)) map areas. In northeastern British Columbia, and in Pelly and Cassiar mountains, Ordovician black graptolitic shale is overlain by mid-Silurian tan-weathering, burrowed platy siltstone (Gordey, 1981b; MacIntyre, 1983). This twofold succession is homotaxial with the Duo Lake and Steel formations.

McEvoy Platform: Siluro-Devonian

McEvoy Platform is the name applied herein to a Siluro-Devonian belt of dominantly shallow-water, shelf siltstone, carbonate, and quartzite, extending from central Watson Lake map area to near the southeast corner of Sheldon Lake map area and possibly farther west. It is named after McEvoy Lake in northeast Finlayson Lake map area. Despite a large gap, the scattered exposures of Siluro-Devonian shallow-water strata in central Tay River region suggest that McEvoy Platform extended northwest, forming the southwest boundary of Selwyn Basin. McEvoy Platform can be considered an outboard appendage of Mackenzie Platform (*see* Fig. 6) with the Selwyn Basin as a re-entrant. Two informal units are recognized, including one of platy siltstone (siltstone unit) overlain with presumed conformity by another of mixed dolostone and quartz arenite (carbonate-sandstone unit).

*Siltstone unit (*Ssp*)*

Only one locality, a short, low ridge 13 km northeast of Mount Mye represents this unit in the project area. Platy, laminated siltstone is poorly exposed as scree and low scattered outcrop. The siltstone is tan- to chocolate-brown-weathering, with dark to light grey, well developed lamination and bedding to 5 cm thick. Neither the base nor top of the formation is exposed. An estimate of thickness is hampered by poor outcrop and the uncertainty of structural complication. About 180 m would be sufficient to account for its extrapolated area of exposure.

*Carbonate-sandstone unit (*SDc*)*

The carbonate-sandstone unit is represented by several small, scattered occurrences with covered and generally obscure relationships. Two informal members are recognized; one dominated by carbonate (carbonate member) and another by quartz arenite (sandstone member). Assumed simple structure and extrapolated lateral extent suggest the unit is as much as 200 m thick, but only 20–30 m of each member is actually exposed.

The carbonate member (SDc1) is represented by isolated, small outcrops 12 km northeast of Mount Mye. One exposure consists of rubbly to nodular light-grey-weathering, dark grey, fine crystalline dolostone at least 12 m thick. A covered interval of about 5 m separates the thin-bedded carbonate from overlying, chocolate-brown-weathering, dark blue-grey slate of the Earn Group. At a nearby location, Tempelman-Kluit (1972) reported small isolated outcrops of massive, buff-weathering, light grey, bioclastic dolostone and minor dark grey limestone with as much as 15 m of strata exposed.

"In place float" of graphitic and fetid crinoidal limestone reported by Tempelman-Kluit (1972) along the Swim Lakes bulldozer road could not be relocated during the present work. Secondly, he reported a 15 cm thickness of fetid limestone intersected in a nearby drillhole, although enclosing rock types are unknown. At another locality 10.5 km north-northwest of Faro town site and 5.8 km southwest of the Faro deposit he recorded an isolated outcrop of 7.6 m of thin-bedded, platy, dark grey, fetid carbonaceous, crinoidal, and micritic limestone. Some of the crinoid stems have distinctive twin-axial canals. Relationships of the limestone to adjacent units of volcanic and tuffaceous chert is unclear.

In southernmost Sheldon Lake map area, 22 km east-southeast of the mouth of Big Timber Creek, a 250 m diameter block of carbonate is trapped within hornblende crystal tuff of the Cretaceous South Fork volcanics. It is dominantly massive, grey-buff-weathering, fine to medium crystalline, calcareous dolostone with minor dark grey, very fine-grained quartz arenite and is considered to have formed from country rock slumping into the volcanic caldera.

Quartz arenite of the sandstone member (SDc2) occurs in several exposures 11 km northeast of Mount Mye as reported by Tempelman-Kluit (1972). The rock is a massive, medium- to light-grey sandstone composed wholly of well rounded monocrystalline quartz grains of high sphericity that range from medium to coarse sand sizes. The grains are cemented by overgrowths of quartz in crystallographic continuity with the grains themselves. Adjacent and probably associated rock types in this area comprise dolostone and limestone of the carbonate member. Quartz arenite bodies described under the Duo Lake Formation are likely lateral equivalents of the sandstone member.

Age and correlation of McEvoy Platform strata

A tentative stratigraphy for McEvoy Platform is erected from the sparse data from the project area and other areas to the southeast (Fig. 18). More complex relationships exist if carbonate and quartz arenite interfinger laterally along the platform. Late Middle Devonian (Givetian) dolostone, limestone, and minor quartz arenite, represented at two localities, are overlain unconformably by shale of the Earn Group. Locally thick (200 m) unfossiliferous quartz arenite (column 2, Fig. 18) appears to lie stratigraphically below the carbonate and above late Early to Early Middle Devonian bioclastic

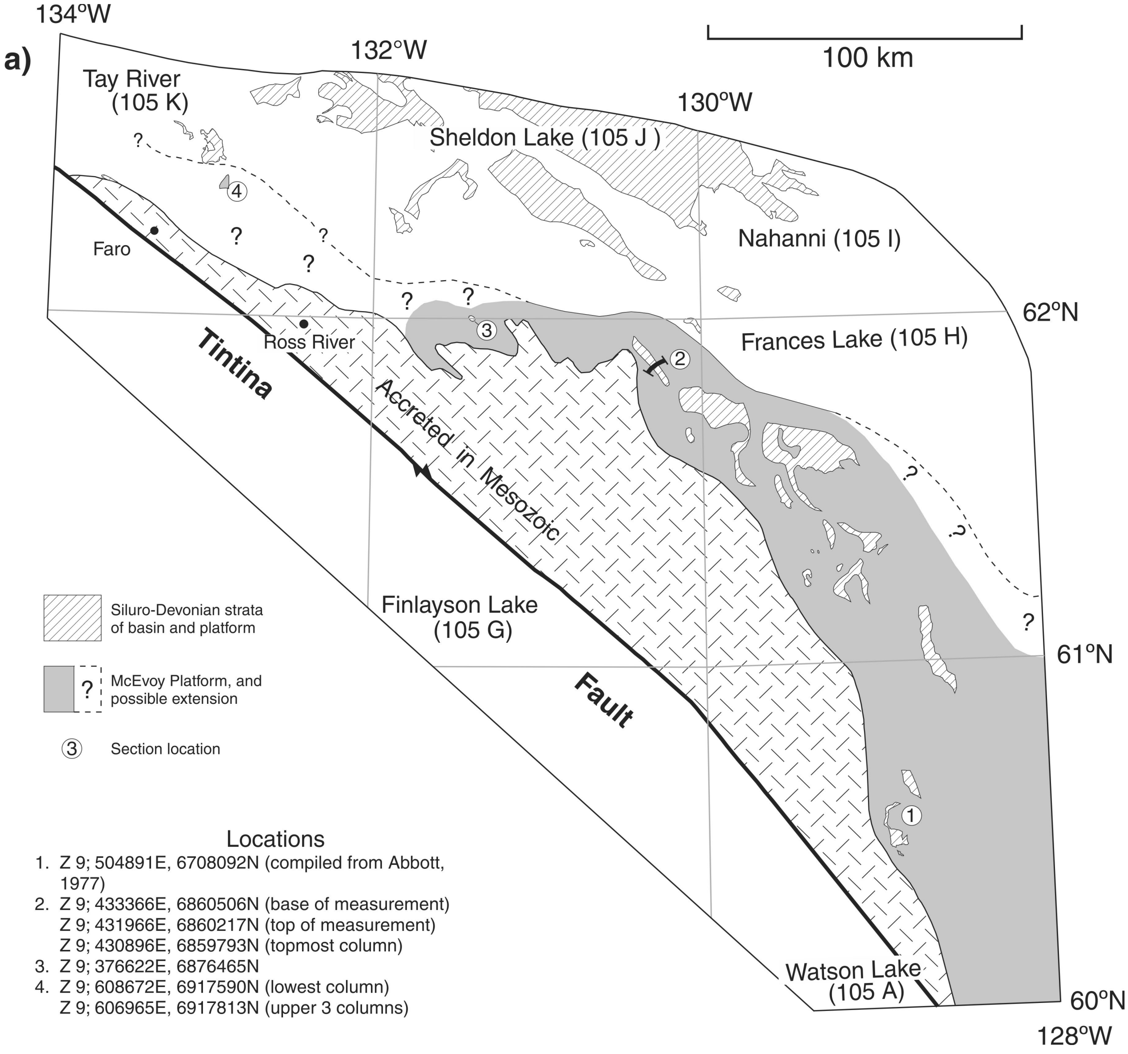


Figure 18. McEvoy Platform; **a)** distribution of Siluro-Devonian strata of McEvoy Platform and immediately adjacent Selwyn Basin. The location of the platform (shaded) is loosely constrained by the presence of discontinuous and widely distributed shallow-water clastic and carbonate strata versus equivalent deeper water siliceous shale to siltstone of the Selwyn Basin to the northeast. West of locality 2 evidence for the platform is preserved in only two small outcrop areas (localities 3 and 4). **b)** Stratigraphic sections of McEvoy Platform. Locations are indicated in Figure 18a.

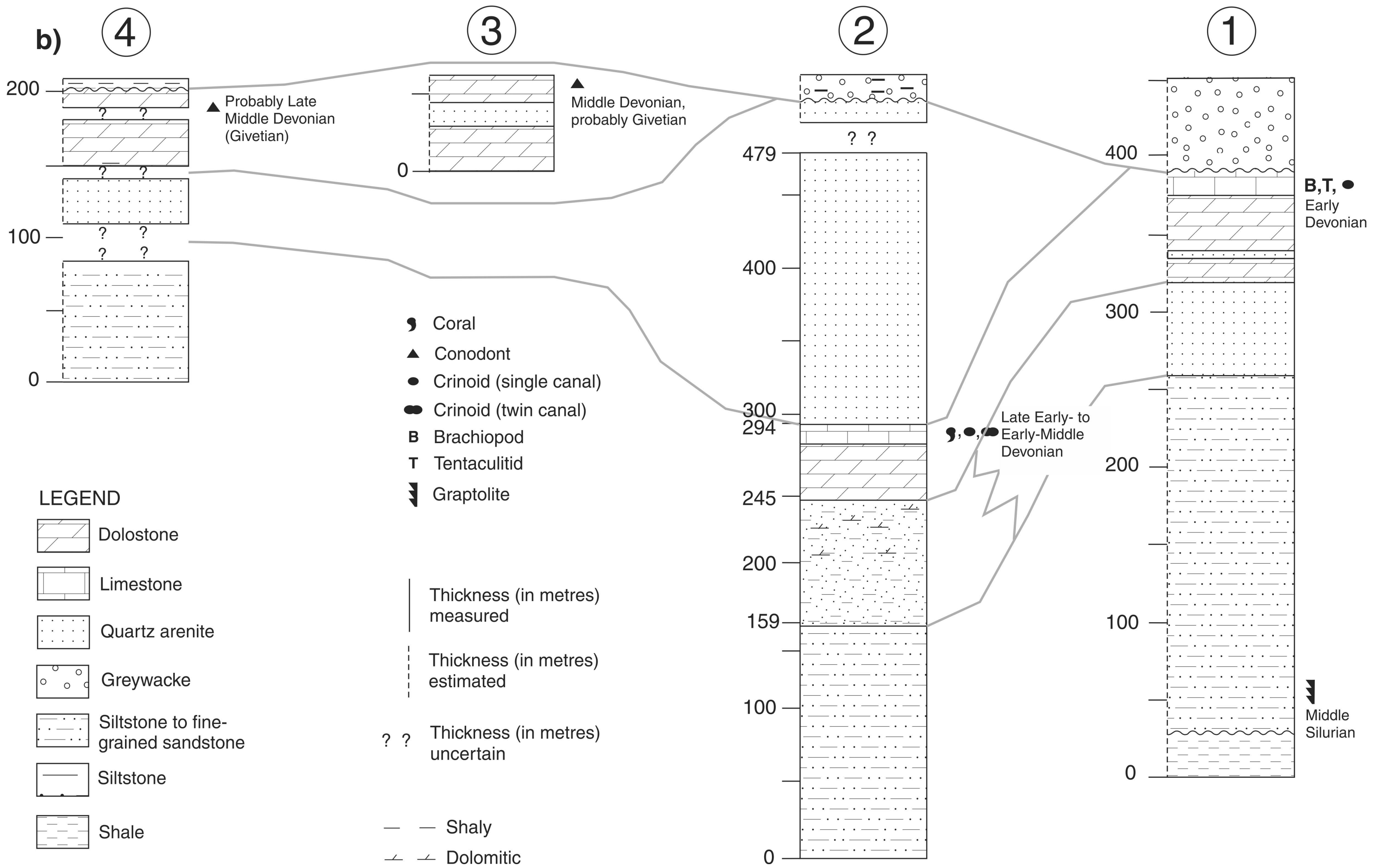


Figure 18. (cont.)

limestone typified by crinoid ossicles with twin-axial canals. In the Tay River map area the siltstone unit strongly resembles mid-Silurian to Early Devonian platy laminated siltstone of corresponding stratigraphic position elsewhere along McEvoy Platform (columns 1 and 2, Fig. 18).

The north margin of McEvoy Platform is not well constrained. In central Tay River area (Fig. 19) the possibly Silurian siltstone unit is replaced northward in Selwyn Basin by distinctive orange-weathering burrowed siltstone to mudstone of the Steel Formation. Similarly, the Early and possibly Middle Devonian carbonate and quartz arenite of the platform are equivalent to poorly dated black siliceous shale and chert that contains local occurrences of fine-grained quartz arenite and one occurrence of silicified crinoid ossicles with twin-axial canals. The quartz arenite and crinoid fragments are interpreted as sediment gravity flows derived from the platform to the south. Farther to the southeast there are large gaps in exposure of Siluro-Devonian strata. Reconnaissance in northeasternmost Finlayson Lake map area suggests stratigraphic relationships similar to those above, although quartz arenite and carbonate beds were not identified within black siliceous shale of Selwyn Basin that occurs there. The depositional south and west margin of the platform are buried beneath the northeast extent of structurally juxtaposed accreted terranes.

Depositional setting of Selwyn Basin and McEvoy Platform

The lithological character of the Hyland Group in Tay River and Sheldon Lake map areas is identical to that in its better exposed and studied type region in adjacent southwest Nahanni map area (Gordey and Anderson, 1993). In both areas a discontinuous limestone member at the top of the coarse clastic Yusezyu Formation marks the contact with strikingly bedded maroon and green slate beds of the overlying Narchilla Formation. The Yusezyu Formation is interpreted as a thick succession of sediment gravity flows deposited on one or several submarine fans. Although the origin of the limestone member is unclear, it signals a reduction in clastic supply. This reduction indicates lower relief or partial submergence of the source area that persisted during deposition of the overlying fine clastic Narchilla Formation. Regionally, the Hyland Group comprises the oldest exposed strata within the Selwyn Basin. Gordey and Anderson (1993) indicated the thickness in adjacent Nahanni map area exceeds 3 km and that the deposits resulted from Eocambrian extension analogous to the thermally driven rift model developed by Bond and Kominz (1984) for the southern Canadian Cordillera on the basis of tectonic subsidence curves.

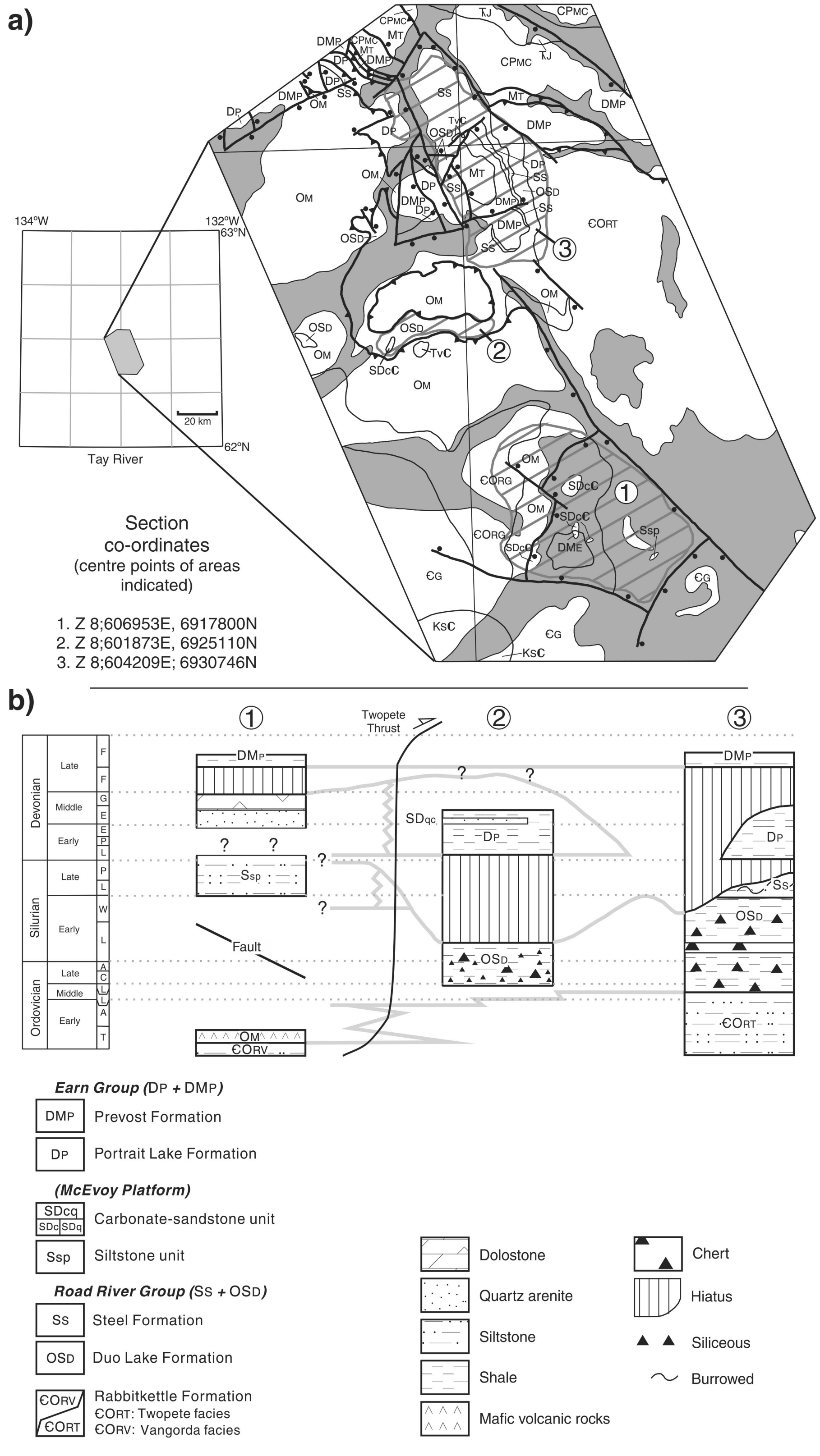
Most of the Gull Lake Formation was deposited below wave base in an off-shelf, quiet-water setting. In contrast, however, the depositional environment of the thick carbonate member in the Anvil Range is unclear; if it were a shallower water deposit this could represent a precursor to McEvoy Platform.

The Gold Creek, Twopete, and Vangorda facies of the Rabbitkettle Formation were deposited in a subwavebase, quiet-water, off-shelf setting west of the shallow-water shelf carbonate of Mackenzie Platform. In general, bedding is even and planar, and current structures other than local ripple crosslamination are rare. Silt and sand beds within fine clastic submembers were likely deposited from turbidity currents. Carbonate conglomerate beds of the Gold Creek facies indicate possible local slope environments, which in combination with minor tectonism, led to slumping and formation of debris flows.

Relationships amongst the three facies of the Rabbitkettle Formation are obscured by thrust faulting and contact metamorphism. In general they form three northwest-trending belts. The central Twopete facies is dominated by silt- and fine sand-size clastic detritus that is coarser than that found in the Gold Creek facies to the east, or in the Vangorda facies to the west. An easterly source for this silt and sand seems improbable, because detritus would have been transported westward across Selwyn Basin from Mackenzie Platform without deposition and preservation remaining in the intervening Cambro-Ordovician (Rabbitkettle Formation) strata. Alternatively, fine silt and sand from a western source would have to be brought in along trend from the northwest or southeast, so as to not influence sedimentation of the Vangorda facies.

The tectonic significance of the Menzie Creek Formation is not clear. Similar, although usually thin and laterally discontinuous Early Paleozoic basaltic volcanic rocks are common in off-shelf strata throughout the Northern Cordillera. The chemistry and original rock characteristics are consistent with an interpretation of local crustal extension (Goodfellow et al., 1995).

Black siliceous shale and chert of the Duo Lake Formation were deposited in a quiet, euxinic, off-shelf setting, starved from clastic input. Water depth is uncertain other than it was greater than wave base. The chert is presumably biogenic, despite the notable lack of well preserved radiolaria. These are now represented by recrystallized spheres that generally amount to only a few per cent. The distribution of chert-dominant facies within the Duo Lake Formation (Fig. 16) represents a restricted area of diminished sediment supply enclosed by Mackenzie Platform on the northeast and a submarine barrier of uncertain character on the southwest that preceded McEvoy Platform. Similarly, deposition of the overlying Steel Formation in a relatively quiet-water, subwavebase, off-shelf setting is indicated by lack of current structures, and a position west of time-equivalent shallow-water carbonate strata of Mackenzie Platform. The wispy lamination characteristic of the Steel Formation resulted from dominantly horizontal burrowing. The presence of burrowing organisms reflected a change to noneuxinic oxygenated bottom water from the reducing euxinic conditions prevailing during Duo Lake Formation deposition. Such a



Section co-ordinates
(centre points of areas indicated)

1. Z 8;606953E, 6917800N
2. Z 8;601873E, 6925110N
3. Z 8;604209E; 6930746N

Figure 19. McEvoy Platform sections; **a)** location of sections illustrated in Figure 19b; **b)** time-stratigraphic sections illustrating relations of McEvoy Platform and adjacent Selwyn Basin strata in central Tay River map area.

change could have occurred by a reduction of water depth or overturn of the water column (Goodfellow and Jonasson, 1986).

Although exposures of Siluro-Devonian carbonate and quartz arenite are few and scattered, their general lithological character indicates deposition on a relatively shallow shelf that forms the northwesterly preserved limit of McEvoy Platform (Fig. 18). In the siltstone unit an apparent lack of bedforms other than flat lamination suggests deposition below wavebase. Clastic detritus was likely derived from longshore transport along the platform, possibly from the southeast as quartz sandstone is abundant in the Lower Devonian strata of northeast British Columbia (e.g. Wokkpash Formation, Taylor and Mackenzie (1970)). The thin quartz arenite bodies within Lower Devonian black shale in central Tay River area could not have been sourced across Selwyn Basin. They were likely westerly derived from McEvoy Platform.

Although evidence for a western side to Selwyn Basin is best defined in McEvoy Platform (Siluro-Devonian) time, facies changes in Ordovician and Cambro-Ordovician strata also imply the presence of a western barrier or restriction. A shallow western side in possibly Early Cambrian time may be indicated by the thick marble member in the Gull Lake Formation in south-central Tay River area. The longevity of such a western barrier suggests buoyancy of a substrate of relatively thicker continental crust than that underlying the centre of Selwyn Basin. This difference likely arose during latest Proterozoic extension that led to deposition of the several kilometre thick Hyland Group. Accordingly, the group may represent the initial fill of Selwyn Basin.

Earn assemblage: Devono-Mississippian

In mid- to Late Devonian time sedimentation changed abruptly, with the deposition of chert conglomerate, sandstone, and shale across the former Selwyn Basin. Equivalent shale transgressed far to the east across Mackenzie Platform (Fig. 7). The feather edge of the western coarse facies occurs east of the project area in Nahanni map area (Gordey and Anderson, 1993).

*Earn Group (*DME*)*

The original definition of the Earn Group by Campbell (1967) included chert, chert conglomerate, and limestone that, unrealized at the time, ranges from probable Ordovician-Silurian (unit 10 of Campbell (1967)), through the Devono-Mississippian (unit 11, Crystal Peak Formation), to early Mississippian (unit 12, Kalzas Formation), Carboniferous-Permian (unit 13), and even Triassic (within unit 13). More recently, strata equivalent to those above and below Campbell's conglomerate (Crystal Peak Formation) have become better understood in other areas of eastern Yukon because of the advent of modern paleontological techniques and increased regional understanding. These units have been assigned different group and formation names. In practice, the term 'Earn Group' has become restricted to the westerly derived Devonian and early Mississippian coarse clastic–bearing succession in the northern Cordillera (Gordey, 1991; Gordey and Anderson, 1993), represented in the original type area by the Crystal Peak Formation.

Over most of the report area two regionally mappable formations comprise the Earn Group. The lower one called the Portrait Lake Formation includes unsubdivided off-shelf Early Devonian strata and ranges into the Late Devonian. The upper Earn Group, or Prevost Formation is latest Devonian to mid-Mississippian. As in Nahanni map area where these formations are defined (Gordey and Anderson, 1993), stratigraphic relations at the base of the Earn Group are complicated and range from diachronous to unconformable (*see* 'Portrait Lake Formation (DP)' section). The Crystal Peak Formation is restricted to conglomerate in northwest Tay River area continuous with that mapped by Campbell (1967) in adjacent Glenlyon area. Volcanic rocks in northwestern Tay River map area, the felsic volcanic unit, are tentatively included within the group. Clastic rocks of the group are possibly conformably overlain in the western part of the area by fine calcareous clastic and carbonate rocks of the Mississippian Tay Formation.

*Portrait Lake Formation (*DP*)*

The Portrait Lake Formation (Gordey and Anderson, 1993) is dominated by well bedded black chert. It is distinguished by its dark grey, black, or blue-black weathering colour, which contrasts sharply with underlying orange-weathering argillite of the Steel Formation and overlying brown-weathering clastic rocks of the Prevost Formation. Occurrences are spotty and restricted to northern Sheldon Lake and central Tay River areas. Beds typically range from 3 cm to 10 cm thick and are commonly separated by shaly partings (Fig. 20). Shale-dominated intervals are rare. Fine- to medium-grained chert-quartz wacke was noted locally.

In central Tay River area, strata assigned to the Portrait Lake Formation 12.2 km south of the mouth of Teddy Creek include thin-bedded, well bedded, blue-black-weathering shale and siliceous shale. Mud-matrix mud-chip sandstone occurs as 10 cm thick scattered beds. A scaly mud-matrix conglomerate, a minimum of 3 m thick contains scattered, angular to rounded, cobble-size clasts of black chert.

At other places in central Tay River area Lower Devonian black siliceous shale and chert contain beds of quartz arenite. Because of the absence of the Steel Formation, these Lower Devonian strata have been included with the underlying Duo Lake Formation from which they are indistinguishable for mapping purposes and are described under that heading.

Thickness of the Portrait Lake Formation is uncertain because of poor scattered exposure, incomplete sections, and structural disruption. As much as 200 m of strata may be present on the north side of Prevost River in the Sheldon Lake area. The Teddy Creek locality in central Tay River area may also amount to about 200 m. In the same area the formation is locally absent beneath brown-weathering clastic rocks of the Prevost Formation that overlie it with apparent regional unconformity. The Portrait Lake Formation overlies orange-weathering mudstone of the Steel Formation with (?)local unconformity. In central Tay River area the Steel Formation is locally thinned or absent beneath Portrait Lake Formation strata (Fig. 16).

Prevost Formation (DMP)

The Prevost Formation (Gordey and Anderson, 1993) consists of brown-weathering chert-bearing clastic rocks that underlie relatively small and widely separated areas.

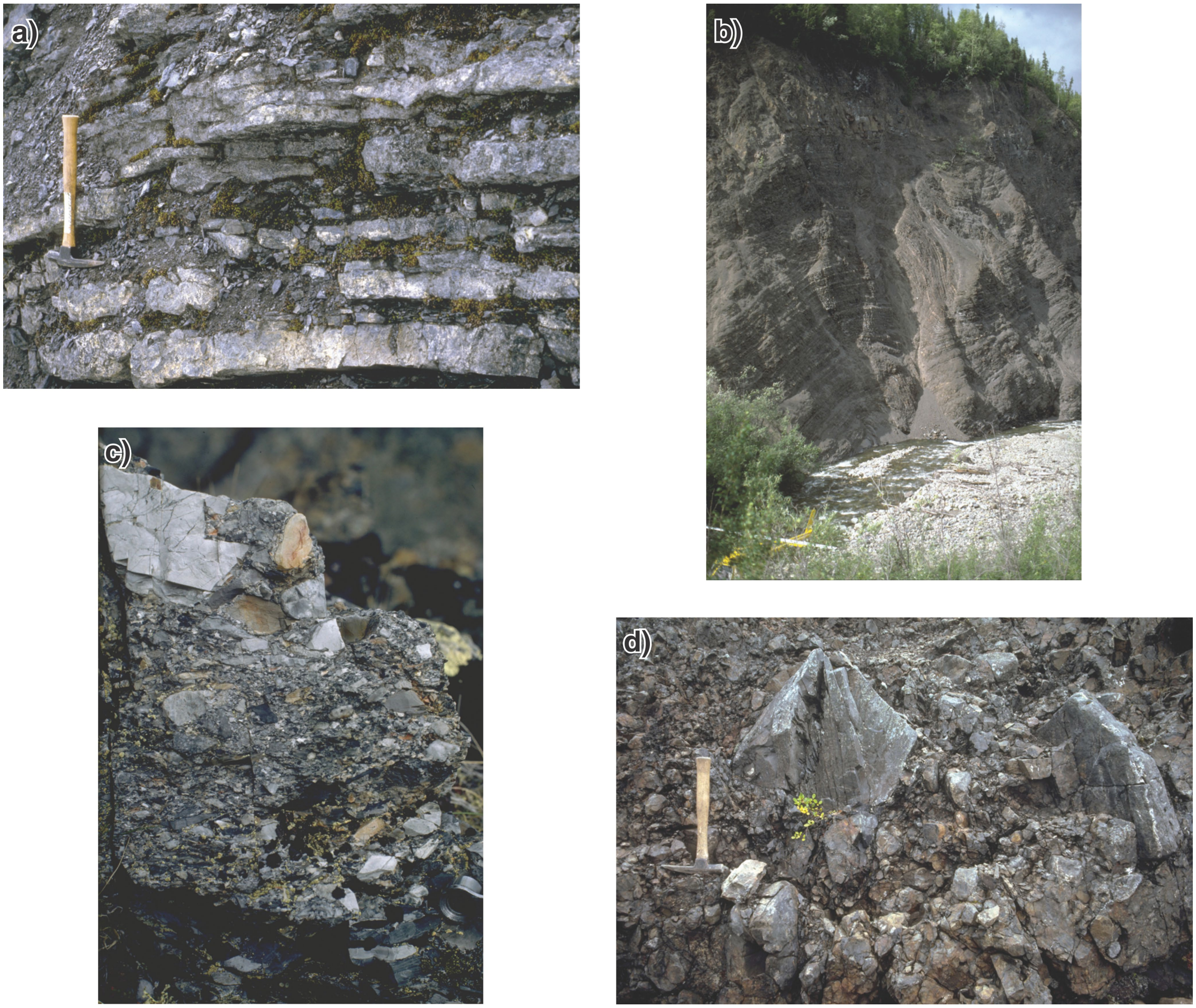


Figure 20. Earn Group, Portrait Lake Formation; **a)** grey- to black-weathering, graphitic, thin-bedded, black chert with siliceous shale partings (105 J/09; 62°38.75'N, 130°23.22'W); rock hammer for scale (34 cm long); Earn Group, Prevost Formation; 2012-104; **b)** recessive, brown-weathering, thin-bedded, even-bedded, shale and siltstone near South Macmillan River, Tay River area (105 K/15; 62°50.72'N, 132°35.40'W); for scale, distance from base to top of outcrop (centre of photograph) is about 30 m; 2012-125; **c)** immature, poorly sorted, angular, slate chip and chert clast conglomerate, near Mount Selous (105 K/16; 62°59.06'N, 132°22.32'W); hand lens for scale, lower right (diameter of eyepiece 2 cm); 2012-123; **d)** immature debris-flow boulder conglomerate near Mount Selous. The clasts are a mixture of gritty quartzose sandstone and chert derived from the Yusezyu Formation and Road River Group, respectively. The two largest clasts (near hammer and near right margin) are the Yusezyu Formation (105 K/16; 62°57.68'N, 132°19.89'W); rock hammer for scale (34 cm long); 2012-101; photographs by S. Gordey.

It contrasts in weathering colour with underlying black- to blue-black-weathering strata of the Portrait Lake Formation. Younger and presumed overlying strata of the Tay Formation, with which it is locally in structural contact, are calcareous and tan- to buff-weathering.

The Prevost Formation in the project area is dominated by dark-brown-weathering, noncalcareous, dark blue-grey to black shale, siltstone, and slate. The overall brown-weathering colour is caused by rusty-brown mottling on cleavage and fracture surfaces. These fine clastic rocks range from massive to locally laminated, the latter seen on weathered surfaces as grey to brown bands up to 2 cm thick.

The coarse clastic rocks consist of well indurated chert-quartz wacke and arenite and chert-pebble conglomerate the proportion of which relative to the fine clastic rocks varies from place to place from as little as a few per cent to as much as 50% in northernmost Sheldon Lake map area. The sandstone is medium to dark grey on fresh surface and ranges from fine to very coarse grain size. Framework grains consist of quartz, chert, and minor lithic (shale and/or siltstone) clasts. Conglomerate consists of subrounded to subangular, white to dark grey chert clasts to 2 cm across, generally clast supported in a quartz-chert sandstone matrix. Fine-grained quartzite clasts occur locally. Pale green to turquoise chert clasts are conspicuous in sections near South Macmillan and Riddell rivers (e.g. 62°51.39'N, 132°35.81'W) and in northernmost Sheldon Lake map area (62°58.18'N, 130°45.79'W). Thicknesses of sandstone and conglomerate range from thin beds to members several tens of metres thick. Although features such as graded bedding, shale rip-up clasts up to several centimetres in diameter, plant impressions, rare imbrication, planar bed tops and bottoms, and load casts were observed in some places, their recognition is hampered by the scree- or felsenmeer-dominated character of exposure.

The coarsest rocks seen regionally within the Earn Group are a matrix-supported boulder conglomerate near Clearwater Creek in northeastern Tay River map. At one locality (62°56.88'N, 132°18.64'W) clasts are predominantly fine-grained to medium-grained pale-green to grey quartz arenite ranging from 1 cm across to as large as 1.2 m. Other conspicuous large clasts include a round boulder at least 70 cm in diameter of medium-grained quartz sandstone and another at least 40 cm in diameter of dark grey- to black-weathering, black fine crystalline to spotty coarse crystalline limestone. The clasts, amounting to about 30%, are supported in a black mud to siltstone matrix. Also occurring in the vicinity, but in uncertain stratigraphic context is a clast-supported conglomerate consisting of rounded cobbles of fine- to medium-grained quartz arenite with a dark grey to black shale or siltstone matrix. At another locality (62°57.70'N, 132°19.82'W) rounded to subangular blocks up to 40 cm across are clast supported within a black shale matrix. The clasts are mostly dark grey to black, gritty, quartz sandstone, but rare limestone and chert are also present.

The Prevost Formation is regionally noncalcareous. A rare exception is a limestone member in northeasternmost Tay River map area. Widely separated outcrops south of Mount Selous delimit a northwest-trending band of carbonate about 23 km long. The member appears to rest above the Hyland Group and to represent basal Prevost Formation strata in that area, but contacts with over- and underlying strata are not exposed. The rock varies from well bedded, thin- to medium-bedded, locally ripple crosslaminated limestone and dark shale, to dark grey or black slaty cleaved, shaly, planar-laminated limestone. The thickness of the member is uncertain, but based on the largest exposure is probably at least 50 m. Exposure in the area is poor and the lateral continuity of the member as extrapolated on the map is also unclear.

Volcanic rocks at one locality in central Tay River area (62°31.80'N, 133°7.22'W) are tentatively included within the Prevost Formation, but time permitted only a cursory examination. A flow or sill of blue-black-weathering, grey vesicular quartz dacite or rhyolite about 10 m thick was traced laterally for about 500 m. This layer rests above a few metres of black siliceous shale and chert, which in turn overlies several tens of metres of massive orange-grey-weathering grey-green quartzose sandstone. The dacite is overlain by several metres of siliceous shale and chert like that beneath it, succeeded by brown-weathering, laminated, grey-brown siltstone.

Thickness of the Prevost Formation is uncertain; its stratigraphic top is not preserved and structural complications cannot be evaluated. About 500 m of strata are present southwest of Tay River. It may be thicker along South Macmillan and Riddell rivers, and in northern Sheldon Lake map area.

*Crystal Peak Formation (*MC*)*

The Crystal Peak Formation outcrops in northwest Tay River map area, contiguous with the formation as defined farther west by Campbell (1967) in northeast Glenlyon map area. In its type area the formation is characterized by dark-grey-weathering, thick-bedded to massive, chert-pebble and rare cobble conglomerate with minor quartzite. Fragments are mostly chert in various shades of grey that are subrounded to subangular and rarely exceed 1.2 cm in diameter. Rare clasts range up to 7.5 cm long. The matrix has a sandy texture dominated by subangular grains of chert and quartz (Campbell, 1967).

In the Tay River area strata are generally resistant and grey- to orange-weathering and medium to dark grey on fresh surface. Conglomerate units are similar to the type area in their range of clast types and sizes, but overall the section is generally finer grained, with coarse-grained to granule chert-quartz wacke and arenite being equal or more abundant than conglomerate. The sandstone units are medium to dark grey on fresh surface. Both the sandstone and conglomerate are massive, locally with partings 1–4 m apart that may represent bedding. Exceedingly rare sedimentary structures include normal grading, top cut-out partial bouma cycles, parallel and locally crosslamination bed tops, and minor shale rip-up clasts. Conglomerate clasts are dominated by grey to black chert, but minor bright pale green to turquoise chert is a conspicuous component. A small isolated outcrop of well laminated quartz-rich siltstone (62°48.86'N, 133°44.34'W) yielded plant stem impressions from one part and well preserved brachiopods (MAPNO K13-2, Appendix B) from another.

Campbell (1967) estimated the thickness of the formation in its type area as about 1370 m (4500 ft.), barring structural complication. In northwest Tay River area an estimated 1000 m of strata are sufficient to account for its outcrop distribution, but there also the degree of internal structural complexity is uncertain. Near Stokes Lake the Crystal Peak Formation overlies poorly exposed chert and argillite of the Road River Group with probable unconformity and is overlain conformably by siltstone and carbonate of the Tay Formation.

*Felsic volcanic unit (*Mv*)*

This unit is confined to a small area in northwestern Tay River map area and consists of orange-weathering, massive, fine-grained grey-green (?)granodiorite and/or volcanic rock. The rock is pyritic, highly altered, and fractures easily along heavily weathered irregular joint surfaces, severely hampering identification of rock types.

Judging from its fine grain size and colour, the unit is dacitic to rhyolitic in composition and volcanic and/or subvolcanic (i.e. high-level intrusive) in origin. During reconnaissance mapping neither volcanic flows nor intrusive features were observed.

Structural and stratigraphic relationships of this 28 km long igneous belt extending northwesterly to Earn Lake in Glenlyon map area remain unclear. An early Mississippian age (*see* below) implies fault contacts (i.e. northeast directed thrusts) with strata to the northeast (Permian Mount Christie Formation) and to the southwest (Cambro-Ordovician Rabbitkettle Formation). In parts of Glenlyon map area the Lower Mississippian (Tournaisian) Kalzas Formation adjoins the felsic volcanic unit on its southwest side along a possible stratigraphic contact. This contact is covered, however, and the intrusive or stratigraphic character is ambiguous. The structural thickness of the unit may be on the order of 300 m.

Age and correlation of Earn Group formations

In Nahanni map area, fossils from the Portrait Lake Formation include graptolites and conodonts that together span an age from Early Devonian to late Late Devonian (mid-Famennian). The age of this formation in the project area is probably similar, but is not as well constrained. Lowermost beds of the Portrait Lake Formation are latest Silurian or earliest Devonian based on several early Devonian fossil collections and a Late Silurian (Ludlovian) age for the underlying Steel Formation. Silty brown-weathering shale yielded two Early Devonian graptolite collections (Lochkovian to Pragian; MAPNO J09-10 and K14-1, Appendix B). Early Emsian conodonts were recovered from grey muddy limestone (J08-8). At another locality, beds included with the Duo Lake Formation for mapping purposes contain well preserved silica molds of crinoid ossicles with twin axial canals, indicative of late Early to early Middle Devonian age (field identification not reported in Appendix B; *see* Gordey and Anderson (1993)). The formation possibly ranges into the Late Devonian ((?)Famennian) as in the Nahanni area (Gordey and Anderson, 1993), but this upper limit has only poor stratigraphic constraints.

The Prevost Formation is likewise poorly dated. In the Nahanni area it is weakly constrained as latest Devonian to earliest Mississippian; a similar range for the present area is considered tentative. The Crystal Peak Formation is in part earliest Mississippian based on early to middle Tournaisian brachiopods from a single locality, and early to middle Tournaisian conodonts recovered from the overlying Tay Formation and its lateral equivalent, the Kalzas Formation, which overlies the Crystal Peak Formation in Glenlyon map area. The age of the base of the Crystal Peak Formation is poorly known, but also may be Mississippian (Campbell, 1967). The Crystal Peak Formation is considered a separately named coarse facies, mappable on a regional scale, in part laterally equivalent to the mixed coarse and fine facies of the Prevost Formation. The felsic volcanic unit was assumed to be Cretaceous by Gordey and Irwin (1987) and on this basis depicted as intrusive; however, preliminary analysis of zircon grains from a sample collected in Glenlyon map area indicates a mid-Paleozoic (Late Devonian) age (J.K. Mortensen, pers. comm., 1994) (This data has not been published. It is indicated as ‘Unpublished Data’ in the Canadian Geochronology Knowledgebase http://atlas.nrcan.gc.ca/site/english/maps/geochron/index.html#cgkb, sample GGA-87-26G3).

The Lower and Middle Devonian parts of the Portrait Lake Formation correlate with all or part of shallow-water carbonate and quartzite of McEvoy and Mackenzie platforms. Clastic formations correlative with Devono-Mississippian parts of the Earn Group blanket the northern Cordillera (Fig. 7). These include the Givetian Hare Indian, Frasnian Canol (Aitken et al., 1982), and Frasnian to early mid-Famennian Imperial formations (Chi and Hills, 1974) of northern Mackenzie Mountains and northern Yukon. The Besa River Formation (Pelzer, 1966) and the Fort Simpson Formation (Belyea and McLaren, 1962) are correlatives in northern British Columbia and western Northwest Territories, respectively. MacIntyre (1983) and Jefferson et al. (1983) described correlative chert-pebble conglomerate, shale, and sandstone and stratiform barite-sulphide deposits of the Gataga district of northeastern British Columbia. In Pelly

Mountains clastic strata and felsic volcanic rocks contemporaneous with Earn Group rocks have been described by Gordey (1981b). Early Mississippian felsic volcanic rocks in the report area are not unique in the miogeocline. They form thin and aerially restricted occurrences in northeast Mayo (Gordey, 1990d) and southeast Nash Creek (Abbott, 1990) map areas. Southwest of Tintina Fault in Pelly Mountains, they form a 100 km long, up to 13 km wide belt that includes alkalic explosive volcanic rocks and syenitic subvolcanic intrusions (Tempelman-Kluit, 1977; Gordey, 1981b; Mortensen, 1982; Hunt, 2002).

Depositional and tectonic framework of the Earn assemblage

The Portrait Lake Formation was deposited in a quiet subwavebase setting which, at most times, featured low clastic influx and deposition of siliceous shale and chert. Rare chert-quartz sandstone and pebbly mudstone were likely deposited by sediment gravity flows.

Gordey and Anderson (1993) proposed a complex, perhaps fault-controlled, submarine fan setting as the depositional environment of the Prevost Formation in Nahanni map area to the east. Although sedimentological observations in the project area are limited and the outcrop areas widely separated, features of the coarse clastic rocks such as massive thick bedding, graded bedding, and shale rip-up clasts are characteristic of sediment gravity flows that are the principal depositional mechanism in this environment. The mud-supported boulder conglomerate units in northeastern Tay River map area were deposited as debris flows. The metre-sized clasts indicate a proximal setting, probably in the upper reaches of a submarine channel in the fan-head area. Shale-dominated successions in the Prevost Formation represent more distal or off-channel deposition.

The Crystal Peak Formation, dominated by massive conglomeratic and coarse clastic facies likely represents a fan-channel deposit. Brachiopods found at one locality indicate a marine setting, whereas plant-stem impressions at the same location could represent far-travelled remains derived from the source area. The massive character of the clastic rocks can be attributed to amalgamation of bedding through rapid multiple depositional episodes with intervening background shale either not deposited at that time or eroded between events. Gordey and Anderson (1993) presented a discussion of the tectonic significance of the Earn Group for the Nahanni region immediately to the east that is applicable to the project area. A synopsis, with modifications and additions for the present area, is given below.

Coarse clastic rocks of the Earn Group reflect uplift of a sedimentary terrane. The clasts of quartz sandstone, shale, and chert, are all rock types in older Selwyn Basin strata. The chert of the Road River Group and quartz sandstone of the Hyland Group are impelling candidates to have been exposed in the source area(s). There is a remarkable likeness between sandstone in the Yusezyu Formation and sandstone cobbles and boulders found in the Prevost Formation, a similarity that extends to thin-section scale. The abundances and compositions of framework and accessory grains, the types of feldspar and their styles of twinning, and even matrices are alike.

The nearest possible source area is in northeastern Tay River (Fig. 21) and southern Lansing map areas where Road River and Hyland Group strata were being eroded by the Late Devonian. There, Earn Group clastic rocks locally rest directly above deeply eroded, block-faulted Hyland Group sandstone. The Earn Group strata include debris-flow and mud-matrix conglomerate units carrying chert, gritty sandstone, and rare black limestone blocks to several metres in diameter. The sandstone and limestone in these blocks closely resemble the immediately underlying Hyland Group rocks. On adjacent fault blocks, erosion was insignificant and Road River Group chert is present beneath Earn Group strata. The faults recognized within this area may reflect synsedimentary tectonic events at the edge of a regional uplift that may have extended well to the north (Fig. 21).

The oldest coarse clastic rocks, Late Devonian (Frasnian) in the Portrait Lake Formation, occur in the Macmillan Pass area where an east-southeast-trending and -flowing submarine channel system is proposed (Abbott, 1983; Abbott and Turner, 1990). Slightly younger Devono-Mississippian channel complexes include the Crystal Peak Formation in northeast Glenlyon map area and coarse clastic rocks of the Prevost Formation in central Nahanni area. The Devono-Mississippian (?)submarine conglomerate channel complex mapped in southwest Niddery Lake map area (Fig. 21) (Blusson, 1974; M.P. Cecile, pers. comm., 1987; Cecile and Abbott, 1989) extends into northern Sheldon Lake map area. The age of the channel is poorly known and may have depositional ties to the Prevost Formation coarse clastic rocks to the southeast in the Nahanni region, to the early Frasnian complex at Macmillan Pass, or both. This dispersal pattern is consistent with the southeast paleoflow demonstrated for the Prevost Formation in the Nahanni region.

If the Prevost Formation and contiguous coarse clastic deposits in southwest Niddery Lake area are part of one depositional system, they suggest a major submarine channel complex along which coarse clastic detritus was transported at least 200 km (*see* Fig. 21) (Gordey and Anderson, 1993). The confinement of turbidity flows by channel walls allows such flows to travel and carry coarse material for great distances. The passing of powerful turbidity currents may also induce traction and saltation transport of coarse bedload.

The Crystal Peak Formation is likely a submarine fan-channel deposit, but the direction of paleoflow is uncertain. The elongate distribution of the formation suggests it was deposited along a northwest trend. Southeasterly transport is compatible with the diminution in maximum grain size from the Glenlyon area southeasterly into the Tay River area (Fig. 21). The common occurrence of conspicuous turquoise

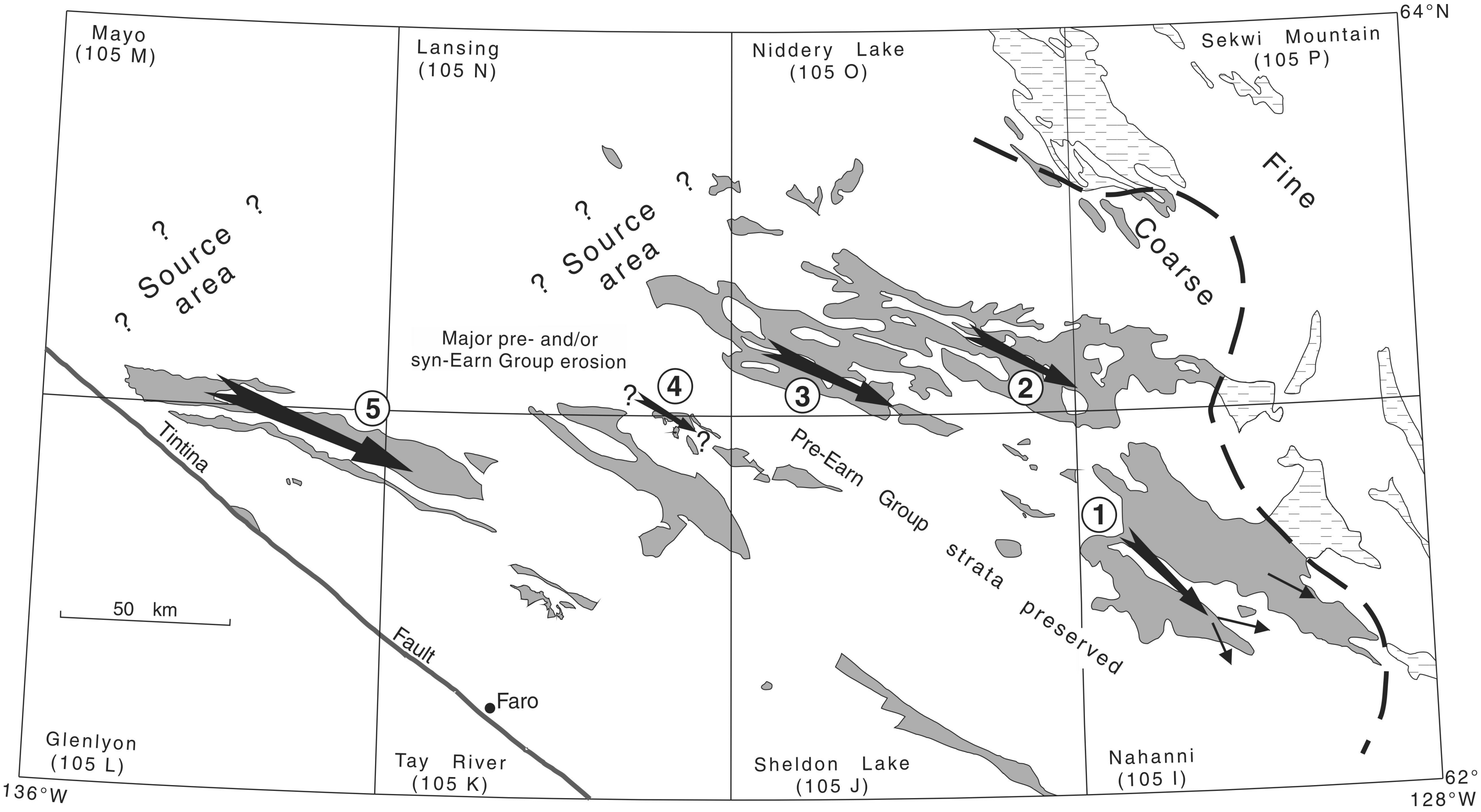


Figure 21. Distribution of Earn Group strata in central Yukon. The shaded fill indicates the presence of sandstone or coarser clastic rocks. The dashed pattern indicates shale. In area 4, possibly the fringe of a source area, Earn Group strata rest unconformably above block-faulted Hyland Group sandstone and Road River Group chert. Debris flows within the Earn Group contain metre-size blocks of these lithologies. Paleoflow (indicated by arrows) and the preservation of pre-Earn Group strata serve to limit the source areas where shown (*see* text).Generalized paleoflow in area 1 is from Gordey and Anderson (1993) and that for area 2 is from Abbott (1983) and Carne (1979, p. 11). In area 3 it is inferred from the distribution of coarse facies (as a (?)channel complex) as shown by Blusson (1974) and Cecile and Abbott (1989). Areas 4 and 5 are further discussed in text. The Cretaceous-Tertiary Tintina Fault and the townsite of Faro are shown for location.

chert clasts in the Crystal Peak Formation and as grains in coarse clastic lenses within the otherwise fine clastic succession of the Prevost Formation along South Macmillan River suggests a depositional tie between the fan-channel deposit of the former and more distal or lateral deposits of the latter.

The location of elongate, en echelon submarine channel systems (Fig. 21) mentioned above are likely to have been controlled through confinement by bottom topography (*see also* Winn and Dott, 1979; Seidler, 2000), whose origin in turn was likely through contemporaneous faulting. This faulting occurred within the context of regional extension or transtension. Evidence includes the absence of angular unconformity within or beneath the Earn Group and equivalent strata, local synsedimentary normal faulting, local felsic volcanism (e.g. the felsic volcanic unit), and barite and barite-zinc-lead exhalitive deposits (Gordey, 1991).

Clastic shelf assemblage: Mississippian to Triassic

The Mississippian to Triassic sequence represents a return to normal marine mixed clastic-carbonate sedimentation after the influx of fan-channel and turbiditic clastic rocks represented by the Devono-Mississippian Earn Group. This interval includes the early Mississippian Tay Formation (shale, siltstone, sandstone, limestone), the early Permian Mount Christie Formation (chert and shale), and the mid- to Late Triassic Jones Lake Formation.

*Tay Formation (*MT*)*

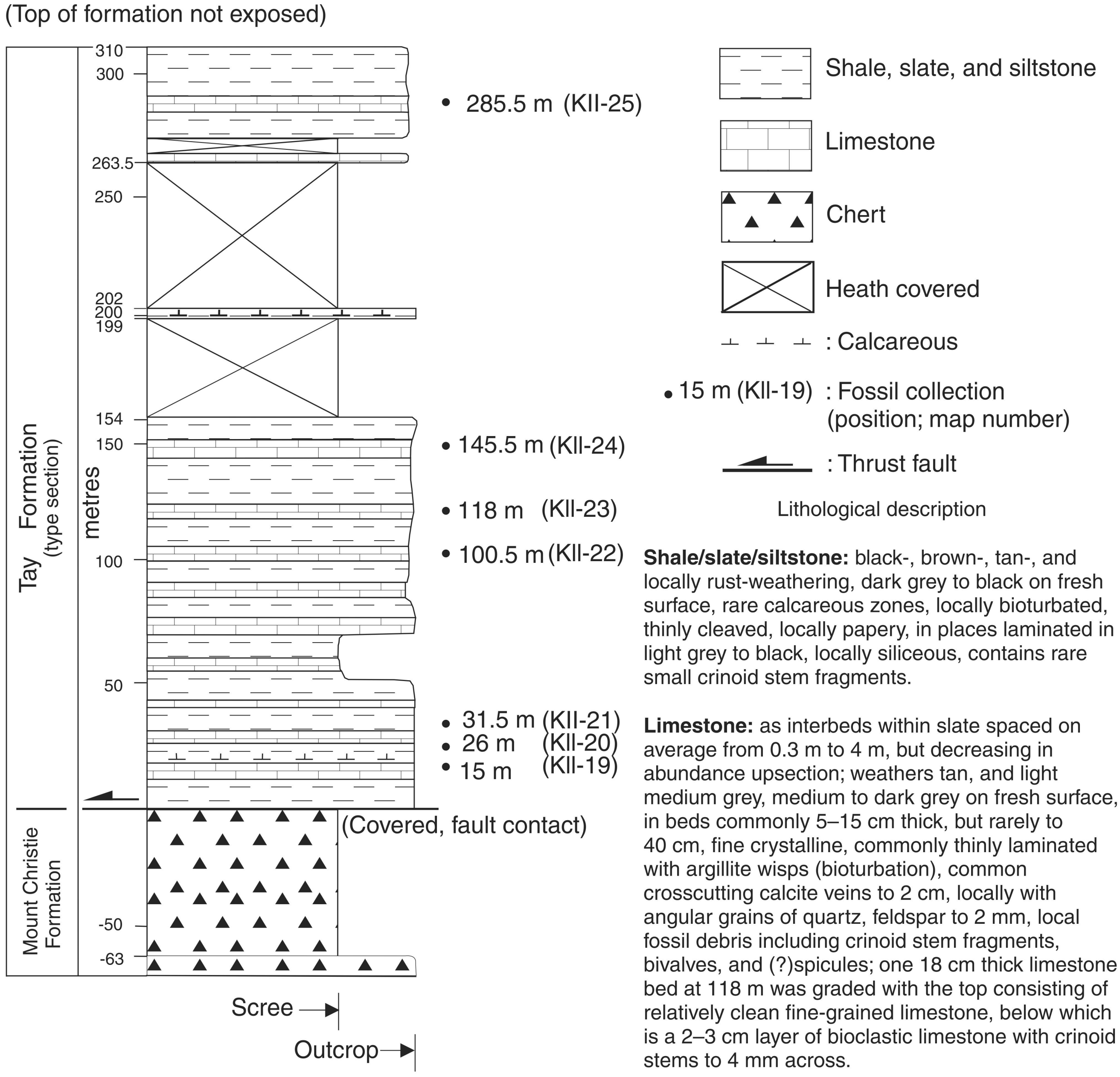
The Tay Formation comprises brown-weathering, fine-grained clastic and minor carbonate strata that outcrop within two northwest-trending belts in central Tay River and southern Sheldon Lake map areas. The name derives from the Tay River, the closest named topographic feature to the type section, about 8.8 km to the north. The formation is recessive and exposures are generally poor. The formation is presumed to overlie chert-bearing clastic rocks of the Earn Group and is (?)unconformably overlain by chert of the Mount Christie Formation.

Type section (62°32.995', 133°06.994'W; UTM zone 8, 596856E, 6936856N)

Unfortunately, there is no locality where a significant thickness of the formation is well exposed that includes either upper or lower formational boundaries. The type section is therefore chosen as the thickest and best exposed section available (310 m), even though its base is a structural contact (Fig. 22) and its top is a limit of measurement reached in the core of a syncline. The section is located along a north-northwest-trending ridge. Beds dip from 40° to 70° southerly with strikes of bedding varying from 60° to 140°. Clastic members are generally cleaved with cleavage parallel to bedding. The base of measurement (co-ordinates indicated above) is at the contact with structurally underlying chert of the Mount Christie Formation. This is at the base of the lowest shale-limestone outcrop as one descends a south-facing slope that is generally moss covered or strewn with small chert scree. This chert is orange- to black-weathering and black on fresh surface. Outcrops of Mount Christie Formation nearest to the section are massive to well bedded with beds defined by a parting 10–15 cm thick. The structurally overlying Tay Formation (Fig. 22) is dominated by brown-, black-, and tan-weathering, black shale, slate, and siltstone punctuated by 5–15 cm thick beds of limestone. The limestone weathers tan to medium grey, is medium to dark grey on fresh surface, and generally fine crystalline. The limestone beds are scattered throughout the section at a spacing of 0.3–4 m, but the spacing generally increases toward the top of the section so that the proportion of carbonate diminishes. The limestone is commonly thinly laminated, and clastic members to a lesser extent. Bioturbation is seen locally in both. Some limestone and a few shale beds contain debris of crinoid stems, bivalves, and spicules.

Elsewhere in Tay River map area the formation is likewise dominated by thin-bedded, bioturbated shale, siltstone, and fine-grained sandstone, locally ripple crosslaminated, and brown- to grey-white-weathering, grey, fine crystalline limestone. Also present are rare occurrences of 1–3 cm thick interbeds of black chert and local, thin interbeds of fine chert-pebble conglomerate and chert sandstone. More prominent variations include thick members of carbonate and quartz arenite. Along Tay River north of Blind Lakes (62°25.84'N, 132°33.01'W) massive buff-tan-weathering, thin- to thick-bedded, dark grey, fine crystalline limestone at least 25 m thick overlies at least 50 m of dark grey, fine-grained quartzite that is massive to thick bedded. Exposures 5 km upstream to the southeast (62°24.85'N, 132°27.55'W) are more typical of the type section and consist of about 70 m of orange-weathering, burrowed, calcareous siltstone. Orange and black striped lamination is well displayed on weathered surfaces. A few beds of grey, fine crystalline limestone about a metre thick are intercalated with siltstone near the stratigraphic top of the exposure. About 17.6 km east-southeast of Twopete Mountain (62°37.76'N, 133°23.19'W) a carbonate member at least 30 m thick near the top of the formation consists of grey-weathering, grey limestone in beds from 0.1 m to 0.3 m thick that are mostly massive, or ripple crosslaminated. Similar grey-white-weathering limestone forms an isolated exposure at least (?)30 m thick 12.8 km east of Twopete Mountain (62°41.61'N, 133°27.88'W). Black, fine crystalline, fetid limestone occurs in massive beds 0.3–2 m thick in which fossil hash of crinoid stem fragments, shells, and corals is abundant.

In southern Sheldon Lake map area carbonate and clastic strata of the Tay Formation underlie a broad area of low elevation and relief. Exposures are small and widely separated, so that the internal stratigraphy, stratigraphic thicknesses, and external relations of the formation there are poorly known. A carbonate member near the base of the formation as much as (?)400 m thick is suggested by discontinuous exposures found in a 40 km long northwest-trending belt from Pelly



Lithological description

Shale/slate/siltstone: black-, brown-, tan-, and locally rust-weathering, dark grey to black on fresh surface, rare calcareous zones, locally bioturbated, thinly cleaved, locally papery, in places laminated in light grey to black, locally siliceous, contains rare small crinoid stem fragments.

Limestone: as interbeds within slate spaced on average from 0.3 m to 4 m, but decreasing in abundance upsection; weathers tan, and light medium grey, medium to dark grey on fresh surface, in beds commonly 5–15 cm thick, but rarely to 40 cm, fine crystalline, commonly thinly laminated with argillite wisps (bioturbation), common crosscutting calcite veins to 2 cm, locally with angular grains of quartz, feldspar to 2 mm, local fossil debris including crinoid stem fragments, bivalves, and (?)spicules; one 18 cm thick limestone bed at 118 m was graded with the top consisting of relatively clean fine-grained limestone, below which is a 2–3 cm layer of bioclastic limestone with crinoid stems to 4 mm across.

Measured by S. Irwin by Jacob staff

Location: 62°32.995'N, 133°06.994'W;
UTM Z8, 596856E, 6936856N

Figure 22. Type section of the Tay Formation. The base is a covered fault contact with the Mount Christie Formation; the top is not exposed.

River to the headwaters of Big Timber Creek. The carbonate is dominated by grey-white- to blue-grey-weathering, massive, fine crystalline limestone. Fresh surfaces are dark grey to black. Rare bioclasts of crinoid stems with single axial canals, and irregular pods of silica were observed. It is unclear whether the carbonate is laterally continuous or comprises numerous individual carbonate lenses along the same stratigraphic horizon. The rest of the formation, exposed to the south and stratigraphically above the carbonate member, comprises mostly orange-grey-weathering, dark grey, fine to medium crystalline, locally crinoidal limestone; brown-weathering laminated quartz siltstone; grey-weathering, very fine-grained quartz arenite; and dark brown to blue-brown-weathering silty shale. This interval may also be as much as possibly 400 m thick based on assumed simple structure and the map distribution of the unit. Stream-cut exposures 22.6 km northwest of where Pelly River crosses the south boundary of the map area, consist of rust-orange-weathering laminated and burrowed calcareous argillite to phyllite containing centimetre-thick beds of grey, fine crystalline limestone (62°9.02'N, 131°4.46'W). Burrowed, grey-green, locally well laminated argillite is a minor component. About 14.2 km north-northwest of the same location, several small exposures consist of limestone conglomerate with grey limestone clasts to 15 cm across (62°6.76'N, 130°54.73'W). The clasts weather light grey, are well rounded, and set in a white-orange-weathering, medium-grained quartz sandstone matrix. The clasts contain abundant fossil debris including crinoid stem fragments with twin axial canals. These double-holed crinoid stems indicate derivation from a late-Early to early-Middle Devonian limestone (cf. Gordey and Anderson, 1993).

Abundant fossil collections, primarily conodonts, indicate an Early Mississippian (Tournaisian) age for the Tay Formation (*see* Appendix B, Fig. B-5). Whether its youngest beds locally extend into the mid-Mississippian (Visean) or younger is uncertain. The youngest short-ranged fossil collection (MAPNO K11-32, Appendix B) is late Tournaisian to mid-Visean. Another collection (MAPNO K10-7, Appendix B) was determined to be Carboniferous, and possibly Namurian. The age of the Tay Formation is the same as that of Kalzas Formation, which comprises about 300 m of grey- and buff-weathering, dark grey to black, fetid, locally bioclastic limestone in adjacent Glenlyon map area (Campbell, 1967). A conodont fauna from the Kalzas Formation immediately beneath the Mount Christie Formation in the Glenlyon area (MAPNO L15-10, Appendix B) is late Tournaisian.

The Tay Formation represents originally widespread mixed siliciclastic-carbonate deposition that succeeded the Earn Group. In Nahanni and Niddery Lake map areas to the east and north equivalent beds may be found in the lower part of the Tsichu Group, a Tournaisian to Pennsylvanian succession of shale, quartz arenite, and limestone (Gordey and Anderson, 1993; Cecile, 2000). In southeast Yukon and southwestern Northwest Territories equivalent strata are included within the Besa River (shale, early Tournaisian), Yohin (sandstone, mid-Tournaisian), and perhaps Prophet (carbonate, early Visean) and lowermost part of the Mattson (sandstone, Visean to Serpukhovian) formations (Bamber et al., 1991). The Keno Hill quartzite in Dawson map area (late Visean; Thompson et al. (1994); Orchard (2006)) appears to be slightly younger.

*Mount Christie Formation (*CPMC*)*

The Mount Christie Formation (Gordey and Anderson, 1993) is a chert-dominated succession. It is best exposed in central Tay River map area, whereas small scattered exposures represent a large area of subcrop in southern Sheldon Lake map area. Its orange to black weathering colour contrasts with the brown to tan colours of the overlying Jones Lake Formation and underlying Tay Formation.

In both areas the formation consists of light green, light grey, black, and rare red chert. Based on map distribution between 200 m and 700 m of strata may be present, but no location presents a complete, well exposed stratigraphic section. Outcrops weather orange, grey, and black and vary from massive to well bedded (Fig. 23). In the latter, the bedding is defined by a parting typically spaced at 10 cm, but which may be as much as 60 cm. Black shale occurs rarely as centimetre-scale or thinner seams along the parting. In the chert, disseminated pyrite is common; bioturbation is seen locally. Unlike the type section in Nahanni area to the east (Gordey and Anderson, 1993), green argillite, quartz arenite, and nodular barite were not observed in the project area.

The Mount Christie Formation overlies the Tay Formation possibly unconformably and is overlain unconformably by the Jones Lake Formation. The base of the Mount Christie Formation is not exposed in the project area and contact relations to underlying strata are unclear. Conodont collections recovered from the chert range from early Pennsylvanian (Bashkirian) to early Late Permian. The apparent separation

Figure 23. Well bedded, thin- to medium-bedded black chert of the Mount Christie Formation (105 K/10; 62°31.88'N, 132°49.22'W); person standing for scale (on left; 1.8 m tall); photograph by S. Gordey; 2012-137

in age between the oldest collection from the Mount Christie Formation (J02-6, Bashkirian to Moscovian) and the youngest beds of the underlying Tay Formation (MAPNO K11-10, K11-6, middle Tournaisian to early Visean, Appendix B) is consistent with relations in Nahanni and Niddery Lake map areas to the east and north where a basal unconformity accounts for omission of underlying units (Cecile and Abbott, 1989; Gordey and Anderson, 1993). One locality at which the presence of an unconformity might be tested through further fossil collection is 6.2 km northeast of Dromedary Mountain in Glenlyon map area (62°54.95'N, 134°37.58'W). There, a 14 m gap in exposure separates bedded chert of the Mount Christie Formation (Campbell (1967), unit 13) from underlying structurally conformable limestone of the Kalzas Formation (equivalent to the Tay Formation). There is no interbedding of these lithologies in beds near this contact. Uppermost Kalzas formation beds have yielded late Tournaisian conodonts (MAPNO L15-10, Appendix B). Conodont fauna recovered from closest overlying chert beds (Mount Christie Formation) is nonspecific and ranges from Carboniferous to Permian (MAPNO L15-11, Appendix B).

Strata of the same age as Mount Christie Formation are regionally widespread, but not extensively preserved. Reconnaissance traverses reveal that large tracts mapped as unit 13 by Campbell (1967) in northeastern Glenlyon map area can be directly assigned to the Mount Christie Formation. The formation is well exposed in Nahanni map area to the east (Gordey and Anderson, 1993) and argillite and chert of similar age, assignable to the Mount Christie Formation, are found in Niddery Lake map area to the north (units CPca and CPa of Cecile and Abbott (1989)). Whether locally preserved Pennsylvanian and Permian carbonate in the same area are isolated carbonate buildups or merely remnants of a regional carbonate platform to which the Mount Christie Formation represents an equivalent deeper water facies is unclear (Cecile and Abbott, 1989; Gordey and Anderson, 1993). In Dawson map area the mid-Permian Tahkandit Formation (limestone) and unit 14 of Tempelman-Kluit (1970a) of green and red slate and minor chert are time-equivalent units. The latter was inferred to be lower Cretaceous by Tempelman-Kluit (1970a), but is now considered Permian (Orchard, 1991). In northeast British Columbia, southeast Yukon, and southwest Northwest Territories latest Mississippian to Permian strata include the Stoddart and Upper Mattson formations (siltstone, shale, sandstone; latest Mississippian), the Kindle Formation (siltstone, shale, sandstone; lower Permian), and the Fantasque Formation (chert; upper Permian) (Bamber et al., 1968, 1991). Because of pre-Permian and pre-late Permian erosion, Pennsylvanian strata in those areas are not represented.

Jones Lake Formation (TRJ)

Clastic and carbonate strata of the Jones Lake Formation (Gordey and Anderson, 1993) are the youngest strata of the Cordilleran miogeocline represented in the project area. Only perfunctory observations were made on the small, widely separated outcrops. The strata are exposed along and near Tay River, in a small area west of Canol Road and southeast of Tay Lake, and in southernmost Sheldon Lake map area. The formation unconformably overlies chert of the Mount Christie Formation, but their mutual contact is not exposed. The Jones Lake Formation resembles the Mississippian Tay Formation in rock types, sedimentary structures, and probable depositional environments.

In central Tay River map area the formation comprises a mixture of clastic and carbonate strata. Brown and locally spheroid-weathering, dark grey, thin- to thick-bedded shale, siltstone and silty limestone are the dominant rock types (Fig. 24). Ripple crosslamination and burrows are common. Grey-weathering, black, fine crystalline limestone in medium beds occurs locally, as does massive, grey-white-weathering, very light grey quartzose siltstone. In some places massive, white-weathering, fine crystalline limestone members are present. They are light grey on fresh surface and may reach 10 m thick.

Scree-dominated exposures of the Jones Lake Formation are found within a small area west of Canol Road and southeast of Tay Lake. The dominant rock types are dark-grey-weathering, massive, fine crystalline, black limestone and grey to tan, laminated, silty black limestone. Additional rare rock types include

Figure 24. Medium-bedded, ripple cross-laminated, calcareous siltstone to sandstone and minor shale of the Jones Lake Formation (105 K/10; 62°34.80'N, 132°59.27'W). Rock hammer for scale (held by person on right; 34 cm long); photograph by S. Gordey; 2012-134

limestone conglomerate with fine crystalline limestone clasts to 5 cm across and a 5 m thick member of massive, fine-grained quartz arenite in beds 0.5 m thick.

In southern Sheldon Lake map area the formation comprises tan-brown-weathering, recessive shaly to silty limestone and members of more resistant massive, grey-white-weathering limestone. The former is dark grey and fine crystalline on fresh surface. Tan- and brown-weathering lamination is seen on weathered surfaces. Chert nodules to 2 cm across are present locally. Massive carbonate members consist of dark grey to black, fine to medium crystalline limestone, locally with centimetre-sized, unidentified bioclastic debris. Minor black shale chips to 1 cm across were noted at one locality. The massive carbonate forms at least six widely separated exposures trending northwest from Fortin Lake. It is not clear whether these represent one unit or several carbonate mounds. These massive carbonate member(s), judging by size of exposure, may reach thicknesses of at least 30–50 m.

Possible structural complications and poor exposure render thickness estimates for the Jones Lake Formation uncertain. As much as (?)400 m of strata may be preserved in the central Tay River area, perhaps less in the other areas described.

Abundant conodont and some bivalve collections indicate a late Middle to Late Triassic (Ladinian to Norian) age. In particular, the late Carnian, and the early, middle, and late Norian stages are well represented by short-ranged diagnostic faunas (*see* Appendix B, Fig. B-5). One collection is restricted to the Ladinian (J02-8) and another to Middle Triassic (J02-7). The apparent absence of Lower Triassic strata suggests an unconformity between the Jones Lake Formation and the underlying Mount Christie Formation, consistent with regional relationships elsewhere (below).

Triassic strata are the youngest preserved over much of central Yukon, and rarely form extensive exposures. Most can be referred to as Jones Lake Formation. Rocks typically include ripple crosslaminated and burrowed siltstone, sandstone, shale, and minor limestone. In addition to the type area in Nahanni map area to the east, isolated occurrences of Triassic strata were reported, but unnamed, in the map areas of Finlayson Lake (Tempelman-Kluit, 1977) and Niddery Lake (Abbott, 1983; Cecile, 1986b; Cecile and Abbott, 1989). In Dawson map area Triassic rocks include siltstone and fossiliferous limestone (Tempelman-Kluit, 1970a). A thick section of strata previously thought Cretaceous in this region by Tempelman-Kluit ((1970a) unit 15) is now known to be Triassic on the basis of several conodont collections (Orchard, 1991). This unit includes at least 600 m of crosslaminated siltstone with interbedded brownish-grey shale. A suspected regional pre-Triassic unconformity would account for the thinning or removal of Carboniferous and Permian strata in all of these areas. The Jones Lake Formation correlates with the upper part of a lithologically similar Triassic succession in northern British Columbia, including the Liard, Luddington, Baldonell, and Pardonet formations (Gibson, 1975, 1991). Triassic strata there rest disconformably above Permian chert (Fantasque Formation), but the basal Triassic units, the Grayling and Toad formations (Gibson, 1975, 1991) are older than Jones Lake Formation, ranging down to the Greisbachian.

Depositional framework of the clastic shelf assemblage

The Tay Formation represents a return to more uniform shelf sedimentation following the influx of chert-bearing submarine channel and fan-related deposits of the underlying Earn Group. The rock types and common macrofossils of the Tay Formation indicate an open, aerated, silty to sandy shelf with local carbonate buildups and interspersed quartz-sand bars or possibly shoals. Some of the limestone beds within muddy to silty sections may have been deposited as sediment gravity flows derived from slumping of debris from nearby carbonate buildups.

The depositional environment of the succeeding Carboniferous to Permian Mount Christie Formation is unclear except that it was in a subwavebase setting with relatively low clastic input and uncertain water depth. Local burrows suggest aerated bottom conditions.

The main rock types, and associated ripple crosslamination and burrow traces indicate deposition of the Triassic Jones Lake Formation on a current-swept, open, aerated, silty to sandy shelf with interspersed local carbonate buildups. This depositional environment is similar to that of the Mississippian Tay Formation.

Although provenance has not been confirmed by sedimentological studies, the clastic input within the assemblage is compatible with derivation from eastern cratonic sources.

Foreland Basin strata: Jura-Cretaceous

Deposition in the Cordilleran miogeocline was terminated in mid-Jurassic time by the accretion of allochthonous terranes and resultant deformation, uplift, and erosion of miogeoclinal strata (Tempelman-Kluit, 1979b). The Cretaceous sedimentary strata in Sheldon Lake and Tay River map areas unconfomably overlie the miogeoclinal record and accumulated in response to this tectonism and uplift.

*Big Timber Formation (*KB*) (new)*

The Big Timber Formation is proposed for clastic strata of probable Cretaceous age in southwestern Sheldon Lake map area. The name derives from Big Timber Creek, which flows within a few kilometres of several occurrences. Because of their regional significance (*see* below) a formal name to refer to these strata is desirable, despite generally poor, small, and widely separated exposures. The formation overlies recessive, generally brown-weathering, fine clastic and carbonate strata of the Jones Lake Formation.

Type section (62°16.405'N, 131°53.853'W; UTM Zone 9, 349632E, 6908007N)

The type section, 22.9 km north-northwest of the mouth of Big Timber Creek, is the thickest and best known exposure of the formation. Strata are flat lying and internally not deformed. During fieldwork they were interpreted as a thrust panel of Earn Group, which they greatly resemble. Because their age and significance were not appreciated until later, the section was only examined briefly and its description is not as complete as desired. The section is well exposed and consists of approximately 120 m of gently dipping chert-pebble conglomerate. The conglomerate is dominantly clast supported with tabular clasts oriented subhorizontal, parallel to bedding, to locally imbricated. Clasts are rounded and moderately sorted in the bottom half of the section and become angular and poorly sorted in its upper parts. Clasts range up to 20 cm in diameter and consist of chert, chert sandstone, and white (?)vein quartz. The rocks are generally massive, but locally there are lenses of coarse-grained sandstone within fine-grained sandstone. The top of the section is limited by the elevation of the ridge on which it occurs. The basal contact is scree covered and placed at the uppermost limit of scree blocks of the underlying Jones Lake Formation that consist of grey-weathering, dark grey to black, locally laminated, fine crystalline limestone.

Near Big Timber Creek, 25 km east-southeast of the type section, scattered exposures consist dominantly of light-grey- to black-weathering, chert-pebble conglomerate with lenses of coarse chert sandstone and siltstone. Clasts are generally well rounded and some consist of coarse sandstone. Rusty-weathering chert breccia was noted in two localities and consists of 1–4 cm angular grey chert clasts in a sandy matrix of black and grey chert. Brown-weathering, dark blue-black shale is a minor constituent in this area.

Cretaceous strata lie in two narrow fault-bounded slivers adjacent the mid-Cretaceous South Fork volcanics 13 km southwest of Dragon Lake. The more northwesterly of these is a scree exposure of blocks of chert-pebble conglomerate amidst soft, recessive, dark grey shale. The second occurrence, a small creek exposure 5.5 km to the southeast, consists mostly of blue-grey-weathering, dark blue-grey, massive, shaly siltstone that yielded Early Cretaceous palynomorphs (J12-1). There, chert-pebble conglomerate is represented as a resistant, 1 m thick, vertically standing rib. The conglomerate is clast supported, with well rounded and generally well sorted clasts of dark chert or argillite and fine-grained quartz sandstone up to 2–3 cm in diameter.

The Big Timber Formation compositionally resembles and can easily be mistaken for clastic rocks of the Earn Group. Stratigraphic position and the common lensing of coarse and fine detritus serve to distinguish the Cretaceous rocks. The Big Timber Formation overlies Upper Triassic strata disconformably, there being no discernible angularity between beds above and below the contact.

The Big Timber Formation is dated as Early Cretaceous on the basis of a single palynomorph collection (J12-1). A conodont fauna recovered an estimated 150 m below the base of the type section from the Jones Lake Formation is Late Triassic, probably late Norian (J05-3).

The nearest equivalent Foreland Basin strata occur in a downfaulted panel in Sekwi Mountain map area, Northwest Territories, 220 km to the northeast (Blusson, 1971). That area, visited during the course of the current mapping, is underlain by at least 1300 m of stacked fining-upward cycles of fluvial (meandering stream) quartzose sandstone, shale, and rare coal. Dating is poor, but palynomorphs and plant fossils representative of the later Early Cretaceous (Barremian to Albian) as well as Late Cretaceous (Coniacian to Campanian) are present (unpub. GSC internal fossil report AS-86-3; J. Basinger, unpub. report, 1987). The nearest other Early Cretaceous strata northeast of Tintina Fault are found in northern Yukon 300 km to the north (*see* Yorath (1991) for summary).

Occurrences of (?)Jurassic-Cretaceous strata southwest of Tintina Fault are known as the Tantalus Formation. South of Dawson in the Indian River area, the succession is described by Lowey and Hills (1988) as interbedded sandstone, shale conglomerate, and coal, about 500 m thick, deposited in a paralic fan-delta plain in the Early Cretaceous (Albian). Although these occurrences are now many hundred kilometres removed from the Big Timber Formation, restoration of 430 km of dextral slip along Tintina Fault places them within 70 km in the Early Cretaceous.

Recently, Long et al. (2001) redescribed a 427 m thick section of mudstone, sandstone, coal, and chert-bearing conglomerate about 3 km west of Ross River deposited in wandering gravel-bed rivers and associated overbank marsh and pond environments. The discovery of dinosaur trackways combined with new palynomorph determinations provided a mid-Cretaceous (middle Albian to early Cenomanian) age (Long et al., 2001) for strata previously considered Eocene (Hughes and Long, 1980). The strata are preserved within a small graben developed between fault splays of the Tintina Fault.

Depositional and tectonic framework of Foreland Basin strata

Interpretation of depositional environment for the Big Timber Formation is tentative because sedimentological data are sparse. The conglomerate units were likely deposited as traction bedload, judging from the lensing of sandy and pebbly layers and local imbrication. A fluvial environment, perhaps braided channel, is suggested by this and the abundance of coarse, pebbly detritus (e.g. Miall, 1992). Clast composition indicates the source area was underlain largely by chert and possibly lesser quartzose sandstone.

The Big Timber Formation contains detritus shed from highlands produced by Jura-Cretaceous contractional orogeny. Preservation of Foreland Basin strata within the internal part of the orogen, such as the occurrences in the report area, is rare because such strata are commonly uplifted and eroded as orogenesis continues and migrates towards the foreland. The Big Timber Formation and correlative remnants (described above) may have once formed a continuous blanket above the accreted terranes, the future Tintina Fault, and ancestral margin strata, or conversely, they may represent little-related deposits formed in widely separated intermontane valleys.

The presence of Cretaceous strata in the Sheldon Lake and adjacent areas provides an important constraint on the age of regional deformation (discussed in 'Structural geology and tectonics' section).

Accreted terranes

Rock assemblages unrelated to the miogeocline are here interpreted as accreted terranes that were juxtaposed and emplaced above strata of the North American margin in the Jura-Cretaceous (Tempelman-Kluit, 1979b; Murphy et al., 2002). On the basis of regional mapping, Tempelman-Kluit (1979b) first recognized their allochthonous character and divided them into three distinctive fault-bounded assemblages he termed the Anvil (oceanic basalt, ultramafic rocks, chert), Nisutlin (largely high-strain metasedimentary rocks), and Simpson (metaplutonic rocks) allochthons. On a regional scale the apparent lack of coherent stratigraphy and high strain in Nisutlin rocks, occurrences of eclogite, and plutonic bodies with high strain and locally fault-truncated bottoms, led him to interpret the assemblages as tectonic slices of oceanic crust (Anvil), arc-trench mélange (Nisutlin), and roots of a plutonic arc (Simpson).

More than a decade of subsequent detailed mapping augmented by voluminous geochronology and geochemistry has greatly modified this interpretation (*see* Murphy (2004) and references to previous works therein). Although the allochonous character of these rocks with respect to the ancestral margin is considered correct, a detailed stratigraphy and intrusive history (e.g. Murphy, 2004) has been developed for most of what was grouped separately as Nisutlin and Simpson allochthons (Tempelman-Kluit, 1979b). As well, some mafic and ultramafic rocks of the Anvil allochthon are recognized now as sills and related extrusive volcanic rocks with intrusive and stratigraphic relationships to parts of the Nisutlin allochthon. As a result, the terminology of Tempelman-Kluit (1979b) has been abandoned in favour of Slide Mountain terrane (includes those parts of the former Anvil allochthon still recognized as oceanic and allochthonous) and Yukon-Tanana terrane (all of Nisutlin and Simpson allochthons and remaining parts of Anvil allochthon) (e.g. Murphy, 2004).

Both Slide Mountain and Yukon-Tanana terranes have aerially and lithologically limited representation in a narrow belt immediately northeast of Tintina Fault.

Yukon-Tanana terrane

Rocks assigned to the Yukon-Tanana terrane comprise two rock units that are dominated by schist and conglomerate, respectively. The schist unit contains several occurrences of eclogite that preserves a record of subduction-zone high-pressure metamorphism. In contrast, the conglomerate unit is unmetamorphosed and contains clasts that strongly resemble rock types seen within Yukon-Tanana and Slide Mountain terranes.

*Schist unit (*CTYm*)*

Small and scattered exposures of the schist unit outline a 5 km wide, northwest-trending belt along the low-lying northeast flank of Pelly River valley and scattered outliers near the head of Tenas Creek. The rocks of this unit received only cursory examination during the present study. They have been thoroughly described by Tempelman-Kluit ((1972) unit 1), Erdmer and Helmstaedt (1983), and Erdmer (1987) from which the following description is summarized.

The unit consists largely of grey-weathering, medium to dark grey, muscovite-bearing metaquartzite that is generally massive with a pervasive foliation defined by strong preferred orientation of mica and quartz (Tempelman-Kluit, 1972). Dark grey graphite-rich, micaceous quartzite occurs rarely. Locally, apparent colour banding results from mineral segregation. The quartzite is fine- to medium-grained and strongly recrystallized, and locally contains bluish grains of quartz as much as 2 mm across as well as partly altered K-feldspar. Muscovite is the dominant mica, but chlorite is present locally. Quartz is strongly strained, has sutured irregular boundaries, and is form oriented. Tourmaline and carbonate are minor constituents.

Several occurrences of eclogite at two localities have been reported within the quartzose schist of the unit. The locality 8.5 km northwest of Faro (Faro occurrence; 62°17.50'N, 133°26.75'W), documented by Tempelman-Kluit (1970b, 1972) and described by Erdmer and Helmstaedt (1983), consists of three separate lenses of eclogite interleaved within graphite-bearing quartzite and siliceous blastomylonite, the host rocks containing quartz, garnet, muscovite, chlorite, zoisite, and rare calcite. The eclogite lenses are 1–2 m by 6 m, 10 m by 4 m, and 1 m by 1 m, and consist of medium green, dense, fine-grained rock with porphyroblasts of euhedral pink garnet up to 2 mm across (Tempelman-Kluit, 1972). Mineral constituents are primarily omphacite, sodic hornblende, and garnet, but muscovite, chlorite, quartz, epidote, plagioclase, rutile, and biotite are also reported (Erdmer and Helmstaedt, 1983). The second locality, described by Erdmer (1987) is 35.6 km southeast of Faro on the northeast side of Pelly River (Ross River occurrence; 62°4.43'N, 126°45.60'W). It consists of numerous lenses of eclogite, commonly a few tens of centimetres long and ranging from less than 1 cm to several metres long interfoliated with quartz-muscovite-glaucophane-garnet schist, and glaucophane-muscovite quartzite. Within the schist, intrafolial isoclinal folds are refolded by tight crenulations. Schistose dark green chlorite-actinolite-plagioclase greenstone is interleaved with the mica schist along sharp contacts (Erdmer, 1987). The eclogite is preserved in three forms. The first is fresh, coarse-grained omphacite-garnet rock with minor quartz, white mica, glaucophane, or secondary albite. The second is amphibolitized eclogite with chlorite-rimmed garnet, corroded pyroxene and barroisite or edenite, glaucophane, epidote, chlorite, carbonate, quartz, and plagioclase. The third is an actinolite or hornblende greenstone with porphyroblastic garnet crystals up to 2 cm across (Erdmer, 1987).

At the locality north of Tenas Creek in southeast Tay River map area (62°6.50'N, 132°15.50'W), the schist unit includes a tectonized siliceous rock with a mylonitic foliation and locally strong lineation. The foliation is deformed by small-scale isoclinal folds and kink bands.

The contacts of the schist unit are not exposed, but the complex spatial distribution as well as the contrast in metamorphic grade and structural fabric with respect to units of Slide Mountain terrane indicates faulted boundaries. It is unclear whether all of the schist unit underwent the same metamorphism indicated by the eclogite occurrences (*see* below), or whether these occurrences were tectonically emplaced within the schist along faults not recognized at the present scale of mapping. Near Faro the structurally uppermost rocks of the unit consist of highly contorted, heavily weathered, and sheared quartzose schist topographically overlain by the conglomerate unit. The spatial distribution of these exposures is consistent with a contact that dips less than 30° to the southwest, but whether this is a fault or unconformity is unclear.

The schist unit represents quartz-rich sediments of likely continental derivation that may have been part of a subduction zone tectonic mélange (Erdmer and Helmstaedt, 1983; Erdmer, 1987). The eclogite may represent boudinaged and deformed dykes and/or sills caught up in the high-pressure metamorphism with their quartzose schist host. Geothermobarometry by Erdmer and Helmstaedt (1983) and Erdmer (1987) indicates metamorphic temperatures of between 470°C and 750°C, and pressures from 10–15 kbar for both eclogite localities within the schist unit. The glaucophane-bearing schist reported by Erdmer (1987) constitutes the first reported extensive exposure of blueschist in the Yukon. Eclogite and blueschist from the Ross River locality have yielded white mica ^{40}Ar/^{39}Ar dates of 267 ± 3 Ma and 273 ± 3 Ma, respectively (Erdmer et al., 1998). White mica in eclogite from the Faro occurrence has been dated by the same method at 260 ± 3 Ma (Erdmer et al., 1998).

*Conglomerate unit (*CTrYcg*)*

The conglomerate unit is well exposed on the northeast side of Pelly River valley, with the largest outcrops near Faro and southeast of Rose Mountain. Three additional occurrences are found near the mouth of Blind Creek, south of Swim Lakes, and near the head of Tenas Creek.

The conglomerate is generally massive and orange-brown weathering. Outcrops vary from well indurated to deeply weathered and crumbly. Well rounded clasts of high sphericity consist of quartzose schist (50%) with fewer aphanitic mafic volcanic rocks (20%), limestone (10%), and black chert or argillite (10%). Rare clast types include granitic gneiss and serpentinite (Tempelman-Kluit, 1972). In size, the clasts range up to 30 cm across, but are generally 1–10 cm. The matrix includes muscovite flakes, angular unstrained quartz grains, and small fragments of the same rock material noted as clasts (Tempelman-Kluit, 1972). Sorting is poor and both clast- and matrix-supported conglomerate types are present. The latter type locally consists of a few per cent fist-size clasts set in a muddy and scaly matrix. Locally, sandstone pockets up to 30 cm across are found within clast-supported conglomerate; otherwise sedimentary structures or interbedding of finer grained materials are lacking. The conglomerate is massive and boundaries between domains of different clast size and proportion of matrix are gradational.

Tempelman-Kluit (1972) mapped a fine-grained clastic member of the conglomerate unit near Rose Mountain that includes thin-bedded and platy, medium grey, silty and calcareous slate, locally with interbedded grey, fine-grained argillaceous limestone. Where best exposed, in two small southwest-flowing tributaries of Pelly River immediately below the peak of Rose Mountain, slate and limestone overlie the conglomerate and comprise at least 100 m of strata without apparent structural repetition (Tempelman-Kluit, 1972). Because bedding is typically absent in the conglomerate unit, its aggregate thickness is unclear. If the unit is relatively flat lying, at least 650 m are exposed near Rose Mountain.

The conglomerate unit is typified by compositional and textural immaturity, and a paucity of sedimentary structures. The massive character, lack of bedforms, and poor sorting suggest rapid deposition as debris-flow deposits. Conodont fauna in the fine clastic member indicate a marine environment for that succession, but the setting for the bulk of the conglomerate is uncertain (for provenance *see* ‘Correlation of units of Yukon-Tanana terrane’). On the basis of conodonts recovered from limestone clasts (MAPNO K03-1, Late Triassic, late Carnian; MAPNO K03-2, Late Triassic, Carnian; Appendix B) the unit is latest Triassic or younger. Conodonts recovered from the fine clastic member by Tempelman-Kluit (1972) that are presumably not reworked indicate latest Triassic ages (MAPNO K05-3, Late Triassic, (?)early Carnian; MAPNO K05-4, Late Triassic, late Norian–Rhaetian; Appendix B).

Correlation of units of Yukon-Tanana terrane

Yukon-Tanana terrane underlies an extensive arcuate belt northeast of Tintina Fault, trending southeasterly from the project area through Finlayson Lake, Francis Lake, and Watson Lake map areas (e.g. Colpron, 2006). Detailed mapping and structural analysis of this region, combined with voluminous lithogeochemical (Piercey et al., 2004, 2006) and geochronological data (Murphy et al., 2006) have outlined a complicated stratigraphy defining several fault- and unconformity-bounded metasedimentary and metavolcanic successions as well as affiliated metaplutonic suites (Murphy et al., 2002; Murphy, 2004). The inferred tectonic history is complicated and includes west-facing Devono-Mississippian arc plutonism and volcanism, Carboniferous-Permian sedimentation, large-scale east-directed Early Permian thrust displacements, Jura-Cretaceous emplacement of the terrane above strata of the ancestral margin, followed by Cretaceous plutonism and extension.

Eclogite- and blueschist-bearing rocks (schist unit) are interpreted to record west-dipping Permian subduction (Erdmer and Helmstaedt, 1983) beneath Yukon-Tanana terrane that is inferred elsewhere in the terrane (i.e. southwest of Tintina Fault) by Permian arc plutonism (Mortensen, 1992b). In this interpretation, the eclogitic rocks (i.e. of the schist unit) formed by subduction beneath the east side (present co-ordinates) of the terrane and are preserved as a thin tectonic slice along the sole fault that eventually emplaced the terrane above strata of the ancestral margin in the Mesozoic ("Inconnu thrust" of Murphy et al. (2002, 2006)). This setting has marked differences to the one proposed by Devine et al. (2004) for Mississippian eclogite-bearing schist units in Francis Lake map area (Erdmer et al., 1998). There, eclogite facies metamorphism is viewed as resulting from Devono-Mississippian subduction beneath the west side (present co-ordinates) of Yukon-Tanana terrane. The position (present day) of these mid-Paleozoic eclogitic rocks, also on the east side of the terrane (present day), is viewed as fortuitous and attributed to large-scale mid-Permian easterly directed overthrusting (Devine et al., 2004).

Mylonitic rocks of the schist unit at the head of Tenas Creek (above) bear striking similarity to tectonized siliceous strata observed by the author in the immediate hanging wall of the Inconnu thrust (sole fault to Yukon-Tanana terrane) in north-central Finlayson Lake map area (tectonized unit Ccs of Murphy et al. (2002), renamed Fortin Creek group (informal) in Murphy (2004)) in a similar structural position immediately above strata of the ancestral margin.

The conglomerate unit is one of the widely distributed suite of rocks in Yukon first described by Tempelman-Kluit (1979a) as "transported synorogenic clastics". Their composition, including detritus of mylonite (schist), volcanic rocks, limestone, chert, quartz, feldspar, and granitic rocks, indicate derivation from Slide Mountain and Yukon-Tanana terranes, and these are distinct from strata of the North American ancestral margin. The conglomerate is regionally recognized northeast of Tintina Fault (unit Pcg of Murphy et al. (2002)) where it is termed the Simpson Lake Group by Murphy (2004) and Murphy et al. (2006) and considered Permian to Triassic. Southwest of Tintina Fault, scattered occurrences of similar immature conglomerate are known from Wolf Lake (unit 12 of Poole et al. (1960)) and Teslin (unit PMscg of Gordey and Stevens (1994)) map areas.

The textural immaturity and diversity of clast composition within the conglomerate reflect rapid deposition from a mixed source of both Yukon-Tanana and Slide Mountain terranes. A Permo-Triassic forearc setting would provide the structural setting and depositional environment to produce the conglomerate as well as allow the production and exhumation of the high-pressure eclogitic rocks of the schist unit.

Slide Mountain terrane

In the project area four different rock types dominate the Slide Mountain terrane including ultramafic rocks, limestone, chert, and basalt. The last three rock types were originally assigned to the Anvil Range Group by Tempelman-Kluit (1972) (adopted from Campbell (1967)), to apply to locally fossiliferous and dated upper Paleozoic basalt, chert, and limestone in west-central Tay River area. This definition persisted to form the basis of the term 'Anvil Allochthon' as used by Tempelman-Kluit (1979b).

The present work, however, shows that the Anvil Range Group as originally applied in its type area by Campbell (1967), and as mapped by Tempelman-Kluit (1972), is in part Ordovician. These Ordovician strata, part of the ancestral margin succession, contain basaltic volcanic rocks (Menzie Creek Formation) lithologically identical to those of demonstrably upper Paleozoic age. As well, for strong reasons indicated previously, the term 'Anvil Allochthon' as originally conceived (Tempelman-Kluit, 1979b) is no longer valid. Given this confusion in nomenclature, the succession as seen in the report area is simply described as informal units of the Slide Mountain terrane.

Ultramafic unit (CPsub)

Ultramafic rocks outcrop in two northwest-trending bands less than 500 m across within a few kilometres northeast of Pelly River. The longest band is about 30 km long. A second, southeast of and on strike with the first, is about 10 km long. A third small occurrence lies along Lapie River at the south boundary of Tay River map area. The ultramafic rocks are fault bounded against various units of Slide Mountain and Yukon-Tanana terranes. The ultramafic rocks were not examined during this study and the following petrological description is summarized from Tempelman-Kluit (1972).

The dominant rock type is dark green to black serpentinite. In thin section the serpentine, mostly antigorite, is seen to be pseudomorphic after olivine and pyroxene. Where the rocks are locally weakly serpentinized the primary rock type is harzburgite containing about 75% medium- to coarse-grained, slightly serpentinized olivine and 25% enstatite altered to bastite with magnetite and perovskite as secondary minerals. Along the margins of the ultrabasic bands the serpentinite is altered to a buff-weathering, pale greenish-white talc-carbonate rock containing minor fuchsite.

The ultramafic rocks may represent parts of the mantle structurally mixed with elements of Slide Mountain terrane, or ultramafic intrusions. No isotopic dates have been obtained from these rocks in the Tay River area so their primary or cooling age remains unknown. A post-mid-Permian age is suggested from U-Pb dating of zircon from a plagiogranite block found within sheared serpentinite matrix mélange in northern Finlayson Lake map area (Mortensen, 1992a). The occurrence of ultramafic clasts within the conglomerate unit (Tempelman-Kluit, 1972) indicates that ultramafic rocks were eroded prior to the Late Triassic. Furthermore, as the ultramafic unit cuts Permian basalt and chert as well as Late Triassic clastic rocks (conglomerate unit) it was emplaced in its present position in Late Triassic or since. The distribution of the ultramafic unit could have resulted from one or several deformation events including the structural stacking of allochthonous units before juxtaposition with ancient North America, modification of such stacking during emplacement against North America in the Jura-Cretaceous, and fault movements related to Cenozoic dextral- or dip-slip motion along Tintina Fault.

*Limestone unit (*CPsl*)*

The limestone unit occurs within a northwest-trending panel 3 km southwest of Pelly River. Near the south boundary of Tay River map area the unit is well exposed on high hills and knobs within Pelly River valley.

The limestone unit is characterized by massive, grey-white- to buff-weathering, generally medium crystalline, grey limestone. Rare compositional layering is defined by subtle shades of colour and differential weathering. In some places the rock appears finely bioclastic (i.e. calc-arenite), although the fragmental material is not identifiable. Tempelman-Kluit (1972) noted crinoid columnals at some localities as well as suspected local tuffaceous zones, marked by chloritic layers in the limestone. Because the limestone is confined to fault-bounded panels its relationships to other units of Slide Mountain terrane is unclear. The rarity of bedding precludes an accurate measurement of thickness, but at least 100 m of strata is probable (Tempelman-Kluit, 1972).

The limestone unit probably formed as a shallow-water reef, because it lacks the even bedding that characterizes peritidal carbonate of platformal aspect. Tempelman-Kluit (1972) examined the carbonate in thin section, and noted that pervasive fine recrystallization had obscured original textures. Fossils from the limestone unit include Early Permian conodonts (Asselian–early Artinskian, MAPNO K02-3, Appendix B), and fusulinids of possible Permian (could be Wolfcampian, MAPNO K02-4, Appendix B) age.

*Chert unit (*CPst*)*

The chert unit outcrops in two main areas. One is southwest of Pelly River and forms the northwest-trending belt of exposures between Tintina and Grew Creek faults. The other is along a northwest-trending belt about 5 km northeast of Pelly River, near Faro. Additional exposures, on strike with the latter belt occur to the southeast near Olgie Lake. The chert unit is overlain by the basalt unit near Rose Mountain. The base of the unit is not exposed, nor is its top exposed southwest of Pelly River valley.

Southwest of Pelly River valley the unit comprises grey-, greenish-grey- and rust-weathering, siliceous green slate and chert with a variably developed foliation. In most exposures the foliation obscures bedding. In some places, the strain fabric is so intense that the rock resembles a siliceous mylonite. Minor rock types include blue-black-weathering slate, and very rubbly-weathering, strongly foliated pale green tuff.

Northeast of Pelly River the unit comprises green-, grey-, orange-, and locally red-weathering siliceous argillite and chert. Fresh surfaces range from grey-green, to grey, to brick red. Red- and green-, or grey-weathering chert, locally forms alternating members about 20 m thick. Bedding from 5 cm to 10 cm is defined by variation in argillaceous content, but is usually obscured by strongly developed bedding-parallel foliation. Less common rock types include massive, sugary crystalline, blue-grey chert, and phyllitic black chert thinly interbedded with black slate. Tempelman-Kluit ((1972) unit 8a) observed relict radiolarian spherulites about 0.15 mm across, and noted that thick sections of red jaspery chert only occur near the contact with volcanic rocks. He also described lenticular beds, as much as 60 m thick, of massive breccia composed of angular, tabular chert fragments from 10 mm to 50 mm across that constitute a small proportion of the unit. The only carbonate within the chert unit, near Rose Mountain (62°20.53'N, 133°32.83'W), is a 1 m thick lens of slightly sandy, brownish-grey-weathering, light grey, bioclastic limestone within impure chert that occurs about 60 m below the base of the basalt unit (Tempelman-Kluit, 1972).

Two small areas of clastic rocks, one including barite, are found within the chert unit. The first, 12.5 km north-northwest of Faro (62°19.33'N, 133°29.31'W) is a poor outcrop of fine- to medium-grained wacke with abundant shale chips. Small outcrops 680 m to the south-southeast (62°19.01'N, 133°29.01'W) consist of white-yellow-weathering, grey-white, very fine crystalline barite on the order of 2 m exposed thickness, but of uncertain attitude. At the second locality 3.0 km south of Olgie Lake (62°4.52'N, 132°29.89'W) similar wacke and carbonaceous shale form small exposures in a stream cut.

Tempelman-Kluit (1972) documented the relationships between the chert and basalt units near Rose Mountain as conformable and laterally gradational. Stratigraphic relationships of the limestone unit (confined to fault panels) to the chert are unknown, although fossil determinations indicate broadly equivalent ages. The degree of structural disruption within the chert unit is unknown, thus thickness cannot be accurately determined. The thickest section, near Rose Mountain, is graphically estimated to be 1000 m thick (based on an estimated uniform dip of 20° southwest). Tempelman-Kluit (1972) estimated the thickness at 600 m (2000 ft.) (which is the graphically estimated thickness for a horizontal attitude).

The siliceous argillite and chert was likely deposited in a relatively deep-water oceanic environment. The thin lens of carbonate described above, perhaps emplaced as a debris flow, has yielded Pennsylvanian (conodonts; MAPNO K05-1, Appendix B) and earliest Permian (fusulinids; MAPNO K05-2, Appendix B) conodonts and fusulinids. The great thickness of chert beneath the fossil locality, at least 600 m, suggests the unit may range well down into the Pennsylvanian (Tempelman-Kluit, 1972).

Basalt unit (CPsv)

The basalt unit outcrops in a narrow, discontinuous belt 5 km northeast of Pelly River with large exposures near Rose Mountain and the mouth of the Ross River. Additional exposures occur on the southwest side of Pelly River east of Grew Creek.

The unit consists of massive, dark-grey- to dark-dun-brown-weathering, aphanitic dark grey-green basalt. Some of the rocks have a reddish tinge caused by disseminated hematite. The volcanic rock is typically well indurated, except where it is cut by extensive fractures. In places, primary fragmental texture is indicated by matrix-supported, subangular to subrounded clasts up to 10 cm across. Larger clasts may be present, but would be obscured by the similar composition and colour of matrix and clasts. The rocks are dominantly aphyric, but feldspar phenocrysts up to 3 mm across and unidentified mafic phenocrysts up to 1 mm across occur rarely. Quartz and epidote veinlets are common and talc-carbonate alteration was seen in a few places. Although both massive and brecciated members are represented, there is a lack of primary layering, so that the continuity and width of individual flow units cannot be established.

Tempelman-Kluit (1972) described the rocks in thin section as comprised of tiny saussuritized plagioclase (50%, 0.2 mm long); scattered fresh augite (<30%, 0.5 mm); local hornblende, penninite, euhedral epidote, chlorite; and local amygdales filled with calcite, chlorite, celadonite, chalcedony, clinozoisite, and chabazite. He saw no mineralogical differences between these rocks (herein called the basalt unit) and basalt units north of the Anvil Range (herein called Ordovician Menzie Creek Formation), which together he included in the same unit (unit 8a, Tempelman-Kluit (1972)).

The relationships between the basalt and underlying chert units near Rose Mountain have been documented by Tempelman-Kluit (1972), which he described as gradational across 3–6 m from tuffaceous or argillaceous chert through siliceous or cherty tuff to massive tuffaceous basalt. The thickness of the basalt unit is uncertain. The thickest section, near Rose Mountain, has a graphically estimated thickness of between 700 m and 1200 m (based on estimated dips of 20° to 45° southwest, respectively). Tempelman-Kluit (1972) estimated the thickness at 460 m (1500 ft.) (which is the graphically estimated thickness for a horizontal attitude). Near Ross River, if the volcanic rocks are flat lying, at least 600 m must be present to account for their distribution with respect to topography. In summary, about 1000 m may be a reasonable thickness estimate for the unit, assuming no structural disruption.

The volcanic rocks were erupted onto the seafloor in a deep-marine environment, as indicated by the underlying and interfingering chert unit. No fossils were found in the volcanic rocks, but a Permian age is likely on the basis of Pennsylvanian and Early Permian conodonts and fusulinids recovered from a carbonate lens in the underlying chert. This age presumes the succession is upright. Independent facing indicators were not found in either volcanic rocks or chert during the present study, nor are they mentioned in the previous work of Tempelman-Kluit (1972).

Correlation of units of Slide Mountain terrane

Northeast of Tintina Fault, the Slide Mountain terrane extends southeasterly from the Tay River map area through northeasternmost Quiet Lake, Finlayson Lake, and Frances Lake map areas (Murphy et al. (2001, 2002); re-interpreted in Murphy (2004) and Murphy et al. (2006)) and thence through Watson Lake (units 8–10 of Gabrielse (1967b)) map area. Geology in the last area has been extensively reinterpreted by Mortensen and Murphy (2005). Specifically, the rock units described in this report correspond in age and lithology to the informal Fortin Creek group (chert unit) and Campbell Range formation (basalt unit) of Murphy (2004). The limestone unit may correlate with the carbonate recognized in either unit (Murphy, 2004). Ultramafic rocks (i.e. ultramafic unit) are commonly associated with the Campbell Range formation (e.g. in Murphy et al. (2001, 2002)).

Southwest of Tintina Fault, equivalent rocks are found in Laberge (Anvil allochthonous assemblage of Tempelman-Kluit (1984)), Quiet Lake (Anvil-Campbell allochthon of Tempelman-Kluit (1977)) and Teslin map areas (Slide Mountain terrane of Gordey and Stevens (1994)).

The most extensively documented occurrence of the Slide Mountain terrane is the Sylvester Allochthon in northern British Columbia, an aerially extensive, complexly deformed, tectonically shuffled stack of Devonian to Triassic chert, argillite, and volcanic and ultramafic rocks thrust onto strata of the ancestral North American margin (Harms and Murchey, 1992; Nelson et al., 1993).

Regionally, the Slide Mountain terrane represents delaminated remnants of a once more vast ocean (Harms and Murchey, 1992) or alternatively, slices derived from a marginal basin of modest extent (Nelson et al., 1993).

PRE-TERTIARY STRATIGRAPHY: SOUTHWEST OF TINTINA FAULT

Along the Tintina Fault, ancestral North American margin strata of the southwest side are dextrally offset from those on the northeast by a minimum of 430 km and perhaps as much as 650 km (Gabrielse, 1985; Gabrielse et al., 2006). The southwest corner of Tay River map area exposes only a small sampling of these displaced strata, which are well represented in contiguous areas to the south and east through Quiet Lake and Finalyson Lake map areas.

Strata southwest of Tintina Fault can be subdivided into two informal assemblages separated by St. Cyr Fault, a prominent strike-slip fault that parallels and merges with the Tintina Fault. Strata southwest of St. Cyr Fault exhibit the well defined stratigraphy that is represented across much of Pelly Mountains and for descriptive purposes are termed the Pelly Mountains assemblage. Those strata bounded by St. Cyr and Tintina faults bear some similarity to the Pelly Mountains assemblage, but overall form a distinctly more basinal sequence, herein termed the St. Cyr assemblage.

Southwest of St. Cyr Fault–Pelly Mountains assemblage

Strata southwest of St. Cyr Fault range from Late Proterozoic to Devono-Mississippian and for descriptive purposes the strata are divided into three successions. Those of Late Proterozoic to Silurian age and of generally deeper water, off-shelf facies are succeeded by widespread shallow-water platformal strata of Siluro-Devonian age (known as Cassiar Platform), which in turn are succeeded by Devono-Mississippian clastic rocks, much like those of the Earn Group, which were deposited in a turbidite basin environment. Carboniferous to Triassic calcareous clastic rocks, representing stable shelf deposition, are seen elsewhere in Pelly Mountains (Tempelman-Kluit, 1977), but do not outcrop in Tay River area.

Late Proterozoic to Silurian off-shelf strata

The regionally fine-grained nature of clastic and carbonate strata of late Proterozoic to Silurian age likely represents deposition in a relatively deep-water off-shelf setting. Three informal units are recognized. In upward succession these include a lower unit of generally noncalcareous slate with a thick carbonate member, a middle unit of calcareous phyllite, and an upper unit of black shale and siltstone.

*Slate unit (*PЄp*)*

The slate unit is exposed within an 8 km wide band across the southwest corner of Tay River map area. At least 1000 m (assuming no internal structural imbrication) of pelitic strata is present, within which lies a member of pelitic limestone and calcareous pelite up to 350 m thick. The unit is distinguished from the overlying phyllite unit by a slightly darker weathering colour and noncalcareous nature.

The slate unit is homogeneous and dominated by noncalcareous, grey, silver-grey, and dark-rust-brown-weathering slate and phyllite. Fresh surfaces are dark blue-grey. The slate is locally laminated and contains disseminated pyrite cubes up to 2 mm across. A strong foliation results in platy, slippery talus of fragments cleaved into sheets 0.5–1 cm thick. Kink bands are common and multiple cleavages were noted locally. Other sparse rock types include isolated, clean quartzite beds up to 0.4 m thick, and rare, grey-weathering, white recrystallized limestone in sharply defined beds to 1.5 m thick. Near Mount Atherton, in the extreme southwest corner of Tay River map area, contact-metamorphosed equivalents of these rocks are muscovite-biotite schist, biotite quartzite, and rare thin beds of marble. The base of the slate unit does not occur in the project area. Its upper contact with the overlying phyllite unit is presumed to be an unconformity on the basis of regional correlation.

A grey- to orange-weathering member of slate and carbonate forms a 13 km long belt near the south boundary of Tay River map area. Rust-brown to grey phyllite is interspersed with the dominant platy, flaggy, well cleaved recrystallized, grey limestone. Although generally 350 m thick, the member pinches out to the northwest. About 5 km northwest of the pinch out, 65 m of thin-bedded, well bedded, grey limestone may represent the same horizon.

No fossils were found in the slate unit. Its stratigraphic position beneath Cambro-Ordovician strata (i.e. phyllite unit) and the regional absence of Middle Cambrian strata in the Pelly Mountains (Tempelman-Kluit et al., 1975) suggest it is late Proterozoic to Early Cambrian. The slate unit probably correlates with along-strike strata found in Glenlyon map area to the north (upper part of Harvey Group of Campbell (1967)) and in Quiet Lake and Finlayson Lake map areas to the south (units PlЄqs and PlЄs of Tempelman-Kluit (1977)). The slate unit lithologically resembles the correlative Gull Lake Formation northeast of Tintina Fault.

*Phyllite unit (*uЄOsl*)*

The phyllite unit occupies a single belt that trends northwest across the southwest corner of Tay River map area. It is differentiated from similar rock types in the underlying slate unit by a lighter weathering colour and calcareous composition. The generally overlying platy siltstone unit weathers similarly, but is coarser in grain size and distinctly nonphyllitic.

The phyllite unit weathers grey to orange-buff and consists primarily of as much as 450 m of light grey to orange, lustrous calcareous phyllite and interbedded, laminated to thin-bedded, light-grey-weathering phyllitic limestone. The limestone is grey to black on fresh surface and very fine crystalline. Phyllitic cleavage parallels bedding and also forms an axial-planar, penetrative to spaced cleavage in areas of intense small-scale folds. Outcrops weather to a platy, characteristically slippery or greasy talus. Crosscutting centimetre-sized veins and centimetre- to decimetre-sized pods of white quartz and carbonate are ubiquitous.

The basal contact of the phyllite unit was not observed. Relationships elsewhere suggest that a regional unconformity below Upper Cambrian strata (Tempelman-Kluit et al., 1975) separates it from the underlying slate unit. The upper boundary with the locally preserved black shale unit is presumed conformable. In most places, however, the phyllite unit is directly and possibly unconformably overlain by the platy siltstone unit.

The age of the phyllite unit is poorly constrained. Regionally, it and correlative strata contain few fossils. Stratigraphic position beneath the graptolite-bearing, black shale unit and sparse data from elsewhere in the Pelly Mountains (Tempelman-Kluit et al., 1975; Gordey, 1981b) suggest a Late Cambrian to Early Ordovician age.

Strata like the phyllite unit are widely exposed along the axis of the Siluro-Devonian Cassiar Platform, including within McDame map area (Kechika Group of Gabrielse (1963); Kechika Formation of Gabrielse (1998)), Wolf Lake (unit 4 of Poole et al. (1960)), and Quiet Lake and Finlayson Lake (unit uЄOsl of Tempelman-Kluit (1977); Kechika Group of Gordey (1981b)) map areas. Volcanic rocks including tuffaceous phyllite and basalt are significant components in the last two regions. In Tay River and Sheldon Lake map areas northeast of Tintina Fault, the phyllite unit resembles some facies of the correlative Rabbitkettle Formation.

*Black shale unit (*OSsl*)*

The black shale unit is exposed at only one locality 17.8 km east of Mount Atherton (62°2.25'N, 133°33.20'W). Its black weathering colour contrasts sharply with the orange-weathering, underlying phyllite unit and the grey to orange-weathering, overlying platy siltstone unit.

The black shale unit consists of medium grey- to black-weathering, finely laminated calcareous shale and siltstone in beds 10–25 cm thick, and contains abundant biserial graptolites. An estimated 30 m of strata are present at the unit's single locality. The basal contact with the underlying phyllite unit is not exposed and is presumed conformable. An unconformity beneath the platy siltstone unit is proposed to account for the restricted preservation of the black shale unit.

Graptolites collected from the black shale unit are early Middle Ordovician to Early Silurian (K04-6). Similar black shale in Quiet Lake and Finlayson Lake map areas contains graptolites of Early to Late Ordovician and also possibly earliest Silurian age (Gordey, 1981b).

As with the phyllite unit beneath it, the black shale unit has widespread correlatives along the axis of the future Cassiar Platform, including within McDame (upper parts of Kechika Group of Gabrielse (1963)), Wolf Lake (possibly within unit 4 of Poole et al. (1960)), and Quiet Lake and Finlayson Lake (unit OSsl of Tempelman-Kluit (1977); graptolitic shale unit of Gordey (1981b)) map areas. Within the project area northeast of Tintina Fault, the black shale unit resembles the noncherty parts of the correlative Duo Lake Formation.

Cassiar Platform: Siluro-Devonian

The term Cassiar Platform has been applied with varied definition. Gabrielse (1967a) originally used the term "Pelly-Cassiar Platform" to describe a Proterozoic to Middle Devonian stable tectonic element. In his tectonic synthesis of the northern Cordillera, Tempelman-Kluit ((1979b), Fig. 2) reduced the time range to Upper Cambrian to Devonian based upon the platform stratigraphy in east-central Yukon. Cecile and Norford (1991) used the term Cassiar Platform in a depositional context rather than a tectonic one. In their synthesis of Ordovician and Silurian strata in the Cordillera, they show Cassiar Platform to be an insignificant feature during early Paleozoic times, when the region was largely represented by basinal facies. Cassiar Platform has also been used as a convenient geographic reference without regard to a restricted existence in time (e.g. Tempelman-Kluit, 1981). In this report, the defining elements of Cassiar Platform are considered the Siluro-Devonian dominantly shallow-water, shelf siltstone, carbonate, and quartzite. This succession extends from Cassiar Mountains in northern British Columbia northward to central Glenlyon map area, where it is structurally terminated by Tintina and D'Abbadie faults (Wheeler and McFeely, 1991). Therefore Cassiar Platform is here considered a time-restricted, relatively shallow-water, depositional element. This usage is consistent with other areas considered as 'platforms' in the northern Cordillera e.g. Mackenzie Platform, MacDonald Platform, Interior Platform (Fig. 6).

The two units of the Cassiar Platform in southwest Tay River area are informally called the platy siltstone and dolostone units.

*Platy siltstone unit (*Sst*)*

The platy siltstone unit occurs as a narrow belt that trends northwest across the southwest corner of Tay River map area. Graphic measurement suggests a 400 m thickness. The unit's orange- to tan-weathering colour distinguishes it from the overlying, grey-weathering dolostone unit. It is easily distinguished from the similar-weathering, underlying phyllite unit by its nonphyllitic nature and coarser grain size.

The unit consists of homogeneous, tan- to orange-weathering, thin-bedded siltstone that is medium grey on fresh surface. It is commonly dolomitic and rarely calcareous. Characteristic, even, parallel lamination commonly leads the rock to weather into large thin sheets and plates. A blocky-weathering habit occurs where the strata are burrowed. Small-scale crosslamination is rare. The platy siltstone unit grades upward into the dolostone unit. The lower contact with the phyllite unit, although not exposed, is abrupt and probably disconformable, accounting for the limited preservation of intervening black, graptolitic strata of the black shale unit.

The age of the platy siltstone unit from the Tay River area is roughly bracketed as post-early Middle Ordovician to probably pre-Devonian. The lower limit is based on the age of graptolites from the underlying black shale unit (K04-6, Appendix B); the upper limit is from the probable age of the dolostone unit. Based on graptolite collections in Quiet Lake and Finlayson Lake map areas from strata similar to the platy siltstone (Gordey, 1981b) the age is most likely Early and Middle Silurian (Landovery and Wenlock of current usage), but may range into the Late Silurian (Ludow and Pridoli of current usage).

*Dolostone unit (*SDdq*)*

The dolostone unit lies immediately southwest of St. Cyr Fault, on both limbs of Magundy syncline. Based upon graphic measurement the unit is about 1000 m thick. From a distance its grey to orange weathering colour easily distinguishes it from underlying orange- to tan-weathering beds of the platy siltstone unit and from the overlying, black-weathering, black clastic unit.

The dolostone unit is dominated by very fine crystalline to sugary, light to dark grey dolostone in massive or laminated beds 0.3–0.7 m thick. Bedding is defined by a thick parting between uniform grey- to buff-weathering beds, or less commonly by alternating light grey-, orange-, or buff-weathering beds. Most strata are unfossiliferous, but oncolites and obscure fossil fragments up to 1 cm across locally amount to 10%. More rarely, silicified bryozoa, corals, and crinoid-stem fragments can be recognized. Grey-weathering, fine- to medium-grained quartz arenite occurs as isolated members, or is interbedded with dolostone. The quartz arenite, most abundant in the middle third of the unit, may comprise up to 70% of some sections over thicknesses of as much as 200 m. Individual sandstone members range from a single thick bed to successions up to 40 m thick. The generally massive beds within the latter, are defined as a 0.6–1.0 m thick parting. Rare ripple marks and parallel lamination are present. The lower contact of the dolostone unit is gradational and conformable on siltstone of the underlying platy siltstone unit. At a briefly examined locality 15.0 km northeast of Mount Atherton (62°8.32'N, 133°41.11'W), a 30 m thick interval of flaggy-bedded dolostone occurs at the base of the unit. The upper contact of the dolostone unit with shale and siltstone of the black clastic unit is abrupt and probably disconformable.

The scant faunal remains collected from the dolostone unit are long-ranging and Devonian. Based upon collections from similar strata to the south in Pelly Mountains the unit is most likely Late Silurian to Middle Devonian, but may be marginally older (Gordey, 1981b).

Correlative shallow-water carbonate strata are widespread southwest of Tintina Fault immediately to the north in Glenlyon (Askin Group of Campbell (1967)) and to the south in Quiet Lake and Finlayson Lake (units SDd and SDdq of Tempelman-Kluit (1977)) map areas. Southward through most of Wolf Lake map area strata of this age are not exposed, but are again represented in southernmost Wolf Lake (units 5 and 6 of Poole et al. (1960)) and contiguous McDame (Sandpile and McDame groups of Gabrielse (1963)) and Jennings River (unit 4 and 5 of Gabrielse (1969)) map areas.

Equivalent shallow-water platformal strata northeast of Tintina Fault are the sparsely represented siltstone and carbonate-sandstone units that define McEvoy Platform.

Devono-Mississippian turbidite basin strata

In upper Devonian time there was an abrupt shift in depositional regime throughout the northern Cordillera (Fig. 7) as an influx of westerly- and northerly-derived chert-rich detritus spread across the ancestral North American margin. This clastic sequence is represented in southwest Tay River area by the black clastic unit.

*Black clastic unit (*DMs*)*

The black clastic unit occupies the core of Magundy syncline immediately southwest of St. Cyr Fault. Exposures are generally small and poorly exposed. From a distance the unit is readily distinguished from the underlying dolostone unit by its recessive nature and dark-grey to black weathering colour. The black clastic unit is probably at least 500 m thick, based on graphic estimates, and forms the youngest beds exposed southwest of St. Cyr Fault.

Dark blue-grey, black, dark brown, and locally rust-weathering shale, siltstone, and conglomerate comprise the black clastic unit. Sandstone varies from very fine-grained to granule-size grade and is composed of chert and slightly less abundant quartz grains. The conglomerate is a framework of clast-supported, subrounded to well rounded, light to dark grey chert pebbles ranging up to 4 cm in diameter with a matrix of quartz-chert sandstone. Because of the limited, poor exposure and brief examination of this unit other features such as bedforms and thickness and distribution of individual coarse clastic members have not been documented. As an approximation, perhaps 30% of the unit is composed of sandstone, 20% conglomerate, and the rest is shale and siltstone. The basal contact of the unit was examined 20 km east of Mount Atherton (62°0.98'N, 133°30.54'W). There, the uppermost dolostone unit is medium-grey-weathering, dark grey to black, very fine crystalline bioclastic dolostone. Bioclasts include poorly preserved yet abundant crinoids, bryozoa, syringoporid, and solitary corals. The lowermost Earn Group outcrop, 4 m stratigraphically above the uppermost dolostone bed, consists of dark blue-black-weathering black shale and siltstone. Gordey (1981b) documented unconformable relations in part of southern Pelly Mountains, but recognized that in some areas relations could be conformable. Based on regional correlation the black clastic unit is Late Devonian to Early Mississippian.

Equivalents of the black clastic unit are widespread in Finlayson Lake (NTS 105 F) and Quiet Lake (105 G) map areas (units uDMs, uDMcg of Tempelman-Kluit (1977); 'black clastic' unit of Gordey (1981b)). Northeast of Tintina Fault, it correlates with similar strata of the Earn Group (*see* 'Earn Group (DME)' section for additional correlations).

Depositional setting of Pelly Mountains assemblage

Proterozoic to Ordovician strata predating Cassiar Platform are typified by fine clastic rocks that feature plane lamination and lack of larger scale bedforms. The likely depositional environment was in relatively quiet water, below wavebase in a muddy off-shelf setting. The carbonate member within the slate unit may have resulted from proximity to a carbonate-producing area such as a local shallow-carbonate platform or buildup. Similarly, the carbonate content of the phyllite unit may derive from dispersion of carbonate-lime mud produced in possibly shallower water areas or on a carbonate platform, the fine carbonate being transported by suspension and turbidity currents into deeper water off-shelf areas. The black shale unit represents a relatively anoxic setting compared to older units.

The depositional setting of the platy siltstone unit of Cassiar Platform is less clear. For similar strata in southern Pelly Mountains, Gordey (1981b) remarked that the widespread occurrence and uniform character of the platy siltstone indicates uniform deposition over a large area. Relatively shallow-water deposition is indicated by the light colour of the siltstone and local interbeds of light-coloured dolostone. The fine parallel lamination indicates deposition in quiet water. The paucity of fossils could indicate an inhospitable environment, but not the euxinic conditions resulting in the underlying black shale unit.

Based on its regional extent, dolostone composition, light colour, relatively sparse fauna, possible algal lamination, and quartz arenite interbeds, the dolostone unit of Cassiar Platform was deposited on a broad, shallow-water shelf. The quartz arenite represents well washed detritus from a beach or shallow-bar environment that from time to time prograded across the shallow subtidal to intertidal carbonate flats.

The lack of sedimentological information from the black clastic unit in southwest Tay River area limits direct interpretation of depositional environment. Based upon regional correlation, the coarse clastic rocks were likely deposited as submarine sediment gravity flows derived from westerly source areas that have not yet been identified (Gordey, 1991). The unit resulted from regional Devono-Mississippian tectonism that featured block faulting, uplift, and erosion of outer miogeoclinal areas, as well as felsic volcanism and formation of exhalative barite-lead-zinc deposits. The unconformity beneath the black clastic unit reflects local uplift and block faulting of a generally subsiding shelf area (i.e. Cassiar Platform) so that some areas may not have been eroded, but received sediment continuously (Gordey, 1981b).

Between St. Cyr and Tintina faults: St. Cyr assemblage

Strata in this belt, referred to as the St. Cyr assemblage, include both possibly dominantly deeper water, off-shelf and probable shelf facies and range from Cambro-Ordovician to Triassic age. Fossil control is poor, contact relationships are uncertain, and regional correlation for some units is speculative in this 10 km wide fault-bounded strip. Seven mappable informal stratigraphic units are recognized.

Silty limestone unit (ЄOc)

The silty limestone unit underlies a nearly continuous band close to and southwest of Tintina Fault. Its light weathering colour distinguishes it from overlying dark slate of the black slate unit. Small-scale folds, the lack of a basal contact, and the unknown regional attitude of these rocks preclude accurate thickness determination. Considering possible structural complications and surface width of the unit, a minimum thickness of 400 m may not be unreasonable.

The silty limestone unit is composed of buff- to grey-white-weathering, variably argillaceous to silty limestone. Fresh surfaces are grey to black and reveal a fine- to medium-crystalline grain size. Beds generally range from 10 cm to 30 cm thick and may be massive or strikingly laminated. In places the limestone grades to a calcareous phyllite. White quartz in pods to 10 cm long and 3 cm across, as well as in veins several centimetres thick is locally present. Very fine-grained calc-silicate hornfels defines an aureole up to 400 m wide near the elongate Buttle Creek pluton. The contact with the overlying black slate unit is not exposed, but apparently sharp and presumed conformable.

There are no fossils from the silty limestone unit. Regional correlation suggests a Cambro-Ordovician age, as are most formations of similar calcareous and phyllitic strata of substantial thickness.

The silty limestone unit and overlying black slate unit are likely homotaxial with the phyllite and black shale units of the Pelly Mountains assemblage. The unit continues southeasterly into central Quiet Lake map area (unit ЄOcsl of Tempelman-Kluit (1977)).

*Black slate unit (*ODsl*)*

The black slate unit is poorly exposed along a northwest-trending strip midway between St. Cyr and Tintina faults. Its dark-grey to black weathering colour distinguishes it from the orange-grey-weathering silty limestone unit and the similar orange-weathering, adjacent, phyllite-limestone unit. Minor folds are abundant, indicating the black slate unit is internally strongly deformed. The width of outcrop of the unit is similar to the underlying phyllite unit, suggesting its thickness may be comparable, i.e. about 400 m.

The black slate unit consists mostly of dark-grey- to black-weathering, recessive, black slate and phyllite. Locally limestone is interbedded with the slate in beds from 20 cm to 2 m thick. The carbonate is grey, massive, and fine crystalline, weathering dark grey to grey-brown. Dark grey, limey siltstone, thinly laminated, and with a flaggy appearance occurs locally. The same unit was briefly examined along strike to the southeast in northern Quiet Lake map area 6.5 km northeast of Mount Cook (from 61°56.80'N, 132°48.14'W to 61°57.58'N, 132°45.91'W). There it consisted mostly of dark-grey- to black-weathering, phyllitic slate with limonite spots, black siliceous graphitic slate, and dark blue-grey- to rust-brown-weathering grey slate. Less abundant were platy, black, very fine crystalline limestone, calcareous siltstone, and quartz sandstone. The black slate unit is presumed to overlie the silty limestone unit conformably.

The age of the black slate unit is incompletely known. An Ordovician to Devonian age is inferred on the basis of stratigraphic position above the silty limestone unit and Middle Devonian (?)Eifelian conodonts recovered from light-grey-weathering, black, very fine crystalline limestone in northern Quiet Lake map area (MAPNO F15-2, Appendix B). Lower parts of the black slate unit likely correlate with the black shale and platy siltstone units of the Pelly Mountains assemblage and the upper parts with the dolostone unit. In northern Quiet Lake area contiguous strata are separable into a lower calcareous graphitic "sooty" slate and an upper graphitic, siliceous, pyritic slate (units OSslc, OSslq of Tempelman-Kluit (1977)). Beds of similar age northeast of Tintina Fault comprise the Road River Group and Siluro-Devonian strata of McEvoy Platform.

*Limestone-phyllite unit (*DMcsl*)*

The limestone-phyllite unit is exposed in a 4 km wide, 35 km long band northeast of and adjacent to St. Cyr Fault. Its distinguishing feature is its bright orange weathering colour. It is overlain by the shale-siltstone unit, and is presumed fault bounded against older strata of the black slate unit that lie to the northeast.

The unit is dominantly buff-orange-weathering, orange to dark blue-grey phyllite and thinly laminated phyllitic limestone. Lesser components include buff- to light-grey-weathering, very fine crystalline limestone; orange-weathering, laminated calcareous siltstone and green slate; and rare, thin-bedded, orange chert. One locality is an isolated exposure of possibly 30 m of massive, blue-grey-weathering, fine crystalline, grey limestone.

Better exposed contiguous strata were briefly examined in northern Quiet Lake map area along a ridge 4 km east of Mount Cook (61°55.79'N, 132°51.64'W to 61°56.49'N, 132°48.50'W). There the unit (part of unit OSslq of Tempelman-Kluit (1977)) also contains orange-weathering phyllite, but is mostly buff-weathering, platy limestone to calcareous phyllite and minor black, graphitic pyrite-spotted slate. The limestone is highly contorted, well laminated, and breaks into thin corrugated sheets. Weathered cleavage surfaces are mottled silver-grey to orange. Massive white quartz veins and pods are locally numerous within the orange-weathering phyllite.

The limestone-phyllite unit is overlain with presumed unconformity by the Late Triassic shale-siltstone unit. The base of the limestone-phyllite unit is not exposed. Its northeast limit of exposure and boundary with the older (*see* below) black slate unit is considered a fault, based on interpretation of the contact as mapped by Tempelman-Kluit (1977) in Quiet Lake map area to the south.

In the Tay River area, the age of the unit is not constrained other than it is possibly overlain by the shale-siltstone unit and therefore predates the Late Triassic. Three conodont collections from strata in Quiet Lake map area (collection F15-3, F15-5, F15-6; Appendix B) that are contiguous with the limestone-phyllite indicate Late Devonian, early late Devonian (Early Frasnian to Early Famennian), and late Late Devonian (Famennian) ages. Adjacent strata of the black slate unit, now faulted against the limestone-phyllite, but perhaps also belonging stratigraphically beneath it, has yielded conodonts of Middle Devonian (?)Eifelian age (collection F15-2, Appendix B). From these inferences, the limestone-phyllite unit is considered Late Devonian.

Upper Devonian carbonate is rare in the northern Cordillera, and that in the Tay River–Finlayson Lake areas is the youngest known. The nearest recognized occurrence is in the McDame area of northern British Columbia. On the east limb of McDame Synclinorium the uppermost carbonate strata of Cassiar Platform are composed of about 100–150 m of light grey-weathering, platy limestone of early Frasnian (early Late Devonian) age. This is overlain by middle Frasnian, black, locally calcareous, deep-water shale (H. Gabrielse, pers. comm., 1995).

Northeast of Tintina Fault, correlative strata belong to the clastic-dominated Earn Group. With one exception, substantive carbonate or carbonate-bearing strata do not appear until the succeeding Tay Formation early in the Carboniferous. The exception is a local member of limestone, dark shale, and black calcareous slate in northeasternmost Tay River area that has yielded Late Devonian (early Famennian; MAPNO K16-1, Appendix B) conodonts.

*Black argillite unit (*DMs*)*

The black argillite unit was examined briefly at a stream cutbank along Magundy River near the south margin of Tay River map area (62°1.16'N, 133°12.50'W). It consists of dark grey- to black-weathering argillite to shale. Stratigraphic relationships of the unit were not observed in the Tay River map area and are based on northwestward extrapolation of contacts mapped by Tempelman-Kluit (1977) in northern Quiet Lake map area. On this inference the unit is presumed to conformably underlie the argillite-chert unit and conformably overlie the limestone-phyllite unit. An age inferred from these relationships would be Devono-Mississippian, in agreement with the lithological similarity of the unit to Devono-Mississippian clastic strata regionally. Contiguous strata to the southeast in northern Quiet Lake map area are designated as Devono-Mississippian (unit Dms of Tempelman-Kluit (1977)). Correlative strata southwest of St. Cyr Fault are widespread in Finlayson Lake and Quiet Lake map areas (black clastic unit of Gordey (1981b); units uDMs and uDMcg of Tempelman-Kluit (1977)). Correlative strata northeast of Tintina Fault comprise the Earn Group.

*Argillite-chert unit (*Mtf*)*

The argillite-chert unit was examined briefly at a single locality along Magundy River near the south margin of Tay River map area (62°2.54'N, 133°16.23'W). It consists of orange-weathering, thin-bedded, well bedded, light grey-green argillite to chert. Based on extrapolation of units mapped by Tempelman-Kluit (1977) in northern Quiet Lake map area, it conformably underlies the limy siltstone unit and conformably overlies the black argillite unit.

The argillite-chert unit is lithologically similar to widespread chert in Pelly Mountains southwest of St. Cyr Fault (unit 4t of Tempelman-Kluit (1977); unit 4t of Gordey (1981b)) that is of Late Mississippian (Visean) age. Although the Magundy River occurrence is northeast of St. Cyr Fault, the same age is assumed. Like the Magundy River occurrence, the Pelly Mountains chert is regionally underlain by black clastic rocks (analogous to the black slate unit) and overlain by calcareous siltstone (analogous to the black argillite unit). Northeast of Tintina Fault, fossil collections of Visean age are rare, and whether Visean beds are represented is not clear.

*Limy clastic unit (*Csl*)*

The black argillite unit was briefly examined at a stream-cut exposure along Magundy River near the south margin of Tay River map area (62°2.03'N, 133°15.43'W). It consists of brown-weathering, contorted, thin- to medium-bedded, laminated calcareous siltstone, silty limestone, and shale. Based on extrapolation of units mapped by Tempelman-Kluit (1977) in northern Quiet Lake map area, it conformably overlies the argillite-chert unit. The top of the limy clastic unit is not exposed; on the west the unit is structurally bounded by St. Cyr Fault. The stratigraphic position and a lithological similarity to Carboniferous strata in Pelly Mountains southwest of St. Cyr Fault (as for the argillite-chert unit) suggest a post-Late Mississippian (post-Visean) Carboniferous age for the limy clastic unit. Contiguous strata to the southeast in northern Quiet Lake map area are designated as Carboniferous (unit Csl of Tempelman-Kluit (1977)); however, in parts of Pelly Mountains southwest of St. Cyr Fault, late Paleozoic strata are lithologically indistinguishable from those of Triassic age. Correlative strata northeast of Tintina Fault are either absent or found within the chert-dominated Mount Christie Formation.

*Shale-limestone unit (*uTRsc*)*

The shale-limestone unit was briefly examined at two stream-cut exposures along Magundy River within 2 km south of the Campbell Highway. One locality (62°11.28'N, 133°34.30'W) comprises a large, contorted outcrop and scree of dark brown- to black-weathering, black, finely crystalline limestone, platy limestone, and shale from which Late Triassic (Late Carnian) conodonts have been recovered (MAPNO K04-2, Appendix B). At the other (62°11.79'N, 133°36.40'W), about 25 m of light to dark grey -weathering, dark grey, limestone succeeded by an equal thickness of light to dark brown-weathering, highly cleaved shale, in turn overlain by about 10 m of orange-weathering, thin-bedded (5 cm), well bedded, dark grey chert. Limestone from this second locality has yielded conodonts of Late Triassic (Early Norian) age (collection K04-3, Appendix B).

At the second locality mentioned above the conodont-bearing limestone closely overlies, with apparent structural concordance, orange- to orange-grey-weathering, grey-green phyllite of the limestone-phyllite unit. The generally close and irregular juxtaposition of the two units also suggests the Triassic rocks are in stratigraphic proximity to the limestone-phyllite, and are preserved as synclinal infolds within it. Including both localities, in excess of 100 m of the shale-limestone unit are likely preserved. Triassic strata of similar character, including minor thin-bedded chert, are widely dispersed within Quiet Lake and Finlayson Lake map areas southwest of St. Cyr Fault (shale-siltstone unit of Gordey (1981b); unit uTRsc of Tempelman-Kluit (1977)). Correlative and lithologically similar strata northeast of Tintina Fault comprise the Jones Lake Formation.

Depositional setting of St. Cyr assemblage

Early Paleozoic parts of the St. Cyr assemblage were deposited in relatively quiet-water off-shelf settings. Fine grain size, even parallel lamination, and lack of traction-produced structures are characteristic. The source of carbonate for the Cambro-Ordovician silty limestone unit is unclear. Like the homotaxial Rabbitkettle Formation northeast of the Tintina Fault it may have been a carbonate platform or buildups in shallow-water areas that shed carbonate in suspension and turbidity currents into deeper water.

The fine grain size and black, locally graphitic character of the Ordovician to Devonian black slate unit indicate a more euxinic environment than the preceding silty limestone, with only minor incursions and preservation of carbonate. Cassiar Platform, as typified by a thick succession of Siluro-Devonian siltstone and carbonate, is not represented in the St. Cyr assemblage.

Origin of the Devono-Mississippian limestone-phyllite unit is enigmatic. Its carbonate content contrasts with the regional Late Devonian incursion of clastic strata (Earn Group) that led to the drowning of carbonate platforms. Given the block faulting and extension in the Late Devonian (e.g. Gordey, 1991), the limestone-phyllite unit may have been deposited on a relatively high-standing fault block, isolated from the clastic influx, where carbonate production was able to proceed. The generally fine grain size and flat lamination in this unit indicate a subwavebase setting; occurrences of massive limestone may represent local carbonate buildups. The possibly overlying black argillite unit reflects the eventual incursion of Devono-Mississippian clastic rocks onto this formerly high-standing area.

Similarity of the argillite-chert unit with regionally widespread Mississippian chert in the Pelly Mountains implies that it too may have been a siliceous exhalative facies of felsic volcanism (Gordey, 1981b). The Carboniferous to Triassic strata (limy clastic and shale-limestone units), like their equivalents south and west of St. Cyr Fault, likely reflect deposition in a regional, clastic-dominant shelf setting (Gordey, 1981b).

CRETACEOUS IGNEOUS SUITES

Mid-Cretaceous plutonic and volcanic rocks underlie about 25% of the project area and are divisible into three suites. Granitic plutons southwest of Tintina Fault are part of the Cassiar Plutonic Suite (Woodsworth et al., 1991). Northeast of Tintina Fault igneous rocks comprise intrusions of the Selwyn Plutonic Suite (Anderson *in* Gordey and Anderson (1993)) and the extensive, coeval South Fork volcanics. Although their margins have been mapped in detail, the petrological and geochemical nature of the igneous rocks is only summarized in this report.

Cassiar Plutonic Suite (Kc)

Southwest of Tintina Fault, three granitic intrusions are considered part of Cassiar Plutonic Suite. The Glenlyon batholith, where examined near Mount Atherton, consists of medium-grained, quartz-poor foliated diorite with about 15% biotite and 10% hornblende. This rock in southwestern Tay River map area may be a local variant because the bulk of the batholith in Glenlyon map area is seriate, medium-grained, biotite granodiorite with an average of 10% biotite, 19% K-feldspar, 41% plagioclase, and 30% quartz (Campbell, 1967). A second small pluton of the Cassiar Plutonic Suite occurs near the south margin of the map area and consists of grey, blocky-weathering, fine-grained granite, with about 10% biotite.

Additionally, north of St. Cyr Fault, the Buttle Creek pluton consists of medium-grained granite with 15–20% biotite and locally up to 5% hornblende. Garnet- and muscovite-bearing pegmatite dykes occur in several places. A local foliation along the margins or roof of the body most likely formed during synemplacement shear. Fault displacement along Tintina Fault, which bounds the Buttle Creek Pluton on its northeast side, did not deform nearby granite outcrops.

Fine-grained pelitic and calc-silicate hornfels is well developed within 200 m of the Buttle Creek pluton. Phyllite and limestone of the slate unit rapidly change metamorphic rank to muscovite-biotite quartz schist and minor marble within 3 km of the Glenlyon batholith. Granitic apophyses within this aureole are common.

Selwyn Plutonic Suite (Ks)

In Tay River and Sheldon Lake map areas, the Selwyn Plutonic Suite includes small stocks to batholiths as much as 45 km long. The large plutonic bodies include the Anvil, Orchay, Mount Mye, and Carolyn batholiths and plutons that lie immediately northeast of Tintina Fault. Two other plutons, Mount Selous and Itsi, form the cores of topographically spectacular ranges near the northern boundary of the study area. The plutons vary from irregular and equant, to elongate in plan. They intrude and hornfels strata as young as Mississippian, crosscut folds and faults, and have aureoles from less than 100 m to as much as 5 km wide. Contacts with country rocks are generally moderate- to steep-dipping (Fig. 25). Plutonic rocks are grey- and resistant-weathering, blocky fracturing, and generally homogeneous. They are generally medium- to coarse-grained and equigranular. Foliation occurs locally and is limited to contact zones.

Intrusions of the Selwyn Plutonic Suite in its type area (Nahanni map area) were distinguished according to the presence of 1) widespread common hornblende; 2) biotite with rare scattered hornblende; or 3) biotite and muscovite (two-mica granite plutons). R.G. Anderson (*in* Gordey and Anderson, 1993) further described petrographic and chemical criteria that distinguish these subdivisions. In Tay River and Sheldon Lake map areas the plutons can also be subdivided into hornblende-bearing and biotite-bearing varieties on the basis of field observations. Two-mica varieties were not separately distinguished, and if present, are included within the biotite-bearing group. An additional plutonic variety recognized in the project area consists of texturally distinct quartz-feldspar porphyry, with minor biotite and minor hornblende.

More recently Mortensen et al. (2000) abandoned the term Selwyn Plutonic Suite, subdividing it into several other suites based on a general northeastward decrease of U-Pb ages. Although this age progression is recognized, the Selwyn Plutonic Suite is the only formally defined name (Woodsworth et al., 1991; R.G. Anderson *in* Gordey and Anderson, 1993) and will be used here in its original sense, i.e. to refer collectively to what Mortensen et al. (2000) called the Anvil, Tay River, South Lansing, and Tungsten suites.

Visually estimated modal compositions for 133 non-porphyritic rock samples of the Selwyn Plutonic Suite are shown in Figure 26 and lie within the granite, granodiorite, and monzodiorite fields. Among hornblende-bearing plutons, hornblende varies from 1% to 15% of modal volume whereas biotite, on average, is almost twice as abundant. The average colour index is about 14, but varies from 2 to 25. Plutons in which hornblende is lacking average about 8% biotite, but locally may contain up to 20%. Although in the Nahanni area, K-feldspar megacrysts are common in all varieties (R.G. Anderson *in* Gordey and Anderson, 1993) and have been reported for the Anvil batholith (Tempelman-Kluit, 1972; Pigage and Anderson, 1985), these were rarely noted for other plutons in the project area.

Quartz-feldspar porphyry characterizes the Marjorie pluton near and northwest of Marjorie Lake, as well as other small scattered bodies. This rock type is mostly composed of 10–25% quartz and 25–40% feldspar phenocrysts set in an aphanitic to fine-grained groundmass. The quartz phenocrysts, 1–10 mm across, are smoky or purplish grey, commonly have pyramidal terminations, and locally show resorption or embayment textures. Scattered biotite to 2 mm across and prismatic hornblende to 5 mm long, together amount to about 6%. They are generally subequal in abundance, but in some samples hornblende may be absent. The feldspar phenocrysts, all plagioclase, are of smaller size and generally euhedral and tabular. Potassium cobaltinitrite stain for K-feldspar shows the matrix to be rich in this mineral, but visually determining the proportion in hand specimen is hindered by fine grain size.

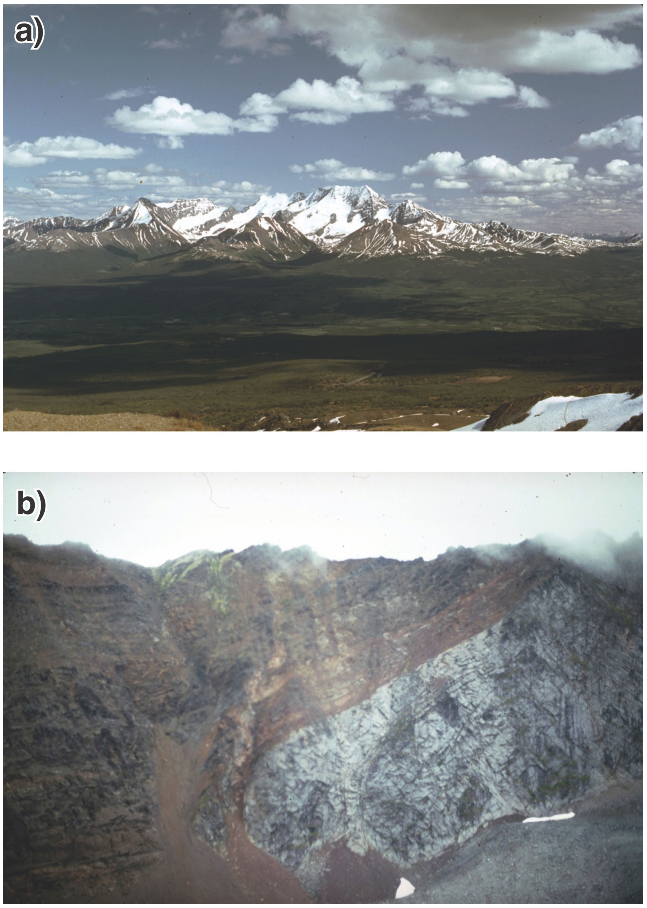


Figure 25. Selwyn Plutonic Suite; **a)** resistant granite-cored Itsi Range, looking to the southeast across the valley of South Macmillan River (105 J/15; view to the southeast from approximately 63°0.02'N, 130°34.18'W); for scale, field of view of Itsi Range is about 12 km across; 2012-136; **b)** moderately north-dipping granite contact of the Itsi Pluton, Itsi Range (105 J/16; 62°55.99'N, 130°14.46'W viewed from the southeast); for scale, relief of cliffs is about 600 m (2000 ft.); 2012-135; photographs by S. Gordey.

With the exception of the Orchay and Anvil batholiths, plutons in the project area have contact aureoles less than 200 m wide of locally rusty-weathering, fine-grained, pelitic and calc-silicate hornfels. In contrast, aureoles surrounding the aforementioned batholiths are as much as 5 km across. In them, slate of the Gull Lake Formation is metamorphosed to coarse-grained muscovite-biotite-quartz schist that locally contains garnet, staurolite, cordierite, andalusite, and sillimanite. Tempelman-Kluit (1972) documented metamorphic isograds around the Anvil batholith. He suggested that these

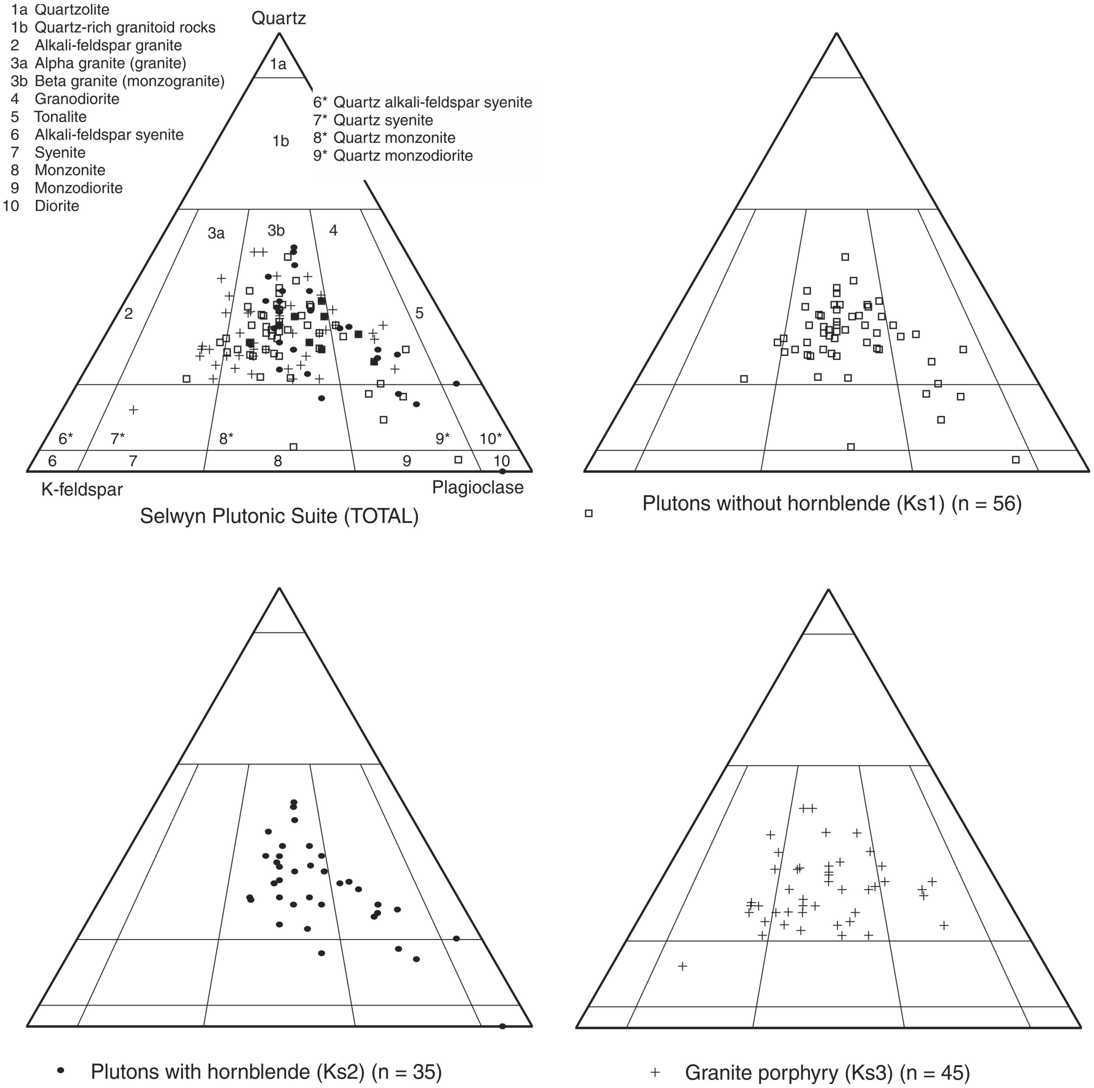


Figure 26. Modal quartz-plagioclase-alkali feldspar proportions for the Selwyn Plutonic Suite in Sheldon Lake and Tay River areas (nomenclature *after* Streckeisen (1976)).

strata, metamorphosed before the Devonian, were raised and arched around the intrusion, leading to the roughly concentric arrangement of isograds around it. In a more detailed study, however, Smith and Erdmer (1990) demonstrated synkinematic metamorphism related to Cretaceous emplacement of the Anvil batholith. They indicated pressures of about 3 kbar and peak temperatures of about 600–620°C.

The geochemical composition and affinities of the Selwyn Plutonic Suite is presented by R.G. Anderson (*in* Gordey and Anderson (1993)) and Pigage and Anderson (1985). For the Tay River and Sheldon Lake map areas specifically, only limited geochemical data exists. The results of 14 lithogeochemical analyses of unaltered samples (many related to isotopic age samples) are shown in Table 1 and are plotted in Figure 27 on numerous standard rock classification, tectonic, and mineral discriminant diagrams (as elaborated e.g. in Piercey et all (2006)). As noted in earlier studies, the suite has an overall evolved (rich in large-ion lithophile elements such as Rb and Ba), restricted, silicic metaluminous to peraluminous, radiogenic calc-alkaline composition low in CaO and MgO and high in K_2O (R.G. Anderson *in* Gordey and Anderson, 1993). Various combinations of trace elements as well as a pronounced negative Eu anomaly indicate a volcanic-arc affinity (Fig. 27j, k, l). As well, the suite falls within the “orogenic granite type” (Fig. 27m, n) of Whalen et al. (2001). Related mineralization is likely to include Au and W deposit types (Fig. 27o, r).

Isotopic ages from biotite, muscovite, and hornblende determined for the Selwyn Plutonic Suite in this study area range from approximately 105 Ma to 75 Ma, with most ages within the 100–90 Ma range (Fig. 28; Appendix C). The youngest ages, those within the 75–90 Ma range are among the earliest analyses and have the largest error limits. Confidence in the accuracy of these ages is correspondingly lower.

Table 1. Geochemical data for Selwyn Plutonic Suite.

Unit	KS1							KS2					KS3			KS1	KS2	KS3	All	
Sample no.	**GGA -83 -27F**	**GGA -85 -27A3**	**GGA -85 -28A3**	**GGA -85 -30F3**	**GGA -85 -50B3**	**GGA -86 -30E3**	**GGA -86 -92B**	**GGA -85 -16B4**	**GGA -85 -27G**	**GGA -86 -5F2**	**GGA -86 -7D2**	**GGAG -86 -54A2**	**GGA -85 -17C2**	**GGA -86 -31B2**	**GGA -87 -15J**	**av.**	**av.**	**av.**	**av.**	**SD**
SiO_2	65.7	62.7	66.8	68.7	67.9	66.1	67.9	65.2	61.8	68.6	69.6	63.9	66.8	70.8	67.2	66.54	65.82	68.27	66.65	2.414
Al_2O_3	15.5	19	15.1	14.8	15.4	15.5	15.7	15.4	16.1	14.8	14.7	15.4	15	14.2	15.1	15.86	15.28	14.77	15.45	1.049
TiO_2	0.62	0.17	0.62	0.43	0.47	0.66	0.49	0.61	0.69	0.45	0.39	0.71	0.52	0.36	0.5	0.49	0.57	0.46	0.51	0.140
$Fe_2O_3t^2$	3.90	1.20	4.00	3.60	3.30	4.30	3.10	5.00	5.20	3.90	3.50	5.60	4.30	2.60	4.10	3.34	4.64	3.67	3.84	1.044
Fe_2O_3	1	<0.2	0.9	0.7	0.4	0.6	0.2	1.1	0.9	0.8	0.4	0.6	1.3	0.4	1.2	0.63	0.76	0.97	0.75	0.322
FeO	2.6	1	2.8	2.6	2.6	3.3	2.6	3.5	3.9	2.8	2.8	4.5	2.7	2	2.6	2.50	3.50	2.43	2.82	0.771
MnO	0.06	0.05	0.07	0.06	0.05	0.07	0.04	0.09	0.1	0.07	0.06	0.09	0.07	0.06	0.06	0.06	0.08	0.06	0.07	0.016
MgO	1.72	0.36	1.68	1.1	1.26	1.85	1.33	1.85	2.33	1.3	0.83	2.21	1.27	0.68	1.23	1.33	1.70	1.06	1.40	0.529
CaO	2.9	0.81	3.14	3.22	3.26	3.46	3.06	4.64	5	3.55	2.21	4.71	3.82	2.27	3.65	2.84	4.02	3.25	3.31	1.028
Na_2O	2.4	4.7	2.5	2.5	2.4	2.4	2.3	2.3	2.4	2.5	3.1	2	2.5	2.6	2.6	2.74	2.46	2.57	2.61	0.600
K_2O	4.29	8.39	3.46	3.88	4.24	3.83	4.57	3.04	2.68	3.86	4	3.44	3.07	4.27	3.33	4.67	3.40	3.56	4.02	1.277
P_2O_5	0.17	0.09	0.14	0.09	0.11	0.18	0.13	0.12	0.13	0.11	0.14	0.17	0.11	0.08	0.12	0.13	0.13	0.10	0.13	0.029
H_2Ot	1.5	0.7	1.9	1.3	0.9	1.2	1	1.6	2.1	0.9	1	1.2	1.8	1	1.7	1.21	1.36	1.50	1.32	0.409
CO_2t	0.2	0.8	0.5	0.2	0.3	0.5	0.2	0.2	1	0.3	0.4	0.2	0.5	0.1	0.2	0.39	0.42	0.27	0.37	0.243
St	<0.02	0.02	0.03	<0.02	0.02	0.02	<0.02	<0.02	0.03	<0.02	0.02	0.02	<0.02	<0.02	<0.02	0.02	0.02		0.02	0.005
Cl	0.015	<0.0050	<0.0050	0.005	0.01	<0.0100	0.0162	0.01	<0.0050	0.0168	0.0174	0.0668	0.025	0.0327		0.01	0.03	0.03	0.02	0.017
F	0.084	0.013	0.07	0.055	0.068	0.0858	0.0828	0.06	0.053	0.0565	0.0721	0.0695	0.062	0.0443		0.07	0.06	0.05	0.06	0.018
TOTAL	**98.76**	**98.80**	**99.71**	**99.64**	**99.39**	**99.76**	**99.62**	**99.72**	**99.21**	**100.11**	**99.74**	**99.29**	**99.55**	**98.90**	**99.49**	**99.38**	**99.61**	**99.31**	**99.45**	**0.376**
Rb	210	390	150	160	190	180	220	130	110	160	220	140	120	180	140	214	152	147	180	65
Cs	5.8	4.5	3.8	5	7.5	8.4	10	3.6	1.2	3.9	9	5.7	4	5.5	3.6	6.4	4.7	4.4	5.4	2.3
Ba	760	250	620	980	550	730	700	870	730	810	720	990	1000	920	1000	656	824	973	775	197
Sr	360	230	380	270	250	350	330	310	380	260	310	380	330	220	320	310	328	290	312	53
Ga	19	19	19	17	19	20	20	17	17	16	18	19	18	16	19	19	17	18	18	1
Ta	1.4	1.9	1	0.7	0.5	1.2	1	1.1	0.7	0.9	1.3	0.9	1	1.1	1	1.1	1.0	1.0	1.0	0.3
Nb	15	15	15	12	12	15	12	12	11	12	18	12	13	11	13	14	13	12	13	2
Hf	4.7	3.4	4.7	4.4	4.9	5.4	5.2	4.2	3.8	4.5	5	4.2	4.9	4.1	4.6	4.7	4.3	4.5	4.5	0.5
Zr	200	89	190	190	190	230	210	160	140	180	180	180	210	170	220	186	168	200	183	34
Y	18	39	18	31	22	25	18	27	26	30	26	26	27	34	28	24	27	30	26	6
Th	19	21	18	17	17	35	21	13	11	23	33	19	15	20	14	21	20	16	20	6
U	2.3	14	4.9	2.8	2.9	5.6	4.7	2.2	3.7	4.1	10	2.7	2.7	3.6	2.9	5.3	4.5	3.1	4.6	3.1
Au	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001						

Table 1. (cont.)

Unit	KS1							KS2					KS3				KS1	KS2	KS3	All	
Sample no.	GGA -83 -27F	GGA -85 -27A3	GGA -85 -28A3	GGA -85 -30F3	GGA -85 -50B3	GGA -86 -30E3	GGA -86 -92B	GGA -85 -16B4	GGA -85 -27G	GGA -86 -5F2	GGA -86 -7D2	GGAG -86 -54A2	GGA -85 -17C2	GGA -86 -31B2	GGA -87 -15J		av.	av.	av.	av.	SD
Au	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001							
In	0.05	<0.05	0.05	0.07	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05						
Tl	1.1	2.4	0.75	0.65	0.76	1.3	1	0.58	0.69	0.7	1.2	0.73	0.56	0.88	0.59		1.14	0.78	0.68	0.93	0.45
Be	3.6	4.3	3.3	2.4	3.5	2.9	4.5	1.8	1.4	2	2.7	2	1.9	2.2	1.9		3.5	2.0	2.0	2.7	0.9
Cd	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2						
Cr	26	<10	21	15	22	23	29	28	26	15	<10	18	15	<10	14		23	22	15	21	5
Ni	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10						
Co	10	<5	9	5	7	10	8	11	12	8	5	14	8	<5	8		8	10	8	9	2
Sc	10	4.4	9.4	10	8.4	11	7.8	15	17	13	6.3	14	13	7.8	12		9	13	11	11	3
V	62	<5	54	38	21	68	23	71	93	51	32	89	49	23	47		44	67	40	52	22
Cu	<10	<10	<10	<10	<10	11	<10	<10	<10	<10	<10	<10	14	<10	<10		11		14	13	2
Pb	34	73	69	21	33	49	43	21	17	21	27	17	23	34	20		46	21	26	33	17
Zn	49	20	87	36	35	52	40	56	50	41	33	38	53	36	41		46	44	43	44	15
As	<30	<30	<30	<30				<30	<30				<30								
Ag	<0.1	<0.1	0.1	0.5	0.1	0.1	0.3	0.3	0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.1		0.2	0.2	0.1	0.2	0.1
Bi	<0.5	<0.5	<0.5	<0.5	0.5	0.5	0.5	<0.5	<0.5	<0.5	1.1	0.6	<0.5	<0.5	<0.5		0.5	0.9		0.6	0.2
Mo	<0.2	<0.2	0.3	0.5	0.4	<0.2	0.2	0.3	0.3	<0.2	0.8	0.8	0.3	0.3	0.2		0.4	0.6	0.3	0.4	0.2
Br	<10	<10	<10	<10				<10	<10				<10								
La	43	20	41	42	41	81	51	35	31	55	55	51	48	40	41		46	45	43	45	13
Ce	89	40	84	80	83	160	100	70	63	120	110	96	94	87	83		91	92	88	91	26
Pr	10	4.9	9.2	9.2	9.2	20	12	8.1	7.4	12	12	11	11	9.5	9.7		10.6	10.1	10.1	10.3	3.2
Nd	35	18	34	32	32	64	40	29	26	40	38	36	38	33	33		36	34	35	35	9
Sm	5.7	4.2	5.3	5.7	5.5	10	6.9	5.5	4.9	7.1	7.1	6.6	6.5	6.4	6.1		6.2	6.2	6.3	6.2	1.3
Eu	1.1	0.5	1	0.85	1.1	1.2	1.2	1.1	1	0.95	0.84	1	1.1	0.81	1		1.0	1.0	1.0	1.0	0.2
Gd	3.9	4.3	3.8	5.1	4.3	6.6	4.2	4.8	4.6	5.9	5.2	4.8	5.2	5.5	5.2		4.6	5.1	5.3	4.9	0.7
Tb	0.59	0.76	0.58	0.84	0.62	0.87	0.62	0.78	0.72	0.83	0.76	0.74	0.91	0.87	0.76		0.70	0.77	0.85	0.75	0.10
Dy	2.9	4.8	2.8	4.5	3.5	4.7	2.8	4.3	3.9	4.9	4.2	4	4.8	4.9	4.7		3.7	4.3	4.8	4.1	0.7
Ho	0.61	1	0.57	0.94	0.64	0.86	0.56	0.85	0.8	0.91	0.78	0.77	1	1	0.9		0.74	0.82	0.97	0.81	0.15
Er	1.6	3.5	1.5	2.7	1.8	2.3	1.3	2.4	2.4	2.6	2.1	2.2	2.4	2.9	2.4		2.1	2.3	2.6	2.3	0.5
Tm	0.25	0.62	0.23	0.42	0.25	0.34	0.21	0.38	0.36	0.43	0.32	0.35	0.34	0.45	0.37		0.33	0.37	0.39	0.35	0.10
Yb	1.6	4.2	1.5	2.7	1.6	2.2	1.3	2.2	2.4	2.7	2	2.1	2.4	3	2.4		2.2	2.3	2.6	2.3	0.7
Lu	0.25	0.69	0.25	0.41	0.28	0.32	0.2	0.38	0.37	0.45	0.33	0.37	0.4	0.48	0.37		0.34	0.38	0.42	0.37	0.11

[1] For analytical methods *see* Appendix F.

[2] Fe_2O_3t not included in totals; total iron represented by FeO and Fe_2O_3

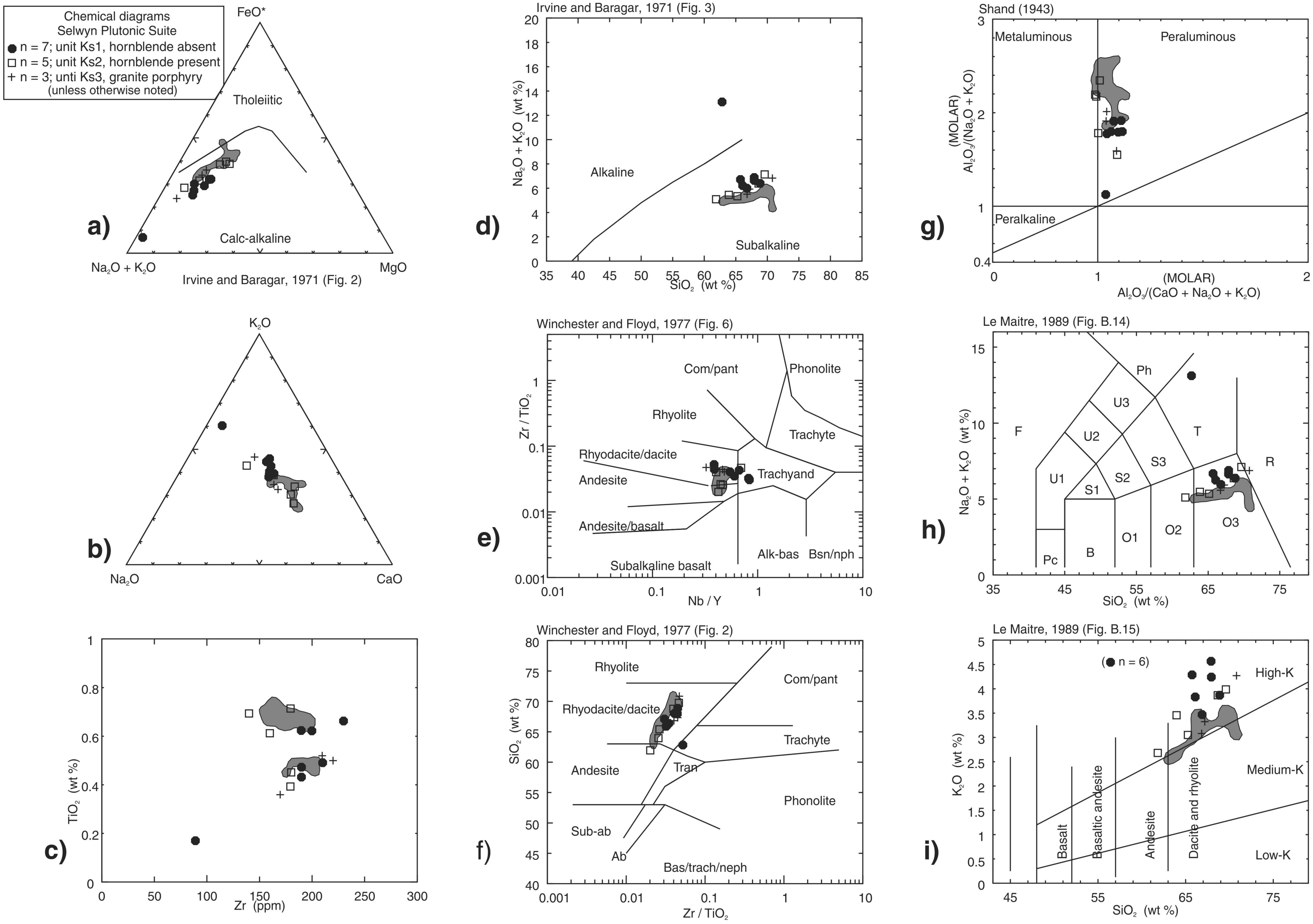


Figure 27. Various chemical discrimination diagrams for the Selwyn Plutonic Suite (a–r). For plotting purposes major elements are normalized to volatile-free basis. The grey shaded area represents an envelope that bounds values of the correlative South Fork volcanics illustrated in Figure 34. Chemical characterization of the Selwyn Plutonic Suite is discussed in the text. Features pertaining to certain diagrams (e.g. abbreviations, background) are discussed with that diagram as follows: **a)** *modified from* Irvine and Barager (1971, Fig. 2); **b)** Na_2O-K_2O-CaO ternary diagram; **c)** TiO_2 versus Zr binary diagram; **d)** *modified from* Irvine and Barager (1971, Fig. 3); **e)** *modified from* Winchester and Floyd (1977, Fig. 6); Com/pant = comendite/pantellerite, Trachyand = trachyandesite, Alk-bas = alkali basalt, Bsn/nph = basanite/nephelinite; **f)** *modified from* Winchester and Floyd (1977, Fig. 2); Com/pant = comendite/pantellerite, Tran = trachyandesite, Sub-ab = subalkaline basalt, Ab = Alkali basalt, bas/trach/neph = basanite/trachyte/nephelinite; **g)** *modified from* Shand (1943); **h)** *modified from* Le Maitre (1989, Fig. B.14). Abbreviations are F (foidite), Pc (picrobasalt), B (basalt), O1 (basaltic andesite), O2 (andesite), O3 (dacite), S1 (trachybasalt), S2 (basaltic trachyandesite), S3 (trachyandesite), T (trachyte (q < 20%), trachydacite (q > 20%)), R (rhyolite), U1 (tephrite (olivine (ol) < 10%), basanite (olivine (ol) > 10%)), U2 (phonotephrite), U3 (tephriphonolite), Ph (phonolite); **i)** *modified from* Le Maitre (1989, Fig. B.15).

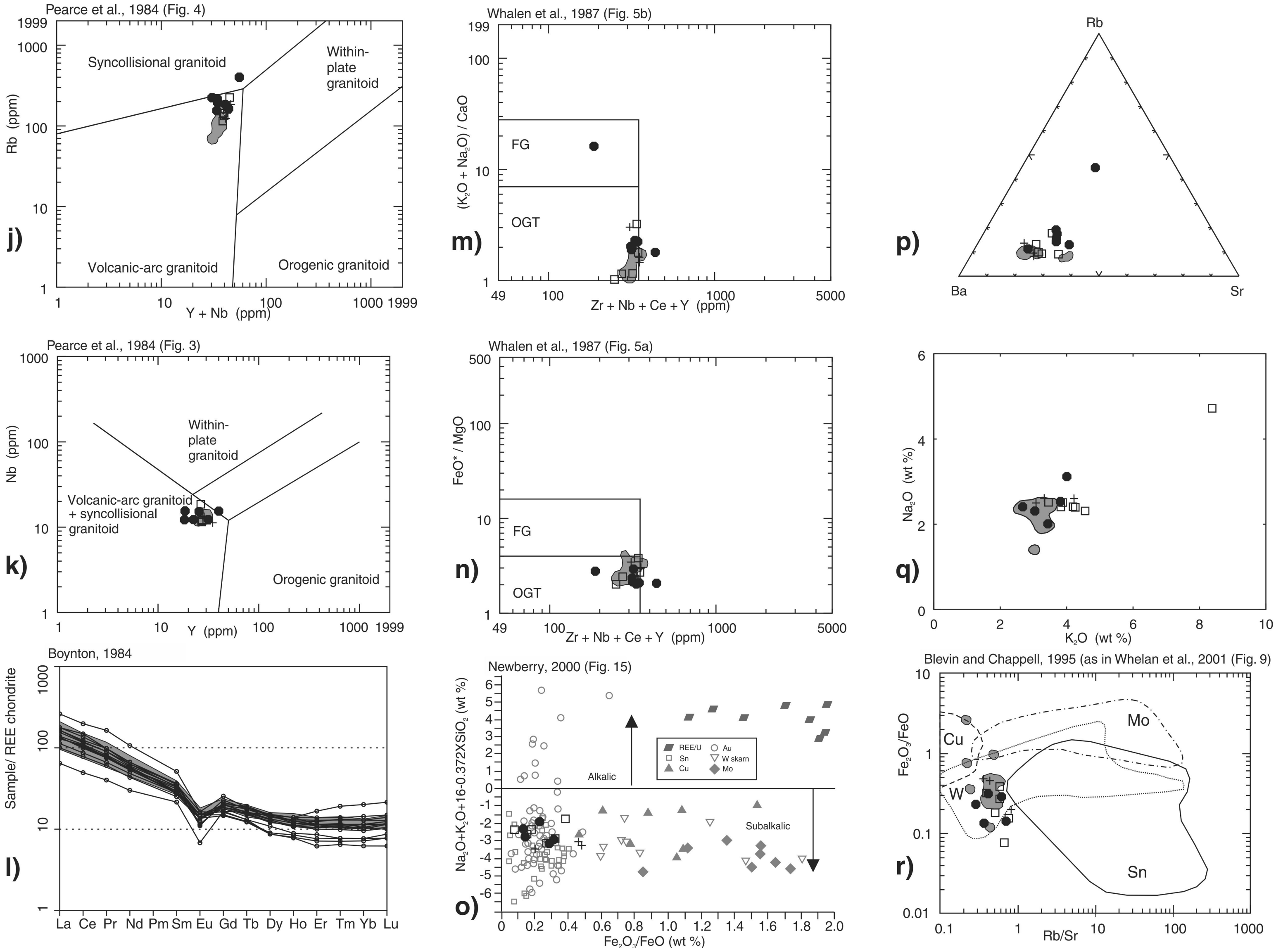


Figure 27. (cont.) Various chemical discrimination diagrams for the Selwyn Plutonic Suite (a–r). For plotting purposes major elements are normalized to volatile-free basis. The grey shaded area represents an envelope that bounds values of the correlative South Fork volcanics illustrated in Figure 34. Chemical characterization of the Selwyn Plutonic Suite is discussed in the text. Features pertaining to certain diagrams (e.g. abbreviations, background) are discussed with that diagram as follows: **j)** *modified from* Pearce et al. (1984, Fig. 4). Some workers (e.g. Whalen et al., 2001) equate within-plate granitoid with A-type granites, syncollisional granitoid with S-type granites, and volcanic-arc granitoid with I-type granites; **k)** *modified from* Pearce et al. (1984, Fig. 3). **l)** Spider diagram *modified from* Boynton (1984). Rare-earth element abundances are normalized against chondrite values. **m)** *modified from* Whalen et al. (1987, Fig. 5b). FG = fractionated granite, OGT = orogenic granite types; **n)** *modified from* Whalen et al. (1987, Fig. 5a); FG = fractionated granite; OGT = orogenic granite types; **o)** *modified from* Newberry (2000, Fig. 15); shaded background shows intrusive-related deposit types of Alaska plotted with respect to the chemistry of their related Mesozoic pluton; **p)** Ba-Rb-Sr ternary plot; **q)** Na_2O versus K_2O binary plot; **r)** *modified from* Blevin and Chappell (1995) as used in Whalen et al. (2001).

In comparison, five uranium-lead zircon and monazite ages performed as part of this study by J.K. Mortensen (Fig. 29; Appendix C) are more tightly clustered between 99–97 Ma, with one age at 101 Ma.

South Fork volcanics (KSF)

Introduction

Roddick and Green (1961a, b) first mapped extensive gently dipping, massive, dark andesite, dacite, and basalt flows in the Sheldon Lake and Tay River areas unconformably overlying deformed Paleozoic strata. Although initially considered Paleocene, radiometric dating (Green (1962); in which the volcanic rocks were first called the "Tay formation") and studies by Roddick (1966) indicated a broadly mid-Cretaceous age. The succession was subsequently named the South Fork volcanics (after the nearby South Fork of Macmillan River) by Gabrielse and Reesor (1974, p. 127), in which they received brief mention within a regional synthesis of Cordilleran plutonism. The name gained widespread acceptance through its additional use on succeeding regional map compilations (Blusson et al., 1974; Gabrielse et al., 1980). A petrological and isotopic study of a small portion (Wood, 1981; Wood and Armstrong, 1982), revealed calc-alkaline andesite and dacite ash-flow tuffs with K-Ar ages of between 102 Ma and 94.4 Ma. The extrusive rocks appear coeval and comagmatic with the regionally extensive mid-Cretaceous Selwyn Plutonic Suite.

During this study particular attention was paid to the volcanic rock–country rock contact and it is everywhere inferred to be a steeply dipping fault. The distribution of large areas of the South Fork volcanic rocks, bounded by arcuate faults, suggests they are preserved within discrete calderas (Fig. 30). The large size of the calderas and their immense volume of fill indicate that the mid-Cretaceous eruptions they represent must have been truly cataclysmic.

Description

The volcanic rocks are preserved within at least eight calderas, ranging from 2.5 km to up to 38 km in diameter, three of which are named informally (Fig. 30). Although their bounding contact is not exposed at any of the calderas, it can be located in many places to within 100–200 m between bounding outcrops. From their intersection with topography (e.g. north half of the Teddy caldera, and much of the eastern and northern margins of the Connolly caldera) contacts are inferred to be steeply dipping. In other areas of poorer exposure the proximity of flat-lying volcanic rocks to adjacent country rocks of higher topographic elevation point toward a contact of at least moderate dip. These curvilinear faults are interpreted as discrete, syneruption, localized failure surfaces forming the caldera margin. Shearing or intense fracturing do not extend into adjacent country rock. Faults bounding area B to the west and north (Fig. 30) separate lithologically different, relatively (?)older tuffs that may comprise a slightly upthrown block (*see* below). Faults bounding the north-trending panel of volcanic rocks of area A (Fig. 30) may be eruption related, but younger normal displacements, perhaps Eocene, and formed through stresses related to Tintina Fault motions, cannot be ruled out.

There are few differences between the tuff units from caldera to caldera. Rocks of the Teddy and most of the Connolly calderas are virtually indistinguishable in grain size, degree of welding, mineralogical composition, and colour. Both contain densely welded crystal or crystal-lithic tuff that weathers dark brown to dark grey and on fresh surfaces ranges from light grey-green to dark grey. Many outcrops resemble granitic rock; they are resistant to erosion, massive, medium-grained, and indurated (Fig. 31). Thin-section examination, however, clearly reveals its pyroclastic texture. Crystals average about 1 mm across, but range up to 4 mm and are commonly broken or bent. They consist of quartz (10–25%), biotite (0–5%), hornblende (0–3%), plagioclase (15–40%), and rare orthopyroxene (Fig. 32, 33) set in a very finely microcrystalline felsic matrix (40–75% of the rock). Rare lithic clasts, typically from pebble to cobble size represent a variety of nearby map units including chert, argillite, and locally granite. In Connolly caldera, a house-sized clast of bedded chert is enveloped in tuff (Fig. 33). Within area B (Fig. 30) of Connolly caldera the tuffs are distinguished from those elsewhere by their dark grey-green weathering colour, lower mafic crystal content, and well displayed bedding.

The Blind Lakes caldera includes crystal-lithic tuff with quartz (15%), feldspar (perhaps approximately 40%), biotite (1%), and typically up to 30% lithic fragments that are up to 0.6 m across. The clasts range from rounded to angular and are commonly chert, argillite, chert-pebble conglomerate, granite porphyry, and rarely limestone. Volcanic rocks of the pendant within Marjorie pluton (*see* Fig. 30) locally resemble this lithic-rich tuff and may be part of the same unit. Tuff units within area A (Fig. 30) and the smaller calderas generally resemble those of the Teddy and main Connolly calderas. In area C (Fig. 30), however, the rock is compositionally different. It typically lacks quartz and contains hornblende, pyroxene, and feldspar crystals densely welded in a finely microcrystalline felsic matrix.

Bedding is rarely seen in the volcanic rocks and is well developed only in southeast Connolly caldera (area B, Fig. 30; Fig. 33). There it is defined within crystal tuff by faint colour lamination that parallels millimetre-scale mineral segregation and alignment. On a larger scale the rock has well developed parting parallel to the colour lamination that gives outcrops a well bedded appearance. In other parts of the Connolly caldera and elsewhere, the rocks are massive, and bedding orientation is reflected by local subvertical columnar jointing, rare visible fiammae, or at one locality the apparent plane of flattening of elliptical gas cavities.

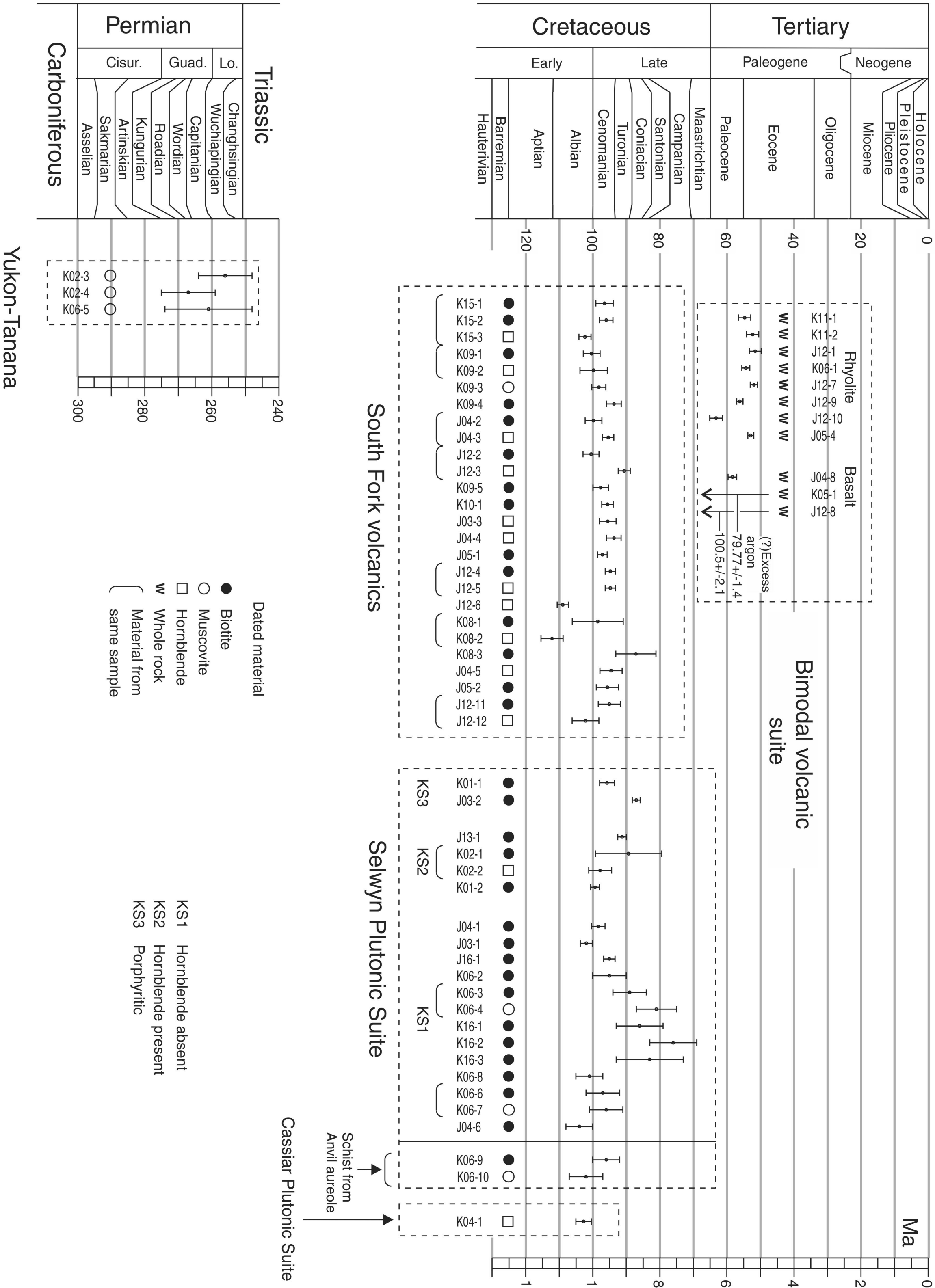


Figure 28. Summary of K-Ar and ^{40}Ar-^{39}Ar isotopic ages for Yukon-Tanana terrane, isotopic ages of Cretaceous Selwyn and Cassiar plutonic suites, Cretaceous South Fork volcanics and Tertiary bimodal volcanic suite; Cisur. = Cisuralian epoch, Guad. = Guadalupian epoch, Lo. = Lopingian epoch. Locality designators, e.g. J03-2, are located on Figures B1 and B2 (Appendix B). Other supporting geochronology data is summarized in Appendix C.

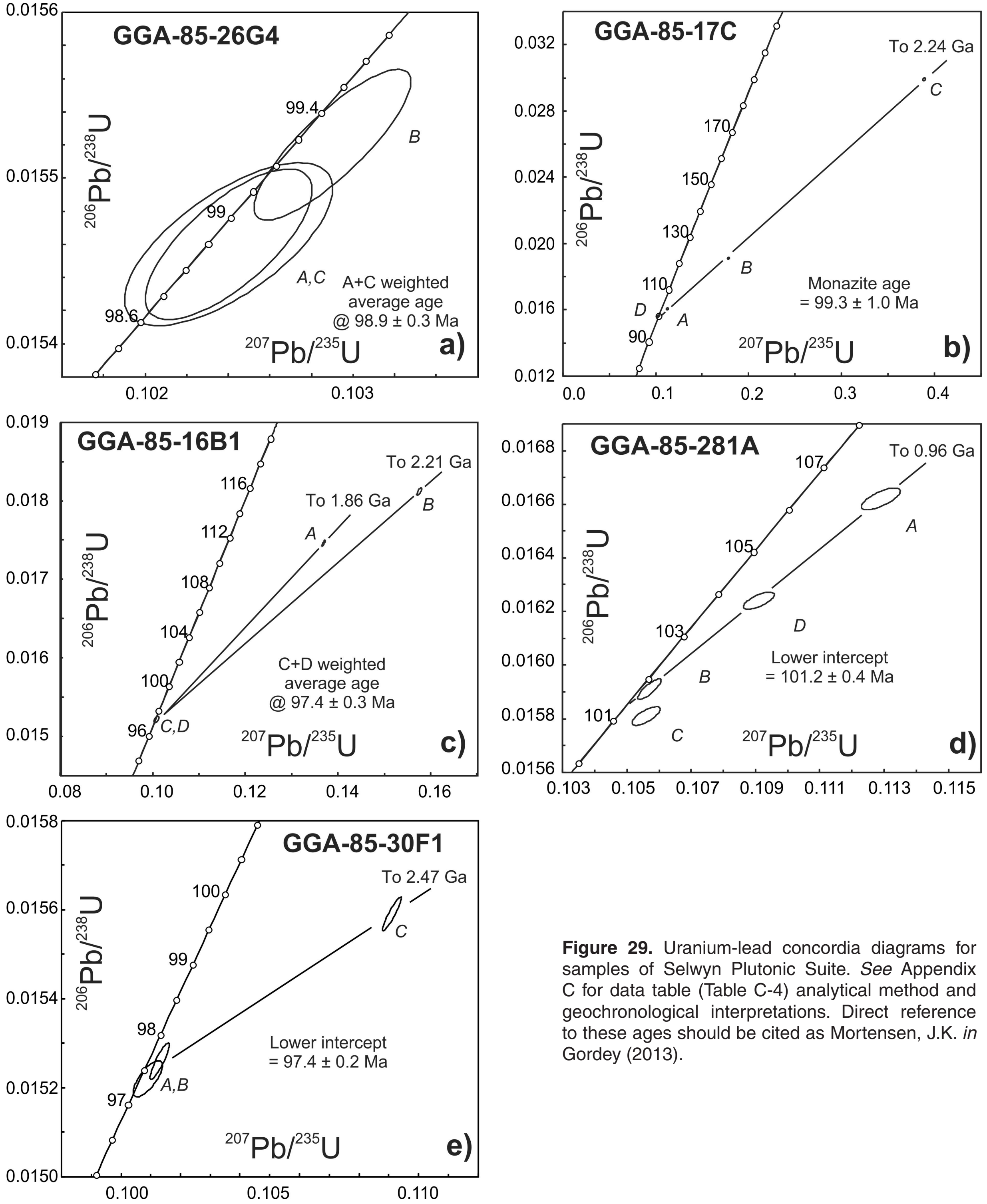


Figure 29. Uranium-lead concordia diagrams for samples of Selwyn Plutonic Suite. *See* Appendix C for data table (Table C-4) analytical method and geochronological interpretations. Direct reference to these ages should be cited as Mortensen, J.K. *in* Gordey (2013).

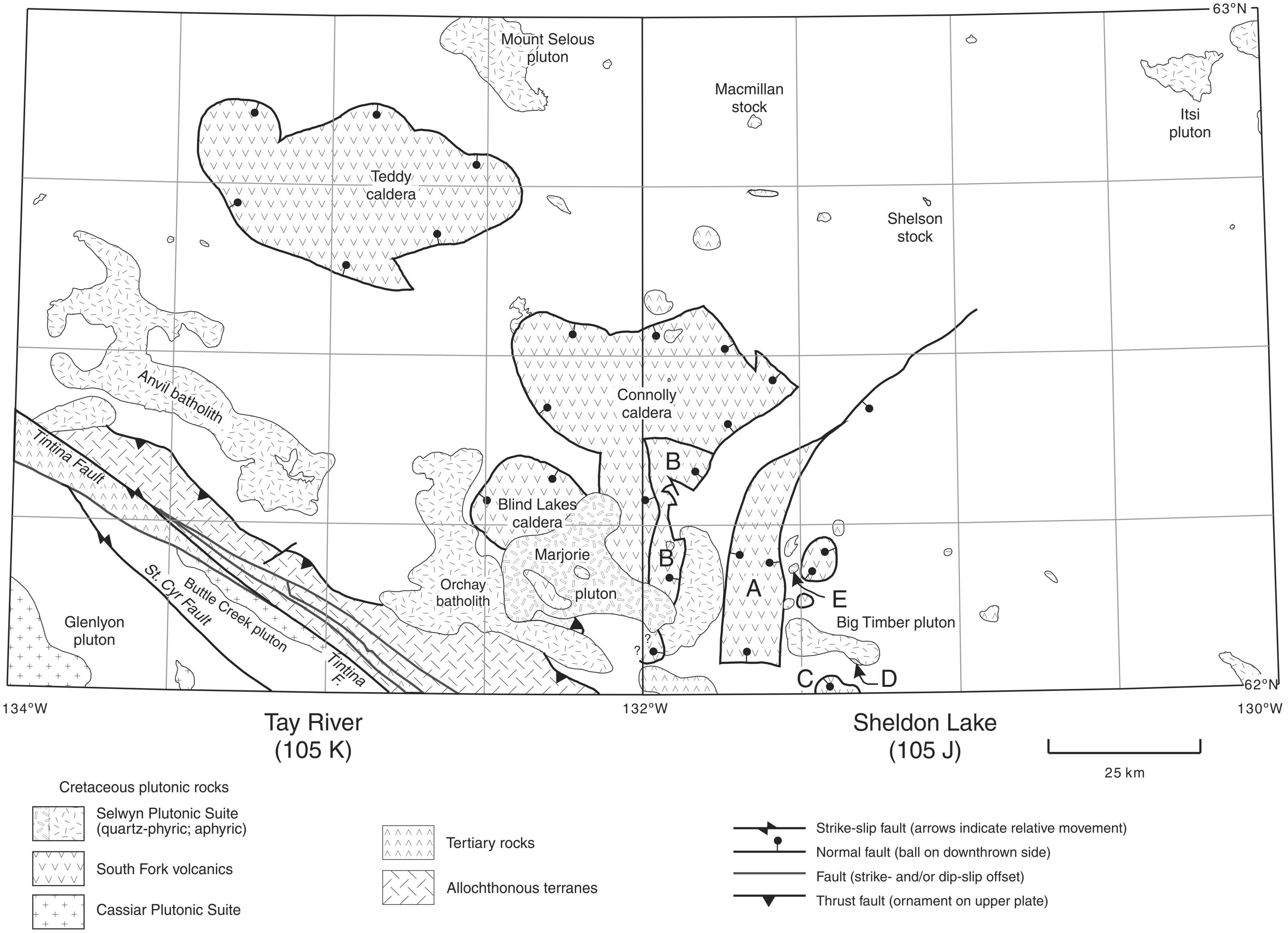


Figure 30. Aerial distribution of South Fork volcanics and Selwyn Plutonic Suite, caldera nomenclature, and locations cited in text.

Figure 31. Resistant, massive, vertically jointed, quartz-biotite-feldspar crystal tuff of the South Fork volcanics along lower Big Timber Creek (105 J/04; 62°04.25'N, 131°36.12'W). For scale, the waterfall is approximately 10 m high; photograph by S. Gordey; 2012-121

The most impressive feature of the volcanic rocks in the Teddy and Connolly calderas is their massive nature and great thickness (Fig. 33). In the Connolly caldera, the volcanic rocks are at least 950 m thick. Their flat-lying attitude is indicated by generally well developed subvertical columnar joints (Fig. 33). From a short distance, the tiers of columnar joints intersected by flat-lying master joint sets give a false impression of individual flows. On detailed inspection, the rocks are massive and without variation in composition or degree of welding across these apparent boundaries. The thickness of the volcanic rocks in Teddy caldera is probably comparable to that of Connolly caldera. These rocks are similarly massive and the combination of columnar jointing and subhorizontal joints also gives a false impression of individual flows. The thickness of tuff is uncertain in area A and the other smaller calderas in areas of low relief, but rocks locally display columnar jointing and are typically massive.

The results of 19 lithogeochemical analyses of unaltered samples (Table 2; several analyses related to isotopic age samples) are plotted in Figure 34 on numerous standard rock classification, tectonic, and mineral discriminant diagrams (as elaborated e.g. in Piercey et al. (2006)). On the basis of major- and trace-element data (Fig. 34; Table 2) the volcanic rocks can be classified as subalkaline, calc-alkalic, high-K, metaluminous to peraluminous rhyodacite to dacite. On granitic classification diagrams (i.e. if the volcanic rocks had solidified at depth and maintained their present composition) various combinations of trace elements, as well as a pronounced negative Eu anomaly indicate a volcanic-arc affinity (Fig. 34j, k, l). As well, the suite falls within the 'orogenic granite type' (Fig. 34m, n) of Whalen et al. (2001). Although these classifications are probably correct in general, it is recognized that original magma composition may not be represented because of escape of magma components as ash during eruption.

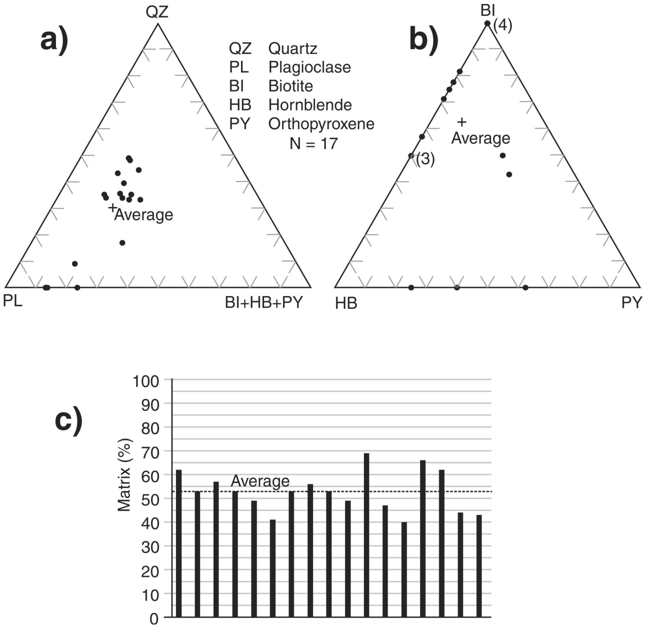


Figure 32. Modal analyses of South Fork volcanics.

Most isotopic age determinations from biotite, hornblende, and one muscovite separate by K-Ar and ^{40}Ar-^{39}Ar methods cluster between 100 Ma and 90 Ma (24 out of 26, Fig. 28; Appendix C). Older ages at about 110 Ma for two samples likely reflect alteration or excess argon contamination.

In comparison, five uranium-lead zircon ages performed as part of this study by J.K. Mortensen (Fig. 35; Appendix C) tightly cluster between 97.7 Ma and 96.8 Ma. These ages more closely indicate the true age of eruption than the widely scattered K-Ar and ^{40}Ar-^{39}Ar ages; the latter have lower blocking temperature and are more susceptible to alteration or excess-argon contamination. The tight clustering of the uranium-lead ages is consistent with the rapid deposition of the South Fork volcanics inferred from volcanological features (*see* 'Mode of formation' below).

Relations of South Fork volcanics to Selwyn Plutonic Suite

Isotopic ages discussed previously (Fig. 28; Appendix C; Wood and Armstrong (1982); Pigage and Anderson (1985)) show that extrusion of the South Fork volcanics and cooling of the mid-Cretaceous Selwyn Plutonic Suite were broadly synchronous at about 100–90 Ma. In detail, field relationships exposed at the northwest end of Connolly caldera and in the vicinity of Marjorie pluton show that caldera formation postdated consolidation of some granitic bodies, but was synchronous with the intrusion of others.

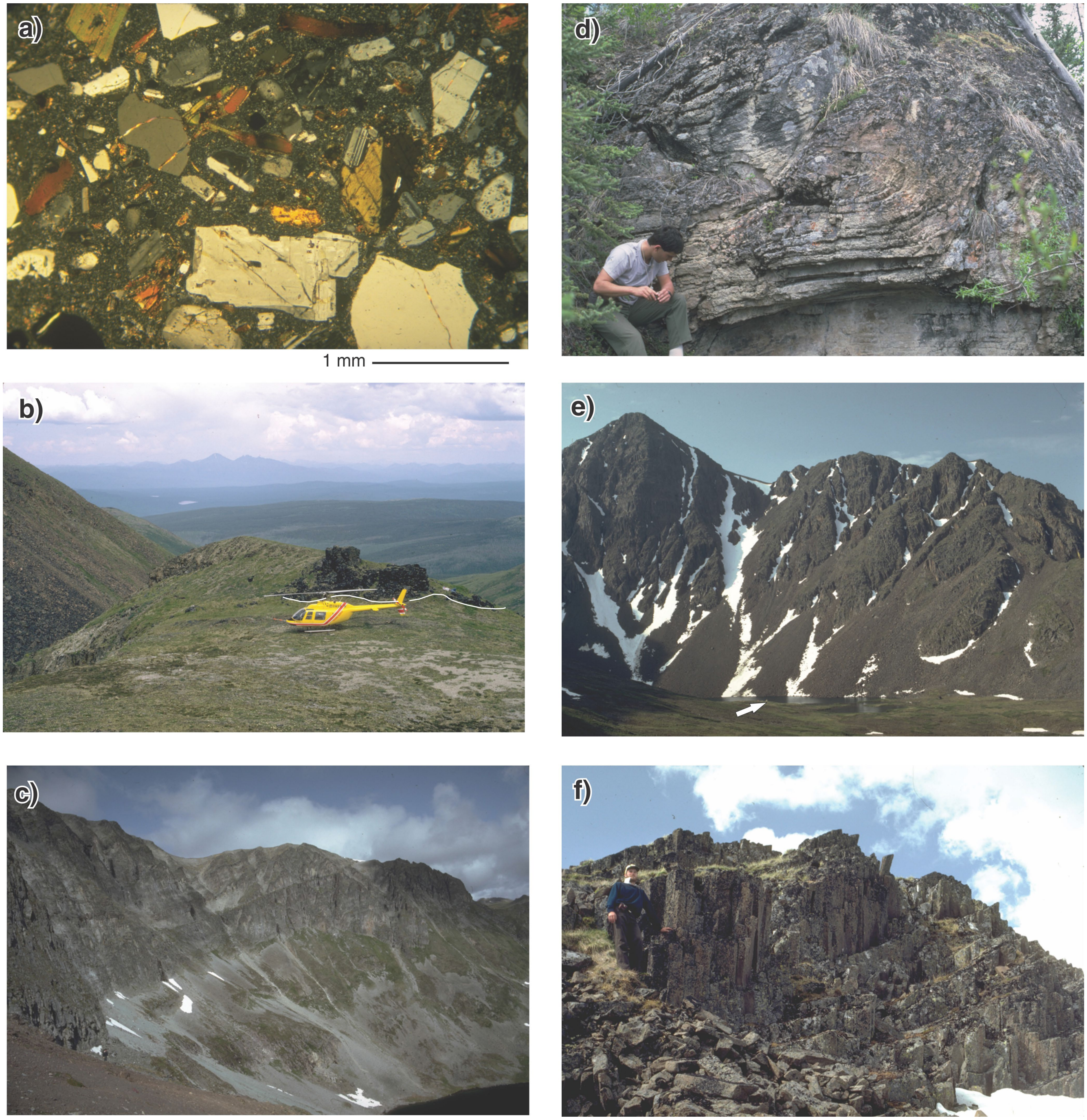


Figure 33. Some features of the South Fork volcanics; **a)** typical texture of crystal tuff as seen in thin section (crossed polarizers). Matrix is very finely crystalline, low birefringent (?)felsic material. Rock is from northwest Connolly caldera from section pictured in photograph 32e; for scale, length of bar is 1 mm; 2012-097; **b)** a large block of bedded chert (white dots) within crystal tuff of the Connolly caldera. All rock in foreground is crystal and crystal-lithic tuff. Low area in middle distance is country rock outside the caldera; helicopter for scale (rotor diameter 10 m); 2012-116; **c)** well bedded crystal tuffs of southeast Connolly caldera, area B (Fig. 30). Bedding dips gently to left of photograph; for scale, relief from lake to ridge top is 320 m (1050 ft.); 2012-099; **d)** bedding-parallel parting in crystal tuff outlining tight (?)slump fold with horizontal axial plane. Tuff is from area A (Fig. 30). Most tuff units in this area are massive; for scale, approximate height of person sitting is 0.9 m; 2012-089; **e)** massive, thick, densely welded crystal tuff at the northwest end of Connolly caldera. Relief is about 440 m (1450 ft.). Arrow points to a tent (small pin-sized dot). On the basis of local vertical columnar joints, the bedding is presumed flat lying. The tuffs form a single cooling unit. Composition and degree of welding is uniform throughout this entire well exposed section; for scale, relief from lake to peak is about 440 m (1450 ft.); 2012-114; **f)** local vertical columnar joints in crystal tuff of the Connolly caldera; person standing for scale (height 1.8 m); 2012-094; photographs by S. Gordey.

Table 2. Geochemical data for the South Fork volcanics.

Sample no.	GGA -83 -23E	GGA -83 -24B	GGA -83 -26A	GGA -83 -26C	GGA -85 -17A2	GGA -85 -21B3	GGA -85 -49A3	GGA -85 -50A3	GGA -85 -66B1	GGA -85 -69D1	GGA -86 -11E2	GGAG -86 -31C	GGA -86 -31H3	GGA -86 -33A2	GGAG -86 -33D2	GGAT -86 -24B3	GGA -87 -10G	GGA -87 -13C	GGA -87 -14A		av.	SD
SiO_2	61.7	65.7	65.4	65.1	64.6	69	64.6	63.1	64.5	64.1	67.4	64.5	61.6	69	69.4	62.2	60.3	68.8	68.7		65.25	2.74
Al_2O_3	14.5	14.8	15.4	15.1	14.6	15.1	15.1	15	13.3	15.5	15	15.4	15.9	14.5	14.4	15.9	16.5	14.7	14		14.98	0.71
TiO_2	0.62	0.62	0.64	0.63	0.66	0.49	0.65	0.64	0.41	0.64	0.46	0.69	0.73	0.47	0.49	0.69	0.69	0.45	0.49		0.59	0.10
$Fe_2O_3t^2$	6.40	5.00	5.20	5.20	5.60	3.80	5.50	5.20	3.70	5.20	3.80	6.20	6.60	4.00	4.20	6.20	5.60	3.80	4.10		5.02	0.95
Fe_2O_3	1.8	2.3	1.5	1.6	1.2	0.9	1.5	0.9	1.1	0.9	0.9	1.1	1.6	0.8	0.4	2.5	3.9	0.8	0.7		1.39	0.79
FeO	4.1	2.4	3.3	3.2	4	2.6	3.6	3.9	2.3	3.9	2.6	4.6	4.5	2.9	3.4	3.3	1.5	2.7	3.1		3.26	0.78
MnO	0.09	0.08	0.08	0.09	0.09	0.05	0.09	0.08	0.06	0.08	0.07	0.11	0.11	0.06	0.07	0.11	0.11	0.06	0.06		0.08	0.02
MgO	1.44	2.04	1.83	1.78	2.17	1.07	1.92	2.01	1.16	1.8	1	2.05	2.64	1.08	1.11	2.35	2.4	1.04	1.27		1.69	0.51
CaO	4.08	3.45	4.66	4.47	3.96	3.07	4.68	4	3.86	4.76	3.31	4.68	5.17	3.21	3.28	5.1	5.39	3.37	3.31		4.10	0.73
Na_2O	1.8	2	2.2	2.1	2	2.4	2.1	1.9	1.3	2.2	2.4	2.2	2.4	2.4	2.3	2.4	2.3	2.5	2.5		2.18	0.29
K_2O	3.03	3.19	3.04	3.11	3.03	3.49	2.98	3.35	2.78	2.95	3.5	2.88	2.57	3.41	3.18	2.55	2.46	3.49	3.12		3.06	0.31
P_2O_5	0.12	0.12	0.12	0.13	0.13	0.1	0.13	0.13	0.09	0.13	0.1	0.14	0.15	0.1	0.11	0.13	0.12	0.1	0.12		0.12	0.02
H_2Ot	3	2.6	1.2	1.4	2.1	1.3	1.4	2.7	4.3	0.8	1.7	1.5	1.9	1.4	1	2.4	3.3	0.8	1.5		1.91	0.90
CO_2t	3.2	0.3	0.5	0.5	1.1	0.3	0.5	1.8	4	1.4	1.2	0.3	0.2	0.2	0.3	0.2	0.3	0.2	0.6		0.90	1.04
St	<0.02	0.02	0.04	0.02	0.03	<0.02	0.02	0.05	0.03	0.04	0.02	0.03	0.02	0.02	0.02	<0.02	<0.02	0.02	<0.02		0.03	0.01
Cl	0.005	0.02	0.03	<0.0050	0.02	0.035	0.03	<0.0050	0.005	0.04	0.0259	0.029	<0.0100	0.017	0.0394	<0.0100					0.02	0.01
F	0.061	0.06	0.06	0.059	0.057	0.057	0.07	0.052	0.05	0.064	0.0653	0.0706	0.0653	0.0592	0.0623	0.0436					0.06	0.01
TOTAL	99.55	99.70	100.00	99.29	99.75	99.96	99.37	99.61	99.25	99.30	99.75	100.28	99.56	99.63	99.56	99.87	99.27	99.03	99.47		99.59	0.30
Rb	130	130	120	130	140	140	120	160	120	130	140	130	99	130	130	88	79	140	130		126	19
Cs	5.9	2.7	4	3.4	4.2	3.8	4.9	13	3	5.2	3.4	3.1	1.5	2.1	3.6	3.3	2.9	3.5	2.3		4.0	2.4
Ba	860	920	880	870	930	1100	860	950	910	870	1100	870	640	940	1100	640	640	1100	1100		909	147
Sr	210	260	300	290	260	290	290	280	210	310	280	300	400	340	290	400	360	300	300		298	49
Ga	18	17	19	18	19	18	20	18	16	18	18	18	18	18	18	17	18	17	17		18	1
Ta	0.9	0.8	1	1	0.9	1	0.9	1.2	0.9	0.4	1.1	1.1	0.8	1	1.2	0.8	0.8	1.1	0.9		0.9	0.2
Nb	12	12	13	13	14	14	14	12	11	13	13	13	12	14	13	11	11	13	13		13	1
Hf	4.1	4.3	4.2	4.4	4.1	4.8	4.5	4.5	3.7	4.3	4.5	4.4	4	4.2	4.5	3.6	3.8	4.4	4.5		4.3	0.3
Zr	150	190	180	170	190	180	190	190	160	180	190	180	160	190	190	150	150	200	200		178	16
Y	30	28	29	29	30	28	31	29	25	27	29	31	29	28	27	24	25	26	25		28	2
Th	13	13	14	13	12	17	13	14	14	14	18	14	12	18	20	11	12	18	15		14	2
U	3.2	3.5	3.5	3.6	3.3	3.3	3.2	3.8	3.2	3.4	3.4	3.3	2.6	3.4	2.7	2.4	2.6	3.1	2.9		3.2	0.4
Au	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
In	0.09	0.05	0.07	<0.05	0.06	<0.05	<0.05	0.05	0.06	0.12	0.06	0.08	0.06	0.05	0.05	<0.05	0.06	<0.05	<0.05		0.07	0.02
Tl	0.59	0.63	0.56	0.64	0.58	0.67	0.64	0.96	0.54	0.55	0.66	0.58	0.41	0.64	0.64	0.4	0.39	0.67	0.63		0.60	0.12

Table 2. (cont.)

Sample no.	GGA -83 -23E	GGA -83 -24B	GGA -83 -26A	GGA -83 -26C	GGA -85 -17A2	GGA -85 -21B3	GGA -85 -49A3	GGA -85 -50A3	GGA -85 -66B1	GGA -85 -69D1	GGA -86 -11E2	GGAG -86 -31C	GGA -86 -31H3	GGA -86 -33A2	GGAG -86 -33D2	GGAT -86 -24B3	GGA -87 -10G	GGA -87 -13C	GGA -87 -14A		av.	SD
Be	2.1	2	2.2	1.9	1.8	1.9	1.9	1.8	1.8	2	2	1.8	1.4	1.9	1.8	1.4	1.4	1.9	1.8		2	0
Cd	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3			
Cr	22	21	21	25	26	16	24	23	16	23	13	27	26	13	15	25	24	12	17		20	5
Ni	<10	<10	<10	21	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10			
Co	9	9	11	11	12	8	12	11	6	12	8	12	14	7	7	13	11	7	8		10	2
Sc	14	14	14	17	17	11	17	15	10	15	11	18	20	11	11	17	17	10	11		14	3
V	65	60	63	73	80	42	77	69	40	65	39	83	110	39	42	95	87	37	60		65	21
Cu	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	12	10	<10	<10	11	10	<10	10			
Pb	19	23	21	21	20	23	21	23	18	21	24	19	21	22	21	23	21	23	20		21	2
Zn	56	49	48	54	60	45	55	51	40	58	46	66	57	46	47	53	54	45	63		52	7
As	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30												
Ag	0.5	0.3	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	1.2	0.1	<0.1	<0.1	<0.1			
Bi	<0.5	<0.5	0.6	0.5	0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
Mo	0.3	0.6	0.7	5.4	0.9	0.2	0.4	0.3	0.3	0.7	0.2	0.8	0.7	0.4	0.5	0.3	0.3	0.4	0.5		1	1
Br	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10												
La	37	40	39	37	37	52	39	39	44	37	50	40	33	53	64	30	32	52	44		42	8
Ce	72	78	76	72	73	100	76	79	87	77	100	84	70	110	120	60	67	120	93		85	17
Pr	8.8	9.2	9	8.8	9.1	12	9.2	8.9	10	8.8	11	9.9	8	12	14	7.1	7.5	12	11		10	2
Nd	32	33	32	31	32	39	31	33	35	33	40	37	30	42	48	27	27	41	37		35	5
Sm	6.2	6.3	5.9	6.1	6.6	6.6	6.4	6.1	6.2	6.3	7.1	6.8	6.1	7.4	7.6	5.2	5.2	6.9	6.5		6.4	0.6
Eu	1.1	1	1.2	1.1	1	1.1	1	1.2	1	1.2	1.1	1.2	1.3	1	1	1.1	1.1	1.1	1		1	0
Gd	5.6	5.1	5.5	5.4	5.5	5.8	5.8	5.2	4.8	5.2	5.8	6	5.3	5.8	6	4.6	5	5.9	5.2		5.4	0.4
Tb	0.88	0.82	0.81	0.83	0.84	0.86	0.93	0.8	0.7	0.79	0.85	0.87	0.78	0.8	0.82	0.67	0.74	0.81	0.76		0.81	0.06
Dy	4.7	4.5	4.4	4.6	4.7	4.4	5	4.5	4.1	4.6	4.6	5.1	4.7	4.8	4.6	4	4.1	4.7	4.4		4.6	0.3
Ho	1	0.93	0.91	0.99	1	0.98	1.1	0.98	0.83	0.93	0.98	1	0.96	0.97	0.91	0.8	0.89	0.96	0.85		0.95	0.07
Er	2.6	2.7	2.5	2.6	2.6	2.5	2.9	2.6	2.2	2.6	2.6	2.8	2.6	2.5	2.3	2.3	2.4	2.5	2.3		2.5	0.2
Tm	0.38	0.38	0.38	0.42	0.4	0.41	0.45	0.39	0.34	0.38	0.39	0.43	0.4	0.4	0.38	0.39	0.38	0.39	0.36		0.39	0.02
Yb	2.7	2.5	2.5	2.6	2.4	2.4	2.7	2.5	2.1	2.5	2.5	2.7	2.7	2.5	2.2	2.3	2.4	2.5	2.3		2.5	0.2
Lu	0.42	0.42	0.41	0.43	0.37	0.39	0.44	0.4	0.34	0.4	0.41	0.44	0.44	0.39	0.35	0.39	0.4	0.41	0.37		0.40	0.03

[1] For analytical methods *see* Appendix F.

[2] Fe_2O_3t not included in totals; total iron represented by FeO and Fe_2O_3

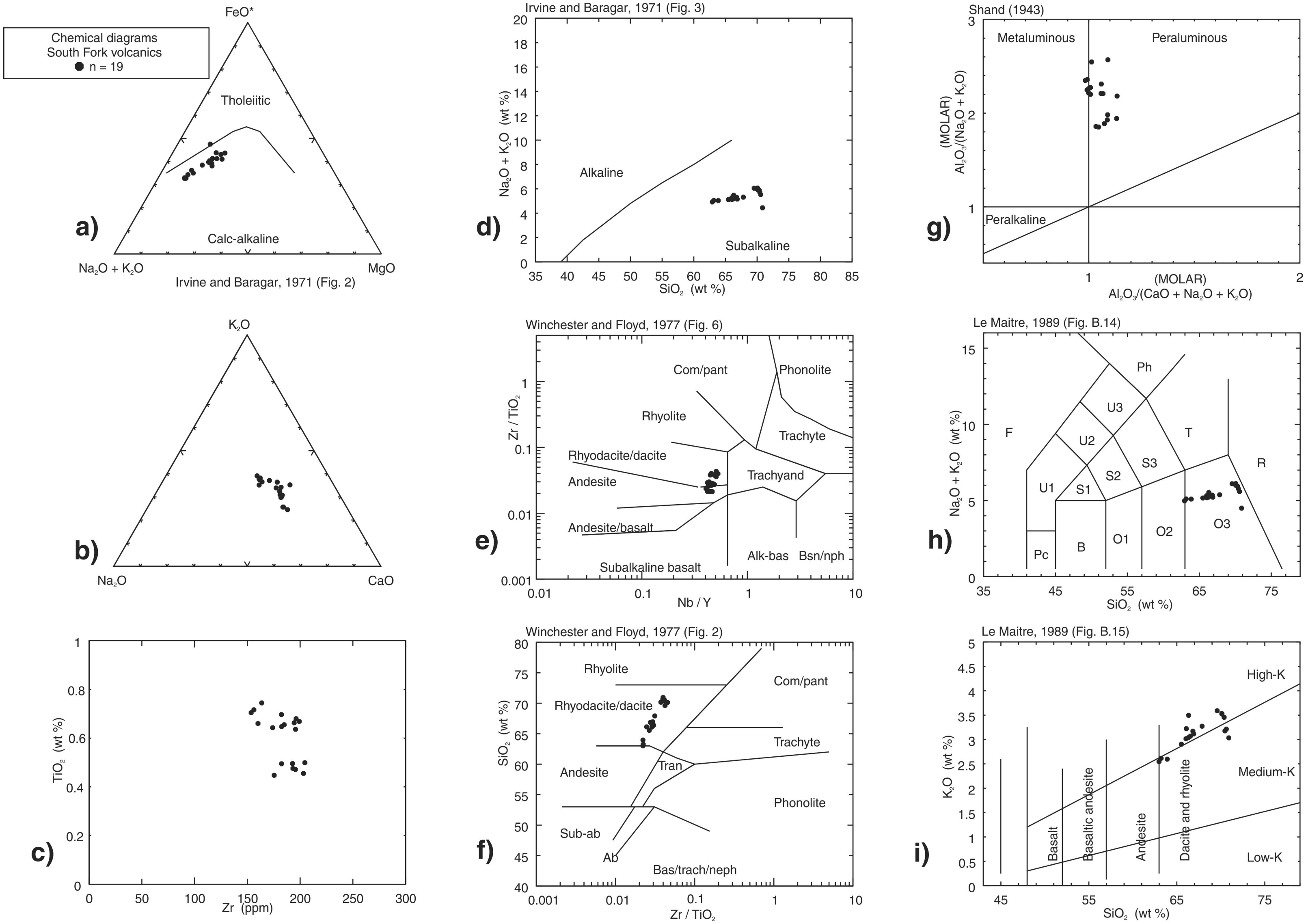


Figure 34. Various chemical discrimination diagrams for the South Fork volcanics (a–r, as indicated). For plotting purposes, major elements have been normalized to volatile-free basis. Chemical characterization of the South Fork volcanics is discussed in the text. Features pertaining to certain diagrams (e.g. abbreviations, background) are discussed with that diagram as follows: **a)** *modified from* Irvine and Barager (1971, Fig. 2); **b)** Na_2O-K_2O-CaO ternary diagram; **c)** TiO_2 versus Zr binary diagram; **d)** *modified from* Irvine and Barager (1971, Fig. 3); **e)** *modified from* Winchester and Floyd (1977, Fig. 6); Com/pant = comendite/pantellerite, Trachyand = trachyandesite, Alk-bas = alkali basalt, Bsn/nph = basanite/nephelinite; **f)** *modified from* Winchester and Floyd (1977, Fig. 2); Com/pan = comendite/pantellerite, Tran = trachyandesite, Sub-ab = subalkaline basalt, ab = alkali basalt, bas/trach/neph = basanite/trachyte/nephelinite; **g)** *modified from* Shand (1943); **h)** *modified from* Le Maitre (1989, Fig. B.14). F = foidite, Pc = picrobasalt, B = basalt, O1 = basaltic andesite, O2 = andesite, O3 = dacite, S1 = trachybasalt, S2 = basaltic trachyandesite, S3 = trachyandesite, T = trachyte (q < 20%), trachydacite (q > 20%), R = rhyolite, U1 = tephrite (olivine (ol) < 10%), basanite = olivine (ol) > 10%), U2 = phonotephrite, U3 = tephriphonolite, Ph = phonolite; **i)** *modified from* Le Maitre (1989, Fig. B.15).

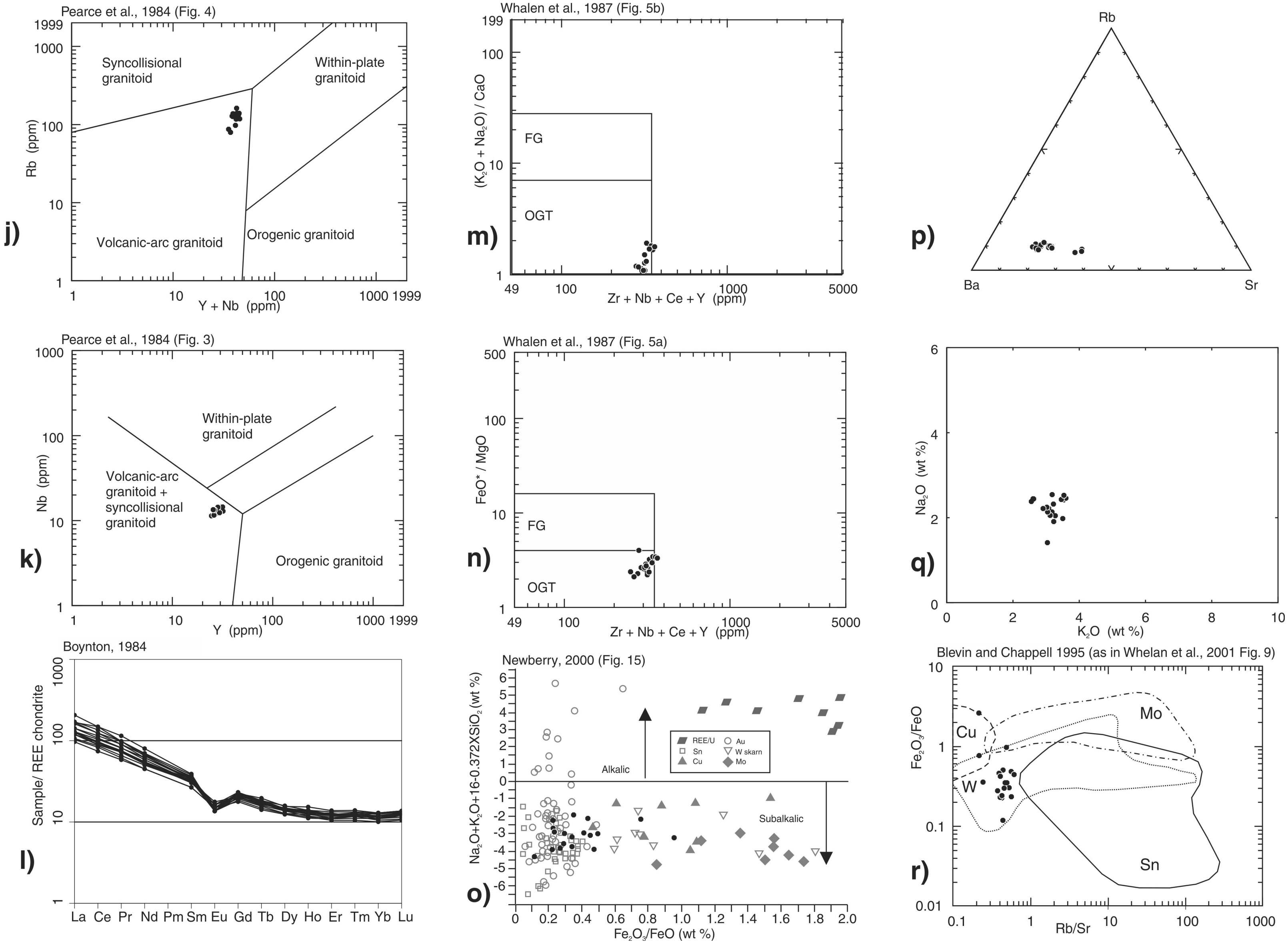


Figure 34. (cont.) Various chemical discrimination diagrams for the South Fork volcanics (a–r, as indicated). For plotting purposes, major elements have been normalized to volatile-free basis. Chemical characterization of the South Fork volcanics is discussed in the text. Features pertaining to certain diagrams (e.g. abbreviations, background) are discussed with that diagram as follows: **j)** *modified from* Pearce et al. (1984, Fig. 4). Some workers (e.g. Whalen et al., 2001) equate within-plate granitoid with A-type granites, syncollisional granitoid with S-type granites and volcanic-arc granitoid with I-type granites; **k)** *modified from* Pearce et al. (1984, Fig. 3). **l)** Spider diagram *modified from* Boynton (1984). Rare-earth element abundances are normalized against chondrite values; **m)** *modified from* Whalen et al. (1987, Fig. 5b); FG = fractionated granite, OGT = orogenic granite types; **n)** *modified from* Whalen et al. (1987, Fig. 5a); FG = fractionated granite, OGT = orogenic granite types; **o)** *modified from* Newberry (2000, Fig. 15). Shaded background shows intrusive-related deposit types of Alaska plotted with respect to the chemistry of their related Mesozoic pluton; **p)** Ba-Rb-Sr ternary plot; **q)** Na_2O versus K_2O binary plot; **r)** *modified from* Blevin and Chappell (1995) as used in Whalen et al. (2001).

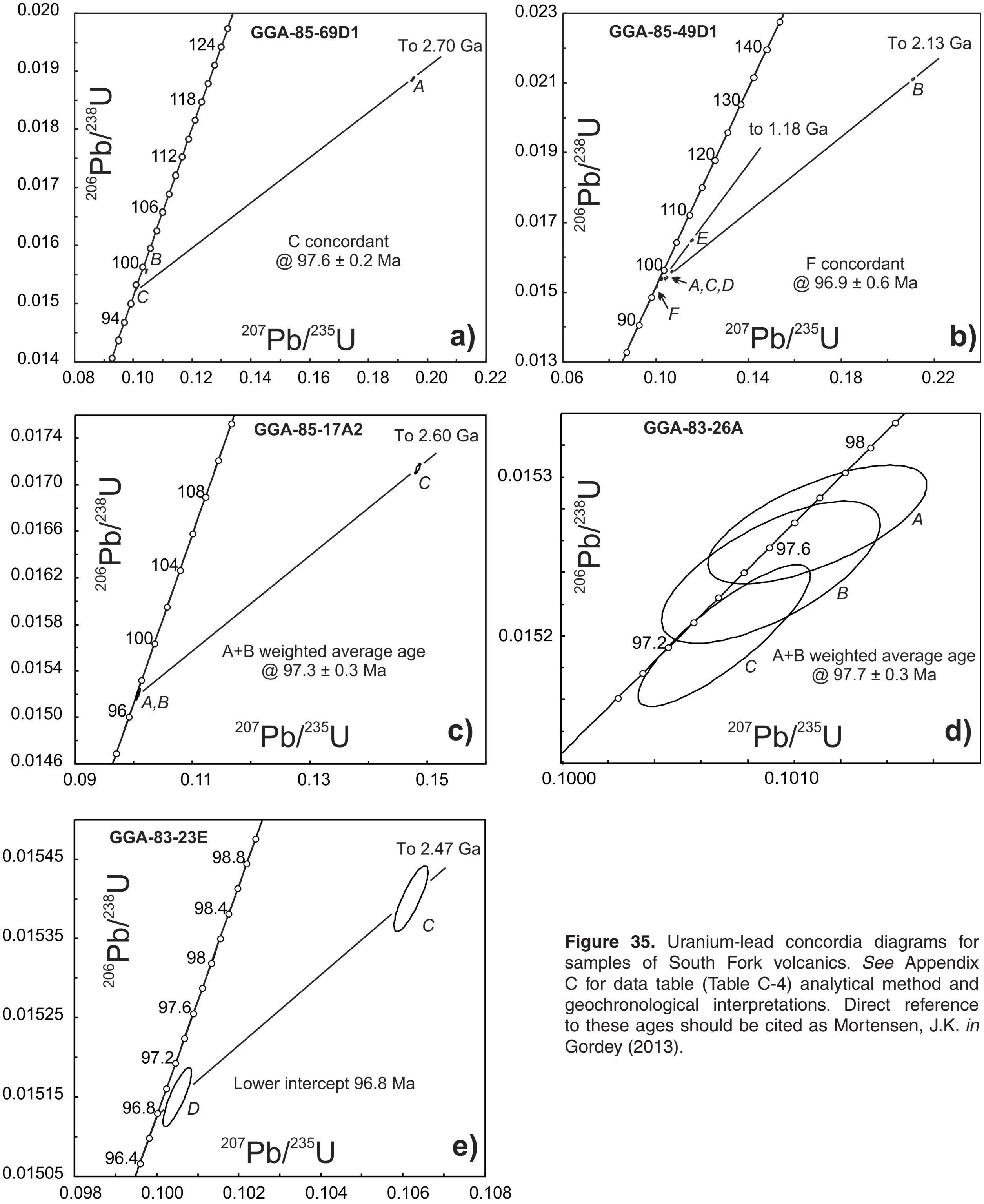


Figure 35. Uranium-lead concordia diagrams for samples of South Fork volcanics. *See* Appendix C for data table (Table C-4) analytical method and geochronological interpretations. Direct reference to these ages should be cited as Mortensen, J.K. *in* Gordey (2013).

At the first locality the contact between tuff and a hornblende-biotite granodiorite pluton follows a curvilinear trace that was closely mapped through felsenmeer. The occurrence of tuff topographically lower than the granodiorite shows the contact is a steeply dipping fault and that the tuff does not overlie the plutonic body unconformably. The curvilinear fault trace and the lack of both deformation and change in character of closely adjacent plutonic rocks shows it likely originated as a caldera-bounding feature that cleanly cut the intrusive rocks after they were consolidated.

Referring to the second area, the Marjorie pluton of southeastern Tay River map area (Fig. 30) is atypical of the mid-Cretaceous suite. It consists of porphyritic biotite±hornblende granite characterized by large smoky grey quartz phenocrysts and locally K-feldspar phenocrysts. Its map trace suggests that it crosscuts the Connolly and Blind Lakes calderas, and therefore is coeval or younger; however, granitic clasts within tuff of the Blind Lakes caldera resemble that of Marjorie pluton granite and indicate a pre-existing granite. Thus the formation of the Blind Lakes caldera and Marjorie intrusion were probably concurrent. Earlier-cooled portions near the top of Marjorie pluton were incorporated as clasts within cogenetic tuff, and the caldera resulting from evacuation of the tuff was subsequently invaded by intrusion of similar magma. The porphyritic character of the Marjorie pluton is consistent with sudden cooling at relatively higher levels of intrusion in the crust than for the equigranular nonporphyritic phases typical of the Selwyn Plutonic Suite.

A cogenetic relationship between the South Fork volcanics and Selwyn Plutonic Suite in general is supported by similarities in their modal mineralogy that includes quartz, biotite, hornblende, and plagioclase and in their geochemistry, where both are subalkalic, calc-alkalic, and metaluminous to peraluminous. Compositional overlap is displayed on numerous geochemical plots (Fig. 27, 34). Initial Sr isotopic ratios of the South Fork volcanics show a clear association with hornblende-bearing varieties of the Selwyn Plutonic Suite (Table 3).

Curiously the Sheldon Lake and Tay River map areas are the only region in the northern Canadian Cordillera where eruptive equivalents of the mid-Cretaceous plutons are preserved. Four rhyolitic calderas of mid-Cretaceous age have been described by Bacon et al. (1990) from east-central Alaska. Evidence for these calderas includes thick deposits of devitrified crystal- and lithic-rich densely welded tuff.

Mode of formation

The following model of emplacement of the South Fork volcanics is patterned after that of Lipman (1984) based upon features of many well studied ash-flow calderas in the western United States. Numbers in the following description refer to Figure 36, a cross-section of a hypothetical caldera. Volcanism began when a shallow magma chamber (e.g. the Marjorie pluton) vented to the surface resulting in a pyroclastic eruption. The eruption partially evacuates the magma chamber, and the resulting subsidence formed a caldera (e.g. Blind Lakes caldera). The initial surface expression of caldera formation is merely downfaulted country rock (1), which may in places include early intrusive phases of broadly coeval plutonic rock (2). The crystal and ash fallout from the paraxysmal pyroclastic cloud, much of it still hot, accumulate within the subsiding caldera to form very thick massive units of densely welded tuff (3) as well as thinner outflow facies (7). Caldera walls are normal fault scarps (4) and may step outward as the eruption progresses, incorporating large blocks of country rock (5) within the caldera fill. Younger intrusive phases (e.g. Marjorie pluton) (6) locally crosscut caldera margins. The outflow facies (7) that once blanketed the landscape beyond the calderas is removed by postvolcanic erosion (8), leaving behind only the fault-bounded caldera fill (3). It is likely, but difficult to determine that ejecta related to one caldera evacuation fell into the topographic depression of another caldera and whether larger calderas represent the coalescence of multiple eruptions. Both the Teddy (55 km maximum diameter) and Connolly (47 km maximum diameter) calderas are near the upper size limits of well documented North and South American examples (e.g. Table 1 *in* Lipman (1984); Lindsay et al. (2001)). Regardless of their periodic or protracted evolution, the eruption(s) that led to the formation of the calderas were cataclysmic volcanic events.

Table 3. Strontium initial ratios, Selwyn Plutonic Suite and South Fork volcanics.

Field number	$^{87}Rb/^{86}Sr$	$^{87}Sr/^{86}Sr$	Sri(@95 Ma)	Sri(@105 Ma)
South Fork volcanics				
GGA-83-24B	1.644	0.71976	0.7175	0.7172
GGA-83-26A(1)	1.279	0.71878	0.7170	0.7168
GGA-85-69D1	1.218	0.71872	0.7170	0.7168
GGA-83-26C	1.391	0.71890	0.7170	0.7168
GGA-85-49A	1.227	0.71831	0.7166	0.7164
GGA-85-21B	1.528	0.71952	0.7174	0.7172
GGA-83-23E	1.867	0.71924	0.7166	0.7164
GGA-85-50A3	1.731	0.71913	0.7167	0.7165
Selwyn Plutonic Suite: hornblende-bearing				
GGA-85-30F1	1.709	0.71935	0.7170	0.7167
GGA-85-16B1	1.252	0.71871	0.7170	0.7168
GGA-85-17C3	1.203	0.71855	0.7169	0.7167
GGA-85-27G4	0.827	0.71924	0.7181	0.7180
GGA-85-21B3	1.528	0.71952	0.7174	0.7172
Selwyn Plutonic Suite: hornblende-free				
GGA-85-28A	1.206	0.72729	0.7256	0.7254
GGA-83-27F	1.948	0.72938	0.7267	0.7264
GGA-85-50B1	2.368	0.73201	0.7287	0.7284
GGA-85-27A3	6.016	0.73245	0.7240	0.7232

[1] Method: isotopic ratios by mass spectrometry carried out at the Geological Survey of Canada.

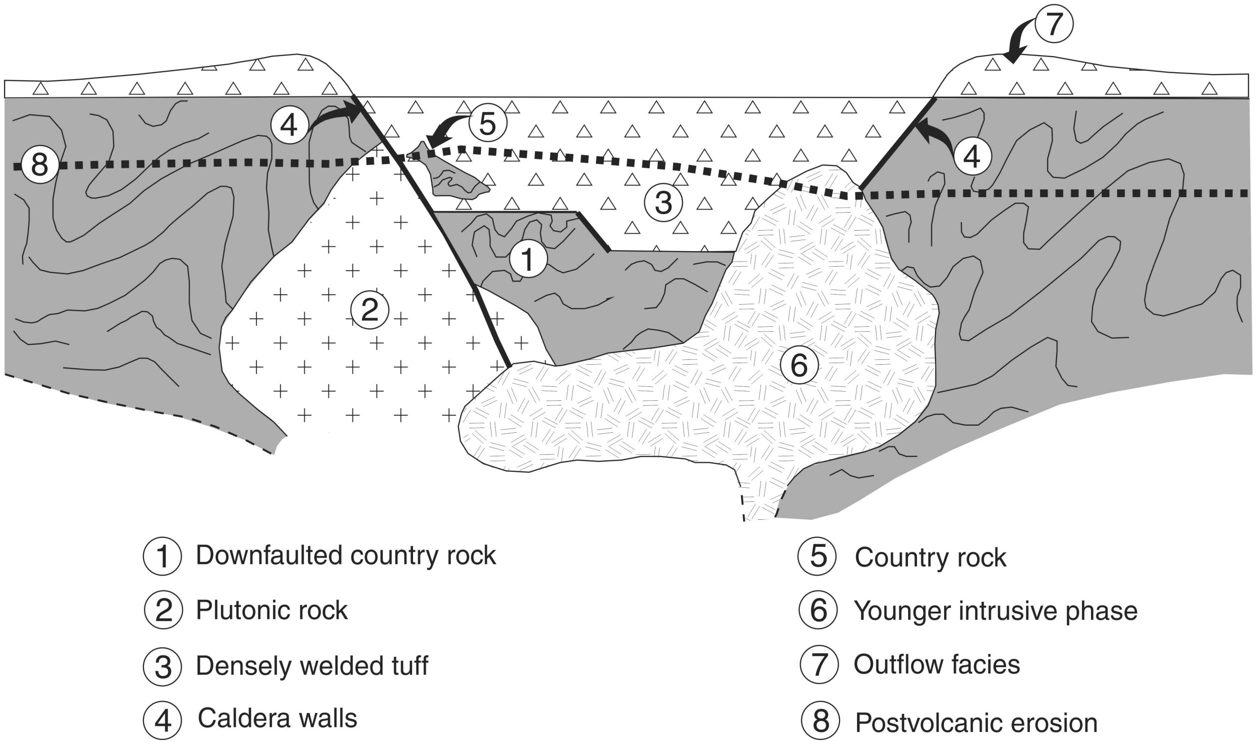


Figure 36. Relations and mode of formation of South Fork volcanics. 1 = Pre-Cretaceous country rock, 2 = pre-eruptive Cretaceous pluton, 3 = caldera-fill volcanic rocks, 4 = inward-dipping caldera-bounding normal falts, 5 = block of country rock contained winthin caldera fill, 6 = crosscutting posteruptive Cretaceous pluton, 7 = extra-caldera tuff, and 8 = present-day erosion surface.

TERTIARY STRATIGRAPHY

Tertiary sandstone, conglomerate, and volcanic rocks form a narrow belt of exposures along or near Pelly River valley (Tintina Fault) and volcanic remnants are scattered as far as 70 km to the northeast. These Tertiary rocks are divided into three units for descriptive purposes including a distinctive limestone conglomerate unit, an alluvial clastic unit, and a bimodal volcanic unit.

Limestone conglomerate unit (Tcg)

Limestone conglomerate is present in large isolated exposures immediately northeast of St. Cyr Fault. The internal structure of the unit is uncertain and neither its base nor top are exposed. It appears to be fault bounded. Based on the extent and distribution of outcrops it is at least 400 m thick.

The conglomerate is brown-grey weathering, massive, clast supported, and poorly sorted. Clasts ranging from angular to subrounded pebbles and cobbles up to 15 cm diameter are mostly laminated or massive, dark grey, fine crystalline limestone. Laminated limestone predominates and tends to be platy and angular. These laminations are visible on weathered surface in shades of grey and brown. Locally, ripple crosslamination is visible. About 5% of the clasts are composed of subrounded light grey to black chert. The matrix is composed of sand-size material of the same composition as the framework. The rocks are apparently massive, but viewed from a distance, an apparent parting several metres thick may reflect bedding. Rare calcite veins 1–2 cm wide crosscut both clasts and matrix.

Two conodont collections from clasts within the conglomerate are both late Late Devonian (Famennian) (collection K03-3 and K03-6, Appendix B). These dates only provide the age of the source material and a maximum for the unit itself. The only known source of Famennian limestone clasts is the limestone-phyllite unit of the St. Cyr assemblage. The limestone-conglomerate unit is considered Tertiary (and nonmarine) and to represent deposition within a strike-slip pull-apart basin or graben developed between the St. Cyr Fault and other strike-slip faults of likely Tertiary age. Other occurrences of conglomerate of this composition are not known in the region.

Alluvial clastic unit (Ts)

Tertiary clastic rocks occur at several localities along and near Tintina Fault. Exposures are poor in an area of extensive vegetation and glacial overburden and relationships to older basement rocks are not exposed.

The alluvial clastic unit is dominated by grey-tan- to dark-grey-weathering, in places weakly indurated, pebble and cobble conglomerate. Clast types include chert in various shades of grey, green, and rarely red as well as slate, basalt, quartz, and minor foliated muscovite quartzite, and muscovite schist. Clasts vary from subrounded to angular and generally range from 2 cm to 40 cm in diameter. Lenses and interbeds of sandstone and conglomerate on the order of 0.5–1.0 m are seen at some localities, whereas at others the rock is massive conglomerate. Casts of lignified wood are common. The conglomerate displays a wide range of compositional and textural maturity from place to place. For example, one locality in the vicinity of Grew Creek consists mostly of chert-rich pebble conglomerate with well rounded clasts, whereas other occurrences in the same area reveal poorly sorted, massive conglomeratic muddy sandstone with rounded, green basalt clasts, and massive conglomerate with very angular slate clasts. Dominantly fine clastic strata were noted at only one locality in the alluvial clastic unit, just east of Campbell Highway along Grew Creek. There, folded dark-brown-weathering, dark brown to black, thin-bedded shale contains about 10% interbeds of fine- to medium-grained sandstone. This shale contains abundant detrital mica. The thickness of the alluvial clastic unit is unknown because of incomplete exposure and internal folds. Exposures along Grew Creek indicate a minimum thickness of 200 m.

The age of the unit is considered Early to Middle Eocene (collection K02-2. Appendix B) based on palynomorphs recovered from shale near Grew Creek. Ages from three plant collections, identified in 1961 during the previous work of Roddick and Green (1961b), are not as specific and include Late Cretaceous to Tertiary (collection K02-1, Appendix B), post-Cretaceous (collection K03-4, Appendix B), and post-mid-Cretaceous (post-Aptian) (collection K03-5, Appendix B).

A conglomeratic section near Ross River has recently yielded a mid-Cretaceous, middle Albian to early Cenomanian age (discussed under 'Big Timber Formation (KBT)') for beds previously thought to be Eocene (Hughes and Long, 1980; Long et al., 2001). Without further age information at each locality it is unclear whether other fluvial clastic deposits along Tintina Trench, including some in the Tay River area, may be similarly misassigned.

The alluvial clastic unit has been previously mapped and briefly described in Tay River map area (unit 12 of Roddick and Green (1961b); unit 15 of Tempelman-Kluit (1972)). Beyond the map area, scattered poor exposures of Tertiary clastic strata and coal are found at numerous places near Tintina Fault, including within Quiet Lake map area (unit Tscg of Tempelman-Kluit (1977)) and near Watson Lake, Faro, and Dawson. Hughes and Long (1980) provided an excellent summary of lithology, stratigraphy, depositional environment, and coal rank and type for many of these localities.

Bimodal volcanic unit (Tv)

Felsic volcanic flows, tuffs, and plugs as well as basalt flows are exposed at scattered localities in four general areas: northeast of Tintina Fault within Pelly River valley, on the northeast side of the Anvil Range, near the west margin of Sheldon Lake map area, and in southernmost Sheldon Lake map area (Fig. 30; *see also* Fig. 37).

Felsic volcanic rocks 30 km northwest of Faro include quartz-feldspar porphyry, ignimbrite, and laminated acid crystal tuff. The porphyry was described by Tempelman-Kluit ((1972) unit 14) as light grey and pinkish rocks that weather a brownish colour, containing clear subhedral phenocrysts of quartz and buff to white altered feldspar in a fine-grained to aphanitic groundmass. Phenocrysts comprise 10–20% of the rock and are as much as 5 mm across. The groundmass displays abundant myrmekitic and micrographic intergrowths of quartz in orthoclase, with feldspar the dominant component. Zircon is a trace constituent, and hematite fills fractures and cavities. Locally the rock resembles an equigranular, medium-grained granite composed largely of subhedral, simply twinned orthoclase with interstitial quartz and minor hornblende. The acid tuff units are described by Tempelman-Kluit (1972) as finely laminated, generally light coloured, flinty rocks with scattered, tiny angular quartz fragments or crystallites. About 28 km northeast of Faro, Tempelman-Kluit (1972) also mapped a small circular occurrence of quartz-feldspar porphyry ignimbrite (unit 14a) here interpreted as a small plug. This body has yielded a K-Ar whole-rock age of 54.3 ± 1.2 Ma (sample no. K06-1, Appendix C).

Pride (1988) examined the Tertiary volcanic rocks at three sites along Tintina Fault because of their potential as a source for epithermal gold (e.g. Grew Creek gold occurrence). Subaqueous basaltic pyroclastic rocks and nonwelded crystal-lithic tuff with abundant unbroken, relatively unworn glass shards are exposed in the Grew Creek area. Duke and Godwin (1986) reported K-Ar ages of 51.5 ± 1.8 Ma to 47.0 ± 1.7 Ma for four samples of sericitized felsic tuff and whole-rock basalt from the Grew Creek prospect.

Near the centre of Tay River map area (62°30.11'N, 133°0.40'W), a semicircular plug of quartz-feldspar porphyry about 400 m in diameter intrudes lower Paleozoic sediments. A steep fault of small vertical displacement truncates its southern margin. The rock consists of about 10% phenocrysts of embayed quartz, sanidine, and rare plagioclase in a microfelsitic groundmass. Biotite (2%) occurs as small, irregular pleochroic brown grains. The plug is uniform in composition except for a small body of enclosed obsidian. The glass is fresh and contains about 8% phenocrysts of embayed quartz, sanidine, and rare plagioclase. Microlites form a trachytic texture. The body has a strong subhorizontal columnar jointing, the columns being perpendicular to the steeply dipping contacts. Potassium-argon whole-rock dates

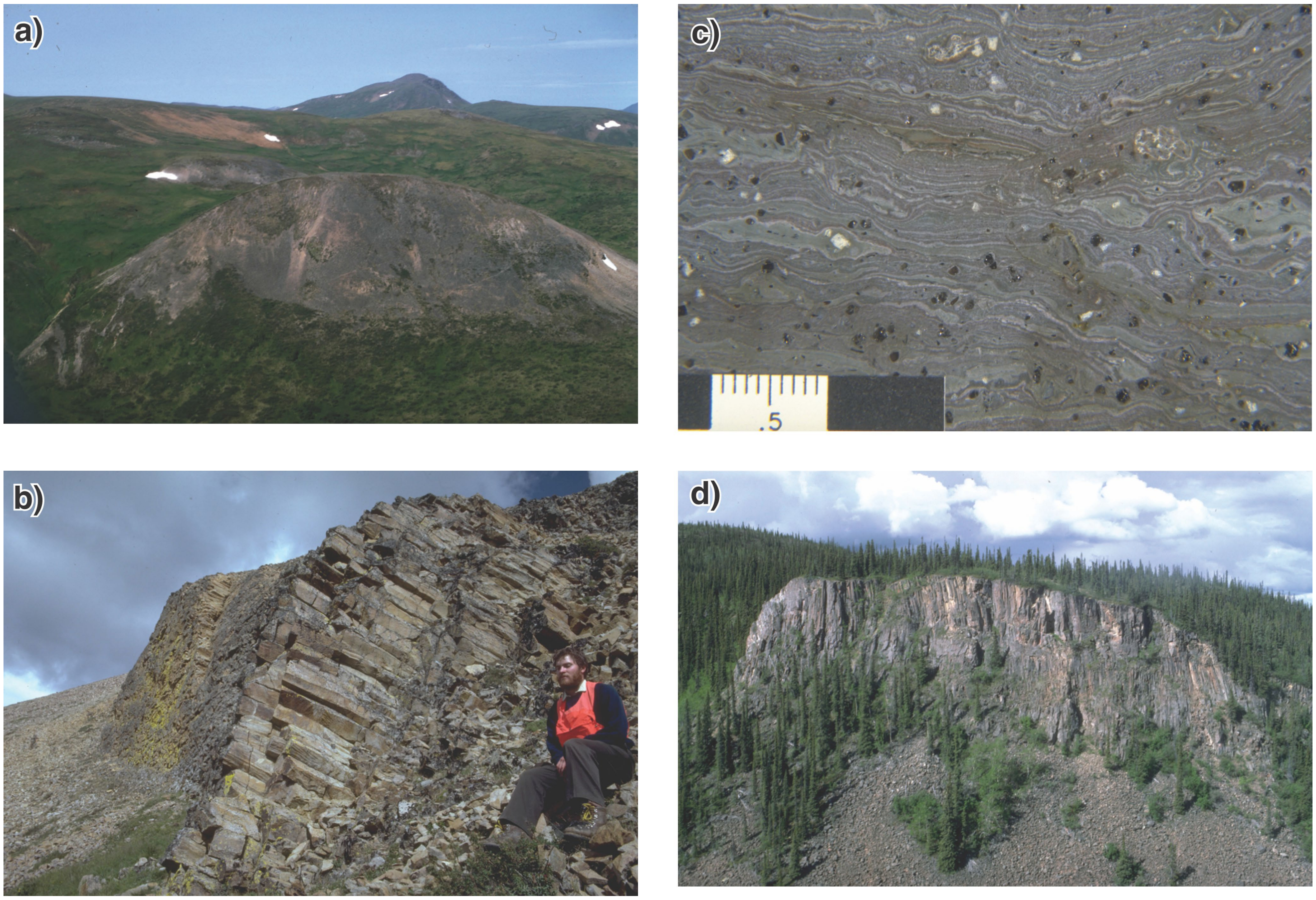


Figure 37. Bimodal volcanic unit; **a)** aerial view of massive light grey-weathering Tertiary rhyolite plug in central Tay River area (105 K/06; 62°26.11'N, 133°02.03'W viewed from the east); for scale, dome in foreground is approximately 500 m across; 2012-093; **b)** columnar jointing in Tertiary felsic volcanic plug, perpendicular to margin of the body (105 K/11; 62°30.13'N, 133°0.39'W); person sitting for scale (sitting height 1.4 m); 2012-105; **c)** sawn surface showing well developed flow banding in Tertiary rhyolite, headwaters of Riddell River (105 J/12; 62°32.05'N, 131°53.07'W); small divisions on scale are millimetres; 2012-112; **d)** remnants of columnar-jointed basalt flow or volcanic neck, southern Sheldon Lake map area (105 J/02; view to the west towards 62°7.35'N, 130°53.01'W); for scale, cliff outcrop is approximately 200 m across; 2012-092; photographs by S. Gordey.

on the porphyry and obsidian are concordant at 54.7 ± 1.8 Ma (sample no. K11-1, Appendix C) and 52.3 ± 1.8 Ma (sample no. K11-2, Appendix C), respectively.

Felsic volcanic rocks also occur as four circular plugs 100 m to 3.0 km across that intrude both the mid-Cretaceous South Fork volcanics and lower Paleozoic sediments near the west margin of Sheldon Lake map area. In general they comprise grey- to white-weathering porphyry with up to 10% phenocrysts of smoky quartz, K-feldspar, and rare plagioclase in a white, spherulitic microfelsitic groundmass. Scattered, small pleochroic brown biotite forms about 1% of the rock. Some exposures are massive whereas others display well developed and intricate flow banding in shades of grey, pink, and white. The three plugs about 20.0 km southwest of the outlet of Dragon Lake have yielded potassium-argon whole-rock ages of 51.5 ± 1.8 Ma (sample no. J12-1), 51.94 ± 1.1 Ma (sample no. J12-7), and 52.82 ± 0.94 Ma (sample no. J05-4) (*see* Appendix C). Felsic porphyry dykes in the same area, 3–5 m wide, yielded K-Ar whole-rock ages of 63.18 ± 1.9 (sample no. J12-10) and 56.12 ± 0.95 Ma (sample no. J12-9) (*see* Appendix C).

Basalt occurs in scattered poor exposures along Pelly River valley. Tempelman-Kluit (1972) described basalt northwest of Faro as a brown-weathering, dark green rock composed of sparse phenocrysts of olivine as much as 5 mm across, subhedral equant microphenocrysts of augite, and a few larger grains of clear sanidine, all within a fine-grained matrix. The matrix comprises a mat of tiny plagioclase laths with scattered epidote and brown alteration minerals. Vesicles and amygdales of amethystine quartz up to 5 mm across occur locally.

Near Grew Creek about 70 m of volcaniclastic sandstone to conglomerate is exposed. A few per cent clasts of amygdaloidal basalt and sandstone up to 30 cm across are scattered within a fine- to coarse-grained matrix of basaltic tuff and lapilli. Bedding is revealed as local lensing of coarse and fine fragments, and by lamination at the base of otherwise massive beds that range from 1 m to 10 m or more in thickness. Pride (1988) noted erosional contacts at the base of some beds, and local soft-sediment deformation. The volcaniclastic rocks at this locality dip steeply and concordantly above chert-pebble conglomerate although the contact is not exposed.

A large extent of basaltic lava probably underlies low, timbered country of southwesternmost Sheldon Lake map area. The scattered outcrops are orange-brown weathering, with an orange-weathering rind, and dark grey to black on fresh surface. The rock is generally massive, although one locality displayed columnar jointing. Vesicular and amygdaloidal textures were not noted in the few outcrops examined. Randomly oriented andesine to labradorite plagioclase laths to about 1.5 mm long comprise about 65% of the rock. The remainder consists of subequal amounts of ophitic clinopyroxene and equant olivine. These volcanic rocks have yielded a K-Ar whole-rock age of 58.3 ± 1.3 Ma (J04-8). They are contiguous with basalt units exposed in northernmost Finlayson Lake map area (unit Qtvbo of Tempelman-Kluit (1977); Jackson et al. (1986)). Other occurrences of basalt include columnar jointed lava 20.0 km northwest of the outlet of Fortin Lake, and a small occurrence of olivine basalt (possibly a volcanic neck) near the head of Riddell River.

The relation between the volcanic rocks and alluvial clastic unit is unclear. Along Grew Creek the former seem to overlie the latter, although the contact is not exposed. The lack of volcanic fragments in the alluvial clastic unit is also suggestive of a younger age for the volcanic rocks.

The general concordance of ages of between 63 Ma and 52 Ma for the felsic and mafic volcanic rocks (Fig. 28) implies that these scattered occurrences be considered a single Paleocene to Early Eocene bimodal volcanic province. The two whole-rock ages from basalt of 100 Ma and 79 Ma are considered anomalous, and possibly the result of alteration and excess argon contamination (Fig. 28). Geochemical analyses on the basaltic and rhyolitic rocks are presented by Jackson et al. ((1986), 7 samples), Pride ((1988), 38 samples), and for this project (Table 4, 12 samples). The basalt units are relatively high in Al_2O_3, TiO_2, and FeO, and low in K_2O and MnO. In general, the data show the suite is tholeiitic and varies from subalkaline to alkaline (Fig. 38, Table 4). The felsic rocks are geochemically characterized as high-K rhyolite.

Elsewhere in the region, Tertiary felsic volcanic rocks in Glenlyon map area have been described by Pride (1988) and basalt units in Finlayon Lake map area by Jackson et al. (1986). Scattered small occurrences of quartz porphyry are reported along and near Tintina Fault in Dawson map area (unit 25 of Green (1972), unit eTt of Mortensen (1996), unit eTqfp of Mortensen (1988)).

Depositional setting of Tertiary strata

The Tertiary clastic rocks were deposited within narrow fault-controlled basins (Hughes and Long, 1980) between anastomosing faults in the Tintina fault zone. The alluvial clastic unit likely represents a range of depositional settings including braided stream, debris flow, and talus apron that resulted from progradation of alluvial fans and fan deltas (Hughes and Long, 1980). The large clast size and restricted composition of the limestone conglomerate unit imply a nearby point source (limestone-phyllite unit) that shed clastic material onto an alluvial or subaqueous fan.

The volcanic rocks represents a range of depositional processes and environments including felsic subaerial pyroclastic flows and small plug domes, subaerial lavas, breccia units, and debris flows, as well as sublacustrine pillow lavas and breccia units. Jackson et al. (1986) showed that some basalt flows and tuffs were deposited in basins bounded by vertical faults. Commonly, bimodal suites are genetically linked to extension of continental crust and normal faulting (Ewart, 1979), which in this area could be related to contemporaneous transcurrent slip along Tintina Fault. The occurrences of basaltic and felsic volcanic rocks well to the northeast of Tintina Fault indicate that crustal extension was not confined to the locus of strike slip. Folding and tilting of Eocene beds such as the alluvial clastic unit near Grew Creek likely resulted from fault-bend compression during recurring episode(s) of dextral slip.

STRUCTURAL GEOLOGY AND TECTONIC EVENTS

Strata of the ancestral North American margin have experienced multiple Paleozoic, Mesozoic, and Cenozoic tectonic events. Paleozoic diastrophism was related to intermittent crustal extension and block faulting, rather than compressional deformation (Gordey and Anderson, 1993) and is recorded by thick clastic successions of the Late Proterozoic Hyland and Devono-Mississippian Earn groups and multiple unconformities. Rocks of Yukon-Tanana terrane contain evidence of Devono-Mississippian and Permian metamorphism and deformation (Murphy et al., 2002; Murphy, 2004) that occurred before their emplacement, along with Slide Mountain terrane, atop strata of the ancestral margin. Deformation related to Jura-Cretaceous arc-continent collision along the continental margin (*see* 'Regional setting' section) resulted in large, gently dipping, northeast-vergent, thrust faults and buried detachments, the hanging-wall strata of which were mildly to severely imbricated and folded, depending on their competency. Normal faulting was a response to mid-Cretaceous plutonism and volcanism. Tertiary dextral and vertical displacements along the anastomosing faults of Tintina fault zone affected both strata of the ancestral North American margin and the already emplaced terranes.

Table 4. Geochemistry of Tertiary volcanic rocks.

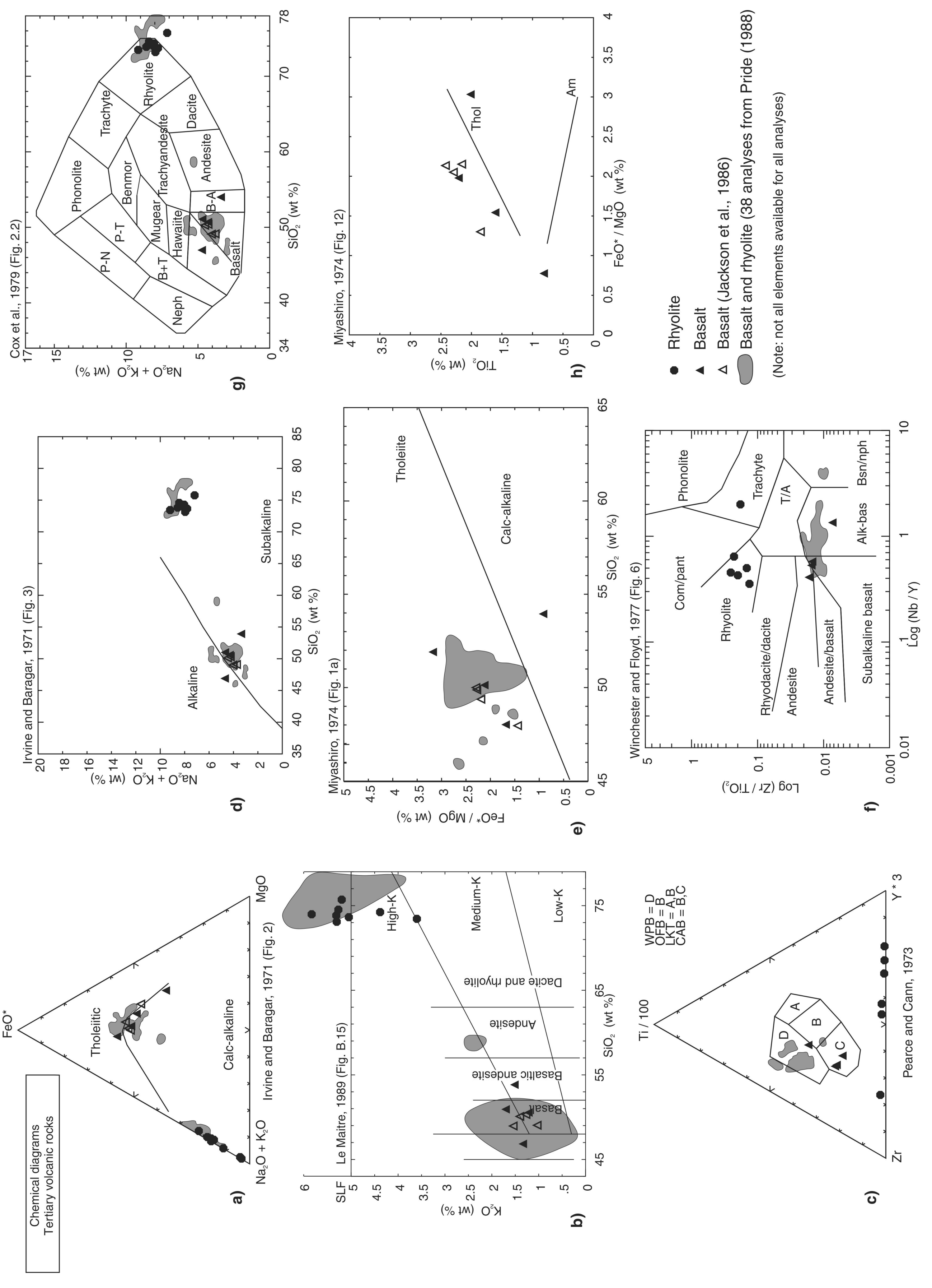
	Rhyolite										Basalt					
Sample no.	GGA -82 -47C1	GGA -83 -35F3	GGA -83 -40D	GGA -86 -40I2	GGA -86 -66B2	GGAT -86 -14H2	GGAT -86 -22C5	GGAT -86 -22D7	av.	SD	GGA -86 -19C2	GGA -86 -69F3	GGA -87 -9E1	GGAT -86 -15B2	av.	SD
SiO_2	75.7	73.6	73.8	74	74.5	73.1	73.4	74.2	74.04	0.75	46.9	50.6	51	53.9	50.60	2.49
Al_2O_3	12.6	12.1	13.5	13.1	13	13	14.7	15.2	13.40	0.98	15.4	16.8	15.2	14.4	15.45	0.86
TiO_2	0.11	0.13	0.07	0.07	0.09	0.18	<0.02	<0.02	0.11	0.04	1.5	1.88	2.15	0.78	1.58	0.52
$Fe_2O_3t^2$	1.80	1.70	1.90	1.80	1.20	2.50	0.50	0.50	1.49	0.66	12.80	11.10	11.30	7.70	10.73	1.87
Fe_2O_3	0.9	0.6	0.9	0.7	0.2	0.4	<0.2	<0.2	0.62	0.25	2.4	4.3	3.5	2.8	3.25	0.72
FeO	0.8	0.9	0.9	1	0.9	1.9	0.4	0.3	0.89	0.45	9.4	6.2	7	4.4	6.75	1.80
MnO	0.01	0.02	0.02	0.01	<0.01	0.04	0.02	0.04	0.02	0.01	0.18	0.12	0.16	0.11	0.14	0.03
MgO	0.07	0.11	<0.04	0.11	<0.04	0.13	0.04	<0.04	0.09	0.03	7.5	3.32	5.13	8.93	6.22	2.16
CaO	0.24	0.93	0.72	0.43	0.71	0.91	0.58	0.23	0.59	0.26	5.17	5.29	8.05	7.12	6.41	1.22
Na_2O	1.9	2.7	3.2	2.2	3.1	2.6	5.5	3.6	3.10	1.04	3.3	3	2.9	1.8	2.75	0.57
K_2O	5.2	5.04	5.32	5.84	5.27	5.3	3.59	4.38	4.99	0.65	1.31	1.19	1.68	1.49	1.42	0.19
P_2O_5	0.02	0.02	0.02	0.01	0.01	0.04	0.01	0.02	0.02	0.01	0.21	0.69	0.54	0.14	0.40	0.23
H_2Ot	1.8	3	0.8	1.2	0.6	1.1	0.5	1	1.25	0.76	4.3	3.9	1.7	2.8	3.18	1.01
CO_2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.21	0.03	0.3	1.8	0.6	0.5	0.80	0.59
Cl	0.05	0.11	0.06	0.0301	0.0212	<0.0100	<0.0100	<0.0100	0.05	0.03	<0.0100	<0.0100		<0.0100		
F	0.14	0.25	0.62	0.3685	0.443	0.4279	0.3671	0.3318	0.37	0.13	0.0489	0.0929		0.0394	0.06	0.02
St	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	0.02		0.09		0.02	<0.02	0.06	0.04
TOTAL	99.84	99.71	100.13	99.27	99.04	99.35	99.31	99.50	99.52	0.33	98.01	99.18	99.63	99.21	99.01	0.60
Rb	450	430	660	730	630	450	840	1300	686	270	16	23	40	54	33	15
Cs	4.6	12	7.7	7.7	5.1	5.5	7.7	49	12.4	14.0	0.76	1.5	1.4	2.3	1	1
Ba	70	60	60	70	30	310	130	90	103	83	15000	1500	680	650	4458	6096
Sr	<20	26	<20	22	<20	67	91	29	47	27	610	620	420	440	523	93
Ga	23	22	30	31	32	22	29	42	29	6	20	20	19	15	19	2
Ta	3.3	2.7	4.5	5	6.1	3	37	21	10	12	1.8	1.5	1.4	0.8	1	0
Nb	40	37	77	77	100	39	87	<100	65	24	31	23	26	9.8	22	8
Hf	6.2	6.2	6.8	6.2	9.1	7.5	4.3	3	6.2	1.7	3	4.5	6.5	3.5	4.4	1.3
Zr	200	190	160	140	230	240	42	33	154	74	110	280	330	130	213	94
Y	20	74	120	180	220	110	2.3	7	92	76	23	40	49	<100	37	11
Th	67	70	94	70	65	93	18	22	62	27	2.9	5	4.7	10	6	3

Table 4. (cont.)

Sample No.	Rhyolite										Basalt					
	GGA -82 -47C1	**GGA -83 -35F3**	**GGA -83 -40D**	**GGA -86 -40I2**	**GGA -86 -66B2**	**GGAT -86 -14H2**	**GGAT -86 -22C5**	**GGAT -86 -22D7**	**av.**	**SD**	**GGA -86 -19C2**	**GGA -86 -69F3**	**GGA -87 -9E1**	**GGAT -86 -15B2**	**av.**	**SD**
U	9.7	15	12	15	14	20	5.2	1.6	12	6	0.72	1.2	1.2	2.6	1	1
Au	<0.002	<0.004	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	0.0014		<0.001		
In	0.08	0.08	0.11	0.17	0.12	<0.05	<0.05	<0.05	0.11	0.03	0.06	0.11	0.08	<0.05	0.08	0.02
Tl	2.1	2.4	3.1	3	2.8	2.5	6.6	8.8	3.9	2.3	0.17	0.15	0.2	0.26	0.20	0.04
Be	6.2	7.6	8.1	5.6	10	5.9	3.6	1.7	6.1	2.4	0.7	2.2	1.5	1.3	1.4	0.5
Cd	0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.0	<0.2	<0.2	<0.2	<0.2		
Cr	<10	<10	<10	<10	<10	<10	<10	<10			150	110	140	680	270	237
Ni	<10	<10	<10	<10	<10	<10	<10	<10			58	32	40	110	60	30
Co	<5	<5	<5	<5	<5	<5	<5	<5			43	32	37	32	36	5
Sc	3.3	2.8	0.7	7.8	1.3	3	2.9	2.7	3.1	2.0	27	18	23	23	23	3
V	<5	<5	<5	<5	<5	<5	<5	<5			230	150	160	140	170	35
Cu	<10	<10	<10	<10	<10	<10	<10	<10			90	14	23	26	38	30
Pb	33	34	67	48	54	17	8	13	34	20	4	8	7	25	11	8
Zn	65	48	100	50	94	41	10	19	53	30	85	85	89	56	79	13
As	110	32	130						91	42						
Ag	4	0.5	<0.1	<0.1	<0.1	<0.1	0.6	<0.1	1.7	1.6	<0.1	0.8	<0.1	<0.1	0.8	0.0
Bi	<0.5	<0.5	<0.5	0.5	0.6	<0.5	2.9	4.8	2.2	1.8	<0.5	<0.5	<0.5	0.8	0.8	0.0
Mo	2.1	5	0.9	1.2	1.3	0.6	<0.2	<0.2	1.9	1.5	0.7	1.6	1.8	0.4	1.1	0.6
Br	<10	<10	<10													
La	38	93	50	53	120	110	3.6	17	61	40	19	44	36	26	31	10
Ce	110	190	120	81	140	210	12	56	115	62	40	95	84	53	68	22
Pr	7.8	25	17	21	42	27	1.4	5.9	18	12	5	12	11	5.9	8	3
Nd	25	88	63	88	180	97	3.2	13	70	54	21	49	47	23	35	13
Sm	5	19	16	27	49	19	0.66	3.4	17	15	4.7	9.4	9.5	4.5	7.0	2.4
Eu	0.21	0.28	0.06	0.09	0.13	0.52	0.03	<0.02	0.19	0.16	<0.02	2.1	2.3	1.1	1.83	0.52
Gd	3.9	15	16	30	48	16	0.43	1.8	16	15	4.9	8	9.7	4	7	2
Tb	0.7	2.3	2.7	4.7	8.1	2.8	0.1	0.65	2.8	2.5	0.73	1.2	1.5	0.69	1.03	0.34
Dy	4	13	17	27	42	16	0.7	4.5	16	13	4.1	6.9	8.7	4	6	2
Ho	0.8	2.7	3.7	5.5	8	3.2	0.14	0.89	3.1	2.5	0.83	1.4	1.8	0.79	1.21	0.42
Er	2.2	6.8	11	15	19	9.4	0.54	3.6	8.4	6.0	2.1	3.8	4.6	2.3	3.2	1.0
Tm	0.34	1.1	1.7	2.1	2.7	1.4	0.14	0.83	1.29	0.81	0.33	0.54	0.7	0.34	0.48	0.15
Yb	2.3	6.6	11	12	16	9.2	1.3	8.1	8.3	4.6	1.9	3.3	4.4	2.4	3.0	1.0
Lu	0.34	0.97	1.6	1.8	2.3	1.4	0.19	1.1	1.21	0.67	0.37	0.57	0.7	0.34	0.50	0.15

[1] For analytical methods *see* Appendix F.

[2] Fe_2O_3t not included in totals; total iron represented by FeO and Fe_2O_3



Chemical diagrams
Tertiary volcanic rocks
a)
FeO*
Na$_2$O + K$_2$O
MgO
Tholeiitic
Calc-alkaline
Irvine and Baragar, 1971 (Fig. 2)
b)
K$_2$O (wt %)
SLF
Le Maitre, 1989 (Fig. B.15)
Basalt
Basaltic andesite
Andesite
Dacite and rhyolite
High-K
Medium-K
Low-K
SiO$_2$ (wt %)
c)
Ti / 100
Zr
Y * 3
WPB = D
OFB = B
LKT = A,B
CAB = B,C
A
B
C
D
Pearce and Cann, 1973
d)
Irvine and Baragar, 1971 (Fig. 3)
Na$_2$O + K$_2$O (wt %)
Alkaline
Subalkaline
SiO$_2$ (wt %)
e)
Miyashiro, 1974 (Fig. 1a)
FeO* / MgO (wt %)
Tholeiite
Calc-alkaline
SiO$_2$ (wt %)
f)
Winchester and Floyd, 1977 (Fig. 6)
Log (Zr / TiO$_2$)
Phonolite
Trachyte
Com/pant
T/A
Rhyolite
Rhyodacite/dacite
Andesite
Andesite/basalt
Alk-bas
Bsn/nph
Subalkaline basalt
Log (Nb / Y)
g)
Cox et al., 1979 (Fig. 2.2)
Na$_2$O + K$_2$O (wt %)
Phonolite
Trachyte
Rhyolite
Dacite
Andesite
Trachyandesite
Benmor
Mugear
Hawaiite
B-A
Basalt
B+T
P-T
P-N
Neph
SiO$_2$ (wt %)
h)
Miyashiro, 1974 (Fig. 12)
TiO$_2$ (wt %)
Thol
Am
FeO* / MgO (wt %)
● Rhyolite
▲ Basalt
△ Basalt (Jackson et al., 1986)
Basalt and rhyolite (38 analyses from Pride (1988)
(Note: not all elements available for all analyses)

Figure 38. Various chemical discrimination diagrams for Tertiary bimodal volcanic rocks (a–h). For plotting purposes, major elements have been normalized to volatile-free basis. The grey shaded area represents envelopes that bound analytical values reported by Pride (1988) for Tertiary volcanic rocks along Tintina Trench. Chemical characterization of the Tertiary volcanic rocks is discussed in the text. Features pertaining to certain diagrams (e.g. abbreviations, background) are discussed with that diagram as follows: **a)** from Irvine and Barager (1971, Fig. 2); **b)** from Le Maitre (1989, Fig. B.15); **c)** from Pearce and Cann (1973). Abbreviations: WPB = within-plate basalt, OFB = ocean-floor basalt, LKT = low-potassium tholeiite, and CAB = calc-alkaline basalt; **d)** from Irvine and Barager (1971, Fig. 3); **e)** from Miyashiro (1974, Fig. 1a); **f)** from Winchester and Floyd (1977, Fig. 6). T/A = trachyandesite, Alk-bas = alkaline basalt, Bsn/nph = basanite/nephelinite, Com/pant = comendite/pantellerite; **g)** from Cox et al. (1979, Fig. 2.2). Neph = nephelenite, P-N = phonolitic nephelenite, B+T = basanite+tephrite, P-T = phonolitic tephrite, Benmor = benmoreite, Mugear = mugearite, B-A = basaltic andesite; **h)** from Miyashiro (1974, Fig. 12); examples of tholeiitic (Thol = Skaergaard) and calc-alkaline (Am = Amagi volcanic arc) trends indicated for comparison.

The following discussions, organized broadly by age, elaborate on how these events affected rock units in the Tay River and Sheldon Lake map areas.

Late Proterozoic to Triassic

Hyland Group tectonic events

The thick, submarine fan sediments of the late Proterozoic Hyland Group are the product of rapid uplift in concert with subsidence of a depositional basin that accumulated at least 3 km of sediment (Gordey and Anderson, 1993). The mode of uplift is uncertain, largely because the location of the clastic source areas remains unidentified. It seems unlikely that the clastic rocks were deposited in a foredeep basin in front of a growing compressional belt, because the strata themselves remained undeformed. Rapid block uplift, perhaps related to strike-slip faulting, or regional extension is probable. Extension of latest Precambrian to earliest Cambrian age has been proposed for the southern Canadian Cordillera (Bond and Kominz, 1984) on the basis of tectonic subsidence curves. The stratigraphic succession is similar to the Yusezyu Formation in age and lithology (but including minor mafic volcanic rocks) and has been interpreted as a rift succession. The Yusezyu Foramtion sediments are the oldest exposed within the Selwyn Basin, and probably represent its initial deposits above an unknown basement. Structures of Hyland Group age have not been identified.

Earn Group tectonic events

The regional influx of westerly derived Devono-Mississippian clastic rocks of the Earn Group (Fig. 7) has been variously attributed to strike-slip faulting (Eisbacher, 1983), extension (Tempelman-Kluit, 1979b), and regional compression and orogenesis (Gabrielse, 1976). A synthesis of this clastic succession in the Cordillera has been presented by Gordey (1991). Local felsic volcanism in the Pelly Mountains (Mortensen, 1982); the occurrence of steeply dipping, normal or reverse syndepositional faults (Abbott and Turner, 1990); presence of widespread, exhalative barite and barite-Ag-Pb-Zn mineralization; and the lack of compressional structures all favour an extensional or transtensional regime. It is possible, or even likely, that this extension was associated with a stress system that featured strike-slip faulting. A major through-going, margin-parallel fault as proposed by Eisbacher (1983) has not been identified (Cecile, 1984c). Although the regional extent of Devono-Mississippian clastic strata may suggest deposition within a foredeep basin, there is no evidence of a flanking mountain belt resulting from coeval foreshortening. Smith et al. (1993) have proposed that such a mountain belt did lie to the west in the form of the Yukon-Tanana terrane and that it was the source of the Earn Group; however, in the Devono-Mississippian this terrane was a magmatic arc (Mortensen, 1992b) and there is no indication of volcanic or granitoid detritus as would be expected from such a source. In addition, the composition of the clastic rocks and the presence of boulder conglomerate units in northern Tay River area clearly demonstrate local derivation from older Selwyn Basin strata. Because uplift occurred in what was formerly a possible deep-marine setting (i.e. the older Selwyn Basin) only local areas may have been elevated above sea level to supply detritus. Such extension may have been in response to lateral crustal stretching or regionally distributed crustal shear. If it was shear, or if stretching were inhomogeneous, associated small strike-slip faults and local compressional deformation might be expected.

The coarsest known Devono-Mississippian clastic rocks in the northern Cordillera occur in northeast Tay River map area (*see* ‘Earn Group’ section). Figure 39 shows this area where Earn Group strata rest disconformably on various units as low as the Late Proterozoic Yusezyu Formation. The lack of angular unconformity, the variable preservation of pre-Earn strata, and spatial coincidence with proximal boulder conglomerate indicate localized uplift and erosion related to block faulting with minimal tilting.

Mid-Paleozoic vertical displacements explain the differential stratigraphic preservation noted across several steep faults in this area (Fig. 39). For example, Road River Group strata are extensively preserved in area A (Fig. 39), but in areas B and C, Earn Group clastic rocks rest directly above the Yusezyu Formation. Strata predating the Earn Group and postdating the Yusezyu Formation are preserved across two faults in the former area. Southwest of fault 1 (Fig. 39), the strata include the limestone member of the Yusezyu Formation and as much as 400 m of Narchilla Formation. South of fault 2, the Ordovician-Silurian Road River Group

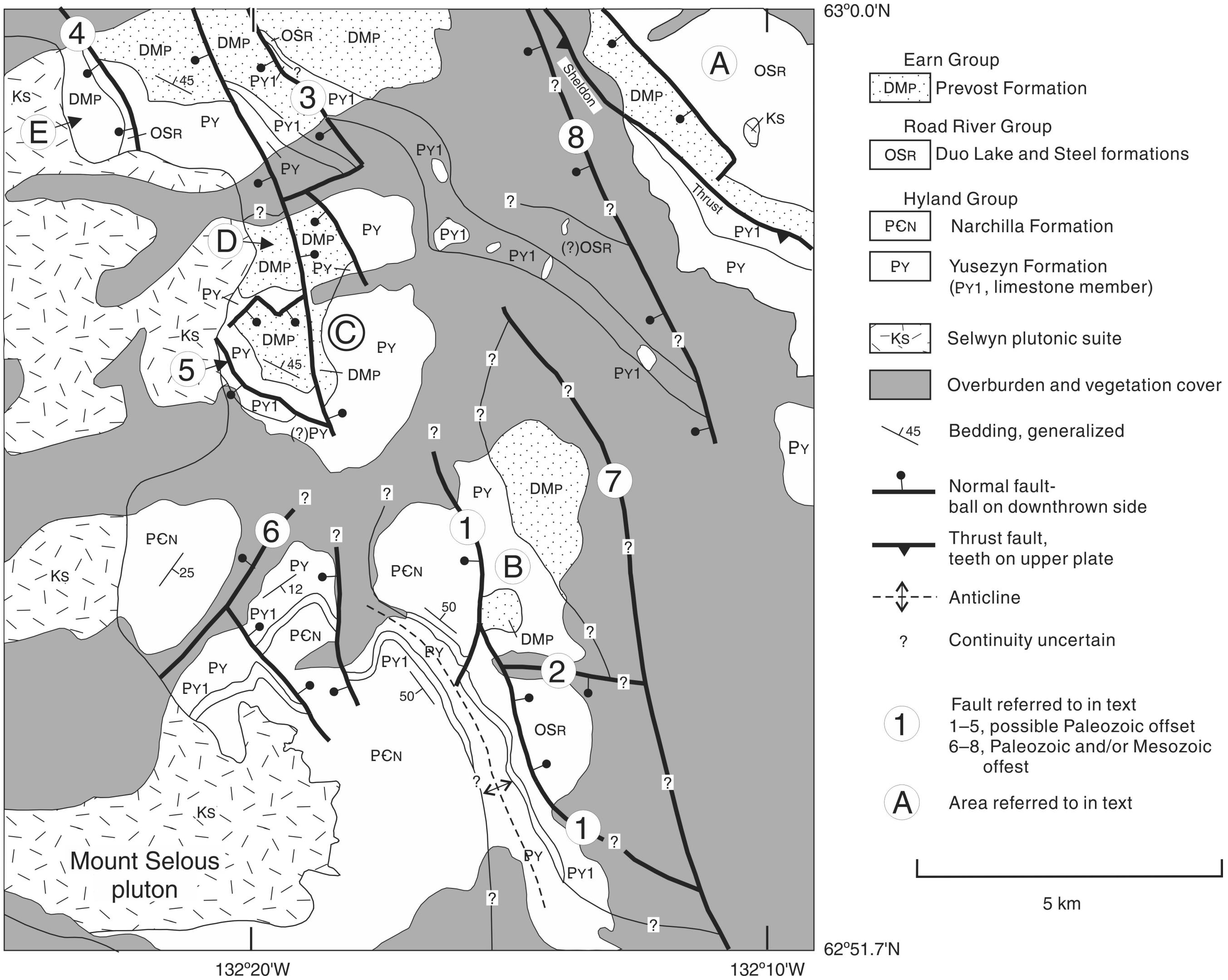


Figure 39. Geological sketch map of northeastern Tay River map area. Faults with possible Devono-Missippian displacement that are discussed in text are numbered. Areas discussed in text are indicated by letter.

is preserved. Aggregate displacements on these faults pre- and likely postdating the Earn Group are at least the thickness of the removed stratigraphic section, about 900 m. Differential preservation of stratigraphy is also noted across faults 3, 4, and 5 (Fig. 39). The fault labelled 6 is typical of many of the structures in the area. It is inferred to separate two panels of different stratigraphic level, but displacement may be Paleozoic, Mesozoic, or both. Faults 7 and 8 are inferred to separate Earn Group and Yusuzyu Formation strata over a broad area of sparse outcrop; the actual contact could be much more complex. Finally, areas D and E indicate where the coarsest and most texturally immature Earn Group (likely Prevost Formation) conglomerate units are located.

Between Riddell and South Macmillan rivers, about 7 km southeast of the area shown in Figure 39, steeply dipping Earn Group conglomerate overlies Yusezyu Formation sandstone and carbonate on an apparently unconformable contact. Although not examined in detail, this contact could be an unconformity that represents erosional bevelling of a tilted block, or a Mesozoic fault.

For the Macmillan Pass area northeast of the project area, Abbott (1983) postulated that older (Devonian) faults could explain depositional patterns, although structures of that age could not be proven.

Regional unconformities

The events that caused regional unconformities beneath the Rabbitkettle, Prevost, and Jones Lake formations, as well as those of more possible local extent beneath the Duo Lake, Steel, and Portrait Lake formations (Fig. 9) are enigmatic. These disconformities probably reflect various combinations of epeirogenic uplift and local intermittent extension. Block faulting would account for rapid changes in stratigraphic thickness in some areas. For example, the Steel Formation in central Tay River area changes abruptly in thickness (beneath the Portrait Lake Formation) from a few tens of metres to apparently more than several hundred metres (Fig. 19, *see* 'Steel Formation (SS)' section). The Duo Lake Formation rests directly on the Hyland Group west of Mount Riddell, whereas to the north, south, and east the intervening Rabbitkettle Formation is preserved (e.g. Fig. 9). In Nahanni area to the east, several structures predating the Rabbitkettle Formation are inferred to indicate local faulting, tilting, and long-wavelength buckling (Gordey and Anderson, 1993).

Yukon-Tanana and Slide Mountain terranes

As indicated by its eclogite occurrences, the narrow belt of metamorphosed and ductile-deformed Yukon-Tanana terrane (schist unit) exposed in the Tay River area represents a tectonic sliver, subducted and exhumed within an east-facing Permian fore-arc basin (Erdmer, 1987). This sliver is preserved along the northeast edge of the terrane at the base of the Mesozoic thrust that emplaced it above the ancestral margin. Most of Yukon-Tanana terrane to the south and east in the Finlayson Lake area rests structurally above the sliver, is relatively unmetamorphosed, and although deformed, has a mappable coherent stratigraphy. There, Devono-Mississippian deformation (indicated by an angular unconformity) and mid-Permian large-scale imbrication of the terrane are documented (Murphy et al., 2002; Murphy, 2004).

Detritus of the immature Triassic conglomerate unit derives from Yukon-Tanana and Slide Mountain terranes, and was likely deposited within a fore-arc basin setting, perhaps a continuation of the Permian arc indicated for the schist unit. A locally well developed, cataclastic fabric (Tempelman-Kluit, 1979b) may indicate subduction-related cataclasis or may be a result of Mesozoic terrane emplacement.

Slide Mountain terrane is relatively unmetamorphosed and apparently little deformed. Its structures, of uncertain Mesozoic age, are described below.

Jura-Cretaceous

The present map pattern in Sheldon Lake and Tay River areas is largely the result of shortening during mid-Jurassic to Paleocene orogeny. Accretion of Yukon-Tanana and Slide Mountain terranes occurred through arc-continent collision at the edge of the miogeocline (*see* 'Regional setting' section). The resulting deformation of the continental margin migrated across Selwyn and Mackenzie mountains toward the craton. As in the Rocky Mountain Fold and Thrust Belt (e.g. Price, 1981), structures in ancestral North American margin strata are thin skinned (Gordey and Anderson, 1993). They developed above and root in a basal detachment that likely extends beneath the entire deformed belt of the northern Cordillera.

Most of Tay River and Sheldon Lake map areas lies within the Selwyn fold belt (Fig. 8) that over large areas is characterized by intricate folds, slaty cleavage, and generally steep dips of bedding. In the project area structure can be complex at a local scale, particularly in strata of the Road River Group. At a larger scale, however, as illustrated in the cross-sections accompanying this report (Gordey, 2012a, b), structure is dominated by a few shallow-dipping thrust faults and buried detachments across which the more complex deformation was accommodated.

For descriptive purposes the region is divided into five informal domains (Fig. 40). These domains, described in sequence are: southwest, allochthonous terranes, Twopete and Tay River thrust sheets, central, and northeast.

Southwest domain

This domain encompasses the region southwest of Tintina Fault and is itself divisible into two subdomains. Between Saint Cyr and Tintina faults, the sequence and probable age of the main units suggests an overall moderate southwest dip; however, all of these strata are cleaved and folded on a small scale and both bedding and cleavage have shallow to steep dips of diverse orientations. A lack of marker horizons precludes estimates of shortening.

Southwest of Saint Cyr Fault, the structure is dominated by the Magundy syncline, a northwest-trending and gently plunging fold at least 35 km long. Development of the syncline was likely controlled by thick competent Siluro-Devonian carbonate. Its limbs dip about 40º and fold amplitude is about 1800 m. The fold is linked en echelon via a short bridging anticline to a southeast-trending and -plunging syncline of similar structural style. Southwest of St. Cyr Fault, the phyllite and slate units display locally ubiquitous small-scale folds, cleavage, and crenulations, but all stratigraphically higher units show little internal deformation.

Allochthonous terranes

In Tay River area the Yukon-Tanana terrane records Permo-Triassic metamorphism and deformation and regionally, Devono-Mississippian deformation and Permian imbrication (*see* discussion above). Jura-Cretaceous emplacement of the terrane produced little internal strain or disruption, except for some imbrication along its basal fault contact (e.g. Murphy et al., 2002).

The age of structures in the Slide Mountain terrane is widely bracketed as post-Permian and pre-mid-Cretaceous (predates Selwyn Plutonic Suite). Volcanic rocks of the basalt unit are massive and structureless. The chert unit in most outcrops displays a weak phyllitic foliation that transects bedding at various angles (Tempelman-Kluit, 1972). Locally there is a weak wrinkle lineation developed on the foliation surface. Minor folds were not seen, but it seems

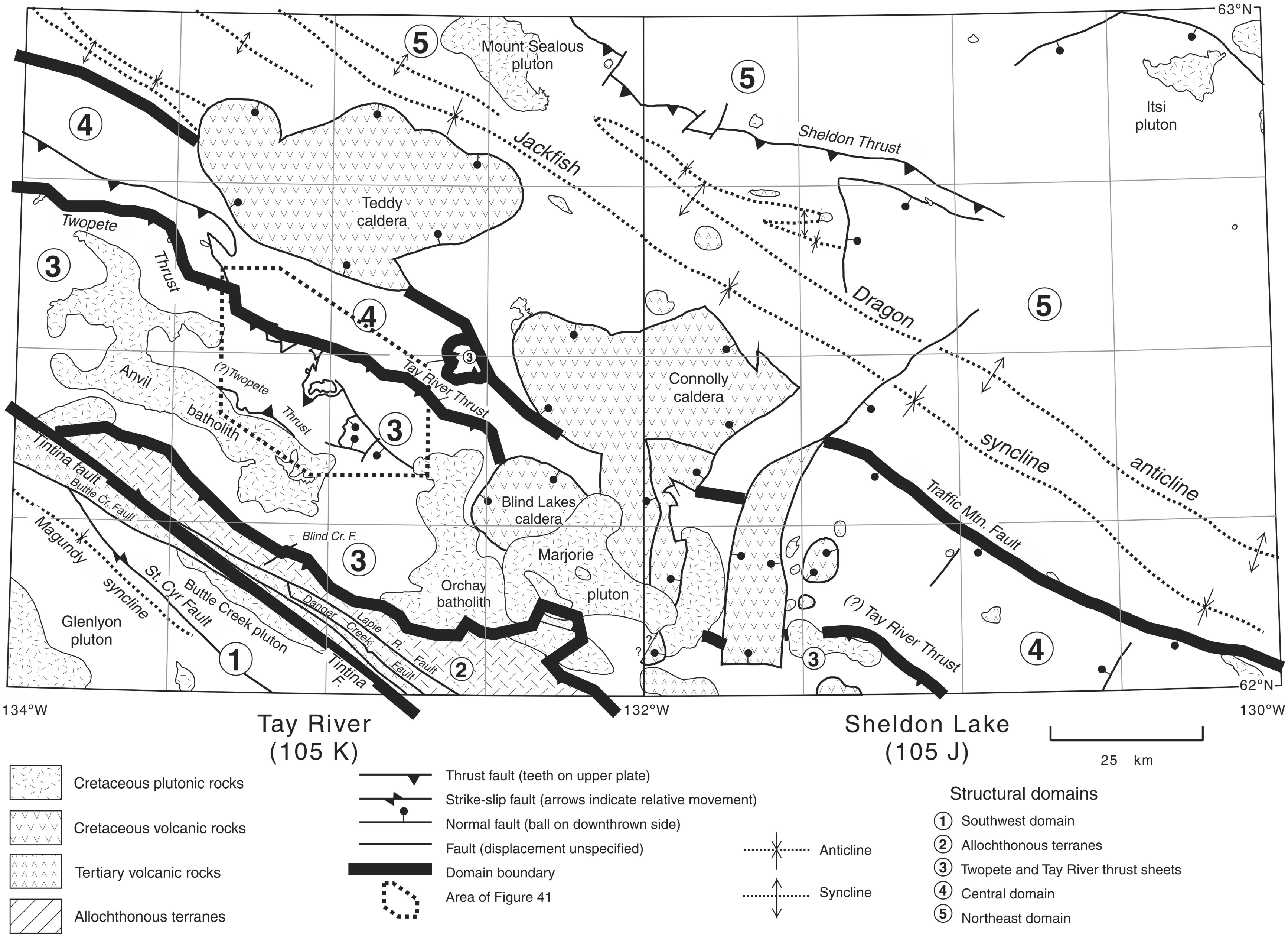


Figure 40. Structural domains for Early Cretaceous contraction.

unlikely that the thick, thin-bedded, incompetent chert unit has escaped structural repetition. Limestone of the carbonate unit is commonly massive, but locally shows a parting of shallow dip. The northwest-trending faults that bound the ultramafite bodies (the Vangorda fault zone of Tempelman-Kluit (1972)) could have formed through Paleozoic or Mesozoic contraction, Cretaceous-Tertiary strike or dip-slip displacement, or a combination of these.

Northeast of Pelly River the structural stacking of terranes resulted from Jura-Cretaceous contraction. From west to east Yukon-Tanana terrane generally overlies Slide Mountain terrane, which in turn overlies strata of the ancestral North American margin. Foliations and bedding in both terranes and miogeoclinal strata are concordant and dip moderately to steeply southwest. The faults that separate both terranes and parautochthonous strata have a somewhat sinuous trace that distinguishes them from the linear Cretaceous-Tertiary faults nearby along Pelly River valley. Their intersection with topography permits a moderate to steep southwest dip concordant with bedding and foliation. On this basis, Cretaceous-Tertiary fault-bounded panels of Slide Mountain terrane within Pelly River valley could represent upthrown blocks from which originally overlying Yukon-Tanana terrane was erosionally stripped. A complication to this structural succession is in southeast Tay River map area, where a thin discontinuous slice of Yukon-Tanana terrane schist and conglomerate are sandwiched between the Slide Mountain terrane and miogeoclinal strata.

The regional geometric relationship of the terranes to ancestral North American margin strata was initially controversial. Tempelman-Kluit (1979b) considered the terranes as large flaps resting in their entirety above North American basement. This interpretation, followed here, is supported by isolated occurrences of Yukon-Tanana terrane schist and conglomerate in southeast Tay River map area (central 105 K/1) that lie north of Gull Lake Formation and Road River Group strata. A minimum overlap of the terrane above the ancestral margin of about 8 km is indicated. In an alternative model, Mortensen and Jilson (1985) postulated the main boundary between accreted and parautochthonous strata to be a steep-dipping transpressional suture (their “Finlayson Lake Fault Zone”). In central Finlayson Lake map area, their proposed suture abuts Yukon-Tanana terrane (as a thick block) against ancestral North American margin strata, with both being overlapped by a flat thrust carrying the Slide Mountain terrane. Recent mapping in the Finlayson Lake area (Murphy et al., 2002, 2006) shows Yukon-Tanana and Slide Mountain terranes are carried above North American margin strata by a regional southwest-dipping Jura-Cretaceous thrust fault, the Inconnu Thrust. Structural overlap in that area, measured from the northeast limit of allochthonous terranes southwesterly to the Tintina Fault, is about 65 km.

Twopete and Tay River thrust sheets

This domain (Fig. 40) comprises hanging-wall strata of the Twopete and Tay River thrusts. Both of these thrusts emplace strata as old as the Cambro-Ordovician Rabbitkettle Formation (Twopete facies) above strata as young as the Permian Mount Christie Formation, a stratigraphic separation of about 2350 m. Both thrust sheets contain rocks as young as Devono-Mississippian. Significant displacement on the Twopete Thrust is indicated by the juxtaposition of facies in Ordovician and Siluro-Devonian strata. The voluminous Ordovician Menzie Creek Formation volcanic rocks in the hanging wall of the Twopete Thrust, are represented by only scattered occurrences in the footwall. Similarly, Siluro-Devonian carbonate and quartzite in the hanging wall contrast with rare footwall occurrences of quartz arenite within black shale.

The Twopete Thrust cuts upsection in its hanging wall through the Rabbitkettle Formation (Twopete facies) southeasterly from Twopete Mountain into central Tay River map area (Fig. 41) where Lower Ordovician Menzie Creek Formation in the hanging wall forms a klippen above Ordovician to Silurian Road River Group (Fig. 42). The latter may include Portrait Lake Formation strata, not separately mapped, as young as Middle Devonian. The measured overlap of the thrust in this vicinity, assuming northeast transport is about 9.0 km. If assignment of thermally metamorphosed calc-silicate strata next to the north margin of Anvil batholith to the footwall of the thrust is correct (Fig. 39, locality A), the overlap is increased to 15 km.

Hanging-wall strata in both the Twopete and Tay River thrusts are relatively flat lying. For the former, gentle dips persist southwesterly across the distance of the Anvil batholith as indicated by gently dipping strata that occur both northwest and southeast of the pluton (cross-sections AB, HI; NTS 105 K; Gordey (2012a)). For the Twopete Thrust, the distance from its surface trace southeast of Twopete Mountain across strike to the southwest side of the batholith is about 35 km. This broad area of relatively older stratigraphy (i.e. Gull Lake and Rabbitkettle formations) carried in the hanging wall of the thrust indicates the subsurface attitude of the fault is likewise gently dipping. If the hanging-wall strata in the fault were displaced southwesterly in an attempt to match them to strata in the footwall (i.e. restore fault displacement), they would have to be moved at least 35 km to the southwest, the entire distance across which the fault is interpreted as gently dipping, about double the 15 km of directly measurable overlap.

In a preliminary map, Gordey and Irwin (1987) indicated a different geometry for the Twopete Thrust (in part called the Faro Thrust), which included a possible extension southwest of the Anvil batholith. This geometry was proposed to account for juxtaposition of the Vangorda (phyllite) and Twopete (siltstone) facies, but it was not possible to demonstrate older-over-younger relationships for these segments. Although the older interpretation cannot be excluded, the

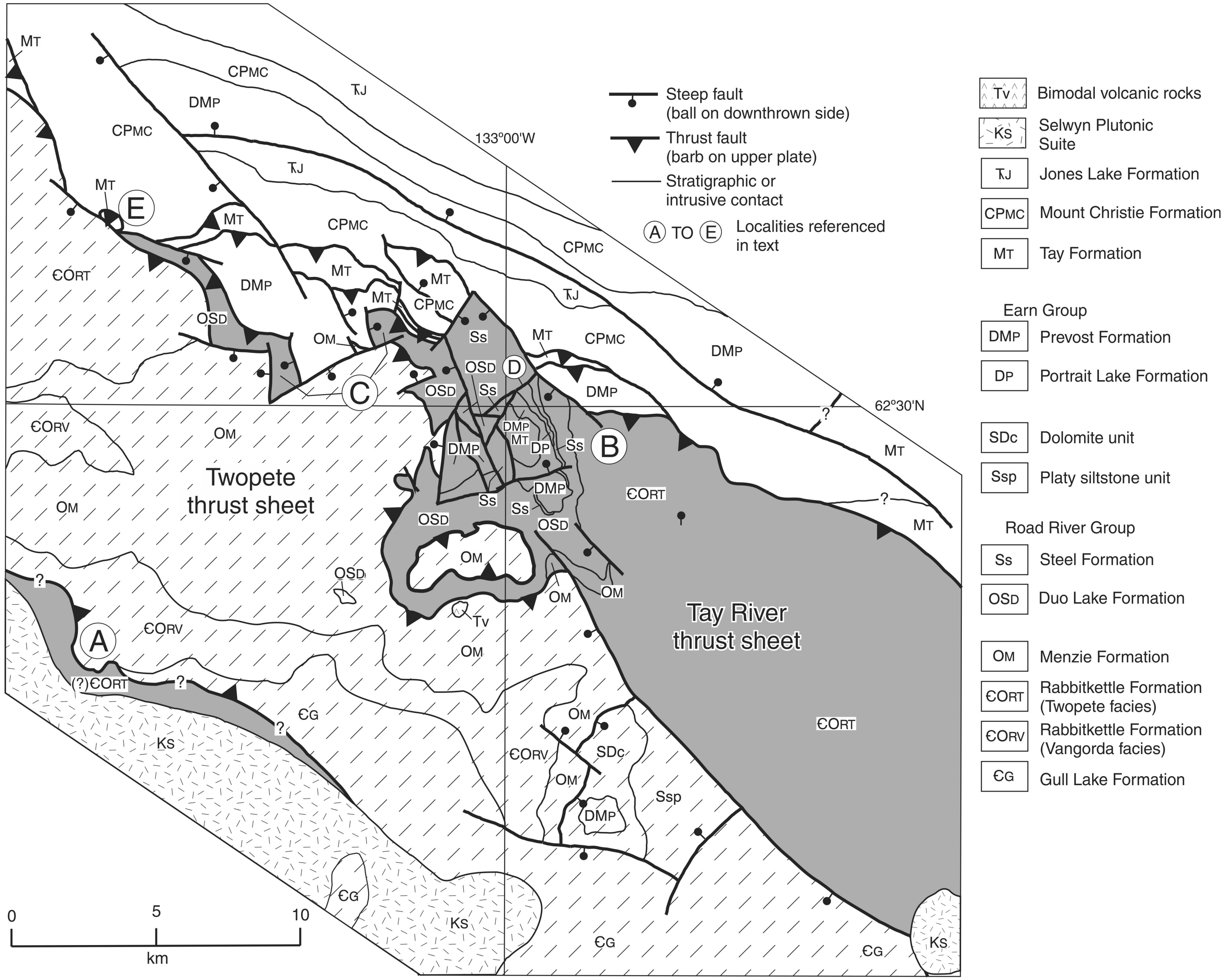


Figure 41. Geological sketch map showing Twopete (diagonal pattern) and Tay River (shaded) thrust sheets. Lettered areas are referenced in text.

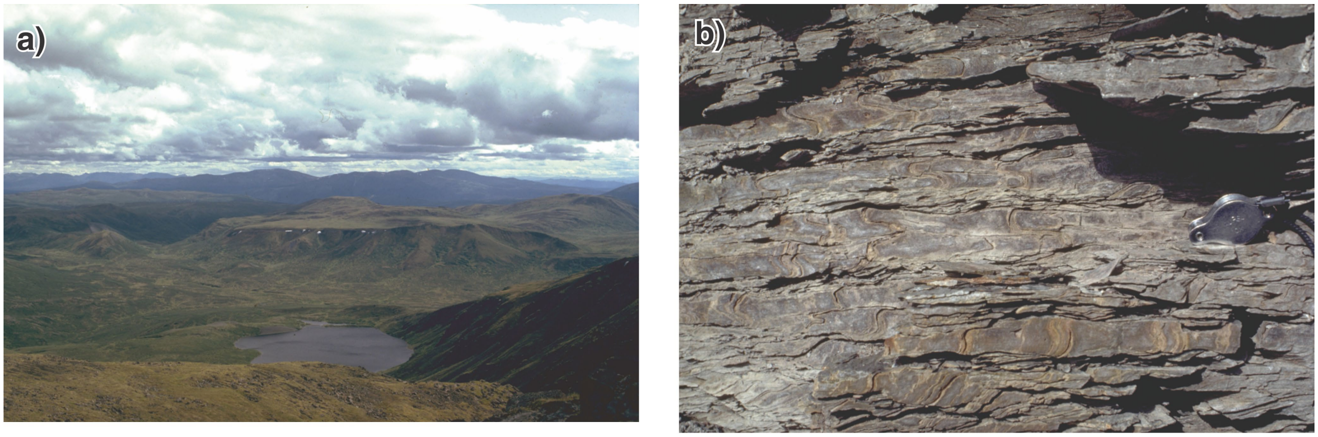


Figure 42. Structures in Twopete thrust sheet; **a)** Menzie Formation volcanic rocks underlie the foreground. The middle ground is underlain by a mesa capped by the same volcanic rocks that are thrust above (Twopete Thrust) recessive siliceous shale and chert of the Road River Group (105 K/06; view to southeast from 62º29.37'N, 133–06.65'W); for scale, field of view (middle-ground) is approximately 4.5 km; 2012-108; **b)** flat-lying crenulation cleavage forming microlithon structure in laminated calcareous phyllite (lamination vertical) of the Rabbitkettle Formation (Vangorda facies) south of Anvil batholith; (105 K/02; 62º13.44'N, 133º28.37'W); hand lens for scale (length of case 3.5 cm); 2012-088; **c)** refolded fold in phyllite of the Rabbitkettle Formation (Vangorda facies), southwest of Anvil batholith (62º14.78'N, 133º09.93'W); hand lens for scale (diameter of eyepiece 2 cm); 2012-129; photographs by S. Gordey.

contact is now considered a lateral facies change, in part obscured by thermal metamorphism. The strike length of the Twopete Thrust in the Tay River area is at least 65 km and it probably continues northwest into Glenlyon map area. Although not mapped by Campbell (1967), traverses by the present author along the east ridge of Dromedary Mountain revealed Cambro-Ordovician (Twopete facies) strata thrust over Permian chert. If this contact is part of the Twopete Thrust, a total minimum strike length of about 107 km is indicated.

Tay River Thrust lies northeast of Twopete Thrust. Overlap measured near a klippen of Cambro-Ordovician Rabbitkettle Formation (Twopete facies) resting above Permian Mount Christie Formation 20 km northwest of Blind Lakes is about 12.5 km. The Tay River Thrust has a minimum strike length of about 30 km. To the southeast its trace is interrupted for a distance of about 45 km by the Cretaceous South Fork volcanics and Selwyn Plutonic Suite. A possible continuation of the fault lies southeast of the igneous rocks east of the Ross River in southern Sheldon Lake map area. There, a 20 km long southeast-trending thrust juxtaposes strata of the Cambrian Gull Lake Formation against Mississippian Tay Formation. If this fault is part of the Tay River Thrust, a total strike length of at least 95 km is indicated.

It is likely that the Tay River and Twopete thrusts merge westward in central Tay River map area (Fig. 41). The geometry of their connection is poorly understood within a complex zone of normal faults. The easily mapped trace of the Tay River Thrust terminates northwesterly against one of these faults (Fig. 41, locality B) and may emerge further northwest where Ordovician and Silurian (and perhaps included unmapped Devonian) black shale and chert are apparently thrust above brown shale of the Devono-Mississippian Prevost Formation (Fig. 41, locality C). The thrust therefore has cut rapidly upsection in its hanging wall to the northwest. To the southwest, both thrusts cut gently downsection to include the Gull Lake Formation in their hanging wall.

Internally, deformation within both thrust sheets is variable. The Twopete facies of the Rabbitkettle Formation and the Menzie Creek formations are relatively undeformed. Minor folds are common in the former near Twopete Mountain, but the chance that some are synsedimentary seems likely in view of the relative competence of that unit. Internal deformation within the Road River and Portrait Lake formations is mild, with only local development of cleavage. On the other hand, the incompetent Rabbitkettle (Vangorda facies) and Gull Lake formations are highly deformed. Minor structures within these rocks, particularly southwest of Anvil batholith are well documented by Tempelman-Kluit

(1972), Jennings and Jilson (1986), and Smith and Erdmer (1990). An early planar fabric and related, locally preserved minor folds of lamination have been overprinted by a variably developed, moderately dipping cleavage (Fig. 42b, c). This later cleavage varies in intensity from a crenulation cleavage through which the older fabric can be detected, to a penetrative cleavage that masks pre-existing structure. Outward from Anvil batholith this younger fabric decreases in intensity along with a decrease in metamorphic grade, indicating it developed in response to a strain gradient in the roof of the batholith during Cretaceous intrusion. The older fabric is likely related to regional shortening preceding batholith emplacement.

Central domain

The central domain (Fig. 40, area 4; Fig. 39) is underlain by Devono-Mississippian to Triassic strata immediately northeast of Twopete and Tay River thrusts. In northwestern and central Tay River map area this domain is characterized by minor thrust faults that emplace Devono-Mississippian above Mississippian strata, or Mississippian onto Permian strata with stratigraphic separations amounting to 200–300 m. Minor folding is present in the central domain (e.g. Fig. 43), but slaty cleavage is generally not developed. In southern Sheldon Lake map area exposure is poor (Fig. 44), but strata of Mount Christie Formation flanked by Tay Formation indicate a broad northwest-trending syncline, broken by northeast-trending normal faults.

The most significant thrust in the central zone, the Stokes Thrust, extends at least 43 km southeasterly from the west border of Tay River map area near Stokes Lake. At its southeastern extent near near Tay River, it appears to be folded and have an overlap (assuming northeast transport) of about 5 km. A small klippe of Mississippian Tay Formation above the Carboniferous to Permian Mount Christie Formation (Fig. 39, locality E) and additional thrust segments with similar stratigraphic relations to the southeast (Fig. 39) may mark the continuation of this fault.

The northwest-trending, 80 km long Traffic Mountain Fault, is interpreted as a normal fault with southwest side down. It juxtaposes Prevost Formation on its south side against the Rabbitkettle Formation to the northeast. A stratigraphic throw of up to 1600 m is suggested, depending on the structural thickness of the highly deformed Road River Group and Rabbitkettle Formation in this area (*see* cross-sections). The linear trace of the fault across an area of high relief on the southwest side of Traffic Mountain indicates a subvertical dip. The age of this fault is unknown and could be as young as Tertiary.

Total shortening across the central domain cannot be determined with the present data, but the open folds and small thrust overlaps suggest it is probably not much more than the 5 km measured across the Stokes Lake Thrust.

Figure 43. Folded, well bedded, calcareous siltstone to sandstone and shale of the Jones Lake Formation (105 K/10; 62°34.80'N, 132°59.27'W); rock hammer for scale (length 34 cm); photograph by S. Gordey; 2012-128

Figure 44. View looking east towards Traffic Mountain, southern Sheldon Lake map area. Poor exposure in this region hinders structural interpretation (105 J/02; view to the east from approximately 62°05.78'N, 133°55.5'W); for scale, elevated area of Traffic Mountain (right side of photograph) is approximately 8 km across; photograph by S. Gordey; 2012-117

Northeast domain

This domain (Fig. 40, area 5) is dominated by severely shortened strata of the Ordovician-Silurian Road River Group, within which are locally included small thrust slices of the Cambro-Ordovician Rabbitkettle Formation and possible small infolds of the Devonian Portrait Lake Formation. Despite steep and moderate dips of strata, this domain has low structural relief punctuated by the Dragon anticline, Jackfish syncline, and Sheldon Thrust which bring Proterozoic Hyland Group rocks to the surface.

Deformation style within Road River Group and adjacent formations is complex and highly variable (Fig. 45). East-central Sheldon Lake map area contains both east- and west-dipping homoclinal successions of alternating Duo Lake and Steel formations that may persist up to 10 km across strike (Fig. 45). The preserved thickness of individual formations is, however, typically on the order of 20–200 m. Unfortunately, exposure and facing indicators are insufficient to determine whether structural repetition results from thrust imbrication, isoclinal folding, or a combination of both. In other areas such as parts of northern Sheldon Lake map area, dip directions alternate across strike every 50 m to 100 m. Fold hinges are not exposed, but presumably are angular, and the folds are chevrons in style. Outcrop-scale chevron folds are seen locally. A lack of marker horizons precludes determining the degree to which the chevron-folded successions are disrupted by thrust or normal faults. In other areas, the structure is typified by steep to vertical bedding and rapid alternation of varicoloured chert and siliceous shale rock types. In these areas the formational identity of strata (Duo Lake, Steel, or Portrait Lake formations) can be ambiguous and the amount and manner of structural repetition unclear. The likelihood that intense faulting as well as tight folding have both occurred is high. In summary, the northeast domain exposes a variety of structural styles, all expressions of intense horizontal shortening, but reflecting no regionally consistent sense of vergence.

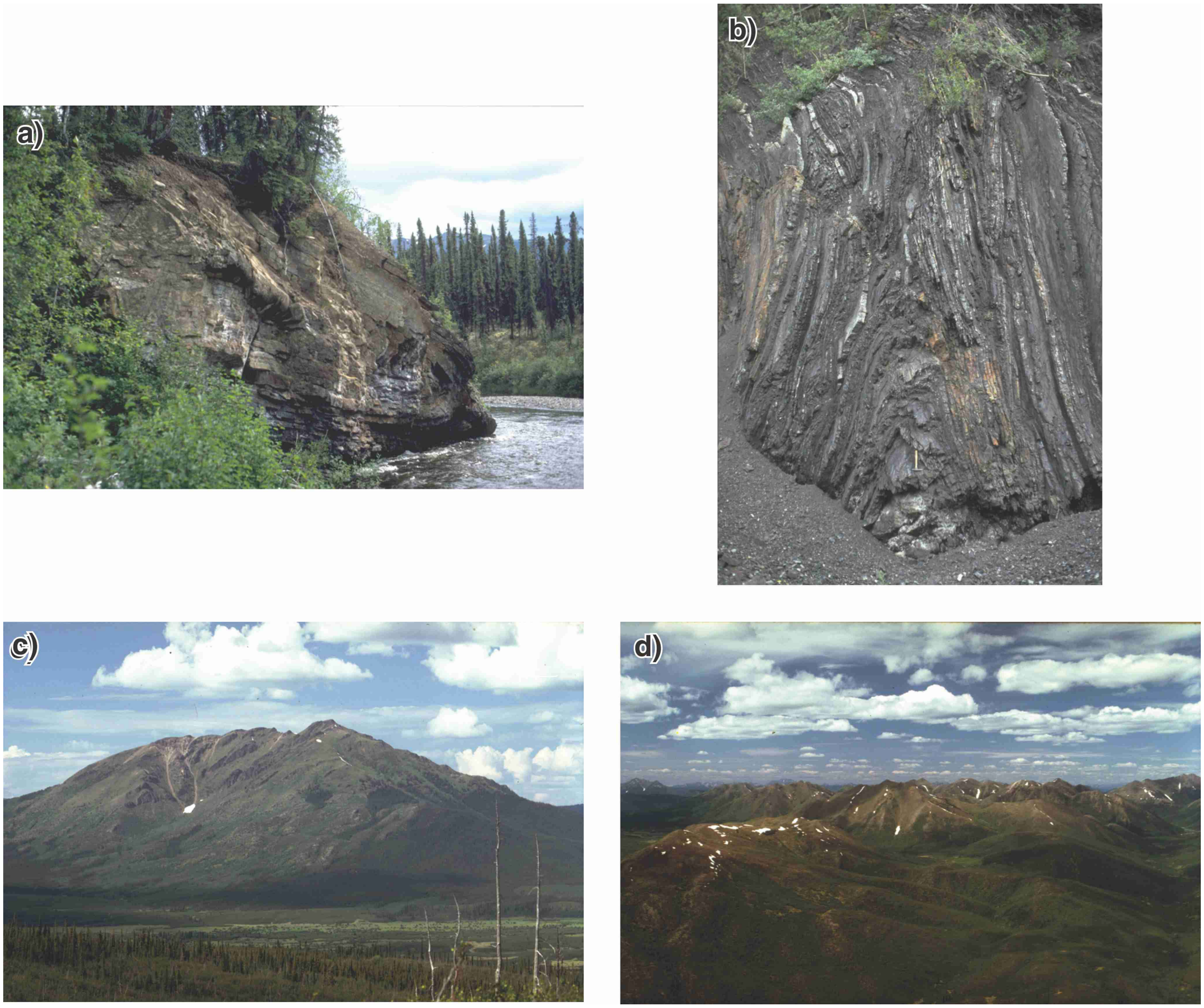


Figure 45. Deformation within northeast domain, Road River Group; **a)** recumbent isoclinal fold in medium-bedded grey chert of the Duo Lake Formation (105 K/14; 62°51.70'N, 133°05.93'W); for scale, cliff is approximately 8 m high; 2012-109; **b)** hinge-line view of moderately plunging tight fold in thin-bedded black chert of the Road River Group (?) Duo Lake Formation) (105 K/15; 62°55.54'N, 132°55.59'W); rock hammer for scale (lower-centre; length 34 cm); 2012-091; **c)** Road River Group strata form an intensely repeated, homoclinal, moderately west-dipping succession that underlies the entire mountain block pictured (105 J/07; view to north from 62°25.81'N, 130°33.59'W); for scale, width of view is approximately 3 km; 2012-118; **d)** aerial view from helicopter showing subdued, mountainous terrane underlying east-central Sheldon Lake map area. Entire view is of Road River Group (105 J/08; view to northwest from approximately 62°25.00'N, 130°10.00'W); for scale, field of view is approximately 7 km; 2012-126; photographs by S. Gordey.

Dragon anticline and its southern complement Jackfish syncline are large, symmetrical, subhorizontal folds that trend northwest across most of Sheldon Lake and into northern Tay River map area with axes at least 140 km long. Structural relief is up to 1800 m, and the wavelength approximately 43 km. Hinge zones are interpreted as gently rounded (*see* cross-sections). Although bedding is locally steep in formations below the Road River Group, overall limb dips on the folds must be about 40° to portray reasonable known stratigraphic thicknesses of these older units. In general, Hyland Group and Gull Lake Formation strata in the core of Dragon anticline are significantly less disrupted and deformed than the flanking Road River Group strata described above. Hyland Group strata in Dragon anticline near Pelly River have varied bedding attitudes indicative of tight folds. These may be attributed to local stresses developed as strata are compressed within the core of the anticline during its growth.

The Sheldon Thrust, which extends across northern Sheldon Lake and the northeast corner of Tay River map areas, is at least 80 km long. It emplaces strata of the Proterozoic Hyland Group against the Devono-Mississippian Earn Group, a stratigraphic separation of about 1400 m. It is offset by several northeast-trending normal faults in northern Sheldon Lake map area, where its trace relative to topography indicates a moderate to steep southwest dip for the thrust fault at surface. The Sheldon Thrust decreases in stratigraphic throw southeasterly to die out within complexly deformed strata of the Road River Group. Its northwestern extent is unclear since it does not extend as a significant structure into adjacent Lansing map area (Roots et al., 1995).

The complex structures exhibited by Road River Group strata throughout this domain imply severe shortening, the result of complex imbrication and folding above a detachment. Cross-sections through northeastern Sheldon Lake map area (sections J-K, L-M, and N-O) portray a regional underlying detachment, which is discussed below. The oldest strata brought to surface are from the Rabbitkettle Formation, so the detachment must be at this stratigraphic level or lower. That it is probably within this formation is consistent with the observation that strata predating Road River Group strata in the core of Dragon anticline are significantly less disrupted than the overlying Road River Group (i.e. the detachment is folded and above Hyland Group strata within Dragon anticline). The relatively low structural relief of the entire domain (i.e. relatively similar stratigraphic level), aside from the regional structures mentioned above, imply a similar low relief and flat attitude for the detachment. The detachment does not surface as a significant thrust fault. Near the boundary with adjoining Nahanni map area to the east it must terminate at depth (*see* "blind" thrusts of Thompson (1979)) because contiguous Road River Group strata in that area are regionally folded, but lack the internal complex deformation typical of Sheldon Lake map area.

The complex shortening in the Road River Group may have been controlled by an upper detachment, which along with the lower décollement, formed a regional duplex (e.g. Boyer and Elliot, 1982). The youngest strata preserved within the complexly deformed areas are generally the Steel or Portrait Lake formations. Therefore the Prevost and younger formations may not have been involved in formation of the duplex and may have formed its roof. The exposure of Prevost Formation is too scanty to provide definitive proof, but outcrops in the core of Jackfish syncline near South Macmillan River are less deformed than nearby Road River Group strata. Similarly, the belt of Earn Group strata in northernmost Sheldon Lake map area is less deformed than adjacent Road River Group strata. Furthermore, the complex deformation in the Road River Group extends southwesterly to where the group dips beneath a much less deformed cover of mid-Paleozoic and younger strata of the central structural domain. In northwestern Tay River map area, this cover is formed by competent conglomerate and sandstone of the Mississippian Crystal Peak Formation which is only broadly warped (cross-section A-B). In southeast Sheldon Lake map area, the Traffic Mountain Fault forms the boundary of northern and central domains. Interpretation of this structure as a steep fault with vertical offset implies that the complex deformation seen within Road River Group strata on its northeast side must extend some distance southwesterly under the less deformed cover of the central domain (cross-section NO).

In summary, the complex deformation of the Road River Group in the northeast domain is attributed to severe shortening above a regionally flat detachment, probably within the Rabbitkettle Formation. Deformation was constrained upward by a kinematically related upper detachment within the lower part of the Earn Group that formed the roof thrust to a regional duplex. The basal detachment was warped by subsequent formation of the Dragon anticline and Jackfish syncline as well as broken by the Sheldon Thrust. Formation of these structures must have been accommodated by a detachment within or below the late Proterozoic Hyland Group that extends beneath all of Sheldon Lake and most of Tay River map area.

Timing and amount of shortening

Within the project area regional contraction is constrained as Early Cretaceous and presumed to have been northeasterly directed, perpendicular to the structural grain. Deformation postdates the Cretaceous Big Timber Formation that rests concordantly above Triassic strata and exhibits steep dips locally. A younger limit is provided by the undeformed mid-Cretaceous South Fork volcanics and Selwyn Plutonic Suite, the contacts of which truncate regional structures. Although at the current level of exposure contraction had ceased by latest Early Cretaceous time, it is probable that the entire region, already shortened and including plutons and volcanic rocks, was transported easterly along a deep master detachment for the orogen that accommodated Cretaceous to Paleogene shortening in the Mackenzie Mountains to the east.

The total amount of shortening northeast of Tintina Fault may amount to over 85 km for Cambro-Ordovician to Middle Devonian strata. It is impossible to accurately measure shortening in the northeast domain because of its complex style, but a minimum estimate can be made based upon conservation of volume (or area in cross-section). An original stratigraphic thickness of the Road River Group of about 450 m has been thickened on a regional scale to at least 760 m. The latter reflects the amount of local relief through which Road River Group strata are exposed (i.e. from valley bottom to ridge top; Fig. 45c). As a result of its increased bulk thickness (i.e. 760 m), the rock unit had to have been proportionally shortened about 0.6 times its original thickness (i.e. 450 m); however, basal and upper detachments are in the subsurface or largely in the air, respectively, which implies that these are minimum estimates. Thus, a shortening of about 0.5 times or 50% may be reasonable. An average shortening of 50% over an across-strike width of about 80 km implies about 40 km of shortening. As discussed previously, overlap on the Tay River (12.5 km and more) and Twopete (30 km) thrusts combined with the above yields a total contraction for Cambro-Ordovician to Devonian strata northeast of Tintina Fault of at least about 85 km. A paleogeographic implication is that the Selwyn Basin was likely about twice as wide as its current foreshortened width.

The amount of contraction is not equal or balanced across the stratigraphic column within the project area. Proterozoic strata have undergone relatively little shortening in comparison to the Cambrian to Devonian succession. If they had, there would be a large area of substantial structural relief, where the flat thrusts and detachments described above would be expected to cut downsection to merge with a deeper detachment from whence they root. The location of this area is enigmatic, but if preserved, likely lies in east-central Alaska, offset from the present area by Cretaceous-Tertiary slip along Tintina Fault. The total shortening of Mississippian to Cretaceous strata cannot be assessed because of their scattered preservation. Likewise, the degree to which the shortening of these rock units is unbalanced with respect to the Cambrian to Devonian section remains unknown.

Mid-Cretaceous

The dominant structures of known mid-Cretaceous age are the caldera-bounding faults of the South Fork volcanics (*see* 'South Fork volcanics (KSF)' (section) that developed in response to magma chamber evacuation and resulting subsidence rather than tectonic activity. The faults that juxtapose different levels of the volcanic rocks within the southern half of Connolly caldera (Fig. 30) were likely synvolcanic, as was the long north-trending segment (Fig. 30) that is truncated by the (?)co-magmatic Marjorie pluton. A minimum vertical displacement on the caldera-bounding faults can be determined by the thickness of ponded caldera tuff they bound, on the order of at least 950 m. The age of the faults bounding the panel of South Fork volcanics in the valley of the Ross River is not well constrained, nor are the faults which seem to truncate the northeast margin of Connolly caldera. They may be mid-Cretaceous, but could also be Tertiary (*see* below).

Tertiary

The dominant Tertiary structure is the dextral Tintina Fault, the main strand of an anastomosing fault zone found along and southwest of Pelly River valley. Within Tay River map area Tintina fault zone comprises all faults between and including the St. Cyr Fault on the southwest and the Lapie River Fault on the northeast. About 430 km of Tertiary dextral slip along the zone is indicated by offset of latest Cretaceous plutons and Jura-Cretaceous structural elements in northern Canada (Gabrielse, 1985; Gabrielse et al., 2006) and Alaska (Dover, 1994). Transcurrent offset in the Eocene or more recently is inferred from deformation and tilting of Eocene beds near Grew Creek. The beds containing Eocene palynomorphs show minor folds and dips of bedding as steep as 65º, presumably related to fault-bend compression. Net dextral offset along Tintina Fault may amount to 750–900 km based on offset Paleozoic facies, the additional slip (i.e. above 430 km) accomplished through pre-Early Cretaceous displacement (Gabrielse, 1985). Normal vertical displacement during late Miocene or Pliocene time may have produced Tintina Trench (Tempelman-Kluit, 1980) a physiographic lineament that regionally follows the trace of the older dextral Tintina Fault (Fig. 46).

In the Tay River area, no faults of the Tintina fault zone are exposed, nor are shear fabrics seen in their nearest bounding outcrops. Outcrops of the Buttle Creek pluton within 400 m of the likely trace of the Tintina fault zone are weakly foliated, but because foliation is shallow, it probably reflects strain related to emplacement of the pluton and is unrelated to strike-slip movement.

Substantial strike-slip along St. Cyr Fault (Green et al., 1960) is required to place the St. Cyr assemblage, an off-shelf succession with a unique Late Devonian limestone-phyllite unit against coeval platformal strata that underlie most of Pelly Mountains to the southwest. The fault has a linear trace extending at least 210 km from northwest Tay River map area southeastward to within 2 km of Tintina Fault in southern Finlayson Lake map area (Green et al., 1960; Tempelman-Kluit, 1977). The St. Cyr Fault converges along its southeast half with the Tintina Fault at an angle of about 10º, and its great length, straight trace, and probable strike-slip offset indicated a likely join. The northwest end of the St. Cyr Fault, in western Tay River map area is truncated against the Buttle Creek Fault that bounds a graben of Tertiary strata.

Figure 46. View northeast toward snow-capped Anvil Range across Tintina Trench. Outcrops on right-middle ground are carbonate of the Slide Mountain terrane. Campbell Highway is in the foreground (105 K/02; view to the northeast from 62º01.75'N, 132º48.26'W). For scale, field of view (middle-ground) is approximately 3 km. Peaks in the Anvil Range (Mount Mye in centre) are 37 km distant; photograph by S. Gordey; 2012-120

The partitioning of displacement amongst faults within the Tintina fault zone is unclear. The Tintina Fault itself and the Saint Cyr Fault likely carry most of the dextral slip as they separate the most disparate geological elements. Minimum displacement along the Saint Cyr Fault must account for the juxtaposition of the Saint Cyr assemblage with different facies of Pelly Mountains strata along the total length of the fault. That is, strata on the southwest side may have travelled a minimum of 200 km (i.e. length of the fault) northward. Both successions also experienced equal or greater northward slip along Tintina Fault to arrive at their present positions. The partitioning of significant slip along the Saint Cyr Fault implies a correspondingly reduced amount of slip on the adjoining segment of the Tintina Fault. Within a dextral regime the Saint Cyr assemblage must have originated southward of its current location. Possibly it originated adjacent to the off-shelf facies of Kechika Basin (Fig. 6).

Other faults within Tintina fault zone preserve Tertiary strata or juxtapose different units within the same succession. The Tertiary clastic and some volcanic rocks were deposited within relatively narrow fault-controlled basins (e.g. Hughes and Long, 1980) that developed in response to vertical displacement along anastomosing fault segments formed during dextral slip. Although the partitioning of the amount of strike-slip on these faults remains uncertain, Tempelman-Kluit ((1972) who named and briefly described a number of them), suggested minimum vertical displacements of 300 m to 1500 m based on stratigraphic omission.

Several large normal faults postdate, or seem to be kinematically unrelated to Cretaceous contraction. A Tertiary age for these is a possibility, based on the suggestion that the bimodal volcanic unit reflects significant crustal extension concomitant with strike-slip faulting, Examples include the faults bounding Cretaceous volcanic rocks along the valley of the Ross River, those bounding the northeast and southeast margins of Connolly caldera, the fault that crosses Jackfish anticline near Jackfish Lake, the two faults forming the downdropped triangular block near Mount Sheldon, and the Traffic Mountain Fault.

MINERAL OCCURRENCES

The Selwyn Basin area is a world-class province with respect to deposits of lead-zinc-silver, barite, tungsten, and gold. The largest deposits of lead-zinc-silver and barite mineralization are stratiform and occur at several horizons within Paleozoic fine-grained clastic rocks. Major camps include the Anvil district (Pb-Zn-Ag, (?)Cambrian (Tempelman-Kluit, 1972; Jennings and Jilson, 1986)), Howards Pass area (Pb-Zn, Lower Silurian (Morganti, 1979, 1981; Goodfellow and Jonasson, 1986)), and Macmillan Pass district (Pb-Zn-Ag-Ba, Late Devonian; Ba, Mississippian (Abbott, 1983; Bailes et al., 1986; McClay and Bidwell, 1986)). Tungsten deposits such as Cantung (Blusson, 1968), Mactung (Dick and Hodgson, 1982; Atkinson and Baker, 1986), and Lened (Glover and Burson, 1986) are skarns developed within limestone of various ages next to granitic plutons of the mid-Cretaceous Selwyn Plutonic Suite. The intrusions are also associated with a variety of other mineralization styles that include significant gold, such as Brewery Creek and Dublin Gulch, and silver-lead, such as at Keno Hill (Hart et al., 2000).

The first important mineral discovery near the study area was the barite-lead-zinc Tom deposit near Macmillan Pass, discovered in 1951 near the headwaters of the Ross River, immediately northeast of Sheldon Lake map area (Carne, 1979; Debicki, 1983). The remote location did not immediately incite other exploration interest in the Macmillan Pass area (*see* Debicki, 1983). Intensive exploration within the Anvil Range began after Al Kulan discovered the zinc-lead Vangorda deposit in 1953 by conventional prospecting, but it was not until 1965 that the Faro orebody was found, which began production in 1969 (Tempelman-Kluit, 1972; Pigage, 1990). Exploration for tungsten skarn deposits accelerated after the discovery of the Canada Tungsten deposit in northeast Flat River map area in 1958. In 1962 the Mactung tungsten skarn deposit was discovered near Macmillan Pass and was named as one of the largest in the world (Atkinson and Baker, 1986). In 1972, a staking rush followed the announcement of the shale-hosted stratiform lead-zinc deposits at Howards Pass, to the east in Nahanni map area, in rocks previously thought to be unmineralized. After the discovery of epithermal gold mineralization at Grew Creek in 1983, Tertiary strata along and near Tintina Trench became an important exploration target. An account of the people and early history of exploration in the Selwyn Basin area is presented by Gaffin (1980).

Within the Sheldon Lake and Tay River map areas the principal mineral occurrences and exploration targets are stratabound or stratiform base-metal sulphide occurrences with barite, and numerous probable Cretaceous or Tertiary base-metal and precious-metal veins. As well, some tungsten skarns and minor porphyry occurrences are related to Cretaceous intrusions. Occurrences in the Tay River and Sheldon Lake areas are classified in Appendix E. A large number of properties (Appendices E, 'Unknown', Fig. E-1) reflect claims staked on the basis of favourable location or geology, geophysical, or geochemical anomalies in areas of overburden for which the reason for staking was not recorded.

The following discussion is provided as an overview of the types of mineralization that occur, or potentially might occur within the project area. Particularly for the latter, it draws on examples of described Yukon deposits outside Tay River and Sheldon Lake map areas, with similar geological settings.

The classification of occurrences shown in Appendix E are from Yukon MINFILE (Deklerk and Traynor, 2005) and parallels, but not precisely so, that used in the discussion below. The property or occurrence designators, e.g. 105J023, used in the following text also correspond to those in Yukon MINFILE (Deklerk and Traynor, 2005).

Stratiform occurrences

In Sheldon Lake and Tay River map areas there are three main exploration targets for stratiform deposits: lead-zinc mineralization in the top of the Cambrian Gull Lake Formation (herein called Anvil type), lead-zinc mineralization within the Ordovician-Silurian Duo Lake Formation (Howards Pass type), and lead-zinc-silver-barite mineralization within the Early to Late Devonian Portrait Lake Formation (Macmillan Pass type).

Anvil type

The model deposits of the Anvil type are five stratiform, pyritic, lead-zinc-silver-(barite) deposits on the south flank of the Anvil Range (Anvil district) including Faro, Vangorda, Swim, Grum, and Dy orebodies. The setting and deposits are well described by Jennings and Jilson (1986; *also* Pigage, 1990) from which the following account is summarized (*see also* Pigage, 2004).

The deposits are associated with a graphitic phyllite member that occurs within a 150 m interval straddling the Gull Lake and Rabbitkettle formations (Mount Mye and Vangorda formations of Jennings and Jilsen (1986)). The first major pulse of volcanism in the Anvil district (i.e. related to dominantly younger Menzie Creek Formation) occurs along this contact. The bulk of the mineralization occurs in uppermost Gull Lake Formation, but the highest horizons in multilayer deposits are hosted within basal Rabbitkettle Formation. A premining geological reserve of 120 000 000 t of 3.7% lead, 5.6% zinc, and about 40–50 g/t silver applied to the aggregated five deposits.

The deposits have been variably affected by penetrative polyphase deformation and greenschist- to amphibolite-facies metamorphism, as well as later nonpenetrative, brittle folding and faulting.

A common arrangement of sulphide lithofacies in the deposits, termed the Anvil cycle (Jennings and Jilson, 1986) consists of graphitic to noncarbonaceous, disseminated sulphide-bearing quartzite units that form the basal or marginal facies, succeeded upwardly and inwardly by massive, pyritic sulphide minerals, then baritic massive pyritic sulphide minerals. The cycle may occur on the scale of an entire deposit down to a metre scale, and is commonly interrupted, truncated, or imperfectly developed.

The sulphide deposits have a variably developed white-mica alteration envelope, best developed in the footwall, that may represent ore-fluid–wall-rock interaction, a metamorphic reaction envelope between sulphide minerals and host, or a combination of both. Feeder zones to the deposits have not been recognized.

A proposed genetic model involves extensional tectonism, rifting, and passive basaltic volcanism with focused exhalation of evolved, metalliferous brines along synsedimentary growth faults into local, reduced basins straddling the Gull Lake–Rabbitkettle formation boundary.

In Sheldon Lake and Tay River map areas exploration for this stratigraphic interval is limited to areas southwest of Twopete and Tay River thrusts, an area that has numerous showings in addition to those mentioned above (Appendix E). Gull Lake Formation elsewhere is only sporadically preserved beneath the generally unconformably overlying Rabbitkettle Formation. Strata of the same age and similar to these formations southwest of Tintina Fault include the slate and limestone-phyllite units, respectively. Although originally separated by several hundred kilometres and dextrally juxtaposed adjacent Anvil Range strata in the Cretaceous–Tertiary, the striking stratigraphic similarities suggests their boundary might also be worth examination.

Howard's Pass type

The second target is exemplified by the Howard's Pass deposits in Nahanni map area to the east (Morganti, 1979, 1981). Found through a geochemical anomaly, these consist of very fine-grained stratiform sphalerite-galena-pyrite horizons within latest Early to Middle Llandovery (Lower Silurian; Norford and Orchard (1985)) black mudstone and carbonaceous chert of the Duo Lake Formation (Road River Group). The mineralization appears to be of the same age and of identical mineralogy in three different bodies (Anniv, XY, OP) that are separated along a strike length of 28 km. In 1982, drill-indicated reserves on the XY and Anniv zones were released as 125 million short tons (113.4 million t) averaging 5.4% Zn plus 2.1% Pb. Significant recent work has refined and added to this resource. A 2011 estimate outlines an indicated resource of 180.69 million tonnes (5.25% Zn, 1.83% Pb) with an additional 216.04 million tonnes inferred (4.47% Zn, 1.38% Pb) (Selwyn Resources Ltd., 2012).

All of these occurrences are characterized by a lack of massive pyrite, relatively low Ag and Cu, lack of associated bedded barite, and lack of volcanic rocks. Mineralized feeder vents or stockworks have not yet been identified. High-grade mineralized shale in outcrop and float resembles nonmineralized shale and is easily overlooked.

The Howard's Pass deposits formed at relatively low temperatures (less than 220ºC) from metalliferous chloride-bicarbonate brines discharged at the seafloor. Sulphur was probably derived from the water column (Goodfellow and Jonasson, 1986).

Large areas in Sheldon Lake and Tay River map areas are underlain by prospective Road River Group, but mineral potential is limited by two considerations. One is that stratigraphic relations suggest the preferred Lower Silurian interval may be absent as a result of erosion prior to deposition of the Steel Formation. Secondly, unlike the simpler deformation at Howard's Pass, the Tay River and Sheldon Lake map areas exhibit very complex Mesozoic deformation that might disrupt continuity of such a deposit.

There are no showings currently known in the project area that can be definitely related to an Early Silurian horizon. At the Rudy property in Sheldon Lake map area (NTS 105 J/37; Deklerk and Traynor (2005)) there is a minimum of 45 m of poorly bedded, thin- to medium-bedded, dark grey to black barite and shaly barite. No sulphide minerals were visible. Stratigraphic relations are poorly understood, but nearest outcrops consist of Duo Lake Formation chert and locally vesicular and amygdaloidal pillow lava of uncertain association. It is possible this occurrence represents another horizon of exhalative mineralization in the Road River Group. The occurrence itself resembles the thick barite occurrences in the Devonian Portrait Lake Formation, but strata of this formation have not been found in the vicinity.

Macmillan Pass type

Near Macmillan Pass, northeast of the project area, the Tom and Jason deposits consist of zinc-lead-silver-barite of probable Frasnian age hosted within shale and turbidite units of the Earn Group (Carne, 1979; Bailes et al., 1986; McClay and Bidwell, 1986). These occurrences formed by flow of reduced, metal-rich fluids along contemporaneous faults and venting of the fluids onto the seafloor. Mixing of the fluids with seawater precipitated barium sulphate, sphalerite, and galena that settled onto the seabottom. At the Jason deposit evidence for contemporaneous faulting, the proximal vent area, and distal sulphide facies is well documented (Turner, 1991). Geological reserves at the Tom comprise 15 million tonnes averaging 7% zinc, 4.61% lead, and 49.1 g/t silver. At the Jason deposit geological reserves total 14 million tonnes grading 7.09% lead, 6.57% zinc, and 79.9 g/t silver (Bailes et al., 1986; McClay and Bidwell, 1986).

Stratiform barite mineralization occurs regionally within the Portrait Lake Formation. In Nahanni map area to the east this includes several barite occurrences, one of the thicker of which (Oro) comprises grey-weathering, thin-bedded barite, ranging up to 50 m thick within black siliceous shale (Gordey and Anderson, 1993). The age of many of these types of occurrences is not well known, but available conodont ages suggest that regionally there are at least two main times of barite deposition (Gordey and Anderson, 1993). One episode was in the Givetian (late Middle Devonian) and the other in mid-Frasnian (mid-early Late Devonian) time (Dawson and Orchard, 1982). The mid-Frasnian horizon appears to be greatest in extent, although at many localities it is inconspicuous, occurring as baritic shale containing small barite nodules.

In the Sheldon Lake and Tay River map areas stratiform Pb-Zn-Ag-Ba occurrences of the Earn Group include the Pete (occurrence 105J023), Coco (occurrence 105J024), and St. Godard (occurrence 105J025) within the Portrait Lake Formation, and the Lady Di (occurrence 105K108) in the Crystal Peak Formation.

Volcanogenic massive-sulphide deposits

Formation of the regional barite horizon and the barite-zinc-lead deposits such as near MacMillan Pass, were synchronous with extension faulting during Earn Group sedimentation. Another type of deposit, related to extension and local felsic volcanism, is exemplified by the volcanogenic massive sulphide Marg occurrence in southeasternmost Larsen Creek map area (Turner and Abbott, 1990; Holbek et al., 2001). This Cu-An-Pb-Au-Ag deposit consists of a series of continuous to discontinuous sheets of massive sulphide mineralization that occurs near the contact between footwall volcaniclastic rocks and hanging-wall argillaceous sediments with an indicated resource of 4 646 200 t grading 1.8% Cu, 2.57% Pb, 4.77% Zn, 65.08 g/t Ag, and 0.99 g/t Au (Deklerk and Traynor (2005), occurrence 106D009).

The Mount Menzie showing (occurrence 105K110) in Tay River map area is of uncertain stratigraphic association although it is likely within the Earn Group. Barite lenses within black shale and chert (Deklerk and Traynor, 2005) of probable Mississippian age may be a clastic member within the felsic volcanic unit. The little known felsic volcanic unit, which extends several tens of kilometres northwesterly into Glenlyon map area, is a promising, but lightly explored target for stratiform and/or volcanogenic massive-sulphide occurrences (e.g. such as the Marg occurrence).

Vein occurrences

This class of occurrence is dominated by Ag-Pb-Zn veins. Mineralogy commonly includes galena, sphalerite, chalcopyrite, pyrite, and arsenopyrite, and lesser pyrrhotite and tetrahedrite. Quartz, calcite, and rarely siderite or gypsum are gangue minerals. The age of many occurrences is uncertain, but the local or regional high heat flow that may have driven them is likely Cretaceous (Selwyn Plutonic Suite and/or South Fork volcanics) and Tertiary (bimodal volcanic unit). The mid-Cretaceous South Fork volcanics, a formation that might be considered prospective for epithermal precious-metal veins, is singularly lacking in mineral occurrences, and is devoid of alteration zones. In any case, the mode of formation of the volcanic rocks as crystal tuff and the absence of preserved extracaldera tuff suggests post-mid-Cretaceous erosion was likely sufficient to denude the higher and possibly more productive levels of precious-metal–bearing vein systems.

The Grew Creek deposit (occurrence 105K009, Appendix E1) is an example in the project area of a gold-bearing epithermal vein system. It is hosted in Tertiary felsic volcanic rocks (bimodal volcanic unit) and consists of stockwork quartz veins and hydrothermal breccia within hydrothermally altered rhyolite. Pyrite, marcasite, arsenopyrite, chalcopyrite, argentite, electrum, silver selenite minerals, galena, and sphalerite occur in a gangue of quartz adularia and calcite (Duke, 1990; Christie et al., 1992). In 1988, drill-indicated reserves in the main zone were calculated as 773 025 t averaging 8.9 g/t Au and 33.6 g/t Ag, using a cut-off grade of 2 g (Deklerk and Traynor (2005), 105K009). In addition to Tertiary strata along Tintina Trench, Tertiary high-level felsic volcanic plugs (bimodal volcanic unit) well to the northeast are also prospective targets for this deposit type.

Skarn occurrences

Skarn deposits are developed within calcareous host rocks of various ages adjacent to mid-Cretaceous granitic plutons or stocks of Selwyn Plutonic Suite. The age of the host rock is unimportant. The skarns are generally broadly stratiform or semiconformable to host-rock layering. Within the project area most skarn showings are not well documented and classification of skarn type is difficult. Dick (1979) presented an outline of skarn deposit types for southeast Yukon that may be applicable to exploration in the current area, and from which much of the following is summarized.

Skarn deposits can be grouped into four main categories based on dominant ore-element assemblages: W-Cu, W-Mo, Zn-Pb, and W-Cu-Sn. The W-Cu-Sn skarns seem restricted in distribution to near the Seagull batholith in south-central Yukon.

Tungsten-copper skarn

Tungsten-copper skarns form the largest group and are the only known economically significant type in the territory. Skarns of this type are typically localized in limestone beds that may be interbedded with biotite and calc-silicate hornfels. The extent of skarn development coincides with the limit of hornfelsic alteration of the interbedded or overlying pelitic sediments; however, the degree of skarn development and grade of mineralization are not necessarily related to the distance from the intrusive contact.

Tungsten mineralization is associated with plutons lacking hornblende. Marginal phases of these plutons, or nearby satellitic intrusions are anomalous in tungsten (>8 ppm) and contain combinations of andalusite, garnet, tourmaline, and/or muscovite as primary accessory minerals (Anderson, 1983). Intense alteration of the granitic rock to greisen occurs locally and the intrusive may contain W- or Mo-bearing veins. In the skarn deposits the ore mineral is typically blue-white fluorescing scheelite; pyrrhotite, pyrite, and chalcopyrite are common associated sulphide mineralization. Molybdenite has not been observed in skarn of the W-Cu type, although minor amounts, accompanied by scheelite, can occur in fractures in the associated intrusion (Dick, 1979). In general, there is a positive correlation between increasing pyrrhotite content and increasing tungsten grade, although even in pyrrhotite-rich skarn, scheelite is extremely erratically distributed and may be absent altogether. Common calc-silicate minerals include pyroxene, garnet, vesuvianite, epidote, and amphibole. In individual deposits there may be several cross-cutting veins indicating several mineralizing events. Each event may have distinctive prograde and retrograde mineral assemblages. Concentrations of scheelite may be identified with a particular mineral paragenesis or mineralizing event (e.g. Lened (Nahanni map area), Glover and Burson (1986)).

The largest deposits in the region occur just outside of the project area. The Mactung deposit, near Macmillan Pass has published reserves of 30 million tons (27.2 million tonnes) 0.9% WO_3 (Dick and Hodgson, 1982). The Canada Tungsten mine, in northeast Frances Lake map area, contained reserves of 4.2 million tons (3.8 million tonnes) grading more than 1.55% WO_3 (Dick and Hodgson, 1982). Examples of this skarn type in the project area may include the Dragon (105J007) and Gulf (105J036) occurrences (Appendix E2).

Zinc-lead skarn

In base-metal (Zn-Pb) skarns sphalerite and galena are the dominant ore minerals. Although scheelite may be a minor accessory, galena-bearing skarns, or portions of skarns generally do not contain scheelite. In contrast to W-Cu skarns, epidote, rather than garnet is the main aluminum-bearing calc-silicate mineral. Actinolite is common, as is pyroxene (as coexisting diopside and manganiferous hedenbergite). Manganiferous calcite, smithsonite, and sphene are common accessories. Sphalerite is generally iron-rich. Pyrite, pyrrhotite, garnet, magnetite, allanite, and smithsonite may also be present. Skarns of this type are widely distributed in the northern Cordillera. They tend to be small in size, but may attain significant grade. Examples in the project area may include the Thomas (105K013, Appendix E1) and Marylou (105J 030, Appendix E2) occurrences.

Tungsten-molybdenum skarn

Skarns of the W-Mo type are uncommon in the northern Cordillera (Dick, 1979). Scheelite and molybdenite are the ore minerals. Associated skarn minerals include garnet, hedenbergite, anorthite, and quartz, with minor actinolite, magnetite, and wollastonite. Skarn deposits of this group are low in total sulphide content and generally do not contain chalcopyrite. There are no clear examples of this type in the project area.

Porphyry occurrences

The Tac occurrence (105J006, Appendix E2) is the only one in the project area classified as porphyry where disseminated chalcopyrite and molybdenite occur in float of altered mid-Cretaceous diorite.

Intrusion-related gold

Portions of the Selwyn Plutonic Suite have been intensely explored for intrusion-related gold deposits. Hart et al. (2000), on which the following discussion is based, recognized three broad settings in which gold and base-metal mineralization occurs with respect to a central mineralizing pluton, including intrusion-hosted, proximal (within thermal aureole), and distal (beyond hornfels zone). Intrusion-hosted mineralization occurs as sheeted, low-sulphide, gold-bearing quartz-vein systems and stockworks (e.g. Dublin Gulch in northwest Mayo map area (Smit et al., 1996; Maloof et al., 2001) and Brewery Creek in southeast Dawson map area (Diment, 1996; Diment and Craig, 1999; Lindsay et al., 2000)). Proximal mineralization occurs as Au-rich or W-rich contact skarns (e.g. Marn (Brown and Nesbitt, 1987) and Horn (116B107) in Dawson map area). Replacements, disseminations, and stockworks and veins in proximal settings are typically characterized by Au-As with pyrrhotite. Distal Au mineralization (e.g. Brewery Creek (*see* above); Scheelite Dome property in Mayo map area (Hulstein et al., 1999)) is seen either as disseminations or veins in country rock dominated by Au-As-Sb-Hg association with some Ag-Pb-Zn veins present (Hart et al., 2000).

In addition to local lithological and structural controls to mineralization, pluton composition plays a critical role in determining the potential for deposit formation. Globally, there is an association between Au deposits and reduced, I-type, metaluminous, calc-alkaline felsic intrusions (Thompson et al., 1999), but in Yukon, alkaline intrusions can also be productive. Tungsten deposits are largely associated with transitional to peraluminous two-mica plutons. Gold mineralization also locally shows this association. Whether calc-alkaline or alkaline, a reduced oxidation state of the associated mineralizing pluton seems to be critical, the presence of arsenopyrite, pyrite, and pyrrhotite, and lack of Fe-oxide minerals indicating a favourable reduced ore-fluid–forming environment (Hart et al., 2000).

Regionally, within the Selwyn Plutonic Suite, the youngest Cretaceous plutons (Tombstone (94–92 Ma) and Tungsten (97–92 Ma) plutonic suites of Mortensen et al. (2000) and Hart et al. (2000)) occur at the northern and eastern peripheries of the mid-Cretaceous plutonic belt and seem to be most favoured for associated Au (and W) mineralization.

The older ages of the plutons (i.e. 100–96 Ma (Appendix D)) in the map area relative to those known to be most prospective for gold (94–92 Ma (Mortensen et al., 2000)) is, at first, dissuasive of exploration; however, the fact that mid-Cretaceous intrusions within the project area were capable of generating gold-bearing fluids is indicated by the several occurrences for which significant gold is reported including the Mount Sheldon (105J008), Dragon (105J007), Spearhead (105J010), Vg (105J043), Mye (105K052), and Mur (105K053) occurrences (Deklerk and Traynor, 2005).

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Appendix A

Index of map areas

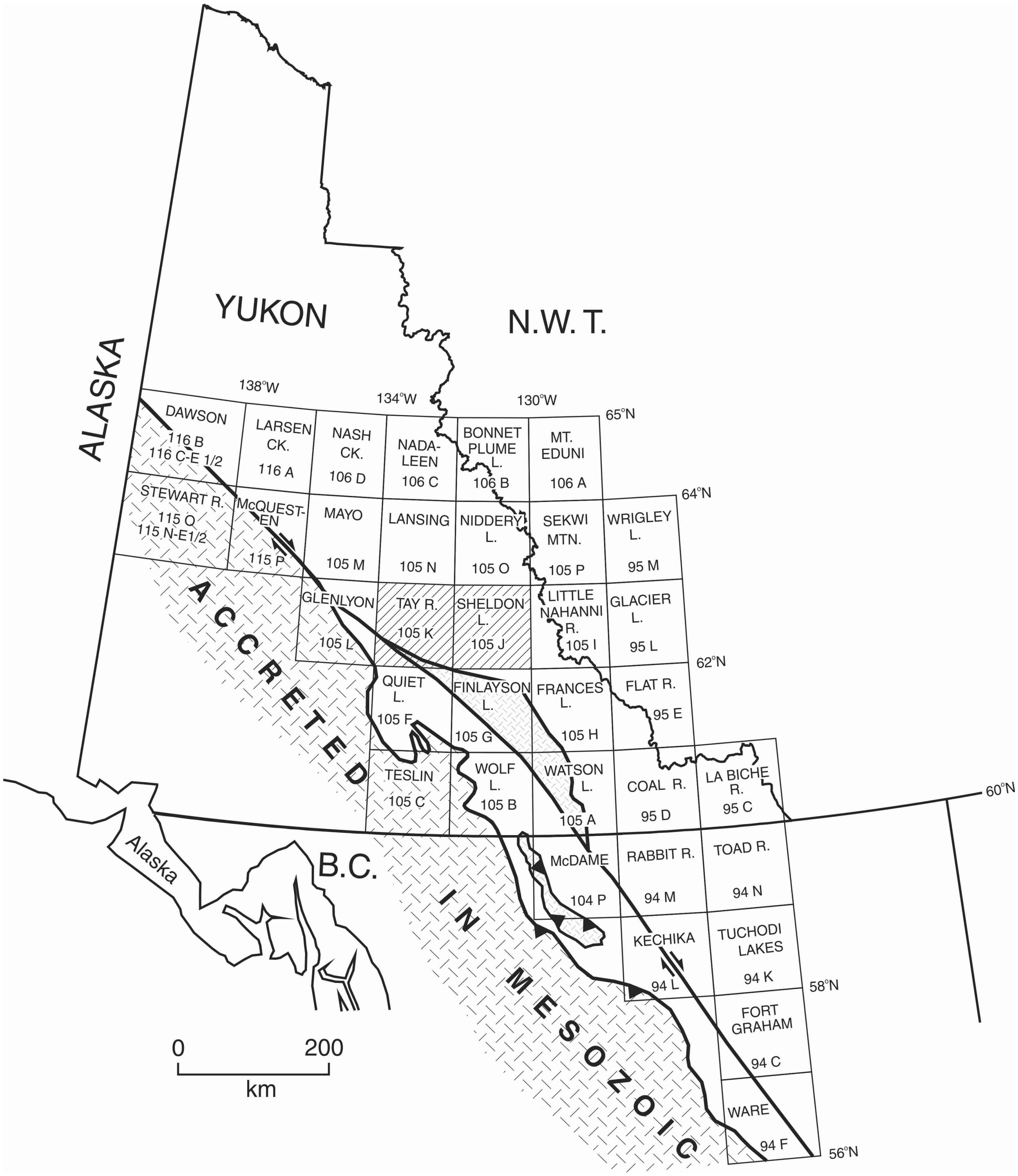
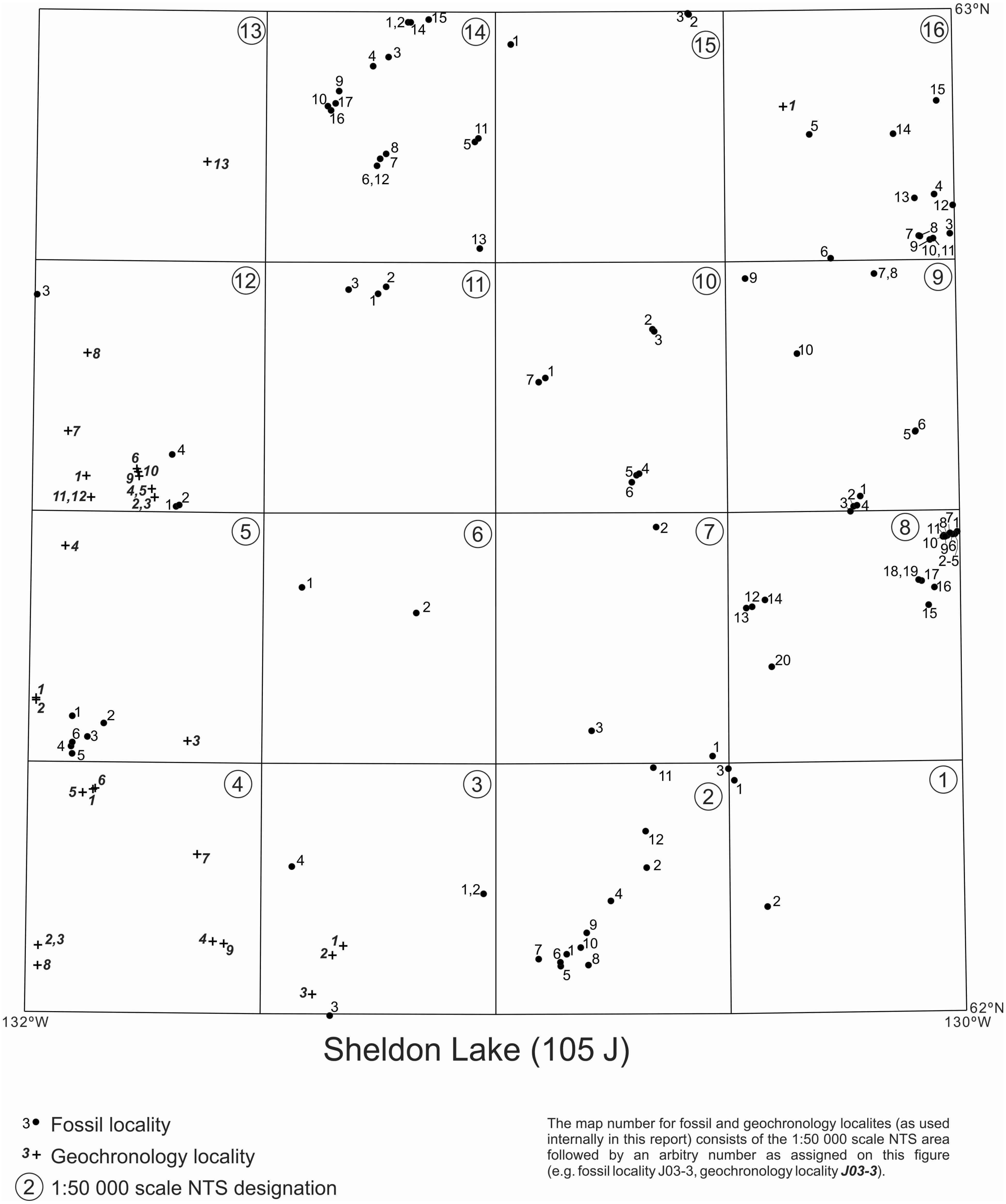


Figure A-1. Index of map areas commonly referred to in text

Appendix B

Paleontology



The map number for fossil and geochronology localites (as used internally in this report) consists of the 1:50 000 scale NTS area followed by an arbitry number as assigned on this figure (e.g. fossil locality J03-3, geochronology locality ***J03-3***).

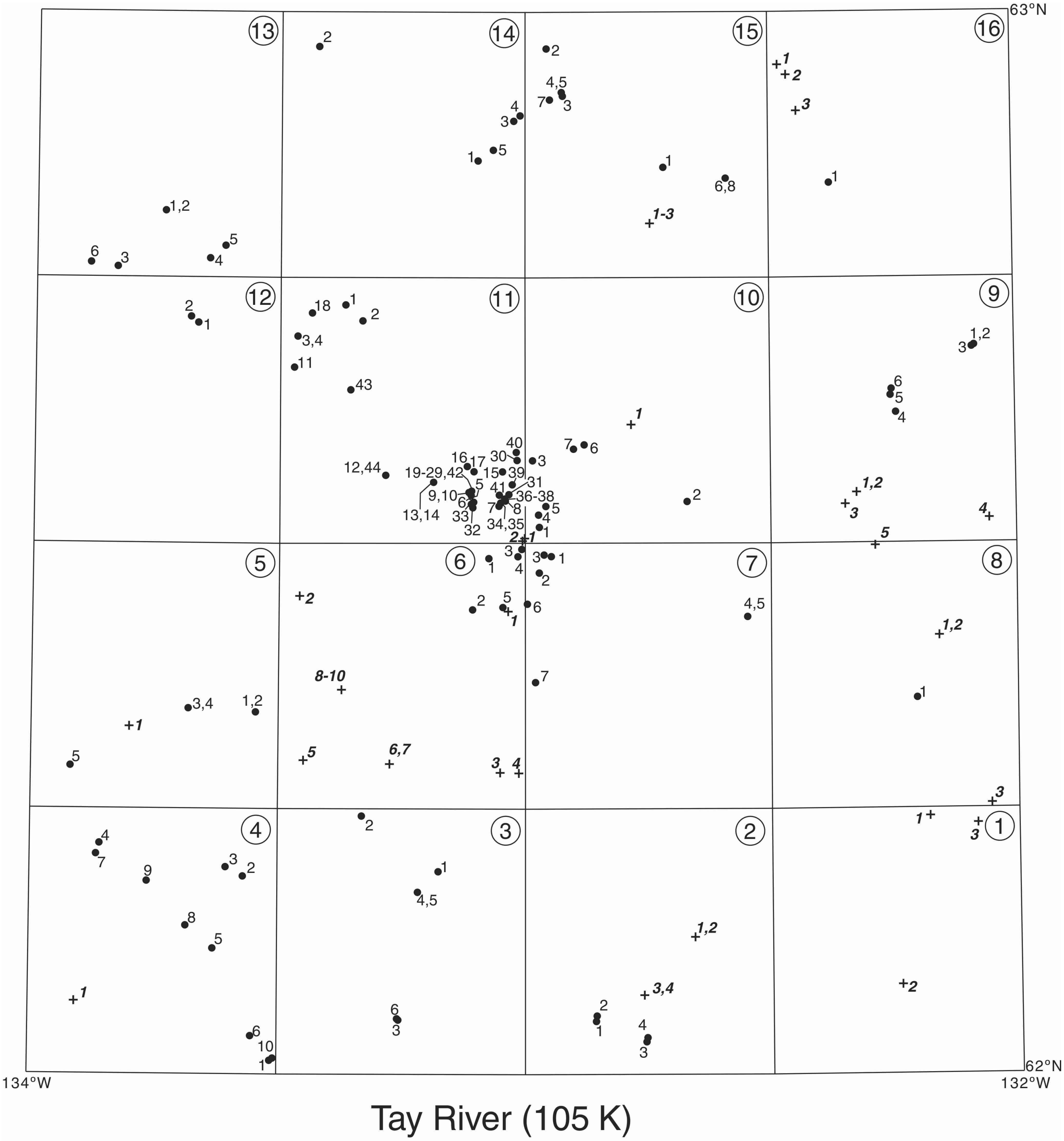
Figure B-1. Index map of fossil (and geochronology) locations for Sheldon Lake (NTS 105J) area. Internal locality numbers correspond to those in fossil identifications in Appendix B reports.

Table B-1. Summary of fossil ages for Sheldon Lake (NTS 105J) area for localities shown in Figure B-1

Mapno	GSCno	Formation	Age
J01-1	42877	Road River Group (undivided)	Ordovician or Silurian
J01-2	C-118091	Rabbitkettle Formation (Gold Creek facies)	Ordovician
J02-1	C-116324	Jones Lake Formation	Late Triassic, Early Norian
J02-2	42881	Duo Lake Formation	Early Middle Ordovician, Llavnirn, probably Diplograptus decoratus Zone
J02-3	42879	Road River Group (undivided)	Early Silurian, Telychian, M. spiralis Zone to Cyrtograptus sakmaricus–C. laqueus Zone
J02-4	C-142786	Tay Formation	Middle Devonian–Early Carboniferous (Mississippian), Eifelian–Tournaisian
J02-5	C-142790	Tay Formation	Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian
J02-6	C-142791	Mount Christie Formation	Late Carboniferous (Pennsylvanian), Bashkirian-Moscovian
J02-7	C-142792	Jones Lake Formation	Late Triassic, Early Carnian
J02-8	C-142794	Jones Lake Formation	Late Triassic, Early Carnian
J02-9	C-157753	Tay Formation	Early Carboniferous (Mississippian), Tournaisian
J02-10	C-157754	Jones Lake Formation	Late Triassic, Norian
J02-11	C-142795	Road River Group (undivided)	Middle Ordovician to Early Silurian
J02-12	C-101947	Rabbitkettle Formation (Gold Creek facies)	(?)Middle Ordovician, possible Late Cambrian
J03-1	C-142776	Tay Formation	Early Carboniferous (Mississippian), Tournaisian
J03-2	C-142784	Tay Formation	Probably Early Carboniferous
J03-3	C-142955	Limestone conglomerate unit	Middle Devonian, probably Givetian
J03-4	C-142767	Jones Lake Formation	Late Triassic, Middle Norian
J05-1	C-142978	Jones Lake Formation	Late Triassic , Middle Norian
J05-2	C-142980	Tay Formation	Middle Devonian–Early Carboniferous, Eifelian–Tournaisian
J05-3	C-142504	Jones Lake Formation	Late Triassic, (?)Rhaetian
J05-4	C-087596	Jones Lake Formation	Late Triassic, Late Carnian–Norian
J05-5	C-087594	Jones Lake Formation	Late Triassic , Early Norian, triangularis Zone
J05-6	C-087595	Jones Lake Formation	Late Triassic, Middle Norian
J06-1	C-118093	Rabbitkettle Formation (Gold Creek facies)	Late Cambrian–Early Ordovician
J06-2	C-142829	Duo Lake Formation	(?) Middle Ordovician
J07-1	42878	Duo Lake Formation	Early Silurian, Telychian
J07-2	C-117377	Duo Lake Formation	Late Ordovician, late Ashgill, D. complanatus ornatus zone
J07-3	C-142765	Rabbitkettle Formation (Gold Creek facies)	Late Cambrian–Early Ordovician
J08-1	C-092576	Duo Lake Formation	Late Middle (late Caradoc) or Late Ordovician (Ashgill)
J08-2	C-092578	Duo Lake Formation	Late Middle or Late Ordovician
J08-3	C-092579	Duo Lake Formation	Late Middle or Late Ordovician
J08-4	C-092580	Duo Lake Formation	Late Ordovician, D. complanatus ornatus Zone
J08-5	42868	Duo Lake Formation	Climacograptus bicornis Zone, or later Ordovician
J08-6	C-087279	Duo Lake Formation	Middle or Late Ordovician
J08-7	C-087277	Duo Lake Formation	Middle or Late Ordovician
J08-8	C-087614	Portrait Lake Formation	Early Devonian, Emsian, gronbergi zone
J08-9	C-087273	Duo Lake Formation	Middle or Late Ordovician, late Llandeilo to Ashgill
J08-10	C-087271	Duo Lake Formation	Silurian
J08-11	C-087272	Duo Lake Formation	Late Ordovician, Ashgill, D. complanatus ornatus Zone
J08-12	42882	Road River Group (undivided)	Silurian, probably Early Silurian
J08-13	C-103814	Duo Lake Formation	Silurian
J08-14	C-103815	Steel Formation	Silurian, probably Ludlow
J08-15	C-150047	Duo Lake Formation	Middle to Late Ordovician, late Llandeilo to Ashgill
J08-16	C-142951	Steel Formation	Early Middle Ordovician to Early Silurian
J08-17	C-142952	Duo Lake Formation	Probably Early Silurian
J08-18	C-142953	Duo Lake Formation	Early Silurian, Late Llandovery, M. spiralis Zone
J08-19	C-142954	Duo Lake Formation	Early Silurian, Late Llandovery, M. spiralis Zone
J08-20	C-142502	Rabbitkettle Formation (Gold Creek facies)	Cambrian–(?) Early Ordovician
J09-1	C-103816	Steel Formation	Early Silurian, Late Llandovery to Wenlock
J09-2	C-103817	Steel Formation	Late Silurian, Ludlow
J09-3	C-103818	Steel Formation	Silurian to Early Devonian
J09-4	C-103819	Steel Formation	Late Silurian, Ludlow M. leintwardinensis primus Zone
J09-5	C-103820	Duo Lake Formation	Middle to Late Ordovician, Caradoc to Ashgill
J09-6	C-103821	Duo Lake Formation	Middle to Late Ordovician, Caradoc to Ashgill

Table B-1. (cont.)

Mapno	GSCno	Formation	Age
J09-7	C-118147	Rabbitkettle Formation (Gold Creek facies)	Late Cambrian–Early Ordovician
J09-8	C-118148	Rabbitkettle Formation (Gold Creek facies)	Late Cambrian–Early Ordovician
J09-9	C-118054	Rabbitkettle Formation (Gold Creek facies)	Late Cambrian–Early Ordovician
J09-10	C-118060	Portrait Lake Formation	Early Devonian, Pragian, M. thomasi Zone to M. yukonensis Zone
J10-1	C-117374	Duo Lake Formation	Late Early to early Middle Ordovician, late Arenig to Llanvirn
J10-2	C-117376	Steel Formation	Silurian
J10-3	C-117375	Duo Lake Formation	Late Ordovician, late Caradoc to Ashgill
J10-4	42960	Duo Lake Formation	Late Ordovician, Orthograptus quadrimucronatus Zone or Dicellograptus complanatus ornatus Zone
J10-5	42955	Duo Lake Formation	Middle or Late Ordovician, Dicranograptus clingani Zone or younger
J10-6	42956	Duo Lake Formation	Middle or Late Ordovician
J10-7	C-201972	Duo Lake Formation	Ordovician–Triassic
J11-1	42880	Road River Group (undivided)	Silurian
J11-2	42873	Road River Group (undivided)	Latest Early to Late Ordovician
J11-3	42957	Duo Lake Formation	Late Ordovician, Orthograptus quadrimucronatus Zone or younger
J12-1	C-118095	Big Timber Formation	Early Cretaceous
J12-2	C-118090	Road River Group (undivided)	(?) Ordovician
J12-3	C-157758	(?) Earn Group	Early Ordovician–Late Devonian
J12-4	C-103764	Rabbitkettle Formation (Gold Creek facies)	Early Ordovician, Tremadoc, Fauna C
J14-1	C-102569	Rabbitkettle Formation (Gold Creek facies)	Middle Ordovician
J14-2	C-107910	Rabbitkettle Formation (Gold Creek facies)	Middle or Late Ordovician, Llanvirn to Ashgill
J14-3	C-101905	Duo Lake Formation	Ordovician, late Arenig to Caradoc
J14-4	C-107911	Duo Lake Formation	Middle or Late Ordovician, Llanvirn to Ashgill
J14-5	C-107912	Duo Lake Formation	Latest Early to earliest Middle Ordovician, P. tentaculatus Zone
J14-6	C-107914	Rabbitkettle Formation (Gold Creek facies)	Probably Early Ordovician, probably Tremadoc or Arenig
J14-7	C-107915	Steel Formation	Late Silurian, Ludlow, M. leintwardinensis primus Zone
J14-8	C-107913	Road River Group (undivided)	Late Middle or Late Ordovician, Caradoc to Ashgill
J14-9	C-107909	Steel Formation	Silurian
J14-10	C-102566	Rabbitkettle Formation (Gold Creek facies)	Ordovician, probably Arenig
J14-11	C-103822	Rabbitkettle Formation (Gold Creek facies)	latest Early to earliest Middle Ordovician, P. tentaculatus Zone
J14-12	C-103849	Rabbitkettle Formation (Gold Creek facies)	Ordovician, late Arenig to Caradoc
J14-13	C-103765	Jones Lake Formation	Late Triassic, Norian
J14-14	C-118069	Rabbitkettle Formation (Gold Creek facies)	Early Ordovician, late Tremadoc to Arenig, A. antiquus Zone to I. victoriae Zone
J14-15	C-118070	Duo Lake Formation	Late Middle or Late Ordovician, late Caradoc to Ashgill, O. quadrimucronatus Zone to D. complanatus ornatus Zone
J14-16	C-118067	Rabbitkettle Formation (Gold Creek facies)	Cambrian–Early Ordovician
J14-17	C-118068	Rabbitkettle Formation (Gold Creek facies)	Ordovician, Late Arenig to Caradoc
J15-1	42874	Duo Lake Formation	Middle or Late Ordovician, probably Climacograptus bicornis Zone to Orthograptus quadrimucronatus Zone
J15-2	C-102568	(?) Portrait Lake Formation	Early Carboniferous (Mississippian), late Tournaisian
J15-3	C-108153	(?) Portrait Lake Formation	Early Carboniferous (Mississippian), late Tournaisian
J16-1	C-087899	Duo Lake Formation	Middle or Late Ordovician, Caradoc to Ashgill
J16-2	C-087897	Duo Lake Formation	Middle Ordovician, Caradoc, C. bicornis Zone to O. quadrimucronatus Zone
J16-3	C-087898	Duo Lake Formation	Caradoc, C. bicornis Zone to O. quadrimucronatus Zone
J16-4	C-087755	Duo Lake Formation	Middle Ordovician, Caradoc, C. bicornis Zone to D. clingani Zone
J16-5	C-088040	Duo Lake Formation	Late Ordovician, Ashgill, D. complanatus ornatus Zone
J16-6	C-087617	Rabbitkettle Formation (Gold Creek facies)	Late Cambrian
J16-7	C-118061	Steel Formation	Early Silurian to Early Devonian
J16-8	C-118062	Steel Formation	Late Silurian, Ludlow, M. nilssoni Zone or M. leintwardinensis primus Zone
J16-9	C-118063	Steel Formation	Early Silurian, latest Llandovery, C. sakmaricus-C. laqueus Zone
J16-10	C-118064	Duo Lake Formation	Middle or Late Ordovician, Caradoc to Ashgill
J16-11	C-118065	Duo Lake Formation	Middle or Late Ordovician, Caradoc to Ashgill
J16-12	C-118089	Duo Lake Formation	late Middle to Late Ordovician, probably Caradoc
J16-13	C-087763	Steel Formation	Late Silurian, Ludlow
J16-14	C-150039	Rabbitkettle Formation (Gold Creek facies)	Early Ordovician, Tremadoc
J16-15	C-150040	Mount Christie Formation	(?)Permian



3● Fossil locality

3+ Geochronology locality

② 1:50 000 scale NTS designation

The map number for fossil and geochronology localites (as used internally in this report) consists of the 1:50 000 scale NTS area followed by an arbitry number as assigned on this figure. (e.g. fossil locality K03-3, geochronology locality ***K03-3***)

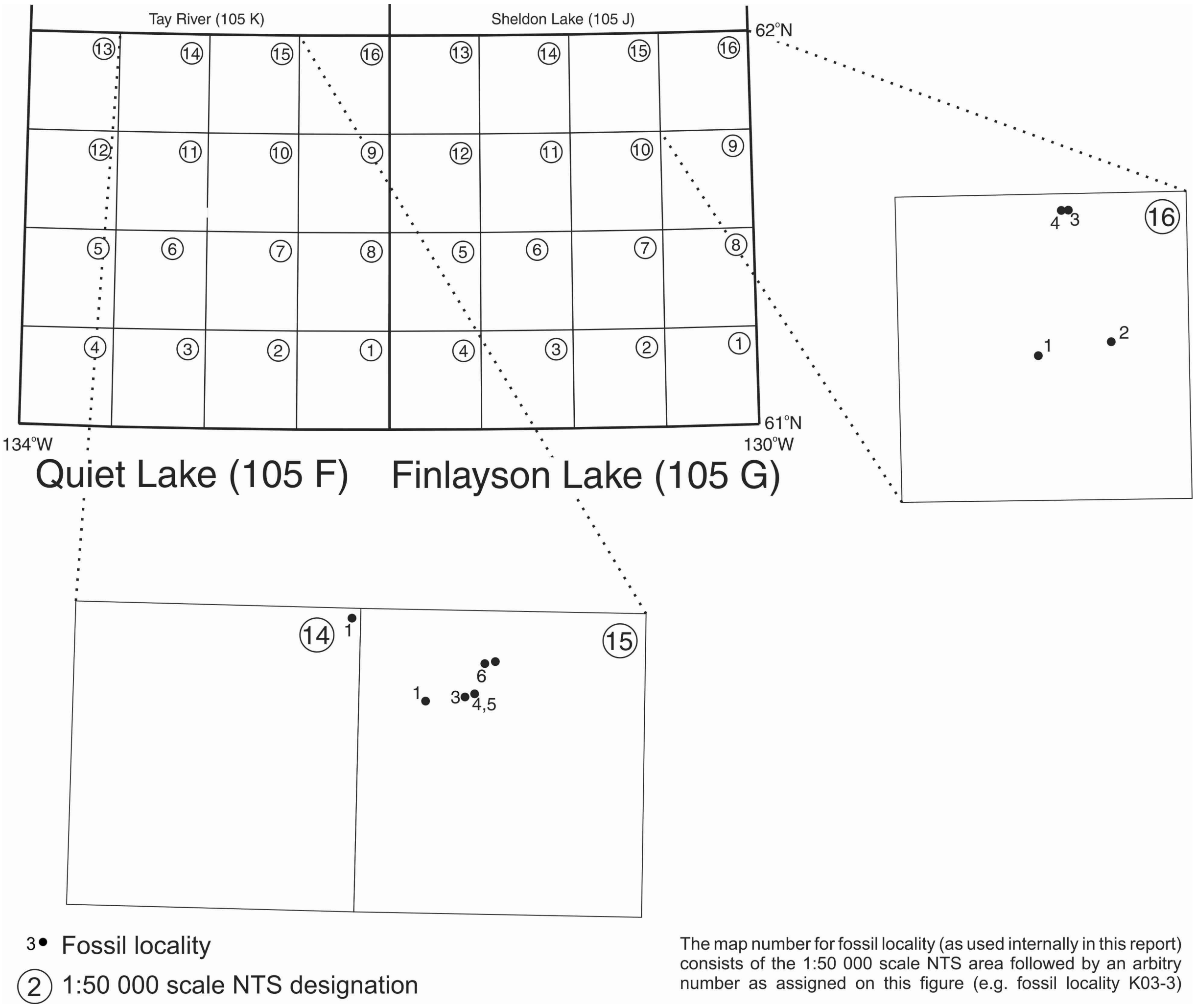
Figure B-2. Index map of fossil (and geochronology) locations for Tay River (NTS 105K) area. Internal locality numbers correspond to those in fossil identifications in Appendix B reports.

Table B-2. Summary of fossil ages for Tay River (NTS 105K) area for localities shown in Figure B-2.

Mapno	GSCno	Formation	Age
K02-1	5684	Alluvial clastic unit	Late Cretaceous to (?)Tertiary
K02-2	C-118097	Alluvial clastic unit	Early to Middle Eocene
K02-3	C-118102	Slide Mountain terrane (limestone unit)	Late Carboniferous–Early Permian, Asselian–early Artinskian
K02-4	82435	Slide Mountain terrane (limestone unit)	Permian, could be Wolfcampian to Wordian
K03-1	C-103825	Yukon-Tanana terrane (conglomerate unit)	Late Triassic , Late Carnian
K03-2	C-157777	Yukon-Tanana terrane ((?) conglomerate unit)	Late Triassic, (?)Carnian
K03-3	C-142984	Limestone-phyllite unit	Late Devonian, early Famennian
K03-4	5686	Alluvial clastic unit	Late Cretaceous or younger
K03-5	5687	Alluvial clastic unit	Post-Aptian
K03-6	C-093424	Limestone-phyllite unit	Late Devonian, early Famennian
K04-1	C-142965	Dolostone unit	Middle–Late Devonian, Eifelian–Frasnian
K04-2	C-142996	Shale-limestone unit	Late Triassic, Late Carnian
K04-3	C-157778	Shale-limestone unit	Late Triassic, Early Norian
K04-4	C-142816	Dolostone unit	Late Devonian, (?)late Famennian
K04-5	C-142825	Dolostone unit	Devonian
K04-6	C-117373	Black slate unit	Probably early Middle Ordovician to Early Silurian
K04-7	42929	Platy siltstone unit	Early Silurian, Telychian to Wenlock
K04-8	42958	Platy siltstone unit	Probably Silurian
K04-9	42921	Dolostone unit	Probably Devonian
K04-10	C-142968	(?) Alluvial clastic unit	Indeterminate
K05-1	O-093500	Slide Mountain terrane (limestone unit)	Late Carboniferous (Pennsylvanian)
K05-2	80025	Slide Mountain terrane (limestone unit)	May be earliest Permian
K05-3	O-086347	Yukon-Tanana terrane (conglomerate unit)	Late Triassic, (?)Early Carnian
K05-4	O-086348	Yukon-Tanana terrane (conglomerate unit)	Late Triassic, Late Norian–Rhaetian
K05-5	42939	Dolostone unit	Late Middle Ordovician or younger
K06-1	C-102596	Menzie Formation	Early Ordovician, Tremadoc (Fauna C)
K06-2	C-107902	Duo Lake Formation	Early to earliest Middle Ordovician, Arenig to basal Llanvirn, T. approximatus Zone to P. P. tentaculatus Zone
K06-3	C-103823	Duo Lake Formation	Middle Ordovician to Early Silurian
K06-4	C-103824	Duo Lake Formation	Middle Ordovician, Caradoc
K06-5	80031	Duo Lake Formation	Middle or Late Ordovician
K07-1	C-107901	Rabbitkettle Formation (Twopete facies)	Probably early Middle Ordovician to Early Silurian (Llanvirn to Llandovery)
K07-2	C-107907	Road River Group (undivided)	Early Ordovician to Early Devonian
K07-3	C-107908	Duo Lake Formation	Late Middle to Late Ordovician, Caradoc or Ashgill
K07-4	C-118127	Tay Formation	Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian
K07-5	C-118096	Tay Formation	Material insufficient for age determination
K07-6	80030	Duo Lake Formation	Ordovician, Llanvirn to Caradoc
K07-7	80033	Limestone conglomerate unit	Probably late Middle Devonian (P. varcus Zone, or the lower part of the S. hermanni–P. cristatus Zone).
K08-1	C-150042	Mount Christie Formation	Phanerozoic
K09-1	42865	Duo Lake Formation	Ordovician
K09-2	42870	Road River Group (undivided)	Late Early to Late Ordovician
K09-3	42872	Duo Lake Formation	Ordovician, Middle or Late
K09-4	C-157785	Road River Group (undivided)	Ordovician–Silurian
K09-5	C-157767	Road River Group (undivided)	Probably Silurian
K09-6	C-157788	Duo Lake Formation	Middle Ordovician, Caradoc, or possibly Late Ordovician, Ashgil
K10-1	C-102593	Tay Formation	Early Carboniferous (Mississippian), Tournaisian
K10-2	C-118131	Mount Christie Formation	Late Permian, Guadalupian
K10-3	C-118136	Jones Lake Formation	Late Triassic, Middle Norian
K10-4	C-117372	Mount Christie Formation	Late Carboniferous (Pennsylvanian), Bashkirian–Moscovian
K10-5	C-117369	Jones Lake Formation	Late Triassic, Late Carnian
K10-6	C-142820	Jones Lake Formation	Late Triassic, Middle Norian
K10-7	C-142822	Tay Formation	Early Carboniferous, probably early Namurian
K11-1	42893	Jones Lake Formation	Upper Triassic, Norian, Monotis subcircularis zone
K11-2	O-086346	Jones Lake Formation	Late Triassic, Middle Norian
K11-3	42858	Tay Formation	Carboniferous, probably Mississippian
K11-4	42859	Tay Formation	Probably Mississippian
K11-5	C-102594	Tay Formation	Early Carboniferous (Mississippian), early to middle Tournaisian
K11-6	C-107903	Tay Formation	Middle Tournaisian (Tn2) to earliest Viséan (V1)
K11-7	C-103806	Tay Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
K11-8	C-103811	Tay Formation	Ordovician–Triassic

Table B-2. (cont.)

Mapno	GSCno	Formation	Age
K11-9	C-103831	Tay Formation	Middle Devonian–Early Carboniferous (Mississippian), Eifelian–Tournaisian
K11-10	C-103574	Tay Formation	Middle Tournaisian (Tn2) to early Viséan (V1)
K11-11	C-103804	Tay Formation	Late Devonian, Famennian
K11-12	C-118108	Tay Formation	Probably Early Carboniferous (Mississippian), Tournaisia n
K11-13	C-118110	Tay Formation	Late Devonian–Early Carboniferous (Mississippian), late Famennian–middle Tournaisian
K11-14	C-118111	Tay Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
K11-15	C-118137	Mount Christie Formation	Late Carboniferous (Pennsylvanian), probably late Namurian–Bashkirian
K11-16	C-118140	Jones Lake Formation	Late Triassic, Middle Norian–Rhaetian
K11-17	C-118141	Jones Lake Formation	Late Triassic, Late Carnian
K11-18	C-118142	Jones Lake Formation	Late Triassic, Early Norian
K11-19	C-142517	Tay Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
K11-20	C-142519	Tay Formation	Early Carboniferous (Mississippian), Tournaisian
K11-21	C-142521	Tay Formation	Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian
K11-22	C-142529	Tay Formation	Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian
K11-23	C-142530	Tay Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
K11-24	C-142533	Tay Formation	Ordovician–Triassic
K11-25	C-142539	Tay Formation	Early Carboniferous (Mississippian), Tournaisian
K11-26	C-142542	Tay Formation	Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian
K11-27	C-142544	Tay Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
K11-28	C-142549	Tay Formation	Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian
K11-29	C-117357	Tay Formation	Middle Devonian–Early Carboniferous (Mississippian), Eifelian–Tournaisian
K11-30	42928	Jones Lake Formation	Probably Mississippian–Triassic
K11-31	O-093484	Jones Lake Formation	Middle–Late Triassic, Late Carnian
K11-32	80028	Tay Formation	Late Tournaisian or early Viséan (tentative)
K11-33	80029	Tay Formation	Carboniferous or Permian
K11-34	C-076500	Tay Formation	Probably Paleozoic
K11-35	O-093483	Tay Formation	Early Carboniferous, Tournaisian
K11-36	O-087056	Tay Formation	Early Carboniferous (Mississippian), early-middle Tournaisian
K11-37	C-076499	Tay Formation	Devonian to Permian
K11-38	42927	Tay Formation	(?)Mississippian
K11-39	O-093485	Jones Lake Formation	Late Triassic, Late Norian–Rhaetian
K11-40	94368	Jones Lake Formation	Upper Norian (Suessi Zone)
K11-41	C-117361	Tay Formation	Ordovician–Triassic
K11-42	C-142522	Tay Formation	Ordovician–Triassic
K11-43	C-118123	Tay Formation	Devonian–(?)Carboniferous
K11-44	C-118109	Tay Formation	Ordovician–Triassic
K12-1	C-103813	Mount Christie Formation	Late Carboniferous–Early Permian, probably Asselian–Sakmarian
K12-2	C-103779	Mount Christie Formation	Early Permian
K13-1	42842	Crystal Peak Formation	Mid-early Upper Devonian (middle Frasian)
K13-2	C-150017	Crystal Peak Formation	Possibly middle to late Tournaisian (Early Carboniferous, Tn2 to Tn3)
K13-3	C-150004	Tay Formation	Early Carboniferous (Mississippian), Tournaisian
K13-4	C-150005	Tay Formation	Early Carboniferous (Mississippian), Tournaisian
K13-5	C-150006	Tay Formation	Early Carboniferous (Mississippian), Tournaisian
K13-6	C-150003	Mount Christie Formation	Carboniferous–Early Permian
K14-1	C-150018	Portrait Lake Formation	Probably Early Devonian, possibly Lochkovian
K14-2	C-117399	Rabbitkettle Formation (Gold Creek facies)	Late Cambrian
K14-3	C-150019	Steel Formation	Early Silurian to Early Devonian
K14-4	C-150020	Duo Lake Formation	Late Middle Ordovician to earliest Silurian
K14-5	42953	Road River Group (undivided)	Early Devonian, Pragian, Monograptus yukonensis Zone
K15-1	42860	Road River Group (undivided)	Not diagnostic
K15-2	42864	Duo Lake Formation	Early Ordovician, Arenig, D. bifidus Zone
K15-3	5685	Prevost Formation	Not determinable
K15-4	C-150013	Prevost Formation	Not determinable
K15-5	C-150014	Prevost Formation	Not determinable
K15-6	C-150015	Prevost Formation	Probably Middle or Upper Devonian, late Emsian to earliest Tournaisian (Devonian part)
K15-7	5689	Prevost Formation	(?) Lower Devonian
K15-8	C-150016	Prevost Formation	Indeterminate
K16-1	C-117397	Prevost Formation	Late Devonian, early Famennian, (?)triangularis Zone

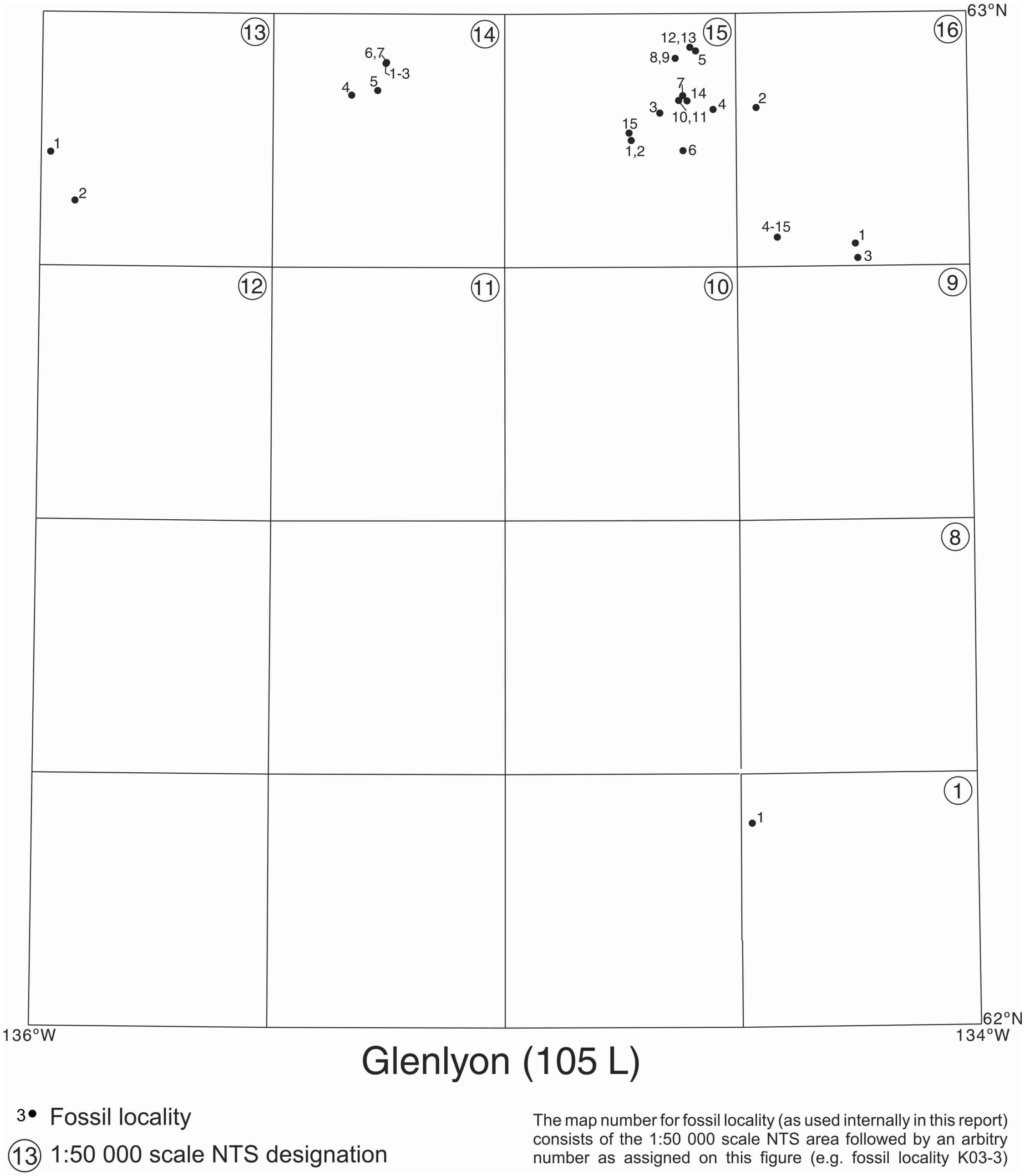


The map number for fossil locality (as used internally in this report) consists of the 1:50 000 scale NTS area followed by an arbitry number as assigned on this figure (e.g. fossil locality K03-3)

Figure B-3. Index map of fossil locations for Quiet Lake (105 F) and Finlayson Lake (105 G) areas. Internal locality numbers correspond to those in fossil identifications in Appendix B reports.

Table B-3. Summary of fossil ages for Quiet Lake (NTS 105 F) and Finlayson Lake (NTS 105 G) areas for localities shown in Figure B-3.

Mapno	GSCno	Formation	Age
F14-1	C-142812	Limestone-phyllite unit	(?)Devonian
F15-1	C-157789	(?) Black slate unit	Early Ordovician, Arenig, *T. fruticosus* Zone to *I. victoriae* Zone
F15-2	C-157790	Black slate unit	Middle Devonian, (?)Eifelian
F15-3	O-086354	Limestone-phyllite unit	Late Devonian
F15-4	O-086355	Limestone-phyllite unit	Middle–Late Devonian
F15-5	O-086356	Limestone-phyllite unit	Late Devonian, early to late Frasnian
F15-6	O-093472a	Limestone-phyllite unit	Late Devonian, Famennian
G16-1	C-087576	Dolostone-sandstone unit	Middle Devonian, probably Eifelian
G16-2	C-087598	(?) Tay Formation	Early Carboniferous, late Visean–early Namurian
G16-3	C-087600	(?) Duo Lake Formation	Silurian, late Liandoven–early Wenlock
G16-4	C-142782	(?) Road River Group	Late Ordovician–Early Silurian Ashgill–Wenlock



The map number for fossil locality (as used internally in this report) consists of the 1:50 000 scale NTS area followed by an arbitry number as assigned on this figure (e.g. fossil locality K03-3)

Figure B-4. Index map of fossil locations for Glenlyon (NTS 105L) area. Internal locality numbers correspond to those in fossil identifications in Appendix B.

Table B-4. Summary of fossil ages for Glenlyon (NTS 105L) area for localities shown in Figure B-4.

Mapno	GSCno	Formation	Age
L01-1	C-118094	?	Ordovician
L14-1	C-102624	(?) Tay Formation	Probably Carboniferous or Permian
L14-2	C-081691	(?) Tay Formation	Early Carboniferous
L14-3	C-102623	(?) Tay Formation	Carboniferous, possibly the same age as collection C-102625
L14-4	C-107906x	(?) Earn Group	Silurian to Permian
L14-5	C-102622	(?) Duo Lake Formation	Late Ordovician to Early Silurian
L14-6	C-081689	(?) Tay Formation	Early Carboniferous, Tournaisian
L14-7	C-081686	(?) Tay Formation	Ordovician–Triassic
L15-1	C-089927	Duo Lake Formation	Probably late Middle or Late Ordovician
L15-2	C-107906	Duo Lake Formation	Late Ordovician, Ashgill, D. complanatus ornatus Zone
L15-3	C-103768	Mount Christie Formation	Probably Permian
L15-4	C-081699	Kalzas Formation	Early Carboniferous
L15-5	C-102625	Tay Formation	Early Carboniferous, probably middle to late Tournaisian
L15-6	C-102736	Tay Formation	Early Carboniferous (Mississippian), late Tournaisian
L15-7	C-102651	Jones Lake Formation	Late Triassic, Early Carnian
L15-8	C-089947	Tay Formation	Tournaisian
L15-9	C-089948	Tay Formation	Late Devonian–Early Carboniferous, Famennian–Tournaisian
L15-10	C-102600	Kalzas Formation	Early Carboniferous (Mississippian), late Tournaisian
L15-11	C-103769	Mount Christie Formation	Carboniferous–Permian
L15-12	C-157787	Tay Formation	Middle to late Tournaisian (Early Carboniferous, Tn2 to Tn3)
L15-13	C-157761	Tay Formation	Middle Devonian–Early Carboniferous
L15-14	C-176041	Jones Lake Formation	Middle Triassic, Anisian
L15-15	C-081685	Kalzas Formation	Ordovician–Triassic
L16-1	C-103834	Kalzas Formation	Early Carboniferous (Mississippian)
L16-2	C-102599	Tay Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
L16-3	C-103835	Jones Lake Formation	Late Triassic, Late Carnian
L16-4	C-150026	Kalzas Formation	Carboniferous, Viséan or Serpukhovian
L16-5	C-150029	Kalzas Formation	Probably Early Carboniferous, but insufficient material for definite age determination
L16-6	C-150030	Kalzas Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
L16-7	C-150033	Kalzas Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
L16-8	C-150027	Kalzas Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
L16-9	C-150023	Kalzas Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
L16-10	C-150035	Kalzas Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
L16-11	C-150024	Kalzas Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
L16-12	C-150022	Kalzas Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
L16-13	C-150021	Kalzas Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
L16-14	C-150028	Kalzas Formation	Early Carboniferous (Mississippian), early–middle Tournaisian
L16-15	C-150031	Kalzas Formation	Early Carboniferous (Mississippian), early–middle Tournaisian

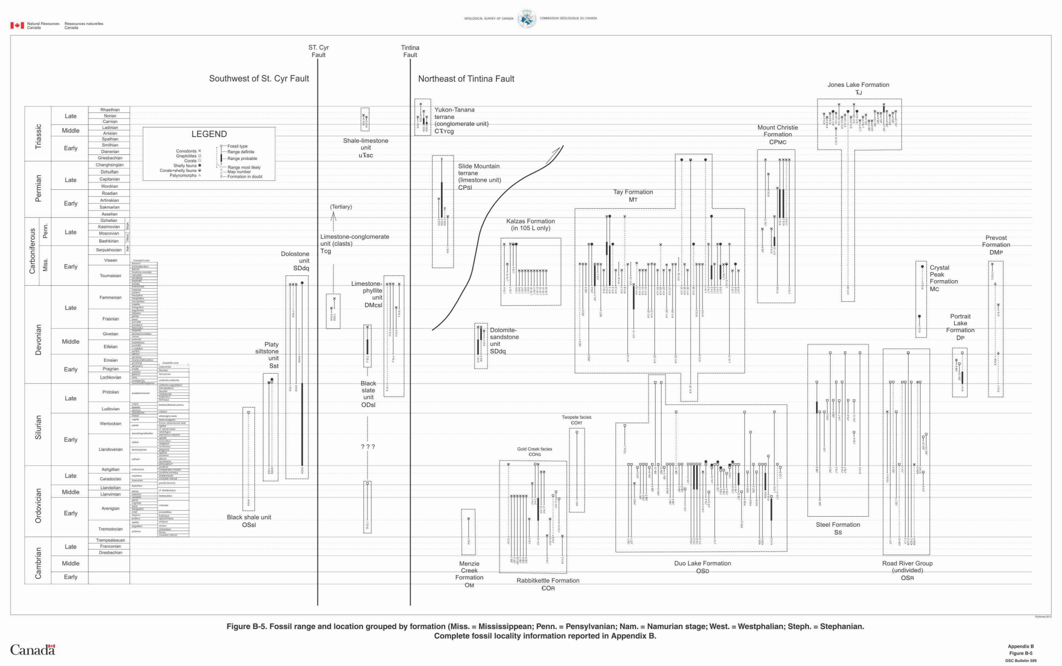


Figure B-5. Fossil range and location grouped by formation (Miss. = Mississippean; Penn. = Pensylvanian; Nam. = Namurian stage; West. = Westphalian; Steph. = Stephanian. Complete fossil locality information reported in Appendix B.

Figure B-5. Fossil range data grouped by formation. Complete fossil locality information reported in Appendix B reports, and summarized in Figures B-1-4 and Tables B-1,2. Click here to view figure.

Appendix B Paleontological determinations

(accompanying fossil range chart, Fig. B-5)

The following reports are dominantly from Sheldon Lake (NTS 105 J) and Tay River (NTS 105 K) map areas, but also include reports for collections from adjacent parts of Glenlyon (NTS 105 L), Quiet Lake (NTS 105 F), and Finlayson Lake (NTS 105 G) map areas. “MAPNO” is an internal reference number for this report only, of which the first letter and two digits (e.g. J05 3) designate the 1:50 000 NTS area. For formal reference to collections the Geological Survey of Canada collection number (ie “GSCNO”) and the appropriate author (and year) should be cited. The datum for all co-ordinates is NAD83. L/L is latitude and longitude. Foss. = fossils found; CAI = colour alteration index.

Fossil identification credits:

MJO	M.J. Orchard
BSN	B.S. Norford
EWB	E.W. Bamber
ETT	E.T. Tozer
CAR	C.A. Ross
DCM	D.C. Mcgregor
DJM	D.J. McIntyre
JMW	J.M. White
JU	J. Utting

The fossil reports are grouped by formation, and within each formation by the internal reference number (ie MAPNO). The order of formations is oldest to youngest by geographic area as follows:

NORTHEAST OF TINTINA FAULT

Formation assignment uncertain
Rabbitkettle Formation (Twopete facies)
Rabbitkettle Formation (Gold Creek facies)
Menzie Formation
Duo Lake Formation
(?) Duo Lake Formation
Steel Formation
Road River Group (undivided)
(?) Road River Group
Carbonate-sandstone unit
Portrait Lake Formation
Prevost Formation
Crystal Peak Formation
(?) Earn Group
Tay Formation
(?) Tay Formation
Kalzas Formation
Mount Christie Formation
Jones Lake Formation
Big Timber Formation

SOUTHWEST OF ST. CYR FAULT

Platy siltstone unit
Dolostone unit

BETWEEN ST. CYR AND TINTINA FAULTS

Black slate unit
(?) Black slate unit
Limestone-phyllite unit
Shale-limestone unit

ALLOCHTHONOUS TERRANES

(?) Yukon-Tanana terrane (conglomerate unit)
Slide Mountain terrane (limestone unit)

TERTIARY

Limestone conglomerate unit
Alluvial clastic unit
(?) Alluvial clastic unit

UNIT: ?
MAPNO: L01- 1 AUTHOR: MJO(1992)
GSCNO: C-118094 FIELDNO: GGA-85-66A1
UTM: Z:8 526881E 6896784N
L/L: 62.20194N; 134.48335W
FOSS: conodonts, sphaeromorphs
TAXA:
Periodon? sp.
CAI: 5
AGE: Ordovician
REMARKS: Possible contaminant. Rock unit uncertain. Sample comes from large blocks or boudins of massive crinoidal limestone within highly folded thin-bedded limestone. Bounding outcrops are siliceous schist of the Nisutlin Allochthon.

UNIT: Rabbitkettle Formation (Twopete facies)
MAPNO: K07- 1 AUTHOR: BSN(1982)
GSCNO: C-107901 FIELDNO: GGA-82-44G1
UTM: Z:8 605581E 6930384N
L/L: 62.48947N; 132.95102W
FOSS: graptolites
TAXA:
?*Climacograptus* sp.

AGE: Probably early Middle Ordovician to Early Silurian (Llanvirn to Llandovery)

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J01- 2 AUTHOR: MJO(1992)
GSCNO: C-118091 FIELDNO: GGA-85-68A6
UTM: Z:9 425568E 6886895N
L/L: 62.10678N; 130.42616W
FOSS: conodonts
TAXA:
coniform elements indet.
CAI: 5–6
AGE: Ordovician

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J02-12 AUTHOR: MJO(1992)
GSCNO: C-101947 FIELDNO: DY-81-1893
UTM: Z:9 412260E 6895732N
L/L: 62.18321N; 130.68542W
FOSS: conodonts
TAXA:
?*Pygodus* fragment
coniform elements
CAI: -
AGE: (?)Middle Ordovician, possible Late Cambrian

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J06- 1 AUTHOR: MJO(1992)
GSCNO: C-118093 FIELDNO: GGA-85-69B1
UTM: Z:9 375018E 6924070N
L/L: 62.42681N; 131.42053W
FOSS: conodonts
TAXA:
"*Acontiodus*" sp.
Cordylodus proavus Muller 1959
Teridontus nakamurai (Nogami 1967)
coniform elements
CAI: ~5
AGE: Late Cambrian–Early Ordovician

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J07- 3 AUTHOR: MJO(1992; 2006)
GSCNO: C-142765 FIELDNO: GGAI-86-23B4
UTM: Z:9 406668E 6907170N
L/L: 62.28448N; 130.79888W
FOSS: conodonts, inarticulate brachiopods
TAXA:
coniform element
CAI: -
AGE: Late Cambrian–Early Ordovician

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J08-20 AUTHOR: MJO(1992; 2006)
GSCNO: C-142502 FIELDNO: GGA-86-56G2
UTM: Z:9 426893E 6913620N
L/L: 62.34686N; 130.41194W
FOSS: conodonts, inarticulate brachiopods
TAXA:
protoconodonts
CAI: -
AGE: Cambrian–(?) Early Ordovician

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J09- 7 AUTHOR: MJO(1992; 2006)
GSCNO: C-118147 FIELDNO: GGA-85-39A1
UTM: Z:9 439633E 6956985N
L/L: 62.73830N; 130.18128W
FOSS: conodonts, inarticulate brachiopods, tubes
TAXA:
Phakelodus tenuis (Muller 1959)
Teridontus nakamurai (Nogami 1967)
coniform elements
CAI: ~5
AGE: Late Cambrian–Early Ordovician
REMARKS: Collection is rich in brachiopods. Includes fused cluster of *Phakelodus*, and five types of coniform elements.

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J09- 8 AUTHOR: MJO(1992; 2006)
GSCNO: C-118148 FIELDNO: GGA-85-39A2
UTM: Z:9 439633E 6956985N
L/L: 62.73830N; 130.18128W
FOSS: conodonts, inarticulate brachiopod fragments
TAXA:
Phakelodus tenuis (Muller 1959)
coniform element
CAI: ~5
AGE: Late Cambrian–Early Ordovician

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J09- 9 AUTHOR: MJO(1992)
GSCNO: C-118054 FIELDNO: GGA-85-42A1
UTM: Z:9 425353E 6956785N
L/L: 62.73388N; 130.46052W
FOSS: conodonts, inarticulate brachiopods, tubes
TAXA:
Cordylodus proavus Muller 1959
Eoconodontus notchpeakensis (Miller 1969)
coniform elements
CAI: 4.5–5
AGE: Late Cambrian–Early Ordovician

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J12-4 AUTHOR: MJO(1992; 2006)
GSCNO: C-103764 FIELDNO: GGAA-83-1-2C
UTM: Z:9 361083E 6939235N
L/L: 62.55784N; 131.70235W
FOSS: conodonts, inarticulate brachiopods
TAXA:
Acontiodus ? sp.
Cordylodus angulatus Pander 1856
Drepanoistodus sp. Lindstrom 1971
Variabiloconus bassleri (Furnish 1938)
CAI: 5
AGE: Early Ordovician, Tremadoc, Fauna C

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J14- 1 AUTHOR: MJO(1992)
GSCNO: C-102569 FIELDNO: GGA-82-17C1
UTM: Z:9 388783E 6986475N
L/L: 62.99091N; 131.19532W
FOSS: conodonts, graptolites, ostracodes, chitinozoans
TAXA:
Ansella nevadensis (Ethington and Schumacher 1969)
Cahabagnathus friendsvillensis (Bergström 1971)
Drepanoistodus suberectus (Branson and Mehl 1933)
Eoplacognathus sp.
Paroistodus sp.
Periodon sp.
Protopanderodus robustus (Hadding 1913)
Pygodus anserinus Lamont and Lindstrom 1957
Spinodus spinatus
CAI: 4.5–5.5
AGE: Middle Ordovician
REMARKS: Large faunule of several hundred elements, sample from limestone at base of medium-bedded chert member

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UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J14- 2 AUTHOR: BSN(1982)
GSCNO: C-107910 FIELDNO: GGA-82-17C2
UTM: Z:9 388803E 6986505N
L/L: 62.99118N; 131.19495W
FOSS: graptolites
TAXA:
Amplexograptus? sp.
Glossograptus sp.

AGE: Middle or Late Ordovician, Llanvirn to Ashgill

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J14- 6 AUTHOR: BSN(1982)
GSCNO: C-107914 FIELDNO: GGA-82-37B1
UTM: Z:9 384863E 6970695N
L/L: 62.84816N; 131.26168W
FOSS: graptolites
TAXA:
Didymograptus? sp.
dichograptid

AGE: Probably Early Ordovician, probably Tremadoc or Arenig

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J14-10 AUTHOR: MJO(1992)
GSCNO: C-102566 FIELDNO: GGA-82-6A1
UTM: Z:9 379693E 6977395N
L/L: 62.90658N; 131.36798W
FOSS: conodonts, shell fragments, scolecodonts
TAXA:
"*Scolopodus*" *quadratus* Pander 1856
acodiform element
CAI: 5
AGE: Ordovician, probably Arenig

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J14-11 AUTHOR: BSN(1983)
GSCNO: C-103822 FIELDNO: GGA-83-52D1
UTM: Z:9 396043E 6973245N
L/L: 62.87439N; 131.04384W
FOSS: graptolites, bivalve
TAXA:
Amplexograptus? sp.
Cryptograptus sp.
Didymograptus 2 spp. (one pendant)
Glyptograptus? sp.
Phyllograptus sp.
inarticulate brachiopod

AGE: Latest Early to earliest Middle Ordovician, *P. tentaculatus* Zone
REMARKS: Fossils from pale green to black shale scree below, but near base of medium-bedded grey chert

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UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J14-12 AUTHOR: MJO(1992)
GSCNO: C-103849 FIELDNO: GGA-83-53E1
UTM: Z:9 384803E 6970685N
L/L: 62.84806N; 131.26286W
FOSS: conodonts, inarticulate brachiopods
TAXA:
Periodon aculeatus Hadding 1913
coniform element
CAI: 5
AGE: Ordovician, late Arenig to Caradoc
REMARKS: From black, fine crystalline limestone immediately beneath medium-bedded chert member

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UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J14-14 AUTHOR: BSN(1985)
GSCNO: C-118069 FIELDNO: GGA-85-52A1
UTM: Z:9 389083E 6986485N
L/L: 62.99109N; 131.18941W
FOSS: graptolites
TAXA:
Bryograptus? sp.
Clonograptus sp.
Didymograptus? sp.
Phyllograptus sp. or *Tetragraptus* sp.
Tetragraptus sp.
dendroid graptolite

AGE: Early Ordovician, late Tremadoc to Arenig, *A. antiquus* Zone to *I. victoriae* Zone

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UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J14-16 AUTHOR: MJO(1992)
GSCNO: C-118067 FIELDNO: GGA-85-54A1
UTM: Z:9 379892E 6976995N
L/L: 62.90306N; 131.36378W
FOSS: conodonts, inarticulate brachiopods, tubes, (?)echinoderm
TAXA:
(?)protoconodonts
coniform elements
CAI: -
AGE: Cambrian–Early Ordovician

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J14-17 AUTHOR: MJO(1992)
GSCNO: C-118068 FIELDNO: GGA-85-54C1
UTM: Z:9 380343E 6977695N
L/L: 62.90949N; 131.35541W
FOSS: conodonts, ostracodes, chitinozoans, mazuelloids
TAXA:
Cordylodus sp.
Drepanodus arcuatus Pander 1856
Drepanoistodus suberectus (Branson and Mehl 1933)
Eoplacognathus sp.
Histiodella sp.
Paroistodus sp.
Periodon aculeatus (Hadding 1913)
Phragmodus undatus (Branson and Mehl 1933)
Protopanderodus robustus (Hadding 1913)
Pygodus sp.
Spinodus spinatus
Walliserodus ethingtoni (Fahraeus 1966)
CAI: 5–5.5
AGE: Ordovician, Late Arenig to Caradoc
REMARKS: Presence of *Cordylodus* sp. suggests reworking of sediments.

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J16- 6 AUTHOR: MJO(1992)
GSCNO: C-087617 FIELDNO: GGA-80-51D2
UTM: Z:9 434873E 6958805N
L/L: 62.75382N; 130.27510W
FOSS: conodonts, inarticulate brachiopods, ichthyoliths
TAXA:
Panderodus? sp.
Proconodontus muelleri Miller 1969
coniform elements
CAI: 5
AGE: Late Cambrian

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: J16-14 AUTHOR: MJO(1992)
GSCNO: C-150039 FIELDNO: GGAI-86-85C2
UTM: Z:9 442193E 6972370N
L/L: 62.87677N; 130.13650W
FOSS: conodonts
TAXA:
Cordylodus proavus Muller 1959
CAI: -
AGE: Early Ordovician, Tremadoc

UNIT: Rabbitkettle Formation (Gold Creek facies)
MAPNO: K14- 2 AUTHOR: MJO(1992)
GSCNO: C-117399 FIELDNO: GGAI-86-83B2
UTM: Z:8 579696E 6983109N
L/L: 62.96900N; 133.42816W
FOSS: conodonts
TAXA:
Phakelodus tenuis (Muller 1959)
coniform element
CAI: (?)6
AGE: Late Cambrian

UNIT: Menzie Formation
MAPNO: K06- 1 AUTHOR: MJO(1992)
GSCNO: C-102596 FIELDNO: GGA-82-54G1
UTM: Z:8 599081E 6929959N
L/L: 62.48745N; 133.07732W
FOSS: conodonts
TAXA:
Acontiodus? sp.
Chosonodina sp.
Rossodus manitouensis Repetski and Ethington 1983
Variabiloconus bassleri (Furnish 1938)
CAI: 5.5–6.5
AGE: Early Ordovician, Tremadoc (Fauna C)

UNIT: Duo Lake Formation
MAPNO: I13- 1 AUTHOR: BSN(1985)
GSCNO: C-118057 FIELDNO: AT-102
UTM: Z:9 449893E 6970695N
L/L: 62.86288N; 129.98465W
FOSS: graptolites
TAXA:
Climacograptus? sp.
Orthograptus? sp.

AGE: Probably Middle or Late Ordovician

UNIT: Duo Lake Formation
MAPNO: J02- 2 AUTHOR: BSN(1960)
GSCNO: 42881 FIELDNO: GC-60-1001A
UTM: Z:9 412333E 6891745N
L/L: 62.14745N; 130.68204W
FOSS: graptolites
TAXA:
Climacograptus sp.
Diplograptus? sp.
Phyllograptus sp.

AGE: Early Middle Ordovician, Llavnirn, probably *Diplograptus decoratus* Zone

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UNIT: Duo Lake Formation
MAPNO: J06- 2 AUTHOR: MJO(1992)
GSCNO: C-142829 FIELDNO: GGAG-86-20A2
UTM: Z:9 387668E 6920845N
L/L: 62.40192N; 131.17366W
FOSS: conodonts
TAXA:
Periodon? sp.
Pygodus? sp.
CAI: -
AGE: (?) Middle Ordovician

UNIT: Duo Lake Formation
MAPNO: J07- 1 AUTHOR: BSN(1992)
GSCNO: 42878 FIELDNO: GC-60-1011a
UTM: Z:9 419933E 6903805N
L/L: 62.25736N; 130.54179W
FOSS: graptolites
TAXA:
M. ex gr. *M. spiralis* (Geinitz)
Monograptus? sp.
Reteolites sp.

AGE: Early Silurian, Telychian

UNIT: Duo Lake Formation
MAPNO: J07- 2 AUTHOR: BSN(1986)
GSCNO: C-117377 FIELDNO: GGA-86-54B1
UTM: Z:9 414593E 6929545N
L/L: 62.48713N; 130.65727W
FOSS: graptolites
TAXA:
Climacograptus sp.
Dicellograptus ornatus Elles and Wood
Glyptograptus complanatus? sp.
Orthograptus amplexicaulis Elles and Wood
retiolitid graptolite

AGE: Late Ordovician, late Ashgill, *D. complanatus ornatus* zone

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UNIT: Duo Lake Formation
MAPNO: J08- 1 AUTHOR: BSN(1980)
GSCNO: C-092576 FIELDNO: 817NEaF
UTM: Z:9 448003E 6928025N
L/L: 62.47968N; 130.00867W
FOSS: graptolites
TAXA:
Climacograptus sp.
Dicellograptus sp.
Orthograptus sp.
Reteograptus cf. *R. pulcherrimus* Keble and Harris

AGE: Late Middle (late Caradoc) or Late Ordovician (Ashgill)

UNIT: Duo Lake Formation
MAPNO: J08- 2 AUTHOR: BSN(1980)
GSCNO: C-092578 FIELDNO: 820NEaF
UTM: Z:9 447693E 6927805N
L/L: 62.47766N; 130.01461W
FOSS: graptolites
TAXA:
Climacograptus sp.
Dicellograptus sp.
Reteograptus sp.

AGE: Late Middle or Late Ordovician

UNIT: Duo Lake Formation
MAPNO: J08- 3 AUTHOR: BSN(1980)
GSCNO: C-092579 FIELDNO: 820NEbf
UTM: Z:9 447693E 6927805N
L/L: 62.47766N; 130.01461W
FOSS: graptolites
TAXA:
Climacograptus sp.
Dicellograptus sp.
Orthograptus sp.

AGE: Late Middle or Late Ordovician
REMARKS: Float from 30–35 m below (?) C-092579

UNIT: Duo Lake Formation
MAPNO: J08- 4 AUTHOR: BSN(1980)
GSCNO: C-092580 FIELDNO: 820NEcF
UTM: Z:9 447693E 6927805N
L/L: 62.47766N; 130.01461W
FOSS: graptolites
TAXA:
Climacograptus hastatus T.S. Hall
Dicellograptus complanatus ornatus Elles and Wood
Orthograptus? sp.

AGE: Late Ordovician, *D. complanatus ornatus* Zone
REMARKS: Approximately 25 m below (?) C-092579

UNIT: Duo Lake Formation
MAPNO: J08- 5 AUTHOR: BSN(1992)
GSCNO: 42868 FIELDNO: GC-60-888A
UTM: Z:9 447693E 6927805N
L/L: 62.47766N; 130.01461W
FOSS: graptolites, bivalve
TAXA:
Dicellograptus spp.
Leptograptus sp.
O. cf. *O. calcaratus grandis* (Ruedemann)
Orthograptus ex gr. *O. truncatus* (Lapworth)
Reteograptus? sp.
inarticulate brachiopod
AGE: *Climacograptus bicornis* Zone, or later Ordovician
REMARKS: Same area as C-092580

UNIT: Duo Lake Formation
MAPNO: J08- 6 AUTHOR: BSN(1982)
GSCNO: C-087279 FIELDNO: GGAA-80-68B-F3
UTM: Z:9 447473E 6927745N
L/L: 62.47709N; 130.01886W
FOSS: graptolites
TAXA:
Climacograptus? sp.
Cryptograptus? sp.
Dicellograptus sp.
Orthograptus? sp.

AGE: Middle or Late Ordovician

UNIT: Duo Lake Formation
MAPNO: J08- 7 AUTHOR: BSN(1982)
GSCNO: C-087277 FIELDNO: GGAA-80-68B-F2
UTM: Z:9 447173E 6927895N
L/L: 62.47840N; 130.02472W
FOSS: graptolites
TAXA:
Dicellograptus sp.
Orthograptus? sp.

AGE: Middle or Late Ordovician

UNIT: Duo Lake Formation
MAPNO: J08- 9 AUTHOR: BSN(1982)
GSCNO: C-087273 FIELDNO: GGAA-80-68B-F1
UTM: Z:9 446593E 6927595N
L/L: 62.47562N; 130.03588W
FOSS: graptolites
TAXA:
Climacograptus? sp.
Dicellograptus sp.
Glossograptus? sp.
Orthograptus sp.

AGE: Middle or Late Ordovician, late Llandeilo to Ashgill

UNIT: Duo Lake Formation
MAPNO: J08-10 AUTHOR: BSN(1982)
GSCNO: C-087271 FIELDNO: GGAA-80-68A-F1
UTM: Z:9 446413E 6927595N
L/L: 62.47560N; 130.03937W
FOSS: graptolites
TAXA:
Monograptus sp. or *Cyrtograptus* sp.
Monograptus spp.

AGE: Silurian

UNIT: Duo Lake Formation
MAPNO: J08-11 AUTHOR: BSN(1982)
GSCNO: C-087272 FIELDNO: GGAA-80-68A-F2
UTM: Z:9 446463E 6927645N
L/L: 62.47605N; 130.03842W
FOSS: graptolites
TAXA:
Climacograptus? sp.
Dicellograptus complanatus ornatus Elles and Wood
Orthograptus sp.

AGE: Late Ordovician, Ashgill, *D. complanatus ornatus* Zone

UNIT: Duo Lake Formation
MAPNO: J08-13 AUTHOR: BSN(1983)
GSCNO: C-103814 FIELDNO: GGA-83-42B1
UTM: Z:9 424273E 6920245N
L/L: 62.40579N; 130.46542W
FOSS: graptolites
TAXA:
Monograptus sp.

AGE: Silurian

UNIT: Duo Lake Formation
MAPNO: J08-15 AUTHOR: BSN(1986)
GSCNO: C-150047 FIELDNO: GGA-86-36A3
UTM: Z:9 444553E 6919970N
L/L: 62.40689N; 130.07298W
FOSS: graptolites
TAXA:
Dicellograptus sp.
biserial graptolite
retiolitid graptolite

AGE: Middle to Late Ordovician, late Llandeilo to Ashgill

UNIT: Duo Lake Formation
MAPNO: J08-17 AUTHOR: BSN(1986)
GSCNO: C-142952 FIELDNO: GGAT-86-20H2
UTM: Z:9 443843E 6922695N
L/L: 62.43124N; 130.08761W
FOSS: graptolites
TAXA:
Glyptograptus sp.
Monograptus? sp.

AGE: Probably Early Silurian

UNIT: Duo Lake Formation
MAPNO: J08-18 AUTHOR: BSN(1986)
GSCNO: C-142953 FIELDNO: GGAT-86-20I4-A
UTM: Z:9 443543E 6922795N
L/L: 62.43209N; 130.09345W
FOSS: graptolites, radiolarians
TAXA:
M. ex gr. *M. priodon* Bronn
M. ex gr. *M. spiralis* (Geinitz)
Monograptus sp.
Retiolites sp.
radiolarians

AGE: Early Silurian, Late Llandovery, *M. spiralis* Zone

UNIT: Duo Lake Formation
MAPNO: J08-19 AUTHOR: BSN(1986)
GSCNO: C-142954 FIELDNO: GGAT-86-20I4-B
UTM: Z:9 443543E 6922795N
L/L: 62.43209N; 130.09345W
FOSS: graptolites, radiolarians
TAXA:
M. ex gr. *M. priodon* Bronn
M. ex gr. *M. spiralis* (Geinitz)
Monograptus sp.
Pseudoplegmatograptus sp.
Stomatograptus grandis imperfectus (Boucek and Münch)
radiolarians

AGE: Early Silurian, Late Llandovery, *M. spiralis* Zone

UNIT: Duo Lake Formation
MAPNO: J09- 5 AUTHOR: BSN(1983)
GSCNO: C-103820 FIELDNO: GGA-83-48A1
UTM: Z:9 443643E 6939295N
L/L: 62.58018N; 130.09694W
FOSS: graptolites
TAXA:
Climacograptus? sp.
Dicellograptus sp.
Orthograptus? sp.

AGE: Middle to Late Ordovician, Caradoc to Ashgill

UNIT: Duo Lake Formation
MAPNO: J09- 6 AUTHOR: BSN(1983)
GSCNO: C-103821 FIELDNO: GGA-83-48A2
UTM: Z:9 443693E 6939345N
L/L: 62.58064N; 130.09598W
FOSS: graptolites, bivalve
TAXA:
Climacograptus? sp.
Dicellograptus sp.
Leptograptus? sp.
Orthograptus? sp.
inarticulate brachiopod

AGE: Middle to Late Ordovician, Caradoc to Ashgill

UNIT: Duo Lake Formation
MAPNO: J10- 1 AUTHOR: BSN(1986)
GSCNO: C-117374 FIELDNO: GGAI-86-56A2
UTM: Z:9 402773E 6946370N
L/L: 62.63516N; 130.89607W
FOSS: graptolites, brachiopod
TAXA:
?*Didymograptus* sp.
D. sp. (pendent)
Isograptus? sp.
inarticulate brachiopod

AGE: Late Early to early Middle Ordovician, late Arenig to Llanvirn

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UNIT: Duo Lake Formation
MAPNO: J10- 3 AUTHOR: BSN(1986)
GSCNO: C-117375 FIELDNO: GGAT-86-31D2
UTM: Z:9 414943E 6951270N
L/L: 62.68213N; 130.66133W
FOSS: graptolites
TAXA:
Climacograptus sp.
Dicellograptus sp.
O. cf. *O.amplexicaulis* Ellis and Wood
Orthograptus sp.

AGE: Late Ordovician, late Caradoc to Ashgill

UNIT: Duo Lake Formation
MAPNO: J10- 4 AUTHOR: BSN(1992)
GSCNO: 42960 FIELDNO: RD-60-591 I
UTM: Z:9 412823E 6935545N
L/L: 62.54055N; 130.69465W
FOSS: graptolites, bivalve
TAXA:
Climacograptus tubuliferus Lapworth
Dicellograptus sp.
Glyptograptus cf. *G. altus* Ross and Berry
Orthograptus cf. *O. quadrimucronatus* (Hall)
Orthograptus ex gr. *O. truncatus* Lapworth
inarticulate brachiopod

AGE: Late Ordovician, *Orthograptus quadrimucronatus* Zone or *Dicellograptus complanatus ornatus* Zone

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UNIT: Duo Lake Formation
MAPNO: J10- 5 AUTHOR: BSN(1992)
GSCNO: 42955 FIELDNO: RD-60-591 II
UTM: Z:9 412553E 6935375N
L/L: 62.53896N; 130.69981W
FOSS: graptolites
TAXA:
Climacograptus sp.
Dicellograptus sp.
Glyptograptus sp.
O. ex gr. *O. truncatus* Lapworth
Orthograptus sp.

AGE: Middle or Late Ordovician, *Dicranograptus clingani* Zone or younger

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UNIT: Duo Lake Formation
MAPNO: J10- 6 AUTHOR: BSN(1992)
GSCNO: 42956 FIELDNO: RD-60-591A
UTM: Z:9 412003E 6934605N
L/L: 62.53193N; 130.71010W
FOSS: graptolites
TAXA:
Arachniograptus sp.
Climacograptus? sp.
Dicellograptus sp.
Glyptograptus? sp.
AGE: Middle or Late Ordovician

UNIT: Duo Lake Formation
MAPNO: J10- 7 AUTHOR: MJO(1992)
GSCNO: C-201972 FIELDNO: GGAI-86-55D1
UTM: Z:9 402018E 6946045N
L/L: 62.63204N; 130.91060W
FOSS: conodonts
TAXA:
ramiform elements
CAI: -
AGE: Ordovician–Triassic

UNIT: Duo Lake Formation
MAPNO: J11- 3 AUTHOR: BSN(1992)
GSCNO: 42957 FIELDNO: RD-60-481
UTM: Z:9 381263E 6956955N
L/L: 62.72379N; 131.32261W
FOSS: graptolites
TAXA:
Amplexograptus? sp.
Dicellograptus sp.
O. ex gr. *O. truncatus* Lapworth
Orthograptus sp.
Reteograptus pulcherrimus Keble and Harris

AGE: Late Ordovician, *Orthograptus quadrimucronatus* Zone or younger

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UNIT: Duo Lake Formation
MAPNO: J14- 3 AUTHOR: MJO(1992)
GSCNO: C-101905 FIELDNO: GGA-82-1B2
UTM: Z:9 386493E 6982645N
L/L: 62.95585N; 131.23785W
FOSS: conodonts
TAXA:
Periodon sp.
Protopanderodus robustus (Hadding 1913)
coniform element indet.
CAI: 5
AGE: Ordovician, late Arenig to Caradoc

UNIT: Duo Lake Formation
MAPNO: J14- 4 AUTHOR: BSN(1982)
GSCNO: C-107911 FIELDNO: GGA-82-1D1
UTM: Z:9 384743E 6981745N
L/L: 62.94723N; 131.27170W
FOSS: graptolites, bivalve
TAXA:
Amplexograptus sp.
Orthograptus? sp.
inarticulate brachiopod

AGE: Middle or Late Ordovician, Llanvirn to Ashgill

UNIT: Duo Lake Formation
MAPNO: J14- 5 AUTHOR: BSN(1982)
GSCNO: C-107912 FIELDNO: GGA-82-36C1
UTM: Z:9 395793E 6972975N
L/L: 62.87190N; 131.04858W
FOSS: graptolites
TAXA:
Amplexograptus? sp.
C. cf. *C. tricornis* (Carruthers)
Cryptograptus sp.
Didymograptus sp.
Glyptograptus sp.
Isograptus sp.
Phyllograptus sp.
diplograptids
graptolite fragments

AGE: Latest Early to earliest Middle Ordovician, *P. tentaculatus* Zone

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UNIT: Duo Lake Formation
MAPNO: J14-15 AUTHOR: BSN(1985)
GSCNO: C-118070 FIELDNO: GGA-85-53A1
UTM: Z:9 391068E 6986694N
L/L: 62.99356N; 131.15040W
FOSS: graptolites, sponge, bivalve
TAXA:
?*Climacograptus* sp.
D. cf. *D. complanatus* Lapworth
Dicellograptus spp.
O. truncatus (Lapworth)
Orthograptus spp.
Orthoretiolites? sp.
inarticulate brachiopod
sponge fragments

AGE: Late Middle or Late Ordovician, late Caradoc to Ashgill, *O. quadrimucronatus* Zone to *D. complanatus ornatus* Zone

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UNIT: Duo Lake Formation
MAPNO: J15- 1 AUTHOR: BSN(1992)
GSCNO: 42874 FIELDNO: GC-60-1006a
UTM: Z:9 400093E 6983595N
L/L: 62.96836N; 130.97050W
FOSS: graptolites
TAXA:
Amplexograptus? sp.
Climacograptus sp.
Dicellograptus 2 sp.
Glyptograptus sp.
O. cf. *O. calcaratus grandis* (Ruedemann)
Orthograptus sp.

AGE: Middle or Late Ordovician, probably *Climacograptus bicornis* Zone to *Orthograptus quadrimucronatus* Zone

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UNIT: Duo Lake Formation
MAPNO: J16- 1 AUTHOR: BSN(1982)
GSCNO: C-087899 FIELDNO: GGA-80-19A-313m
UTM: Z:9 448173E 6961185N
L/L: 62.77729N; 130.01549W
FOSS: graptolites, bivalve
TAXA:
Climacograptus? sp.
Dicellograptus sp.
Orthograptus sp.
Reteograptus? sp.
inarticulate brachiopod

AGE: Middle or Late Ordovician, Caradoc to Ashgill

UNIT: Duo Lake Formation
MAPNO: J16- 2 AUTHOR: BSN(1982)
GSCNO: C-087897 FIELDNO: GGA-80-19A-460m
UTM: Z:9 448173E 6961185N
L/L: 62.77729N; 130.01549W
FOSS: graptolites, bivalve
TAXA:
Climacograptus? sp.
Dicellograptus? sp.
Orthograptus cf. *O. truncatus* (Lapworth)
inarticulate brachiopod

AGE: Middle Ordovician, Caradoc, *C. bicornis* Zone to *O. quadrimucronatus* Zone

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UNIT: Duo Lake Formation
MAPNO: J16- 3 AUTHOR: BSN(1982)
GSCNO: C-087898 FIELDNO: GGA-80-19A-657m
UTM: Z:9 448173E 6961185N
L/L: 62.77729N; 130.01549W
FOSS: graptolites
TAXA:
Climacograptus sp.
Dicellograptus sp.
Leptograptus? sp.
Orthograptus sp.
Reteograptus sp.
undetermined graptolite

AGE: Caradoc, *C. bicornis* Zone to *O. quadrimucronatus* Zone

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UNIT: Duo Lake Formation
MAPNO: J16- 4 AUTHOR: BSN(1982)
GSCNO: C-087755 FIELDNO: GGA-80-33D
UTM: Z:9 446603E 6965545N
L/L: 62.81620N; 130.04764W
FOSS: graptolites
TAXA:
Climacograptus bicornis longispina Hall
Cryptograptus cf. *C. tricornis* (Carruthers)
Dicellograptus sp.
Leptograptus? sp.

AGE: Middle Ordovician, Caradoc, *C. bicornis* Zone to *D. clingani* Zone

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UNIT: Duo Lake Formation
MAPNO: J16- 5 AUTHOR: BSN(1980)
GSCNO: C-088040 FIELDNO: GGA-80-51A
UTM: Z:9 432883E 6972575N
L/L: 62.87702N; 130.31957W
FOSS: graptolites, bivalves
TAXA:
Climacograptus
Dicellograptus cf. *D. complanatus ornatus* Elles and Wood
Orthograptus cf. *O. truncatus abbreviatus* Elles and Wood
inarticulate brachiopods
retiolitid graptolite

AGE: Late Ordovician, Ashgill, *D. complanatus ornatus Zone*

UNIT: Duo Lake Formation
MAPNO: J16-10 AUTHOR: BSN(1985)
GSCNO: C-118064 FIELDNO: GGA-85-45B1
UTM: Z:9 446323E 6960675N
L/L: 62.77245N; 130.05157W
FOSS: graptolites, bivalve
TAXA:
Climacograptus? sp.
Dicellograptus sp.
Orthograptus sp.
Reteograptus? sp.
inarticulate brachiopod

AGE: Middle or Late Ordovician, Caradoc to Ashgill

UNIT: Duo Lake Formation
MAPNO: J16-11 AUTHOR: BSN(1985)
GSCNO: C-118065 FIELDNO: GGA-85-45C1
UTM: Z:9 446323E 6960720N
L/L: 62.77286N; 130.05159W
FOSS: graptolites
TAXA:
Leptograptus? sp.
Orthograptus sp.

AGE: Middle or Late Ordovician, Caradoc to Ashgill

UNIT: Duo Lake Formation
MAPNO: J16-12 AUTHOR: BSN(1985)
GSCNO: C-118089 FIELDNO: GGA-85-67-72m
UTM: Z:9 448623E 6964270N
L/L: 62.80504N; 130.00762W
FOSS: graptolites
TAXA:
Dicellograptus sp
Orthograptus cf. *O. calcaratus* (Lapworth)

AGE: Late Middle to Late Ordovician, probably Caradoc

UNIT: Duo Lake Formation
MAPNO: K06- 2 AUTHOR: BSN(1982)
GSCNO: C-107902 FIELDNO: GGA-82-71E3
UTM: Z:8 597531E 6924584N
L/L: 62.43964N; 133.11043W
FOSS: graptolites
TAXA:
Tetragraptus cf. *T. quadribrachiatus* (Hall)
graptolite fragments

AGE: Early to earliest Middle Ordovician, Arenig to basal Llanvirn, *T. approximatus* Zone to *P. P. tentaculatus* Zone

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UNIT: Duo Lake Formation
MAPNO: K06- 3 AUTHOR: BSN(1983)
GSCNO: C-103823 FIELDNO: GGA-83-35G1
UTM: Z:8 602521E 6931034N
L/L: 62.49616N; 133.00998W
FOSS: graptolites
TAXA:
Orthograptus? sp.

AGE: Middle Ordovician to Early Silurian

UNIT: Duo Lake Formation
MAPNO: K06- 4 AUTHOR: BSN(1983)
GSCNO: C-103824 FIELDNO: GGA-83-36A1
UTM: Z:8 602131E 6930284N
L/L: 62.48954N; 133.01799W
FOSS: graptolites
TAXA:
Dendrograptus sp.
Dicranograptus sp.
Orthograptus sp.

AGE: Middle Ordovician, Caradoc

UNIT: Duo Lake Formation
MAPNO: K06- 5 AUTHOR: BSN(1992)
GSCNO: 80031 FIELDNO: TO-67-304
UTM: Z:8 600701E 6924884N
L/L: 62.44149N; 133.04888W
FOSS: graptolites
TAXA:
Dicellograptus sp.
Glyptograptus sp.
indeterminate graptolites

AGE: Middle or Late Ordovician
REMARKS: Locality F2 of Tempelman-Kluit (1972) (NOTE: collection re-examined by BSN in 1992).

UNIT: Duo Lake Formation
MAPNO: K07- 3 AUTHOR: BSN(1982)
GSCNO: C-107908 FIELDNO: GGA-82-49A1
UTM: Z:8 604831E 6930564N
L/L: 62.49130N; 132.96546W
FOSS: graptolites
TAXA:
Dicellograptus sp.
Orthograptus? sp.

AGE: Late Middle to Late Ordovician, Caradoc or Ashgill

UNIT: Duo Lake Formation
MAPNO: K07- 6 AUTHOR: BSN(1968)
GSCNO: 80030 FIELDNO: TO-67-321
UTM: Z:8 603251E 6925294N
L/L: 62.44447N; 132.99926W
FOSS: graptolites, bivalve
TAXA:
Caryocaris? sp.
Climacograptus? sp.
Glossograptus sp.
inarticulate brachiopod

AGE: Ordovician, Llanvirn to Caradoc
REMARKS: Locality F1 of Tempelman-Kluit (1972).

UNIT: Duo Lake Formation
MAPNO: K09- 1 AUTHOR: BSN(1960)
GSCNO: 42865 FIELDNO: GC-60-816 b1
UTM: Z:8 649094E 6954046N
L/L: 62.68665N; 132.08698W
FOSS: graptolites
TAXA:
diplograptids

AGE: Ordovician

UNIT: Duo Lake Formation
MAPNO: K09- 3 AUTHOR: BSN(1992)
GSCNO: 42872 FIELDNO: GC-60-816a
UTM: Z:8 649011E 6953919N
L/L: 62.68555N; 132.08871W
FOSS: graptolites
TAXA:
Amplexograptus? sp.
Glyptograptus sp.
nemagraptid? graptolite
sponge spicules

AGE: Ordovician, Middle or Late

UNIT: Duo Lake Formation
MAPNO: K09- 6 AUTHOR: BSN(1987)
GSCNO: C-157788 FIELDNO: GGA-87-34D1
UTM: Z:8 640621E 6949104N
L/L: 62.64568N; 132.25639W
FOSS: graptolites
TAXA:
Dicellograptus sp.
Reteograptus sp.
diplograptid

AGE: Middle Ordovician, Caradoc, or possibly Late Ordovician, Ashgill

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UNIT: Duo Lake Formation
MAPNO: K14- 4 AUTHOR: BSN(1986)
GSCNO: C-150020 FIELDNO: GGAT-86-42A5
UTM: Z:8 600881E 6976459N
L/L: 62.90409N; 133.01464W
FOSS: graptolites
TAXA:
Orthograptus sp.

AGE: Late Middle Ordovician to earliest Silurian

UNIT: Duo Lake Formation
MAPNO: K15- 2 AUTHOR: BSN(1992)
GSCNO: 42864 FIELDNO: GC-60-562B-I
UTM: Z:8 603441E 6983584N
L/L: 62.96728N; 132.95986W
FOSS: graptolites
TAXA:
?Clonograptus sp.
D. cf. *D. bifidus* (Hall)
Dichograptus cf. *D. octobrachiatus* (Hall)
Didymograptus ex. gr. *D. extensus* (Hall)
Phyllograptus sp.
Tetragraptus cf. *T. fruticosus* (Hall)
Tetragraptus cf. *T. quadribrachiatus* (Hall)

AGE: Early Ordovician, Arenig, *D. bifidus* Zone
REMARKS: (NOTE: collection originally identified in 1961; re-examined by BSN in 1992)

UNIT: Duo Lake Formation
MAPNO: L15- 1 AUTHOR: BSN(1983)
GSCNO: C-089927 FIELDNO: TOA-6-2
UTM: Z:8 513631E 6971874N
L/L: 62.87665N; 134.73202W
FOSS: graptolites
TAXA:
Climacograptus? sp.
Dicellograptus? sp.
biserial graptolite

AGE: Probably late Middle or Late Ordovician

UNIT: Duo Lake Formation
MAPNO: L15- 2 AUTHOR: BSN(1982)
GSCNO: C-107906 FIELDNO: GGA-82-56D1
UTM: Z:8 513631E 6971874N
L/L: 62.87665N; 134.73202W
FOSS: graptolites
TAXA:
Dicellograptus complanatus ornatus Elles and Wood
Orthograptus sp.

AGE: Late Ordovician, Ashgill, *D. complanatus ornatus* Zone

UNIT: (?) Duo Lake Formation
MAPNO: G16- 3 AUTHOR: MJO(1992)
GSCNO: C-087600 FIELDNO: GGA-80-60A-72m
UTM: Z:9 436638E 6873540N
L/L: 61.98895N; 130.20934W
FOSS: conodonts, microgastropods, sponge spicules, mazuelloids
TAXA:
Aspelundia? sp. (Sa)
Distomodus? sp. (Sa)
CAI: 5
AGE: Silurian, late Llandovery–early Wenlock
REMARKS: The named species accompanied by mazuelloids, are the characteristic association near the top and above the Active Zone at Howards Pass.

UNIT: (?) Duo Lake Formation
MAPNO: L14- 5 AUTHOR: BSN(1983)
GSCNO: C-102622 FIELDNO: DY-82-2374
UTM: Z:8 485756E 6977384N
L/L: 62.92608N; 135.28050W
FOSS: graptolites
TAXA:
? *Monograptus* sp.
retiolitid or *Orthograptus* sp.

AGE: Late Ordovician to Early Silurian
REMARKS: Age indicates derivation from Road River Group, probably Duo Lake Formation; however, stratigraphic/structural relation of locality to surrounding strata is unclear.

UNIT: Steel Formation
MAPNO: I13- 2 AUTHOR: BSN(1985)
GSCNO: C-118058 FIELDNO: ATB-82-2
UTM: Z:9 452493E 6965295N
L/L: 62.81476N; 129.93203W
FOSS: graptolites
TAXA:
M. ex gr. *M. spiralis* (Geinitz)
Monograptus sp. or spp.

AGE: Early Silurian, late Llandovery, *M. spiralis* Zone to *C. sakmaricus*–*C. laqueus* Zone

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UNIT: Steel Formation
MAPNO: J08-14 AUTHOR: BSN(1983)
GSCNO: C-103815 FIELDNO: GGA-83-42D2
UTM: Z:9 426393E 6921095N
L/L: 62.41384N; 130.42477W
FOSS: graptolites
TAXA:
Monograptus 3 spp.

AGE: Silurian, probably Ludlow

UNIT: Steel Formation
MAPNO: J08-16 AUTHOR: BSN(1986)
GSCNO: C-142951 FIELDNO: GGAT-86-20A3
UTM: Z:9 445268E 6921945N
L/L: 62.42472N; 130.05978W
FOSS: graptolites
TAXA:
Glyptograptus sp.

AGE: Early Middle Ordovician to Early Silurian

UNIT: Steel Formation
MAPNO: J09- 1 AUTHOR: BSN(1983)
GSCNO: C-103816 FIELDNO: GGA-83-46C1
UTM: Z:9 437303E 6932295N
L/L: 62.51634N; 130.21774W
FOSS: graptolites
TAXA:
Cyrtograptus sp. or
Monograptus ex gr. *M. spiralis* (Geinitz)
Monograptus sp.

AGE: Early Silurian, Late Llandovery to Wenlock

UNIT: Steel Formation
MAPNO: J09- 2 AUTHOR: BSN(1983)
GSCNO: C-103817 FIELDNO: GGA-83-46D1
UTM: Z:9 436593E 6931195N
L/L: 62.50635N; 130.23112W
FOSS: graptolites
TAXA:
M. cf. *M. bohemicus* (Barrande)
Monograptus sp.

AGE: Late Silurian, Ludlow

UNIT: Steel Formation
MAPNO: J09- 3 AUTHOR: BSN(1983)
GSCNO: C-103818 FIELDNO: GGA-83-47A1
UTM: Z:9 436193E 6930675N
L/L: 62.50162N; 130.23869W
FOSS: graptolites
TAXA:
Monograptus sp.

AGE: Silurian to Early Devonian

UNIT: Steel Formation
MAPNO: J09- 4 AUTHOR: BSN(1983)
GSCNO: C-103819 FIELDNO: GGA-83-47C1
UTM: Z:9 436933E 6931295N
L/L: 62.50731N; 130.22456W
FOSS: graptolites
TAXA:
Linograptus sp.
M. cf. *M. bohemicus* (Barrande)
Monograptus spp.

AGE: Late Silurian, Ludlow *M. leintwardinensis primus* Zone

UNIT: Steel Formation
MAPNO: J10- 2 AUTHOR: BSN(1986)
GSCNO: C-117376 FIELDNO: GGAT-31C3
UTM: Z:9 414853E 6951470N
L/L: 62.68391N; 130.66318W
FOSS: graptolites
TAXA:
Monograptus sp.

AGE: Silurian

UNIT: Steel Formation
MAPNO: J14- 7 AUTHOR: BSN(1982)
GSCNO: C-107915 FIELDNO: GGA-82-37C1
UTM: Z:9 385173E 6971405N
L/L: 62.85463N; 131.25609W
FOSS: graptolites
TAXA:
Linograptus? sp.
Monograptus bohemicus (Barrande)
Monograptus spp.

AGE: Late Silurian, Ludlow, *M. leintwardinensis primus* Zone

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UNIT: Steel Formation
MAPNO: J14- 9 AUTHOR: BSN(1982)
GSCNO: C-107909 FIELDNO: GGA-82-5D1
UTM: Z:9 380793E 6979075N
L/L: 62.92201N; 131.34756W
FOSS: graptolites
TAXA:
Monograptus 2 spp.

AGE: Silurian

UNIT: Steel Formation
MAPNO: J16- 7 AUTHOR: BSN(1985)
GSCNO: C-118061 FIELDNO: GGA-85-44B1
UTM: Z:9 444713E 6961025N
L/L: 62.77535N; 130.08322W
FOSS: graptolites, sponge
TAXA:
Monograptus sp
(?)sponge

AGE: Early Silurian to Early Devonian

UNIT: Steel Formation
MAPNO: J16- 8 AUTHOR: BSN(1985)
GSCNO: C-118062 FIELDNO: GGA-85-44C1
UTM: Z:9 444893E 6960955N
L/L: 62.77475N; 130.07967W
FOSS: graptolites
TAXA:
M. cf. *M. bohemicus* Barrande
Monograptus sp.

AGE: Late Silurian, Ludlow, *M. nilssoni* Zone or *M. leintwardinensis primus* Zone

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UNIT: Steel Formation
MAPNO: J16- 9 AUTHOR: BSN(1985)
GSCNO: C-118063 FIELDNO: GGA-85-45A1
UTM: Z:9 445933E 6960545N
L/L: 62.77123N; 130.05917W
FOSS: graptolites
TAXA:
Cyrtograptus sp.
M. ex gr. *M. spiralis* (Geinitz)
Monograptus sp. or spp.
Retiolites cf. *R. geinitzianus angustidens* Elles and Wood

AGE: Early Silurian, latest Llandovery, *C. sakmaricus*–*C. laqueus* Zone

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UNIT: Steel Formation
MAPNO: J16-13 AUTHOR: BSN(1982)
GSCNO: C-087763 FIELDNO: GGAB-80-29A
UTM: Z:9 444433E 6965185N
L/L: 62.81264N; 130.09008W
FOSS: graptolites
TAXA:
Monograptus? sp.
Monograptus cf. *M. bohemicus* (Barrande)

AGE: Late Silurian, Ludlow

UNIT: Steel Formation
MAPNO: K14- 3 AUTHOR: BSN(1986)
GSCNO: C-150019 FIELDNO: GGAT-86-41C7
UTM: Z:8 600281E 6975884N
L/L: 62.89910N; 133.02679W
FOSS: graptolites
TAXA:
Monograptus sp.

AGE: Early Silurian to Early Devonian

UNIT: Road River Group (undivided)
MAPNO: J01- 1 AUTHOR: BSN(1960)
GSCNO: 42877 FIELDNO: GC-60-1013
UTM: Z:9 422343E 6901085N
L/L: 62.23346N; 130.49419W
FOSS: graptolites
TAXA:
indeterminable graptolites

AGE: Ordovician or Silurian

UNIT: Road River Group (undivided)
MAPNO: J02- 3 AUTHOR: BSN(1992)
GSCNO: 42879 FIELDNO: GC-60-1011b
UTM: Z:9 421753E 6902415N
L/L: 62.24528N; 130.50614W
FOSS: graptolites
TAXA:
M. ex gr. *M. priodon* (Bronn)
M. ex gr. *M. spiralis* (Geinitz)
Monoclimacis cf. *M. Linnarsoni* (Tullberg)
Monograptus sp.
Retiolites sp.

AGE: Early Silurian, Telychian, *M. spiralis* Zone to *Cyrtograptus sakmaricus–C. laqueus* Zone

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UNIT: Road River Group (undivided)
MAPNO: J02-11 AUTHOR: BSN(1986)
GSCNO: C-142795 FIELDNO: GGAT-86-17F2
UTM: Z:9 413368E 6902870N
L/L: 62.24751N; 130.66768W
FOSS: graptolites
TAXA:
biserial graptolite

AGE: Middle Ordovician to Early Silurian

UNIT: Road River Group (undivided)
MAPNO: J08-12 AUTHOR: BSN(1992)
GSCNO: 42882 FIELDNO: GC-60-865
UTM: Z:9 424953E 6920395N
L/L: 62.40727N; 130.45233W
FOSS: graptolites
TAXA:
Monograptus? sp.
Petalograptus? sp.
biserial graptolite

AGE: Silurian, probably Early Silurian

UNIT: Road River Group (undivided)
MAPNO: J11- 1 AUTHOR: BSN(1992)
GSCNO: 42880 FIELDNO: GC-60-836
UTM: Z:9 384483E 6956385N
L/L: 62.71970N; 131.25929W
FOSS: graptolites
TAXA:
Monograptus aff. *M. concinnus* Lapworth

AGE: Silurian

UNIT: Road River Group (undivided)
MAPNO: J11- 2 AUTHOR: BSN(1992)
GSCNO: 42873 FIELDNO: GC-60-836b
UTM: Z:9 385293E 6957185N
L/L: 62.72713N; 131.24401W
FOSS: graptolites
TAXA:
Amplexograptus? sp.

AGE: Latest Early to Late Ordovician

UNIT: Road River Group (undivided)
MAPNO: J12- 2 AUTHOR: MJO(1992)
GSCNO: C-118090 FIELDNO: GGA-85-48C1
UTM: Z:9 361643E 6933645N
L/L: 62.50793N; 131.68695W
FOSS: conodonts
TAXA:
coniform element
CAI: 4–6
AGE: (?)Ordovician

UNIT: Road River Group (undivided)
MAPNO: J14- 8 AUTHOR: BSN(1982)
GSCNO: C-107913 FIELDNO: GGA-82-38A1
UTM: Z:9 385803E 6971915N
L/L: 62.85940N; 131.24407W
FOSS: graptolites
TAXA:
Climacograptus? sp.
Reteograptus sp.
diplograptids

AGE: Late Middle or Late Ordovician, Caradoc to Ashgill

UNIT: Road River Group (undivided)
MAPNO: K07- 2 AUTHOR: BSN(1982)
GSCNO: C-107907 FIELDNO: GGA-82-45B1
UTM: Z:8 604431E 6928614N
L/L: 62.47392N; 132.97440W
FOSS: graptolites
TAXA:
indeterminate graptolites

AGE: Early Ordovician to Early Devonian
REMARKS: From one clast of float, different in rock type from nearby outcrop, and possibly far travelled.

UNIT: Road River Group (undivided)
MAPNO: K09- 2 AUTHOR: BSN(1992)
GSCNO: 42870 FIELDNO: GC-60-816b
UTM: Z:8 649094E 6954046N
L/L: 62.68665N; 132.08698W
FOSS: graptolites
TAXA:
Caryocaris? sp.
Glossograptus sp.
Glyptograptus sp.

AGE: Late Early to Late Ordovician

UNIT: Road River Group (undivided)
MAPNO: K09- 4 AUTHOR: MJO(1992)
GSCNO: C-157785 FIELDNO: GGA-87-32C1
UTM: Z:8 641256E 6946729N
L/L: 62.62415N; 132.24600W
FOSS: conodonts, phosphatic fragments
TAXA:
Oulodus? sp.
Walliserodus? sp.
ramiform elements
CAI: 5–5.5
AGE: Ordovician-Silurian

UNIT: Road River Group (undivided)
MAPNO: K09- 5 AUTHOR: MJO(1992)
GSCNO: C-157767 FIELDNO: GGA-87-34B1
UTM: Z:8 640545E 6948559N
L/L: 62.64082N; 132.25833W
FOSS: conodonts, mazuelloids
TAXA:
ramiform elements
CAI: 5
AGE: Probably Silurian

UNIT: Road River Group (undivided)
MAPNO: K14- 5 AUTHOR: BSN(1992)
GSCNO: 42953 FIELDNO: RD-60-(R)567
UTM: Z:8 598231E 6972764N
L/L: 62.87167N; 133.06894W
FOSS: graptolites
TAXA:
Monograptus yukonensis Jackson and Lenz

AGE: Early Devonian, Pragian, *Monograptus yukonensis* Zone

UNIT: Road River Group (undivided)
MAPNO: K15- 1 AUTHOR: BSN(1992)
GSCNO: 42860 FIELDNO: GC-60-557-B
UTM: Z:8 616011E 6971534N
L/L: 62.85542N; 132.72058W
FOSS: bivalves
TAXA:
inarticulate brachiopod

AGE: Not diagnostic

UNIT: (?) Road River Group
MAPNO: G16- 4 AUTHOR: MJO(1992)
GSCNO: C-142782 FIELDNO: GGAI-86-33A2
UTM: Z:9 436143E 6873495N
L/L: 61.98846N; 130.21877W
FOSS: conodonts, ichthyoliths, mazuelloids, sponge spicules
TAXA:
Panderodus sp.
Protopanderodus sp.
exognathiform element
M elements
CAI: 5
AGE: Late Ordovician–Early Silurian, Ashgill-Wenlock

UNIT: Carbonate-sandstone unit
MAPNO: G16- 1 AUTHOR: MJO(1992)
GSCNO: C-087576 FIELDNO: GGA-80-28A-246m
UTM: Z:9 433443E 6860520N
L/L: 61.87156N; 130.26546W
FOSS: conodonts
TAXA:
Icriodus norfordi Chatterton 1978
Polygnathus sp. Hinde 1879
drepanodiform element
ramiform elements
CAI: 5.5
AGE: Middle Devonian, probably Eifelian
REMARKS: Low diversity fauna of 'shallow water' aspect. Icriodids conform to a generalized concept of *I. expansus*, and more specifically to the species described previously from the Funeral Formation.

UNIT: Carbonate-sandstone unit
MAPNO: J03- 3 AUTHOR: MJO(1992)
GSCNO: C-142955 FIELDNO: GGA-86-34B2
UTM: Z:9 376618E 6876470N
L/L: 62.00044N; 131.35605W
FOSS: conodonts
TAXA:
Dvorakia sp.
Icriodus sp.
Polygnathus ex gr. *linguiformis* Hinde 1879
Polygnathus ex gr. *varcus* Stauffer 1940
acodiform element
ramiform elements
CAI: 5
AGE: Middle Devonian, probably Givetian

UNIT: Carbonate-sandstone unit
MAPNO: K07- 7 AUTHOR: TTU(1968)
GSCNO: 80033 FIELDNO: TO-67-338
UTM: Z:8 604681E 6917304N
L/L: 62.37239N; 132.97642W
FOSS: conodonts
TAXA:
P. varcus Stauffer
P. sp. (probably n. sp.) (approaching *Schmidtognathus* in the size of basal cavity
Polygnathus linguiformis linguiformis Hinde

AGE: Probably late Middle Devonian (*P.varcus* Zone, or the lower part of the *S. hermanni–P. cristatus* Zone).
REMARKS: This locality is recorded as F3 in Tempelman-Kluit (1972), which according to Tempelman-Kluit's original field notes and photo, has been incorrectly located. Revised location is given here. Field notes indicate collection from a slab, not outcrop, probably derived from nearby.

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UNIT: Portrait Lake Formation
MAPNO: J08- 8 AUTHOR: MJO(1992)
GSCNO: C-087614 FIELDNO: GGAA-80-68B2
UTM: Z:9 446833E 6927615N
L/L: 62.47584N; 130.03123W
FOSS: conodonts, ichthyoliths, radiolarians, sponge spicules
TAXA:
Pandorinellina steinhornensis (Ziegler 1956)
Polygnathus gronbergi Klapper and Johnson 1975
ramiform elements
CAI: 5.5–6.5
AGE: Early Devonian, Emsian, *gronbergi* Zone

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UNIT: Portrait Lake Formation
MAPNO: J09-10 AUTHOR: BSN(1985)
GSCNO: C-118060 FIELDNO: GGA-85-43C1
UTM: Z:9 430773E 6948270N
L/L: 62.65853N; 130.35102W
FOSS: graptolites
TAXA:
Monograptus ex gr. *M. yukonensis* Jackson and Lenz
AGE: Early Devonian, Pragian, *M. thomasi* Zone to *M. yukonensis* Zone

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UNIT: Portrait Lake Formation
MAPNO: K14- 1 AUTHOR: BSN(1986)
GSCNO: C-150018 FIELDNO: GGA-86-83G2
UTM: Z:8 596656E 6971609N
L/L: 62.86173N; 133.10055W
FOSS: graptolites
TAXA:
Climacograptus? sp.
Monograptus sp. (proximal part slightly deflexed)

AGE: Probably Early Devonian, possibly Lochkovian

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UNIT: Prevost Formation
MAPNO: J15- 2 AUTHOR: MJO(1992)
GSCNO: C-102568 FIELDNO: GGA-82-13H2
UTM: Z:9 419943E 6986395N
L/L: 62.99840N; 130.58055W
FOSS: conodonts
TAXA:
Geniculatus? n. sp. A
'*Hindeodella*' *segaformis* Bischoff 1957
carminate element
ramiform elements
CAI: 5–5.5
AGE: Early Carboniferous (Mississippian), late Tournaisian

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UNIT: Prevost Formation
MAPNO: K15- 3 AUTHOR: DCM(1961)
GSCNO: 5685 FIELDNO: GC-60-(F)822b
UTM: Z:8 605281E 6978654N
L/L: 62.92253N; 132.92673W
TAXA:
unidentifiable; no spores

AGE: Not determinable
REMARKS: Thought to be comminuted plants in field

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UNIT: Prevost Formation
MAPNO: K15- 4 AUTHOR: JU(1988)
GSCNO: C-150013 FIELDNO: GGA-86-85A6
UTM: Z:8 605181E 6979009N
L/L: 62.92574N; 132.92847W
FOSS: palynomorphs
TAXA:
abundant exinous, woody, and coaly fragments
rare spores with ornament of grana

AGE: Not determinable
REMARKS: Thinner parts of exine brownish black, thinner parts are brown; T.A.I. = 3+

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UNIT: Prevost Formation
MAPNO: K15- 5 AUTHOR: JU(1988)
GSCNO: C-150014 FIELDNO: GGA-86-85A7
UTM: Z:8 605181E 6979009N
L/L: 62.92574N; 132.92847W
FOSS: palynomorphs
TAXA:
abundant exinous, woody, and coaly fragments
rare amorphous fragments
rare medium-brown scolecodonts
rare spores including specimens with ornament of grana and spines

AGE: Not determinable
REMARKS: Thicker parts of exine brownish black, thinner parts dark brown; T.A.I. = 3+; rare scolecodonts and abundant land-derived material suggest a nearshore-marine environment.

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UNIT: Prevost Formation
MAPNO: K15- 6 AUTHOR: JU(1988)
GSCNO: C-150015 FIELDNO: GGA-86-86J1
UTM: Z:8 622606E 6970634N
L/L: 62.84519N; 132.59179W
FOSS: palynomorphs
TAXA:
Hystricosporites sp. or *Ancyrospora* sp.; S1. 2, 33.2 X 100.3
abundant exinous, woody, and coaly fragments
common, poorly preserved unidentifiable spores, some specimens with ornament of grana and spines
rare amorphous fragments

AGE: Probably Middle or Upper Devonian, late Emsian to earliest Tournaisian (Devonian part)
REMARKS: *Hystricosporites* sp. or *Ancyrospora* sp. based on one spore fragment with grapnel tipped spine; spores are black with thinner parts brownish black, T.A.I. = 4-

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UNIT: Prevost Formation
MAPNO: K15- 7 AUTHOR: DCM(1961)
GSCNO: 5689 FIELDNO: RD-60-(F)573B
UTM: Z:8 603951E 6978254N
L/L: 62.91933N; 132.95315W
TAXA:
Sporogonites?
unidentifiable unornamented sterile axes

AGE: (?) Lower Devonian
REMARKS: One specimen of which only the outline remains, most closely resembles *Sporogonites*, although it is a bit large for this genus. If it is *Sporogonites*, its age would be Lower Devonian, but the identification cannot be confirmed from this one specimen. Unfortunately no spores were found.

UNIT: Prevost Formation
MAPNO: K15- 8 AUTHOR: JU(1988)
GSCNO: C-150016 FIELDNO: GGA-86-86J2
UTM: Z:8 622606E 6970634N
L/L: 62.84519N; 132.59179W
FOSS: palynomorphs
TAXA:
abundant exinous, woody, and coaly fragments
poorly preserved unidentifiable spores common
rare amorphous fragments

AGE: Indeterminate
REMARKS: T.A.I. = 4-

UNIT: Prevost Formation
MAPNO: K16- 1 AUTHOR: MJO(1992)
GSCNO: C-117397 FIELDNO: GGA-86-75A1
UTM: Z:8 633456E 6970534N
L/L: 62.84049N; 132.37902W
FOSS: conodonts
TAXA:
Icriodus alternatus Branson and Mehl 1934
Palmatolepis minuta Branson and Mehl 1934
Palmatolepis sp. cf. *P. triangularis* Sannemann 1955
Palmatolepis sp. indet. Ulrich and Bassler 1926
ramiform elements
CAI: 5.5–6
AGE: Late Devonian, early Famennian, ?*triangularis* Zone

UNIT: Crystal Peak Formation
MAPNO: K13- 1 AUTHOR: AWN(1960)
GSCNO: 42842 FIELDNO: GC-60-(F)829a
UTM: Z:8 564156E 6965494N
L/L: 62.81401N; 133.74135W
TAXA:
Calvinaria aff. *C. variabilis* (Whiteaves)
Cyrtospirifer sp.
Eleutherokomma sp.
Schizophoria sp.
(?)chonetid

AGE: Mid-early Upper Devonian (middle Frasian)
REMARKS: The juxtaposition of the genera *Eleutherokomma* and *Cyrtospirifer* indicates a mid-early Upper Devonian (middle Frasnian) age and represents a fairly restricted horizon in Western Canada. This fauna is equivalent to forms in the Perdrex–Mount Hawk formation boundary in the Alberta Rockies and the Lower Escarpment Formation ("Upper Hay River shale") on Hay River. Equivalent beds to the east must occur in the grey shales at present referred to as the lower "Imperial", below the horizon of common reef development, and below major sandstone development. This fauna should be re-examined. A Mississippian age is more likely on basis of regional geological relations and recollection at same or very closely nearby locallity C-150017.

UNIT: Crystal Peak Formation
MAPNO: K13- 2 AUTHOR: EWB(1987)
GSCNO: C-150017 FIELDNO: GGA-86-79B2
UTM: Z:8 564156E 6965509N
L/L: 62.81415N; 133.74134W
FOSS: bivalves, bryozoa
TAXA:
small branching bryozoans
spiriferid brachiopods, possibly *Prospira* sp.

AGE: Possibly middle to late Tournaisian (Early Carboniferous, Tn2 to Tn3)
REMARKS: Fossils are too poorly preserved for definite age determination. The spiriferid brachiopods in this collection are similar to those from GSC no. C-157787.

UNIT: (?) Earn Group
MAPNO: J12- 3 AUTHOR: MJO(1992)
GSCNO: C-157758 FIELDNO: GGA-87-21B6
UTM: Z:8 346568E 6957575N
L/L: 62.71650N; 132.00085W
FOSS: conodonts
TAXA:
Icriodus sp.
geniculate element
ramiform elements
CAI: 4.5
AGE: Early Ordovician–Late Devonian
REMARKS: Geniculate element is probably Ordovician.
Icridid (Devonian) may be a contaminant.

UNIT: (?) Earn Group
MAPNO: L14- 4 AUTHOR: EWB(1983)
GSCNO: C-107906x FIELDNO: GGA-82-58A
UTM: Z:8 482931E 6976884N
L/L: 62.92147N; 135.33608W
FOSS: bryozoa, bivalve, graptolite
TAXA:
(?) gastropod, indet.
(?)dictyonemid graptolite - very poorly preserved
fenestellid bryozoan, indet.
ramose bryozoan, indet.

AGE: Silurian to Permian
REMARKS: Submitted by and location given by Anaconda Inc.

UNIT: Tay Formation
MAPNO: J02- 4 AUTHOR: MJO(1992)
GSCNO: C-142786 FIELDNO: GGA-86-24A3
UTM: Z:9 408293E 6888145N
L/L: 62.11419N; 130.75763W
FOSS: conodonts
TAXA:
Polygnathus sp.
ramiform elements
CAI: 4.5–5
AGE: Middle Devonian–Early Carboniferous (Mississippian), Eifelian–Tournaisian

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UNIT: Tay Formation
MAPNO: J02- 5 AUTHOR: MJO(1992; 2006)
GSCNO: C-142790 FIELDNO: GGA-86-25G2
UTM: Z:9 402418E 6881095N
L/L: 62.04947N; 130.86628W
FOSS: conodonts
TAXA:
Patrognathus? sp. Rhodes, Austin and Druce 1969
Polygnathus sp. Hinde 1879
CAI: ~5
AGE: Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian

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UNIT: Tay Formation
MAPNO: J02- 9 AUTHOR: MJO(1992; 2006)
GSCNO: C-157753 FIELDNO: GGA-87-16D3
UTM: Z:9 405412E 6884670N
L/L: 62.08230N; 130.81096W
FOSS: conodonts, ichthyoliths, tubular spines
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Hindeodus? sp. Rexroad and Furnish 1964
Polygnathus communis Branson and Mehl 1934
ramiform elements
CAI: 4–4.5
AGE: Early Carboniferous (Mississippian), Tournaisian

UNIT: Tay Formation
MAPNO: J03- 1 AUTHOR: MJO(1992)
GSCNO: C-142776 FIELDNO: GGA-86-22F2
UTM: Z:9 394143E 6889445N
L/L: 62.12214N; 131.02942W
FOSS: conodonts
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Clydagnathus? sp.
Polygnathus inornatus Branson 1934
ramiform elements
CAI: 3–4
AGE: Early Carboniferous (Mississippian), Tournaisian

UNIT: Tay Formation
MAPNO: J03- 2 AUTHOR: EWB(1987)
GSCNO: C-142784 FIELDNO: GGA-86-22F3
UTM: Z:9 394118E 6889445N
L/L: 62.12214N; 131.02990W
FOSS: bivalves, trilobite, ostracods, gastropod
TAXA:
abundant ostracodes
platyceratid gastropod
spiriferid and rhynchonellid brachiopods
trilobite pygidia, indet.

AGE: Probably Early Carboniferous

UNIT: Tay Formation
MAPNO: J05- 2 AUTHOR: MJO(1992)
GSCNO: C-142980 FIELDNO: GGA-86-45B2
UTM: Z:9 352523E 6909695N
L/L: 62.28970N; 131.84336W
FOSS: conodonts, tubular spines
TAXA:
Polygnathus sp.
ramiform elements
CAI: 5
AGE: Middle Devonian–Early Carboniferous, Eifelian–Tournaisian

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UNIT: Tay Formation
MAPNO: K07- 4 AUTHOR: MJO(1992)
GSCNO: C-118127 FIELDNO: GGA-85-30H1
UTM: Z:8 626421E 6924744N
L/L: 62.43238N; 132.55114W
FOSS: conodonts
TAXA:
Patrognathus sp.
Polygnathus sp.
Polygnathus sp. cf. *P. inornatus* Branson 1934
ramiform elements
CAI: 5
AGE: Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian

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UNIT: Tay Formation
MAPNO: K07- 5 AUTHOR: EWB(1985)
GSCNO: C-118096 FIELDNO: GGA-85-30H2
UTM: Z:8 626421E 6924744N
L/L: 62.43238N; 132.55114W
FOSS: bivalves
TAXA:
rhynchonellid and (?)chonetid brachiopods (poor preservation)

AGE: Material insufficient for age determination

UNIT: Tay Formation
MAPNO: K10- 1 AUTHOR: MJO(1992)
GSCNO: C-102593 FIELDNO: GGA-82-46C1
UTM: Z:8 604256E 6933409N
L/L: 62.51698N; 132.97488W
FOSS: conodonts
TAXA:
'*Hindeodella*' *segaformis* Bischoff 1957
Hindeodus sp.
Polygnathus spp.
Siphonodella sp.
CAI: 5
AGE: Early Carboniferous (Mississippian), Tournaisian

UNIT: Tay Formation
MAPNO: K10- 7 AUTHOR: MJO(1992)
GSCNO: C-142822 FIELDNO: GGAG-86-16D2
UTM: Z:8 607631E 6941734N
L/L: 62.59069N; 132.90412W
FOSS: conodonts, spicules
TAXA:
Gnathodus bilineatus (Roundy 1926)
Gnathodus girtyi Hass 1953
Gnathodus texanus Roundy 1926
Lochriea commutata (Branson and Mehl 1941)
Rhachistognathus sp.
ramiform elements
CAI: 1.5–2.5
AGE: Early Carboniferous, probably early Namurian
REMARKS: Several elements are embedded in brown organic material. Excellent preservation.

UNIT: Tay Formation
MAPNO: K11- 3 AUTHOR: AWN(1960)
GSCNO: 42858 FIELDNO: GC-60-(F)696a
UTM: Z:8 578351E 6952674N
L/L: 62.69622N; 133.46894W
TAXA:
"Phillipsia" sp.
Cleiothyridina sp.
Spirifer sp.
productids

AGE: Carboniferous, probably Mississippian

UNIT: Tay Formation
MAPNO: K11- 4 AUTHOR: AWN(1960)
GSCNO: 42859 FIELDNO: GC-60-(F)696aI
UTM: Z:8 578351E 6952674N
L/L: 62.69622N; 133.46894W
TAXA:
"Phillipsia" sp.
productids

AGE: Probably Mississippian

UNIT: Tay Formation
MAPNO: K11- 5 AUTHOR: MJO(1992)
GSCNO: C-102594 FIELDNO: GGA-82-51B1
UTM: Z:8 596971E 6936544N
L/L: 62.54708N; 133.11451W
FOSS: conodonts, ?bryozoan
TAXA:
Siphonodella sp.
ramiform elements
CAI: 5–6
AGE: Early Carboniferous (Mississippian), early to middle Tournaisian

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UNIT: Tay Formation
MAPNO: K11- 6 AUTHOR: EWB(1985)
GSCNO: C-107903 FIELDNO: GGA-82-51C3
UTM: Z:8 597281E 6935784N
L/L: 62.54018N; 133.10892W
FOSS: corals
TAXA:
?*Michelinia* sp.
Lophophyllum? sp.

AGE: Middle Tournaisian (Tn2) to earliest Viséan (V1)
REMARKS: Corals provisionally assigned to the genus *Lophophyllum* range in age from middle Tournaisian (Tn2) to middle Visean (V2) in western Canada, but they are rare in the upper part of this interval. Fauna from this locality is the same as that from GSC no. 80028, collected by D. Tempelman-Kluit.

UNIT: Tay Formation
MAPNO: K11- 7 AUTHOR: MJO(1992)
GSCNO: C-103806 FIELDNO: GGA-83-17I2
UTM: Z:8 599961E 6935464N
L/L: 62.53660N; 133.05705W
FOSS: conodonts
TAXA:
Bispathodus sp. cf. *B. aculeatus* (Branson and Mehl 1934)
Bispathodus sp. cf. *B. stabilis*
Palmatolepis sp.
Patrognathus sp.
Polygnathus communis carina Hass 1959
Polygnathus spp.
Siphonodella sp.
ramiform elements
CAI: 5–6
AGE: Early Carboniferous (Mississippian), early-middle Tournaisian
REMARKS: Palmatolepids are all fragments and are presumably reworked from the Upper Devonian.

UNIT: Tay Formation
MAPNO: K11- 8 AUTHOR: MJO(1992)
GSCNO: C-103811 FIELDNO: GGA-83-18A1
UTM: Z:8 600581E 6936109N
L/L: 62.54222N; 133.04462W
FOSS: conodonts
TAXA:
ramiform elements
CAI: ~5
AGE: Ordovician–Triassic

UNIT: Tay Formation
MAPNO: K11- 9 AUTHOR: MJO(1992)
GSCNO: C-103831 FIELDNO: GGA-83-38A1
UTM: Z:8 596821E 6936834N
L/L: 62.54972N; 133.11726W
FOSS: conodonts
TAXA:
Polygnathus sp. Hinde 1879
CAI: ~5
AGE: Middle Devonian–Early Carboniferous (Mississippian), Eifelian–Tournaisian
REMARKS: Specimen could be an early siphonodellid (Devonian–Carboniferous boundary).

UNIT: Tay Formation
MAPNO: K11-10 AUTHOR: EWB(1985)
GSCNO: C-103574 FIELDNO: GGA-83-38A2
UTM: Z:8 596821E 6936834N
L/L: 62.54972N; 133.11726W
FOSS: corals, bivalves
TAXA:
Lophophyllum? sp. (tentative - poor preservation)
Syringopora sp.

AGE: Middle Tournaisian (Tn2) to early Viséan (V1)
REMARKS: This sample appears to be the same age as C-107903, based on *Lophophyllum*? sp., but the corals (C-103754) are too poorly preserved for definite identification.

UNIT: Tay Formation
MAPNO: K11-11 AUTHOR: MJO(1992)
GSCNO: C-103804 FIELDNO: GGA-83-5D1
UTM: Z:8 578131E 6949424N
L/L: 62.66711N; 133.47474W
FOSS: conodonts
TAXA:
'*Icriodus*' sp.
Polygnathus sp.
Polygnathus sp. cf. *P. communis* Branson and Mehl
ramiform elements
CAI: 5
AGE: Late Devonian, Famennian

UNIT: Tay Formation
MAPNO: K11-12 AUTHOR: MJO(1992; 2006)
GSCNO: C-118108 FIELDNO: GGA-85-15A1
UTM: Z:8 588031E 6938384N
L/L: 62.56583N; 133.28729W
FOSS: conodonts
TAXA:
Epigondolella postera (Kozur and Mostler 1971)
Hindeodus? sp. Rexroad and Furnish 1964
Polygnathus spp. Hinde 1879
ramiform elements
CAI: 5
AGE: Probably Early Carboniferous (Mississippian), Tournaisian
REMARKS: Atypical for Tay Fm.; outcrop approximately 20% limestone, 80% chert.

UNIT: Tay Formation
MAPNO: K11-13 AUTHOR: MJO(1992)
GSCNO: C-118110 FIELDNO: GGA-85-15D1
UTM: Z:8 593056E 6937744N
L/L: 62.55886N; 133.18994W
FOSS: conodonts
TAXA:
Polygnathus sp.
Pseudopolygnathus sp.
Siphonodella sp.
ramiform elements
CAI: 5.5–6
AGE: Late Devonian-Early Carboniferous (Mississippian), late Famennian–middle Tournaisian

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UNIT: Tay Formation
MAPNO: K11-14 AUTHOR: MJO(1992)
GSCNO: C-118111 FIELDNO: GGA-85-15D2
UTM: Z:8 593056E 6937744N
L/L: 62.55886N; 133.18994W
FOSS: conodonts
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Polygnathus sp.
Pseudopolygnathus sp.
Siphonodella sp.
ramiform elements
CAI: 5–6
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Tay Formation
MAPNO: K11-19 AUTHOR: MJO(1992)
GSCNO: C-142517 FIELDNO: GGAI-86-64C1 (15 m of Irwin section A)
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts, conularids
TAXA:
Hindeodus sp. Rexroad and Furnish 1964
Polygnathus sp. cf. *communis carina* Hass 1959
Polygnathus sp. Hinde 1879
Pseudopolygnathus? sp. Branson and Mehl 1934
Siphonodella sp. Branson and Mehl 1944
ramiform elements
CAI: 5.5–6
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Tay Formation
MAPNO: K11-20 AUTHOR: MJO(1992)
GSCNO: C-142519 FIELDNO: GGAI-86-65A1 (26 m Irwin section A)
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Polygnathus sp.
Pseudopolygnathus? sp.
ramiform elements
CAI: 5
AGE: Early Carboniferous (Mississippian), Tournaisian

UNIT: Tay Formation
MAPNO: K11-21 AUTHOR: MJO(1992)
GSCNO: C-142521 FIELDNO: GGAI-86-65C1 (31.5 m Irwin section A)
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts
TAXA:
Pseudopolygnathus? sp.
CAI: ~5
AGE: Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian

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UNIT: Tay Formation
MAPNO: K11-22 AUTHOR: MJO(1992)
GSCNO: C-142529 FIELDNO: GGAI-86-65L1 (100.5 m of Irwin section A)
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts
TAXA:
Polygnathus? sp.
Pseudopolygnathus sp.
ramiform elements
CAI: 5
AGE: Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian

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UNIT: Tay Formation
MAPNO: K11-23 AUTHOR: MJO(1992)
GSCNO: C-142530 FIELDNO: GGAI-86-66A1 (118 m Irwin section A)
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts, ichthyoliths, conularids
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Polygnathus sp. cf. *P. inornatus* Branson 1934
Pseudopolygnathus sp.
Siphonodella sp.
ramiform elements
CAI: 5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Tay Formation
MAPNO: K11-24 AUTHOR: MJO(1992)
GSCNO: C-142533 FIELDNO: GGAI-86-66D1 (145.5 m Irwin section A)
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts, echinoderms
TAXA:
ramiform elements
CAI: 5
AGE: Ordovician–Triassic

UNIT: Tay Formation
MAPNO: K11-25 AUTHOR: MJO(1992)
GSCNO: C-142539 FIELDNO: GGAI-86-67B1 (287.5 m Irwin section A)
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts, conularids
TAXA:
Hindeodus sp.
Pseudopolygnathus sp.
Siphonodella? sp.
ramiform elements
CAI: 5
AGE: Early Carboniferous (Mississippian), Tournaisian

UNIT: Tay Formation
MAPNO: K11-26 AUTHOR: MJO(1992)
GSCNO: C-142542 FIELDNO: GGAI-86-69A1 (364.5 m Irwin section A)
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts
TAXA:
(*Pseudo*)*polygnathus* sp.
ramiform elements
CAI: 5
AGE: Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian

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UNIT: Tay Formation
MAPNO: K11-27 AUTHOR: MJO(1992)
GSCNO: C-142544 FIELDNO: GGAI-86-69C1 (390 m of Irwin section A)
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts, ichthyoliths, conularids
TAXA:
Polygnathus sp.
Siphonodella sp.
ramiform elements
CAI: 5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Tay Formation
MAPNO: K11-28 AUTHOR: MJO(1992; 2006)
GSCNO: C-142549 FIELDNO: GGAI-86-70B1 (730.5 m Irwin section A)
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts, ichthyoliths
TAXA:
Polygnathus spp. Hinde 1879
Pseudopolygnathus? sp. Branson and Mehl 1934
ramiform elements
CAI: 5
AGE: Late Devonian–Early Carboniferous (Mississippian), Famennian–Tournaisian

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UNIT: Tay Formation
MAPNO: K11-29 AUTHOR: MJO(1992)
GSCNO: C-117357 FIELDNO: GGAI-86-71C1 (931.5 m Irwin section A)
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts
TAXA:
Polygnathus sp. Hinde 1879
CAI: 5
AGE: Middle Devonian–Early Carboniferous (Mississippian), Eifelian–Tournaisian

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UNIT: Tay Formation
MAPNO: K11-32 AUTHOR: EWB(1968)
GSCNO: 80028 FIELDNO: TO-67-326a
UTM: Z:8 597221E 6935294N
L/L: 62.53580N; 133.11037W
FOSS: bivalves, corals
TAXA:
?Michelinia sp.
Lophophyllum ? sp.
orthotetid brachiopod

AGE: Late Tournaisian or early Viséan (tentative)
REMARKS: Poor preservation; locality F4 of Tempelman-Kluit (1972); field number uncertain, could be TO67-326b. Faunal list changed from that reported by Tempelman-Kluit (1972) by EWB (June, 1992).

UNIT: Tay Formation
MAPNO: K11-33 AUTHOR: EWB(1968)
GSCNO: 80029 FIELDNO: TO-67-326b
UTM: Z:8 597111E 6935534N
L/L: 62.53799N; 133.11237W
FOSS: bivalves
TAXA:
spirifirid, orthotetid and chonetid brachiopods

AGE: Carboniferous or Permian
REMARKS: Fossils too poorly preserved for identification; fossil locality F5 of Tempelman-Kluit (1972); field number uncertain, could be TO67-326a.

UNIT: Tay Formation
MAPNO: K11-34 AUTHOR: EWB(1978)
GSCNO: C-076500 FIELDNO: TO-76-3-1(1)
UTM: Z:8 600161E 6935809N
L/L: 62.53964N; 133.05296W
FOSS: bivalves
TAXA:
(?)pelecypods - very poorly preserved
rhynchonellid brachiopod

AGE: Probably Paleozoic
REMARKS: Same location as GSC no. 93483 microfossil collection.

UNIT: Tay Formation
MAPNO: K11-35 AUTHOR: MJO(1992; 2006)
GSCNO: O-093483 FIELDNO: TO-76-3-1(2)
UTM: Z:8 600161E 6935809N
L/L: 62.53964N; 133.05296W
FOSS: conodonts, (?)radiolarian
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Polygnathus spp. Hinde 1879
CAI: 5–6
AGE: Early Carboniferous, Tournaisian
REMARKS: Same location as for GSC no. C-076500 macrofossil collection.

UNIT: Tay Formation
MAPNO: K11-36 AUTHOR: MJO(1992; 2006)
GSCNO: O-087056 FIELDNO: TO-76-3-2(1)
UTM: Z:8 600531E 6936234N
L/L: 62.54335N; 133.04552W
FOSS: conodonts
TAXA:
Polygnathus sp. Hinde 1879
Pseudopolygnathus? sp. Branson and Mehl 1934
Siphonodella sp. Branson and Mehl 1944
ramiform elements
CAI: 5–6
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian
REMARKS: The siphonodellid is a small growth stage that has probably not developed fully diagnostic characteristics. It appears to belong in either *S. cooperi* or *S. quadruplicata*, both of which have the same range, i.e. *S. sandbergi-duplicata* zone through lower *crenulata* zone; same location as GSC no. C-76499 macrofossil collection.

UNIT: Tay Formation
MAPNO: K11-37 AUTHOR: EWB(1978)
GSCNO: C-076499 FIELDNO: TO-76-3-2(2)
UTM: Z:8 600531E 6936234N
L/L: 62.54335N; 133.04552W
TAXA:
Schizophoria sp.
Syringopora sp.
trilobite indet.

AGE: Devonian to Permian
REMARKS: Same location as GSC no. C-087056
microfossil collection

UNIT: Tay Formation
MAPNO: K11-38 AUTHOR: AWN(1960)
GSCNO: 42927 FIELDNO: RD-60-530A
UTM: Z:8 600531E 6936234N
L/L: 62.54335N; 133.04552W
FOSS: bivalves
TAXA:
Camarotoechia - like brachiopod
undetermined spiriferid

AGE: (?)Mississippian

UNIT: Tay Formation
MAPNO: K11-41 AUTHOR: MJO(1992)
GSCNO: C-117361 FIELDNO: GGA-86-62B1
UTM: Z:8 599956E 6936674N
L/L: 62.54746N; 133.05644W
FOSS: conodonts
TAXA:
ramiform elements
CAI: 5
AGE: Ordovician–Triassic

UNIT: Tay Formation
MAPNO: K11-42 AUTHOR: MJO(1992)
GSCNO: C-142522 FIELDNO: GGAI-86-65D1
UTM: Z:8 596881E 6936859N
L/L: 62.54993N; 133.11608W
FOSS: conodonts, ichthyoliths
TAXA:
ramiform elements
CAI: 6
AGE: Ordovician–Triassic

UNIT: Tay Formation
MAPNO: K11-43 AUTHOR: MJO(1992)
GSCNO: C-118123 FIELDNO: GGA-85-25E3
UTM: Z:8 584131E 6947204N
L/L: 62.64587N; 133.35877W
FOSS: conodonts, tubes
TAXA:
bryantodiform element
ramiform elements
CAI: 6
AGE: (?) Devonian–Carboniferous

UNIT: Tay Formation
MAPNO: K11-44 AUTHOR: MJO(1992)
GSCNO: C-118109 FIELDNO: GGA-85-15A2
UTM: Z:8 588031E 6938384N
L/L: 62.56583N; 133.28729W
FOSS: conodonts
TAXA:
ramiform elements
CAI: 5
AGE: Ordovician–Triassic

UNIT: Tay Formation
MAPNO: K13- 3 AUTHOR: MJO(1992)
GSCNO: C-150004 FIELDNO: GGA-86-78G2
UTM: Z:8 559281E 6959484N
L/L: 62.76090N; 133.83909W
FOSS: conodonts
TAXA:
Polygnathus communis carina Hass 1959
Polygnathus spp.
ramiform elements
CAI: 5.5–6
AGE: Early Carboniferous (Mississippian), Tournaisian

UNIT: Tay Formation
MAPNO: K13- 4 AUTHOR: MJO(1992)
GSCNO: C-150005 FIELDNO: GGA-86-78I2
UTM: Z:8 568956E 6960609N
L/L: 62.76931N; 133.64922W
FOSS: conodonts
TAXA:
Polygnathus sp. cf. *inornatus* Branson 1934
CAI: 6
AGE: Early Carboniferous (Mississippian), Tournaisian

UNIT: Tay Formation
MAPNO: K13- 5 AUTHOR: MJO(1992)
GSCNO: C-150006 FIELDNO: GGA-86-79A2
UTM: Z:8 570506E 6961959N
L/L: 62.78113N; 133.61830W
FOSS: conodonts
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Polygnathus communis carina Hass 1959
Polygnathus communis communis Branson and Mehl 1934
ramiform elements
CAI: 4–5
AGE: Early Carboniferous (Mississippian), Tournaisian

UNIT: Tay Formation
MAPNO: L15- 5 AUTHOR: EWB(1983)
GSCNO: C-102625 FIELDNO: DY-82-2416A
UTM: Z:8 520731E 6981684N
L/L: 62.96436N; 134.59121W
FOSS: bivalves
TAXA:
?Unispirifer sp.
orthotetid brachiopods, indet.

AGE: Early Carboniferous, probably middle to late Tournaisian

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UNIT: Tay Formation
MAPNO: L15- 6 AUTHOR: MJO(1992; 2006)
GSCNO: C-102736 FIELDNO: GGA-82-73E1
UTM: Z:8 519331E 6970716N
L/L: 62.86600N; 134.62009W
FOSS: conodonts
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Gnathodus delicatus Branson and Mehl 1938
Pseudopolygnathus sp. Branson and Mehl 1934
ramiform elements
CAI: 5
AGE: Early Carboniferous (Mississippian), late Tournaisian
REMARKS: Sample from drill core, DDH-8, 75 m (1982), of Anaconda Inc., who submitted sample and supplied co-ordinates (lat. & long.). Their lithological description fits the Mississippian Tay Formation, but the localities stratigraphic position above or below the Kalzas Formation limestone is uncertain. The sampled unit is overlain structurally by a thrust sheet of Cambro-Ordovician phyllite.

UNIT: Tay Formation
MAPNO: L15- 8 AUTHOR: EWB(1985)
GSCNO: C-089947 FIELDNO: TOA-82-3-3(1)
UTM: Z:8 518456E 6980884N
L/L: 62.95730N; 134.63616W
FOSS: bivalves
TAXA:
?*Prospira* sp.
?linoproductid brachiopod, indet.
large orthotetid brachiopod

AGE: Tournaisian
REMARKS: The fauna closely resembles that of the middle Tournaisian (Tn2) Pekisko Formation of western Alberta and northeastern British Columbia. Location is the same as for GSC no. C-089948 microfossil collection.

UNIT: Tay Formation
MAPNO: L15- 9 AUTHOR: MJO(1992)
GSCNO: C-089948 FIELDNO: TOA-82-3-3(2)
UTM: Z:8 518456E 6980884N
L/L: 62.95730N; 134.63616W
FOSS: conodonts, ostracodes, tubes
TAXA:
Siphonodella? sp.
ramiform elements
CAI: 5
AGE: Late Devonian–Early Carboniferous, Famennian–Tournaisian
REMARKS: Location is the same as for GSC no. C-089947 macrofossil collection.

UNIT: Tay Formation
MAPNO: L15-12 AUTHOR: EWB(1987)
GSCNO: C-157787 FIELDNO: GGA-87-26B2
UTM: Z:8 520101E 6982079N
L/L: 62.96794N; 134.60359W
FOSS: bivalves, coral, bryozoa
TAXA:
?Prospira sp.
Rhipidomella sp.
Spirifer sp.
branching bryozoan
orthotetid brachiopod
solitary coral, indet.

AGE: Middle to late Tournaisian (Early Carboniferous, Tn2 to Tn3)

UNIT: Tay Formation
MAPNO: L15-13 AUTHOR: MJO(1992)
GSCNO: C-157761 FIELDNO: GGA-87-26B4
UTM: Z:8 520101E 6982079N
L/L: 62.96794N; 134.60359W
FOSS: conodonts, tubular spines, ichthyoliths
TAXA:
Bispathodus? sp.
Polygnathus? sp.
ramiform elements
CAI: 5
AGE: Middle Devonian–Early Carboniferous

UNIT: Tay Formation
MAPNO: L16- 2 AUTHOR: MJO(1992)
GSCNO: C-102599 FIELDNO: GGA-82-57A1
UTM: Z:8 527381E 6975494N
L/L: 62.90837N; 134.46111W
FOSS: conodonts
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Hindeodus? sp.
Polygnathus sp.
Siphonodella sp.
ramiform elements
CAI: 5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian
REMARKS: Collection from a small limestone pod (?)beneath the Crystal Peak Formation

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UNIT: (?) Tay Formation
MAPNO: G16- 2 AUTHOR: MJO(1992)
GSCNO: C-087598 FIELDNO: GGAA-80-70B-2
UTM: Z:9 440173E 6861420N
L/L: 61.88075N; 130.13783W
FOSS: conodonts, foraminifers
TAXA:
Gnathodus bilineatus (Roundy 1926)
Gnathodus sp. cf. *G. girtyi* Hass 1953
Lochreia commutata (Branson and Mehl 1941)
ramiform elements
CAI: 4.5–5
AGE: Early Carboniferous, late Visean–early Namurian

UNIT: (?) Tay Formation
MAPNO: J15- 3 AUTHOR: MJO(1992)
GSCNO: C-108153 FIELDNO: TOA-83-7-2
UTM: Z:9 419868E 6986520N
L/L: 62.99950N; 130.58209W
FOSS: conodonts
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
'*Hindeodella*' *segaformis* Bischoff 1957
Scaliognathus? sp.
ramiform elements
CAI: 4.5–5.5
AGE: Early Carboniferous (Mississippian), late Tournaisian
REMARKS: *Scaliognathus?* is a remarkable homeomorph of *'Gondolella'* sp.

UNIT: (?) Tay Formation
MAPNO: L14- 1 AUTHOR: EWB(1983)
GSCNO: C-102624 FIELDNO: DY-82-2381A(1)
UTM: Z:8 486681E 6980334N
L/L: 62.95259N; 135.26252W
FOSS: bivalves, crinoids
TAXA:
echinoderm columnals
spiriferid brachiopods

AGE: Probably Carboniferous or Permian
REMARKS: Poor preservation; same location as GSC no. C-081691 microfossil collection; geology of surrounding area poorly understood.

UNIT: (?) Tay Formation
MAPNO: L14- 2 AUTHOR: MJO(1992)
GSCNO: C-081691 FIELDNO: DY-82-2381A(2)
UTM: Z:8 486681E 6980334N
L/L: 62.95259N; 135.26252W
FOSS: conodonts, microgastropods
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
ramiform elements
CAI: 5–6
AGE: Early Carboniferous
REMARKS: Same location as GSC no. 102624 macrofossil collection; geology of surrounding area poorly understood.

UNIT: (?) Tay Formation
MAPNO: L14- 3 AUTHOR: EWB(1983)
GSCNO: C-102623 FIELDNO: DY-82-2379
UTM: Z:8 486681E 6980334N
L/L: 62.95259N; 135.26252W
FOSS: bivalves
TAXA:
spiriferid brachiopods

AGE: Carboniferous, possibly the same age as collection C-102625
REMARKS: Geology of surrounding area poorly understood.

UNIT: (?) Tay Formation
MAPNO: L14- 6 AUTHOR: MJO(1992)
GSCNO: C-081689 FIELDNO: DY-82-2382
UTM: Z:8 486681E 6980359N
L/L: 62.95282N; 135.26252W
FOSS: conodonts
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Polygnathus sp. cf. *P. communis* Branson and Mehl 1934
ramiform elements
CAI: 6–7
AGE: Early Carboniferous, Tournaisian
REMARKS: Location is approximate; geology of surrounding area poorly understood.

UNIT: (?) Tay Formation
MAPNO: L14- 7 AUTHOR: MJO(1992)
GSCNO: C-081686 FIELDNO: DY-82-2383
UTM: Z:8 486681E 6980359N
L/L: 62.95282N; 135.26252W
FOSS: conodonts
TAXA:
carminate element
ramiform element
CAI: 6
AGE: Ordovician–Triassic
REMARKS: Location is approximate; geology of surrounding area poorly understood.

UNIT: Kalzas Formation
MAPNO: L15- 4 AUTHOR: MJO(1992)
GSCNO: C-081699 FIELDNO: DY-82-2418
UTM: Z:8 522631E 6975284N
L/L: 62.90681N; 134.55462W
FOSS: conodonts
TAXA:
Doliognathus? sp.
ramiform elements
CAI: 5
AGE: Early Carboniferous

UNIT: Kalzas Formation
MAPNO: L15-10 AUTHOR: MJO(1992)
GSCNO: C-102600 FIELDNO: GGA-82-59A1
UTM: Z:8 518861E 6976244N
L/L: 62.91564N; 134.62870W
FOSS: conodonts
TAXA:
Gnathodus sp.
Pseudopolygnathus sp.
Staurognathus sp.
ramiform elements
CAI: 5.5–6
AGE: Early Carboniferous (Mississippian), late Tournaisian
REMARKS: Collection from top of the Kalzas Formation.

UNIT: Kalzas Formation
MAPNO: L15-15 AUTHOR: MJO(1992)
GSCNO: C-081685 FIELDNO: DY-82-2367
UTM: Z:8 513444E 6972599N
L/L: 62.88316N; 134.73563W
FOSS: conodonts, sponge spicules
TAXA:
ligonodiniform element
CAI: 5.5
AGE: Ordovician–Triassic

UNIT: Kalzas Formation
MAPNO: L16- 1 AUTHOR: MJO(1992; 2006)
GSCNO: C-103834 FIELDNO: GGA-83-34A1
UTM: Z:8 538321E 6960574N
L/L: 62.77348N; 134.24925W
FOSS: (?)conodonts, foraminifers
TAXA:
Gnathodus n. sp. Pander 1856
ramiform elements
CAI: 5
AGE: Early Carboniferous (Mississippian)
REMARKS: Collection from top of the Kalzas Formation.

UNIT: Kalzas Formation
MAPNO: L16- 4 AUTHOR: EWB(1987)
GSCNO: C-150026 FIELDNO: GGAI-86-77A2 (8.5 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: corals, bivalves, gastropod, foraminifera
TAXA:
Koninckophyllum? sp.
endothyrid foraminifers, not studied
platyceratid gastropod, indet.
rhynchonellid brachiopod, indet.

AGE: Carboniferous, Viséan or Serpukhovian
REMARKS: Fossils collected 8.5–8.6 m above base of the Kalzas Formation.

UNIT: Kalzas Formation
MAPNO: L16- 5 AUTHOR: EWB(1987)
GSCNO: C-150029 FIELDNO: GGAI-86-77C2 (17 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: bivalve
TAXA:
spiriferid brachiopod, indet.

AGE: Probably Early Carboniferous, but insufficient material for definite age determination
REMARKS: Fossils collected from 17.0–17.1 m above the base of the Kalzas Formation.

UNIT: Kalzas Formation
MAPNO: L16- 6 AUTHOR: MJO(1992)
GSCNO: C-150030 FIELDNO: GGAI-86-77D2 (21.5 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: conodonts
TAXA:
Pseudopolygnathus sp.
Siphonodella sp.
ramiform elements
CAI: ~5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Kalzas Formation
MAPNO: L16- 7 AUTHOR: MJO(1992)
GSCNO: C-150033 FIELDNO: GGAI-86-77G1 (30.0 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: conodonts, ichthyoliths
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Pseudopolygnathus sp.
Siphonodella sp.
ramiform elements
CAI: ~5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Kalzas Formation
MAPNO: L16- 8 AUTHOR: MJO(1992)
GSCNO: C-150027 FIELDNO: GGAI-86-77B1 (15 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: conodonts
TAXA:
Polygnathus sp.
Siphonodella sp.
ramiform elements
CAI: ~5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Kalzas Formation
MAPNO: L16- 9 AUTHOR: MJO(1992)
GSCNO: C-150023 FIELDNO: GGAI-86-76C1 (4.13 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: conodonts, ichthyoliths
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Siphonodella sp.
ramiform elements
CAI: ~5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Kalzas Formation
MAPNO: L16-10 AUTHOR: MJO(1992)
GSCNO: C-150035 FIELDNO: GGAI-86-78B1 (43.5 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: conodonts, ichthyoliths
TAXA:
Siphonodella sp.
ramiform elements
CAI: ~5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Kalzas Formation
MAPNO: L16-11 AUTHOR: MJO(1992)
GSCNO: C-150024 FIELDNO: GGAI-86-76D1 (5 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: conularids
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Siphonodella sp.
ramiform elements
CAI: 4.5–5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Kalzas Formation
MAPNO: L16-12 AUTHOR: MJO(1992)
GSCNO: C-150022 FIELDNO: GGAI-86-76B1 (2.25 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: conodonts, ichthyoliths
TAXA:
(*Pseudo*)*polygnathus* sp.
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Siphonodella sp.
ramiform elements
CAI: 5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Kalzas Formation
MAPNO: L16-13 AUTHOR: MJO(1992)
GSCNO: C-150021 FIELDNO: GGAI-86-76A2 (0 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: conodonts, ichthyoliths, conularids, tubular spines
TAXA:
Pseudopolygnathus? sp.
Siphonodella sp.
ramiform elements
CAI: 4–5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Kalzas Formation
MAPNO: L16-14 AUTHOR: MJO(1992)
GSCNO: C-150028 FIELDNO: GGAI-86-77C1 (17 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: conodonts
TAXA:
Bispathodus ex gr. *stabilis* (Branson and Mehl 1934)
Polygnathus sp.
Siphonodella spp.
ramiform elements
CAI: ~5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Kalzas Formation
MAPNO: L16-15 AUTHOR: MJO(1992)
GSCNO: C-150031 FIELDNO: GGAI-86-77E1 (24 m Irwin section B)
UTM: Z:8 529756E 6961184N
L/L: 62.77975N; 134.41692W
FOSS: conodonts, ichthyoliths, tubular spines
TAXA:
Hindeodus sp.
Polygnathus sp.
Siphonodella spp.
ramiform elements
CAI: ~5
AGE: Early Carboniferous (Mississippian), early–middle Tournaisian

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UNIT: Mount Christie Formation
MAPNO: J02- 6 AUTHOR: MJO(1992; 2006)
GSCNO: C-142791 FIELDNO: GGA-86-25H3
UTM: Z:9 402443E 6881495N
L/L: 62.05306N; 130.86602W
FOSS: conodonts
TAXA:
Idiognathoides sp. Harris and Hollingsworth 1933
ramiform elements
CAI: -
AGE: Late Carboniferous (Pennsylvanian), Bashkirian–Moscovian

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UNIT: Mount Christie Formation
MAPNO: J16-15 AUTHOR: MJO(1992)
GSCNO: C-150040 FIELDNO: GGAT-86-51D3
UTM: Z:9 447168E 6975940N
L/L: 62.90956N; 130.03985W
FOSS: conodonts
TAXA:
Neogondolella? sp.
CAI: ~6
AGE: (?)Permian

UNIT: Mount Christie Formation
MAPNO: K08- 1 AUTHOR: MJO(1992)
GSCNO: C-150042 FIELDNO: GGA-86-93B2
UTM: Z:8 644441E 6916914N
L/L: 62.35562N; 132.20909W
FOSS: radiolarians
TAXA:
radiolarians
CAI: -
AGE: Phanerozoic

UNIT: Mount Christie Formation
MAPNO: K10- 2 AUTHOR: MJO(1992)
GSCNO: C-118131 FIELDNO: GGA-85-32F1
UTM: Z:8 619681E 6936594N
L/L: 62.54088N; 132.67330W
FOSS: conodonts
TAXA:
Neogondolella serrata (Clark and Ethington 1962)
Neogondolella sp. indet.
CAI: 7
AGE: Late Permian, Guadalupian

UNIT: Mount Christie Formation
MAPNO: K10- 4 AUTHOR: MJO(1992)
GSCNO: C-117372 FIELDNO: GGA-86-67A2
UTM: Z:8 604121E 6934684N
L/L: 62.52846N; 132.97672W
FOSS: conodonts
TAXA:
Idiognathoides sp. Harris and Hollingsworth 1933
Neogondolella clarki (Koike)
ramiform elements
CAI: 6–7
AGE: Late Carboniferous (Pennsylvanian), Bashkirian–Moscovian

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UNIT: Mount Christie Formation
MAPNO: K11-15 AUTHOR: MJO(1992; 2006)
GSCNO: C-118137 FIELDNO: GGA-85-33G1
UTM: Z:8 600201E 6939083N
L/L: 62.56900N; 133.05026W
FOSS: conodonts, spumellarian radiolarians
TAXA:
Declinognathodus? sp. Dunn 1966
gnathodid indet.
CAI: -
AGE: Late Carboniferous (Pennsylvanian), probably late Namurian–Bashkirian

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UNIT: Mount Christie Formation
MAPNO: K12- 1 AUTHOR: MJO(1992)
GSCNO: C-103813 FIELDNO: GGA-83-2B2
UTM: Z:8 567901E 6953834N
L/L: 62.70871N; 133.67261W
FOSS: conodonts
TAXA:
Neogondolella sp. cf. *dentiseperata* Reshetkova and Chernikh 1986
ramiform elements
CAI: 5.5
AGE: Late Carboniferous–Early Permian, probably Asselian-Sakmarian

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UNIT: Mount Christie Formation
MAPNO: K12- 2 AUTHOR: MJO(1992)
GSCNO: C-103779 FIELDNO: GGA-83-2D1
UTM: Z:8 567081E 6954484N
L/L: 62.71469N; 133.68838W
FOSS: conodonts
TAXA:
Neogondolella sp.
Sweetognathus sp. cf. *S. inornatus* Ritter 1986
ramiform elements
CAI: 5–6
AGE: Early Permian

UNIT: Mount Christie Formation
MAPNO: K13- 6 AUTHOR: MJO(1992)
GSCNO: C-150003 FIELDNO: GGA-86-78F2
UTM: Z:8 556456E 6959884N
L/L: 62.76494N; 133.89426W
FOSS: conodonts
TAXA:
gnathodid indet.
ramiform elements
CAI: 6
AGE: Carboniferous–Early Permian

UNIT: Mount Christie Formation
MAPNO: L15- 3 AUTHOR: MJO(1992)
GSCNO: C-103768 FIELDNO: GGA-82-55B2
UTM: Z:8 516806E 6974859N
L/L: 62.90331N; 134.66930W
FOSS: conodonts
TAXA:
Neogondolella sp.
ramiform elements
CAI: 5–6
AGE: Probably Permian

UNIT: Mount Christie Formation
MAPNO: L15-11 AUTHOR: MJO(1992)
GSCNO: C-103769 FIELDNO: GGA-82-59A3
UTM: Z:8 518861E 6976244N
L/L: 62.91564N; 134.62870W
FOSS: conodonts
TAXA:
ramiform elements
CAI: 5–6
AGE: Carboniferous–Permian

UNIT: Jones Lake Formation
MAPNO: J02- 1 AUTHOR: MJO(1992; 2006)
GSCNO: C-116324 FIELDNO: MJO-83-CA6935
UTM: Z:9 403063E 6882375N
L/L: 62.06112N; 130.85465W
FOSS: conodonts, ichthyoliths
TAXA:
Epigondolella quadrata Orchard 1991
Epigondolella triangularis (Budurov 1972)
Epigondolella aff. *quadrata* Orchard 1991
ramiform elements
CAI: 4–4.5
AGE: Late Triassic, Early Norian
REMARKS: Collected by Cyprus-Anvil Mining Corporation

UNIT: Jones Lake Formation
MAPNO: J02- 7 AUTHOR: MJO(1992; 2006)
GSCNO: C-142792 FIELDNO: GGA-86-25J2
UTM: Z:9 399993E 6881970N
L/L: 62.05668N; 130.91312W
FOSS: conodonts, ichthyoliths
TAXA:
Metapolygnathus polygnathiformis? (Budurov and Stefanov 1965)
Neogondolella inclinata (Kovacs 1983)
ramiform elements
CAI: 4.5
AGE: Late Triassic, Early Carnian

UNIT: Jones Lake Formation
MAPNO: J02- 8 AUTHOR: MJO(1992; 2006)
GSCNO: C-142794 FIELDNO: GGA-86-26B2
UTM: Z:9 405468E 6881070N
L/L: 62.05002N; 130.80796W
FOSS: conodonts
TAXA:
Metapolygnathus polygnathiformis? (Budurov and Stefanov 1965)
Neogondolella inclinata (Kovacs 1983)
ramiform elements
CAI: 4.5
AGE: Late Triassic, Early Carnian

UNIT: Jones Lake Formation
MAPNO: J02-10 AUTHOR: MJO(1992; 2006)
GSCNO: C-157754 FIELDNO: GGA-87-16F1
UTM: Z:9 404768E 6883075N
L/L: 62.06783N; 130.82242W
FOSS: conodonts, ichthyoliths
TAXA:
Epigondolella? sp. indet. Mosher 1968
CAI: ~3
AGE: Late Triassic, Norian

UNIT: Jones Lake Formation
MAPNO: J03- 4 AUTHOR: MJO(1992; 2006)
GSCNO: C-142767 FIELDNO: GGAI-86-28C2
UTM: Z:9 372893E 6893095N
L/L: 62.14831N; 131.43904W
FOSS: conodonts, ichthyoliths
TAXA:
Epigondolella elongata Orchard 1991
Epigondolella multidentata? Mosher 1970
Epigondolella postera (Kozur and Mostler 1971)
Epigondolella tozeri Orchard 1991
Epigondolella triangularis (Budurov 1972)
Neogondolella steinbergensis (Mosher 1968)
ramiform elements
CAI: 3.5–4
AGE: Late Triassic, Middle Norian
REMARKS: Fauna is a mixture of both Early and Middle Norian species.

UNIT: Jones Lake Formation
MAPNO: J05- 1 AUTHOR: MJO(1992; 2006)
GSCNO: C-142978 FIELDNO: GGA-86-44C3
UTM: Z:9 349068E 6910585N
L/L: 62.29630N; 131.91065W
FOSS: conodonts, microgastropods, ichthyoliths
TAXA:
Epigondolella postera (Kozur and Mostler 1971)
Norigondolella steinbergensis (Mosher 1968)
ramiform elements
CAI: 4.5
AGE: Late Triassic, Middle Norian
REMARKS: Some neogondolellids appear older, and epigondolellids may be mixed too.

UNIT: Jones Lake Formation
MAPNO: J05- 3 AUTHOR: MJO(1992; 2006)
GSCNO: C-142504 FIELDNO: GGA-86-59A7
UTM: Z:9 350643E 6908295N
L/L: 62.27641N; 131.87836W
FOSS: conodonts
TAXA:
Epigondolella mosheri? Kozur and Mostler 1971
Epigondolella ex. gr. *bidentata* Mosher 1968
Parvigondolella sp. Kozur and Mock 1972
CAI: 4.5–5
AGE: Late Triassic, (?)Rhaetian

UNIT: Jones Lake Formation
MAPNO: J05- 4 AUTHOR: MJO(1992; 2006)
GSCNO: C-087596 FIELDNO: WBT-80-12A-71m
UTM: Z:9 348813E 6907275N
L/L: 62.26653N; 131.91269W
FOSS: conodonts, microgastropods
TAXA:
Epigondolella sp. indet. Mosher 1968
Metapolygnathus nodosus? (Hayashi 1968)
CAI: 4.5
AGE: Late Triassic, Late Carnian–Norian

UNIT: Jones Lake Formation
MAPNO: J05- 5 AUTHOR: MJO(1992; 2006)
GSCNO: C-087594 FIELDNO: WBT-80-3A-2C
UTM: Z:9 348883E 6906435N
L/L: 62.25903N; 131.91061W
FOSS: conodonts
TAXA:
Epigondolella quadrata Orchard 1991
Epigondolella triangularis (Budurov 1972)
Epigondolella aff. *quadrata* Orchard 1991
ramiform elements
CAI: 4.5
AGE: Late Triassic, Early Norian, *triangularis* Zone

UNIT: Jones Lake Formation
MAPNO: J05- 6 AUTHOR: MJO(1992; 2006)
GSCNO: C-087595 FIELDNO: WBT-80-8A-C
UTM: Z:9 348893E 6907705N
L/L: 62.27042N; 131.91152W
FOSS: conodonts, ichthyoliths, shell fragments, microgastropods, echinoderms, (?)bryozoans
TAXA:
Epigondolella elongata Orchard 1991
Epigondolella ex gr. *bidentata* Mosher 1968
CAI: 4.5–5
AGE: Late Triassic, Middle Norian
REMARKS: Shelly fauna phosphatized.

UNIT: Jones Lake Formation
MAPNO: J14-13 AUTHOR: MJO(1992; 2006)
GSCNO: C-103765 FIELDNO: GGA-83-53I
UTM: Z:9 395933E 6961095N
L/L: 62.76538N; 131.03844W
FOSS: conodonts
TAXA:
Epigodolella? sp. indet. Mosher 1968
ramiform elements
CAI: 3–4
AGE: Late Triassic, Norian
REMARKS: Platform fragment could be Paleozoic, but CAI is low.

UNIT: Jones Lake Formation
MAPNO: K10- 3 AUTHOR: MJO(1992; 2006)
GSCNO: C-118136 FIELDNO: GGA-85-33F1
UTM: Z:8 603331E 6940383N
L/L: 62.57980N; 132.98861W
FOSS: conodonts
TAXA:
Epigondolella elongata Orchard 1991
Epigondolella tozeri ? Orchard 1991
Epigondolella ex gr. *bidentata* Mosher 1968
Norigondolella steinbergensis (Mosher 1968)
ramiform elements
CAI: 3–4
AGE: Late Triassic, Middle Norian
REMARKS: Poorly preserved, but clearly Middle Norian morphotypes.

UNIT: Jones Lake Formation
MAPNO: K10- 5 AUTHOR: MJO(1992; 2006)
GSCNO: C-117369 FIELDNO: GGA-86-67E2
UTM: Z:8 604881E 6935604N
L/L: 62.53649N; 132.96140W
FOSS: conodonts, ichthyoliths
TAXA:
Metapolygnathus polygnathiformis (Budurov and Stefanov 1965)
Metapolygnathus carpathicus (Mock 1979)
Metapolygnathus ex gr. *nodosus* (Hayashi 1968)
Metapolygnathus n. sp. C
CAI: 4.5
AGE: Late Triassic, Late Carnian

UNIT: Jones Lake Formation
MAPNO: K10- 6 AUTHOR: MJO(1992; 2006)
GSCNO: C-142820 FIELDNO: GGAG-86-16A2
UTM: Z:8 608731E 6942184N
L/L: 62.59440N; 132.88243W
FOSS: conodonts, microgastropods, ichthyoliths
TAXA:
Epigondolella elongata Orchard 1991
Epigondolella mathewi Orchard 1991
Epigondolella multidentata Mosher 1970
Epigondolella tozeri Orchard 1991
Norigondolella steinbergensis (Mosher 1968)
ramiform elements
CAI: 2.5
AGE: Late Triassic, Middle Norian

UNIT: Jones Lake Formation
MAPNO: K11- 1 AUTHOR: ETT(1960)
GSCNO: 42893 FIELDNO: GC-60-698c
UTM: Z:8 583291E 6956114N
L/L: 62.72600N; 133.37076W
FOSS: bivalves
TAXA:
Monotis subcircularis Gabb

AGE: Upper Triassic, Norian, *Monotis subcircularis* zone

UNIT: Jones Lake Formation
MAPNO: K11- 2 AUTHOR: MJO(1992; 2006)
GSCNO: O-086346 FIELDNO: GC-60-698
UTM: Z:8 585131E 6954459N
L/L: 62.71073N; 133.33562W
FOSS: conodonts
TAXA:
Epigondolella tozeri? Orchard 1991
Norigondolella steinbergensis (Mosher 1968)
ramiform elements
CAI: 3–4
AGE: Late Triassic, Middle Norian
REMARKS: The specimen referred to as *Gondolella* sp. A approaches *Polygnathus tethydis* Huckriede as figured by Lindstrom (1964). It is characterized by having the platform ornamented with minute shallow pits, a development which according to Lindstrom is characteristic of the Triassic. On the other hand *Polygnathus tethydis* is fairly commonly represented in the Middle and Upper Triassic.

UNIT: Jones Lake Formation
MAPNO: K11-16 AUTHOR: MJO(1992; 2006)
GSCNO: C-118140 FIELDNO: GGA-85-35C1
UTM: Z:8 596521E 6939494N
L/L: 62.57367N; 133.12159W
FOSS: conodonts
TAXA:
Norigondolella steinbergensis (Mosher 1968)
CAI: 4.5
AGE: Late Triassic, Middle Norian–Rhaetian

UNIT: Jones Lake Formation
MAPNO: K11-17 AUTHOR: MJO(1992; 2006)
GSCNO: C-118141 FIELDNO: GGA-85-35D1
UTM: Z:8 597241E 6938959N
L/L: 62.56868N; 133.10789W
FOSS: conodonts, ichthyoliths
TAXA:
Metapolygnathus carpathicus (Modk 1979)
Metapolygnathus nodosus (Hayashi 1968)
Metapolygnathus polygnathiformis (Budurov and Stefanov 1965)
CAI: 5
AGE: Late Triassic, Late Carnian

UNIT: Jones Lake Formation
MAPNO: K11-18 AUTHOR: MJO(1992; 2006)
GSCNO: C-118142 FIELDNO: GGA-85-36A1
UTM: Z:8 579801E 6955159N
L/L: 62.71821N; 133.43945W
FOSS: conodonts, ichthyoliths
TAXA:
Epigondolella quadrata Orchard 1991
Epigondolella triangularis (Budurov 1972)
Epigondolella aff. *quadrata* Orchard 1991
Epigondolella n. sp. A
ramiform elements
CAI: 3–4
AGE: Late Triassic, Early Norian
REMARKS: Association suggests derivation of Lower Norian conodonts.

UNIT: Jones Lake Formation
MAPNO: K11-30 AUTHOR: BSN(1960)
GSCNO: 42928 FIELDNO: RD-60-533a
UTM: Z:8 601731E 6940304N
L/L: 62.57954N; 133.01978W
FOSS: bivalves
TAXA:
indeterminable large pelecypods

AGE: Probably Mississippian–Triassic

UNIT: Jones Lake Formation
MAPNO: K11-31 AUTHOR: MJO(1992; 2006)
GSCNO: O-093484 FIELDNO: TO-76-3-3
UTM: Z:8 600931E 6936709N
L/L: 62.54750N; 133.03747W
FOSS: conodonts, ichthyoliths
TAXA:
Metapolygnathus carpathicus (Mock 1979)
Metapolygnathus nodosus? (Hayashi 1968)
Metapolygnathus polygnathiformis (Budurov and Stefanov 1965)
Neogondolella? *inclinata? (Kovacs 1983)*
ramiform elements
CAI: 5
AGE: Middle–Late Triassic, Late Carnian

UNIT: Jones Lake Formation
MAPNO: K11-39 AUTHOR: MJO(1992; 2006)
GSCNO: O-093485 FIELDNO: TO-76-3-4
UTM: Z:8 601221E 6937774N
L/L: 62.55698N; 133.03120W
FOSS: conodonts
TAXA:
Epigondolella ex. gr. *bidentata* Mosher 1968
Metapolygnathus polygnathiformis (Budurov and Stefanov 1965)
Norigondolella steinbergensis? (Mosher 1968)
Parvigondolella sp. Kozer and Mock 1972
CAI: 4.5–5.5
AGE: Late Triassic, Late Norian–Rhaetian
REMARKS: Metapolygnathid is older than other elements ((?) composite sample (?)reworking).

UNIT: Jones Lake Formation
MAPNO: K11-40 AUTHOR: ETT(1976)
GSCNO: 94368 FIELDNO: TO-76-3-8
UTM: Z:8 601581E 6941184N
L/L: 62.58747N; 133.02218W
TAXA:
Monotis sp., *M. subcircularis* Gabb or *M. ochotica* Keyserling

AGE: Upper Norian (*Suessi* Zone)

UNIT: Jones Lake Formation
MAPNO: L15- 7 AUTHOR: MJO(1992; 2006)
GSCNO: C-102651 FIELDNO: GGA-82-59C1
UTM: Z:8 519331E 6976734N
L/L: 62.92001N; 134.61940W
FOSS: conodonts, ichthyoliths
TAXA:
Metapolygnathus tadpole (Hayashi 1968)
Metapolygnathus ex gr. *polygnathiformis* (Budurov and Stefanov 1965)
Mosherella sp. Kozur 1980
Neogondolella? *inclinata*? (Kovacs 1983)
ramiform elements
CAI: 5
AGE: Late Triassic, Early Carnian

UNIT: Jones Lake Formation
MAPNO: L15-14 AUTHOR: MJO(1992; 2006)
GSCNO: C-176041 FIELDNO: GGA-91-23-1A
UTM: Z:8 519806E 6976234N
L/L: 62.91550N; 134.61010W
FOSS: conodonts
TAXA:
Neogondolella ? *praeszaboi* Kovacs
ramiform elements
CAI: 5
AGE: Middle Triassic, Anisian

UNIT: Jones Lake Formation
MAPNO: L16- 3 AUTHOR: MJO(1992; 2006)
GSCNO: C-103835 FIELDNO: GGA-83-34B2
UTM: Z:8 538571E 6958984N
L/L: 62.75918N; 134.24472W
FOSS: conodonts
TAXA:
Metapolygnathus carpathicus (Mock 1979)
Metapolygnathus n. sp. C
CAI: 5
AGE: Late Triassic, Late Carnian

UNIT: Big Timber Formation
MAPNO: J12- 1 AUTHOR: DJM(1987)
GSCNO: C-118095 FIELDNO: GGA-85-48A2
UTM: Z:9 361368E 6933520N
L/L: 62.50671N; 131.69218W
FOSS: palynomorphs
TAXA:
Cicatricosisporites ?*australiensis* (Cookson) Pocock
Cicatricosisporites ?*exilioides* (Malyavkina) Dorhofer
Cicatricosisporites ?*hughesii* Dettmann
Cicatricosisporites ?*minutaestriatus* (Bolkhovitina) Pocock
dinoflagellate? fragments

AGE: Early Cretaceous
REMARKS: Strongly carbonized.

UNIT: Black shale unit
MAPNO: K04- 6 AUTHOR: BSN(1986)
GSCNO: C-117373 FIELDNO: GGAI-86-54B2
UTM: Z:8 575556E 6879184N
L/L: 62.03737N; 133.55561W
FOSS: graptolites
TAXA:
Glyptograptus? sp.

AGE: Probably early Middle Ordovician to Early Silurian

UNIT: Platy siltstone unit
MAPNO: K04- 7 AUTHOR: BSN(1992)
GSCNO: 42929 FIELDNO: RD-60-536 B
UTM: Z:8 558761E 6897864N
L/L: 62.20800N; 133.87037W
FOSS: corals, stromatoporoids, bivalves
TAXA:
Atrypoidea? sp.
Coenites sp.
Pentamerus sp.
Ptychopleurella sp.
Spinatrypa sp.
Thamnopora sp.
phaceloid and solitary rugose corals

AGE: Early Silurian, Telychian to Wenlock

UNIT: Platy siltstone unit
MAPNO: K04- 8 AUTHOR: BSN(1992)
GSCNO: 42958 FIELDNO: RD-60-514
UTM: Z:8 568361E 6890574N
L/L: 62.14095N; 133.68870W
FOSS: bivalve, graptolites
TAXA:
Monograptus? sp.
coarsely ribbed brachiopod

AGE: Probably Silurian

UNIT: Dolostone unit
MAPNO: K04- 1 AUTHOR: MJO(1992)
GSCNO: C-142965 FIELDNO: GGA-86-42E2
UTM: Z:8 577606E 6876634N
L/L: 62.01407N; 133.51755W
FOSS: conodonts, ichthyoliths, sphaeromorphs, echinoderms
TAXA:
Icriodus sp. Branson and Mehl 1938
CAI: 5
AGE: Middle–Late Devonian, Eifelian–Frasnian

UNIT: Dolostone unit
MAPNO: K04- 4 AUTHOR: MJO(1992; 2006)
GSCNO: C-142816 FIELDNO: GGAG-86-13C1
UTM: Z:8 559081E 6899034N
L/L: 62.21845N; 133.86382W
FOSS: conodonts, (?)scolecodonts
TAXA:
Apatognathus? sp. Branson and Mehl 1934
Icriodus sp. Branson and Mehl 1938
Pelekysgnathus sp. Thomas 1949
Polygnathus sp. Hinde 1879
drepanodiform element
ramiform elements
CAI: 5
AGE: Late Devonian, (?) late Famennian
REMARKS: Polygnathid has rostral ridges.

UNIT: Dolostone unit
MAPNO: K04- 5 AUTHOR: MJO(1992)
GSCNO: C-142825 FIELDNO: GGAI-86-15A2
UTM: Z:8 571281E 6888309N
L/L: 62.12009N; 133.63363W
FOSS: conodonts
TAXA:
Pandorinellina sp. aff. *P. insita* (Stauffer 1940)
ramiform elements
CAI: 4.5–5.5
AGE: Devonian
REMARKS: Low-diversity fauna indicative of restricted environment.

UNIT: Dolostone unit
MAPNO: K04- 9 AUTHOR: BSN(1992)
GSCNO: 42921 FIELDNO: RD-60-(F)504A
UTM: Z:8 564187E 6895162N
L/L: 62.18286N; 133.76707W
FOSS: corals, bivalve
TAXA:
Alveolites? sp.
Favosites sp.
Thamnopora sp.
undetermined brachiopod

AGE: Probably Devonian

UNIT: Dolostone unit
MAPNO: K05- 5 AUTHOR: BSN(1992)
GSCNO: 42939 FIELDNO: RD-60-444A
UTM: Z:8 555801E 6907034N
L/L: 62.29075N; 133.92433W
FOSS: bivalves, crinoids
TAXA:
echinoderm debris
indeterminate brachiopod
solitary coral

AGE: Late Middle Ordovician or younger

UNIT: Black slate unit
MAPNO: F15- 2 AUTHOR: MJO(1992)
GSCNO: C-157790 FIELDNO: GGA-87-37E1
UTM: Z:8 617111E 6871734N
L/L: 61.95996N; 132.76670W
FOSS: conodonts
TAXA:
Belodella sp. Ethington 1959
Panderodus sp. Ethington 1959
Polygnathus ex. gr. *costatus* Klapper 1971
Polygnathus ex. gr. *linguiformis* Hinde 1879
ramiform elements
CAI: 6
AGE: Middle Devonian, (?)Eifelian

UNIT: (?) Black Slate unit
MAPNO: F15- 1 AUTHOR: BSN(1987)
GSCNO: C-157789 FIELDNO: GGA-87-36B1
UTM: Z:8 610941E 6867759N
L/L: 61.92616N; 132.88673W
FOSS: graptolites
TAXA:
Didymograptus sp. (extensiform)
Phyllograptus? sp.
T. cf *T. bigsbyi* (Hall)
T. cf *T. serra* (Brognart)
Tetragraptus sp. (quadribrachiate)

AGE: Early Ordovician, Arenig, *T. fruticosus* Zone to *I. victoriae* Zone

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UNIT: Limestone-phyllite unit
MAPNO: F14- 1 AUTHOR: MJO(1992; 2006)
GSCNO: C-142812 FIELDNO: GGAG-86-10B3
UTM: Z:8 603781E 6875034N
L/L: 61.99344N; 133.01879W
FOSS: conodonts
TAXA:
neoprioniodiniform elements
CAI: -
AGE: (?)Devonian

UNIT: Limestone-phyllite unit
MAPNO: F15-3 AUTHOR: MJO(1994)
GSCNO: O-086354 FIELDNO: 73-TO-F28 (24A)
UTM: Z:8 614487E 6868353N
L/L: 61.93043N; 132.81886W
FOSS: condoonts
TAXA:
Palmatolepis sp.
Polygnathus spp.
CAI: 5–5.5
AGE: Late Devonian

UNIT: Limestone-phyllite unit
MAPNO: F15-4 AUTHOR: MJO(1994)
GSCNO: O-086355 FIELDNO: 73-TO-F28b (24B)
UTM: Z:8 615352E 6868692N
L/L: 61.93321N; 132.80218W
FOSS: conodonts
TAXA:
ramiform elements
Icriodus sp.
Palmatolepis? sp. indet.
Polygnathus sp. indet.
CAI: 5
AGE: Middle–Late Devonian

UNIT: Limestone-phyllite unit
MAPNO: F15-5 AUTHOR: MJO(1994)
GSCNO: O-086356 FIELDNO: 73-TO-44a (191)
UTM: Z:8 615352E 6868692N
L/L: 61.93321N; 132.80218W
FOSS: conodonts
TAXA:
Icriodus sp. (I element)
Palmatolepis proversa Ziegler 1958
Palmatolepis subrecta Miller and Youngquist 1947
Polygnathus sp. (P. element)
O1 element of *Palmatodella* sp.

AGE: Late Devonian, early to late Frasnian

UNIT: Limestone-phyllite unit
MAPNO: F15-6 AUTHOR: MJO(1994)
GSCNO: O-093472a FIELDNO: 76-TOA-13 (195)
UTM: Z:8 616131E 6871506N
L/L: 61.95821N; 132.78552W
FOSS: conodonts
TAXA:
Palmatolepis sp. cf. *P. minuta* Branson and Mehl 1934
Palmatolepis sp. cf. *P. triangularis* Sannemann 1955
Palmatolepis sp. indet.
Polygnathus spp.
ramiform elements
CAI: 5.5–6.5
AGE: Late Devonian, Famennian

UNIT: Shale-limestone unit
MAPNO: K04- 2 AUTHOR: MJO(1992; 2006)
GSCNO: C-142996 FIELDNO: GGA-86-49C2
UTM: Z:8 574231E 6895934N
L/L: 62.18794N; 133.57388W
FOSS: conodonts, microgastropods, ichthyoliths
TAXA:
Budurovignathus mungoensis (Diebel 1956)
Metapolygnathus polygnathiformis (Budurov and Stefanov 1965)
Neogondolella inclinata (Kovacs 1983)
CAI: 5–5.5
AGE: Late Triassic, Late Carnian

UNIT: Shale-limestone unit
MAPNO: K04- 3 AUTHOR: MJO(1992; 2006)
GSCNO: C-157778 FIELDNO: GGA-87-2D2
UTM: Z:8 572391E 6896834N
L/L: 62.19638N; 133.60885W
FOSS: conodonts, microgastropods
TAXA:
Metapolygnathus primitius (Mosher 1970)
Metapolygnathus n. sp. B
Norigondolella navicula? (Huckriede 1958)
CAI: 5
AGE: Late Triassic, Early Norian
REMARKS: (?)Reworked; large phosphate residue.

UNIT: Yukon-Tanana terrane (conglomerate unit)
MAPNO: K03- 1 AUTHOR: MJO(1992)
GSCNO: C-103825 FIELDNO: GGA-83-30J1
UTM: Z:8 594731E 6896984N
L/L: 62.19275N; 133.17968W
FOSS: conodonts
TAXA:
Metapolygnathiformis carpathicus (Mock 1979)
Metapolygnathus ex gr. *polygnathiformis* (Budurov and Stefanov 1965)
Metapolygnathus ex. gr. *nodosus* (Hayashi 1968)
CAI: 5
AGE: Late Triassic, Late Carnian
REMARKS: Clast from polymictic conglomerate.

UNIT: (?) Yukon-Tanana terrane (conglomerate unit)
MAPNO: K03- 2 AUTHOR: MJO(1992; 2006)
GSCNO: C-157777 FIELDNO: GGA-87-20B3
UTM: Z:8 586511E 6902549N
L/L: 62.24467N; 133.33480W
FOSS: conodonts, ichthyoliths
TAXA:
Merrillina? sp.
ramiform elements
CAI: 5
AGE: Late Triassic, (?)Carnian

UNIT: Yukon-Tanana terrane (conglomerate unit)
MAPNO: K05- 3 AUTHOR: MJO(1992; 2006)
GSCNO: O-086347 FIELDNO: TO-68-430b (sample 1)
UTM: Z:8 568006E 6913374N
L/L: 62.34562N; 133.68664W
FOSS: conodonts
TAXA:
Metapolygnathus ex gr. *polygnathiformis* (Budurov and Stefanov 1965)
Neogondolella? *inclinata*? (Kovacs 1983)
CAI: 5
AGE: Late Triassic, (?)Early Carnian
REMARKS: locality F8 of Tempelman-Kluit (1972).

UNIT: Yukon-Tanana Terrane (conglomerate unit)
MAPNO: K05- 4 AUTHOR: MJO(1992; 2006)
GSCNO: O-086348 FIELDNO: TO-68-430b (sample 2)
UTM: Z:8 568006E 6913374N
L/L: 62.34562N; 133.68664W
FOSS: conodonts, ichthyoliths
TAXA:
Epigondolella cf. *mosheri* (Kozur and Mostler 1971)
Norigondolella steinbergensis (Mosher 1968)
CAI: 5
AGE: Late Triassic, Late Norian–Rhaetian

UNIT: Slide Mountain Terrane (limestone unit)
MAPNO: K02- 3 AUTHOR: MJO(1992; 2006)
GSCNO: C-118102 FIELDNO: GGA-85-7B1
UTM: Z:8 617191E 6879794N
L/L: 62.03223N; 132.75987W
FOSS: conodonts
TAXA:
Adetognathus sp. Lane 1967
Hindeodus? sp. Rexroad and Furnish 1964
Mesogondolella spp. Kozur 1988
ramiform elements
CAI: 5.5–6.5
AGE: Late Carboniferous–Early Permian, Asselian–early Artinskian

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UNIT: Slide Mountain Terrane (limestone unit)
MAPNO: K02- 4 AUTHOR: CAR(1972)
GSCNO: 82435 FIELDNO: TO-68-501
UTM: Z:8 617306E 6880224N
L/L: 62.03605N; 132.75739W
FOSS: fusulinids
TAXA:
Schwagerina sp. (very large)

AGE: Permian, could be Wolfcampian to Wordian
REMARKS: Locality F7 of Tempelman-Kluit (1972).

UNIT: Slide Mountain Terrane (limestone unit)
MAPNO: K05- 1 AUTHOR: MJO(1992; 2006)
GSCNO: O-093500 FIELDNO: TO-76-27-1
UTM: Z:8 575116E 6913124N
L/L: 62.34202N; 133.54949W
FOSS: conodonts
TAXA:
Gnathodus sp. indet.
Idiognathoides? sp.
Polygnathus? sp. indet.
Streptognathodus sp.
gnathodid indet.
ramiform elements
CAI: 4–5
AGE: Late Carboniferous (Pennsylvanian)
REMARKS: This fragmented fauna includes only one complete platform conodont, but unfortunately it belongs to a group which is not especially diagnostic. *S. anteeccentrius* occurs in the Morrowan, but the specimen also resembles *S. gracilis* which ranges from mid-Pennsylvanian through Lower Permian. *Polygnathus* and *Gnathodus* may range into the Lower Pennsylvanian, but not higher. The variation in CAI value suggests the fauna is mixed, and includes a reworked component. From the same locality as GSC no. 80025.

UNIT: Slide Mountain Terrane (limestone unit)
MAPNO: K05- 2 AUTHOR: CAR(1972)
GSCNO: 80025 FIELDNO: TO-67-85
UTM: Z:8 575116E 6913124N
L/L: 62.34202N; 133.54949W
FOSS: fusulinids
TAXA:
Pseudofusulinella sp.
Schubertella sp.
Thompsonella sp.
Tricites sp. advanced form

AGE: May be earliest Permian
REMARKS: This collection contains a fusulinacean fauna very similar to that described by Skinner and Wilde (1965), from the lower two or three zones of the McCloud Limestone, Northern California. The lowest McCloud zone generally is considered either latest Pennsylvanian or earliest Permian. Elsewhere the occurence of *Thompsonella* in strata of fairly definite Virgilian age suggest a latest Pennsylvanian age for the lower zone and a Permian age for the higher zones. However, because *Schubertella* sp. occurs in several slides from GSC 80025 and does not occur in the lowest McCloud zone, GSC 80025 may be earliest Permian; locality F6 of Tempelman-Kluit (1972).

UNIT: Limestone - Conglomerate unit
MAPNO: K03- 3 AUTHOR: MJO(1992; 2006)
GSCNO: C-142984 FIELDNO: GGAG-86-37B4
UTM: Z:8 590931E 6881334N
L/L: 62.05327N; 133.26073W
FOSS: conodonts
TAXA:
Icriodus alternatus Branson and Mehl 1934
Palmatolepis delicatula Branson and Mehl 1934
Palmatolepis minuta Branson and Mehl 1934
Palmatolepis sp. cf. *P. triangularis* Sannemann 1955
Palmatolepis sp. indet. Ulrich and Bassier 1926
Pelekygnathus sp. Thomas 1949
Polygnathus sp(p). Hinde 1879
ramiform elements
CAI: 4.5
AGE: Late Devonian, early Famennian
REMARKS: Sample is from clast from conglomerate close to locality C-093424

UNIT: Limestone - Conglomerate unit
MAPNO: K03- 6 AUTHOR: MJO(1992)
GSCNO: C-093424 FIELDNO: TO-75-23-7
UTM: Z:8 590906E 6881384N
L/L: 62.05373N; 133.26118W
FOSS: conodonts
TAXA:
Icriodus sp.
Palmatolepis delicatula Branson and Mehl 1934
Palmatolepis minuta minuta Branson and Mehl 1934
Palmatolepis quadrantinodosalobata Sannemann 1955
Palmatolepis triangularis Sannemann 1955
Palmatolepis cf. *subperlobata* Branson and Mehl 1934
Palmatolepis sp. cf. *P. regularis* Cooper 1931)
Polygnathus sp.
CAI: -
AGE: Late Devonian, early Famennian
REMARKS: Sample from a conglomerate; uncertain if conodonts derived from clasts or matrix; close to locality C-142984.

UNIT: Alluvial clastic unit
MAPNO: K02- 1 AUTHOR: DCM(1961)
GSCNO: 5684 FIELDNO: GC-60-(F)669
UTM: Z:8 611856E 6881764N
L/L: 62.05152N; 132.86052W
TAXA:
fragments of angiosperm leaves

AGE: (?) Late Cretaceous–Tertiary
REMARKS: *Trochodendroides* may be present, but this genus ranges throughout the upper Cretaceous and Tertiary. Apex, margins, finer venation and in most cases the bases are missing from the specimens, and they are therefore not identifiable. There are no spores present. (Note: this report was written in 1960; identification and age range could differ in light of more recent knowledge.)

UNIT: Alluvial clastic unit
MAPNO: K02- 2 AUTHOR: JMW(1992)
GSCNO: C-118097 FIELDNO: GGA-85-1A2
UTM: Z:8 611881E 6882344N
L/L: 62.05671N; 132.85968W
FOSS: palynomorphs
TAXA:
?Erysiphales, microthyraceous fungal fruiting body, rare (72.1x19.0)
Alnus, common
Ctenosporites eskerensis Elsik and Jansonius 1974 emend. Smith 1978, rare (101.0x8.4)
Dicellaesporites common (100.2x14.0)
Inapertisporites, common
Monoporisporites, ?new sp., rare (98.0X16.1)
Multicellaesporites spp. common (103.0x4.0,91.9x11.4)
Pesavis tagluensis Elsik and Jansonius 1974, rare (90.0x11.9,78.1x6.7)
Pistillipollenites mcgregorii Rouse 1962, rare (96.0x4.1)
Pterocarya, common
Sequoiapollenites polyformosus Thiegart 1937, rare (76.0x4.7)
Staphlosporonites spp., rare (96.0x11.6)
Tilia vescipites Wodehouse 1933, common (90.1x16.6)
Ulmus, common (95.9x12.2)
Bisaccates, common
fungal hypha, ?Hyphomycetes, rare (84.0x13.8)
Taxodiaceae-Cupressaceae-Taxaceae, abundant
Tricolporate pollen, common
Triporate pollen, common

AGE: Early to Middle Eocene
REMARKS: The pollen flora of the sample contains a definite Early to Middle Eocene assemblage, including *Ctenosporites eskerensis*, *Pistillipollenites mcgregorii*, *Tilia vescipites,* and *Pesavis tagluensis*, which are characteristic of Early to Middle Eocene palynomorphs for the Arctic and south-central British Columbia (Rouse, 1977, Kalgutkar and Sweet, 1978). Similarly, other abundant fungal material is consistent with an Eocene age.

UNIT: Alluvial clastic unit
MAPNO: K03- 4 AUTHOR: DCM(1961)
GSCNO: 5686 FIELDNO: RD-60-510-I
UTM: Z:8 592651E 6894764N
L/L: 62.17335N; 133.22080W
TAXA:
Sequoia, Metasequoia or Taxodium?

AGE: Late Cretaceous or younger
REMARKS: It is impossible to distinguish Cretaceous from Tertiary from these fragments, but they are probably Late Cretaceous or younger. No spores were present. (Note: this report was written in 1960; identification and age range could differ in light of more recent knowledge.)

UNIT: Alluvial clastic unit
MAPNO: K03- 5 AUTHOR: DCM(1961)
GSCNO: 5687 FIELDNO: RD-60-(F)510
UTM: Z:8 592651E 6894764N
L/L: 62.17335N; 133.22080W
TAXA:
angiosperm leaf (poor impression)
conifer fragment

AGE: Post-Aptian
REMARKS: No spores are present. (Note: this report was written in 1960; identification and age range could differ in light of more recent knowledge.)

UNIT: (?) Alluvial clastic unit
MAPNO: K04-10 AUTHOR: JU(1988)
GSCNO: C-142968 FIELDNO: GGA-86-42G3
UTM: Z:8 577931E 6876884N
L/L: 62.01625N; 133.51123W
FOSS: palynomorphs
TAXA:
amorphous debris of uncertain affinity
mainly (approx. 90%) black, angular, woody, and coaly fragments
rare circular and triangular black bodies, probably thermally altered trilete spores

AGE: Indeterminate
REMARKS: T.A.I. 4

Appendix C

Geochronology

Table C-1. Summary of published potassium and argon ages in Sheldon Lake (NTS 105 J) area. Locations are indicated in Figure B-1. Full data indicated in Table C-3.

Mapno	GSCno	Formation	Lab	Material	Date (Ma)	Standard deviation
J03-1	4018	Selwyn Plutonic Suite	GSC	Biotite	101.9	1.8
J03-2	4016	Selwyn Plutonic Suite	GSC	Biotite	87	1.2
J03-3	4090	South Fork volcanics	GSC	Hornblende	95.52	2.5
J04-1	4023	Selwyn Plutonic Suite	GSC	Biotite	98.36	2
J04-2	3839	South Fork volcanics	GSC	Biotite	99.78	2.5
J04-3	4092	South Fork volcanics	GSC	Hornblende	95.37	1.7
J04-4	4094	South Fork volcanics	GSC	Hornblende	93.71	2.2
J04-5		South Fork volcanics	UBC	Hornblende	94.4	3.3
J04-6		Selwyn Plutonic Suite	UBC	Biotite	104	4
J04-7	4290	South Fork volcanics	GSC	Biotite	95.4	1.6
J04-8	4305	Bimodal volcanic unit (basalt)	GSC	Whole rock	58.3	1.3
J04-9	4302 (231)	South Fork volcanics	GSC	Hornblende	100.3	1.9
J05-1	4021	South Fork volcanics	GSC	Biotite	97.09	1.4
J05-2		South Fork volcanics	UBC	Biotite	95.5	3.3
J05-3	4315 (237)	South Fork volcanics	GSC	Biotite	94.3	0.3
J05-4	3984	Bimodal volcanic unit (rhyolite)	GSC	Whole rock	52.82	0.94
J12-1		Bimodal volcanic unit (rhyolite)	UBC	Whole rock	51.5	1.8
J12-2	3842	South Fork volcanics	GSC	Biotite	100.5	2.4
J12-3	4091	South Fork volcanics	GSC	Hornblende	90.59	1.8
J12-4	3669	South Fork volcanics	GSC	Biotite	94.6	1.5
J12-5	3670	South Fork volcanics	GSC	Hornblende	94.6	1.5
J12-6	3668	South Fork volcanics	GSC	Hornblende	108.8	1.7
J12-7	3990	Bimodal volcanic unit (rhyolite)	GSC	Whole rock	51.94	1.1
J12-8	3987	Bimodal volcanic unit (basalt)	GSC	Whole rock	100.5	2.1
J12-9	3985	Bimodal volcanic unit (rhyolite)	GSC	Whole rock	56.12	0.95
J12-10	3989	Bimodal volcanic unit (rhyolite)	GSC	Whole rock	63.18	1.9
J12-11		South Fork volcanics	UBC	Biotite	94.9	3.3
J12-12		South Fork volcanics	UBC	Hornblende	102	4
J13-1	4014	Selwyn Plutonic Suite	GSC	Biotite	91.26	1.3
J16-1	4019	Selwyn Plutonic Suite	GSC	Biotite	95.03	1.7

Table C-2. Summary of published potassium and argon ages in Tay River (NTS 105 K) area. Locations are indicated in Figure B-2.

Mapno	GSCno	Formation	Lab	Material	Date (Ma)	Standard deviation
K01-1	4026	Selwyn Plutonic Suite	GSC	Biotite	95.73	2.2
K01-2	4017	Selwyn Plutonic Suite	GSC	Biotite	99.3	1.3
K01-3	4291	Selwyn Plutonic Suite	GSC	Biotite	96.7	1.4
K02-1	4015	Selwyn Plutonic Suite	GSC	Biotite	89.3	9.9
K02-2	4089	Selwyn Plutonic Suite	GSC	Hornblende	97.81	3.4
K02-3		Yukon-Tanana terrane (schist unit)	UBC	Muscovite	256	8
K02-4		Yukon-Tanana terrane (schist unit)	UBC	Muscovite	267	8
K04-1	4088	Selwyn Plutonic Suite	GSC	Hornblende	102.7	2.3
K05-1	3988	Bimodal volcanic unit (basalt)	GSC	Whole rock	79.77	1.4
K06-1	3986	Bimodal volcanic unit (rhyolite)	GSC	Whole rock	54.34	1.2
K06-2	65-41	Selwyn Plutonic Suite	GSC	Biotite	95	5
K06-3	65-43	Selwyn Plutonic Suite	GSC	Biotite	89	5
K06-4	65-42	Selwyn Plutonic Suite	GSC	Muscovite	81	6
K06-5	76-157	Yukon-Tanana terrane (schist unit)	GSC	Muscovite	261	13
K06-6	70-45	Selwyn Plutonic Suite	GSC	Muscovite	96	5
K06-7	70-46	Selwyn Plutonic Suite	GSC	Biotite	97	5
K06-8	72-32	Selwyn Plutonic Suite	GSC	Biotite	101	4
K06-9	67-47	Selwyn Plutonic Suite aureole	GSC	Muscovite	102	5
K06-10	67-48	Selwyn Plutonic Suite aureole	GSC	Biotite	96	4
K08-1	4013	South Fork volcanics	GSC	Biotite	98.39	7.6
K08-2	4095	South Fork volcanics	GSC	Hornblende	112	3.3
K08-3	65-44	South Fork volcanics	GSC	Biotite	87	6
K09-1	3841	South Fork volcanics	GSC	Biotite	100.3	2.5
K09-2	4093	South Fork volcanics	GSC	Hornblende	99.73	4.1
K09-3	3794	South Fork volcanics	GSC	Biotite	98.18	2.1
K09-4	3840	South Fork volcanics	GSC	Biotite	93.7	2.2
K09-5	3843	South Fork volcanics	GSC	Biotite	97.63	2.3
K10-1	4020	South Fork volcanics	GSC	Biotite	95.6	1.7
K11-1		Bimodal volcanic unit (rhyolite)	UBC	Whole rock	54.7	1.8
K11-2		Bimodal volcanic unit (rhyolite)	UBC	Whole rock	52.3	1.8
K15-1	3797	South Fork volcanics	GSC	Biotite	96.49	2.6
K15-2	3891	South Fork volcanics	GSC	Biotite	96	2
K15-3	3892	South Fork volcanics	GSC	Hornblende	102.3	1.8
K16-1	65-38	Selwyn Plutonic Suite	GSC	Biotite	86	7
K16-2	65-40	Selwyn Plutonic Suite	GSC	Biotite	76	7
K16-3	65-39	Selwyn Plutonic Suite	GSC	Biotite	83	10

Table C-3. Compilation of age dates (K-Ar, Ar-Ar), Sheldon Lake (NTS 105 J) and Tay River (NTS 105 K) areas. Full data indicated in Table C-3.

Field #	Rock type	^{1} No	GSC#	Lab	Material	Date (Ma)	SD	^{2} Old date (Ma)	^{3} K	^{4} Ar	^{5} Atm	Reference
Bimodal volcanic												
GGA-87-9E3	Olivine basalt	J04-8	4305	GSC	Whole rock	58.3	1.3	NA	1.213	2.792×10^{-6}	35.9	Hunt and Roddick (1992)
GGA-86-40I3	Flow-banded rhyolitic quartz-feldspar porphyry	J05-4	3984	GSC	Whole rock	52.82	0.94	NA	4.51	94.04×10^{-7}	1.7	Hunt and Roddick (1991)
GGA-83-40D	Flow-banded quartz-feldspar rhyolite porphyry	J12-1	NA	UBC	Whole rock	51.5	1.8	NA	4.27	86.72×10^{-7}	8.3	Jackson et al. (1986)
GGAT-86-14H3	Intrusive plug of rhyolitic quartz-feldspar porphyry	J12-7	3990	GSC	Whole rock	51.94	1.1	NA	4.74	97.12×10^{-7}	4.9	Hunt and Roddick (1991)
GGAT-86-15B3	Basalt	J12-8	3987	GSC	Whole rock	100.5	2.1	NA	1.22	49.15×10^{-7}	4.7	Hunt and Roddick (1991)
GGAT-86-22C5	Rhyolitic quartz-feldspar porphyry	J12-9	3985	GSC	Whole rock	56.12	0.95	NA	2.62	57.99×10^{-7}	7.5	Hunt and Roddick (1991)
GGAT-86-22D7	Rhyolitic quartz-feldspar porphyry	J12-10	3989	GSC	Whole rock	63.18	1.9	NA	3.48	86.87×10^{-7}	8.4	Hunt and Roddick (1991)
GGA-86-69F2	Basalt	K05-1	3988	GSC	Whole rock	79.77	1.4	NA	1.04	32.88×10^{-7}	28.0	Hunt and Roddick (1991)
GGA-86-66B3	Rhyolitic quartz-feldspar porphyry	K06-1	3986	GSC	Whole rock	54.34	1.2	NA	4.23	90.75×10^{-7}	1.4	Hunt and Roddick (1991)
GGA-82-47C1	Quartz-feldspar porphyry	K11-1	NA	UBC	Whole rock	54.7	1.8	NA	4.26	92.03×10^{-7}	2.8	Jackson et al. (1986)
GGA-83-35F3	Fresh, flow-banded obsidian with quartz-feldspar phenocrysts	K11-2	NA	UBC	Whole rock	52.3	1.8	NA	4.22	87.07×10^{-7}	7.2	Jackson et al. (1986)
Selwyn Plutonic Suite aureole												
TO67-2a(2)	Fine-grained biotite-muscovite quartz schist (drill core)	K06-9	67-47	GSC	Muscovite	102	5	99	6.54	$^{40}Ar/^{40}K$: 0.0060	9	Wanless et al. (1970)
TO67-2a(1)	Fine-grained biotite-muscovite quartz schist (drill core)	K06-10	67-48	GSC	Biotite	96	4	93	5.80	$^{40}Ar/^{40}K$: 0.0056	18	Wanless et al. (1970)
Selwyn Plutonic Suite												
GGA-85-50B1	Medium-grained biotite granite		4024	GSC	Biotite	95.67	1.4	NA	7.38	281×10^{-7}	5.1	Hunt and Roddick (1991)
GGA-86-30E3	Medium-grained biotite granodiorite	J03-1	4018	GSC	Biotite	101.9	1.8	NA	6.77	276×10^{-7}	3.7	Hunt and Roddick (1991)
GGA-86-31B3	Porphyritic biotite granite	J03-2	4016	GSC	Biotite	87	1.2	NA	5.81	201.3×10^{-7}	9.6	Hunt and Roddick (1991)
GGA-83-27F	Biotite granite	J04-1	4023	GSC	Biotite	98.36	2	NA	5.98	235×10^{-7}	74.0	Hunt and Roddick (1991)
WBT-80-43D	Biotite-quartz monzonite	J04-6	NA	UBC	Biotite	104	4	NA	4.97	206.32×10^{-7}	6.5	Wood and Armstrong (1982)
GGAG-86-54A3	Meduim-grained biotite-hornblende granodiorite	J13-1	4014	GSC	Biotite	91.26	1.3	NA	6.52	237×10^{-7}	4.8	Hunt and Roddick (1991)
GGA-86-92B3	Medium-grained biotite granodiorite	J16-1	4019	GSC	Biotite	95.03	1.7	NA	7.13	270.3×10^{-7}	3.9	Hunt and Roddick (1991)
GGA-85-17C3	Quartz-feldspar porphyritic granite	K01-1	4026	GSC	Biotite	95.73	2.2	NA	5.91	226×10^{-7}	16.0	Hunt and Roddick (1991)
GGA-86-7D2	Medium-grained biotite-quartz monzodiorite	K01-2	4017	GSC	Biotite	99.3	1.3	NA	7.27	288.3×10^{-7}	4.0	Hunt and Roddick (1991)
GGA-87-15J3	Porphyritic biotite-hornblende granite	K01-3	4291	GSC	Biotite	96.7	1.4	NA	5.270	2.03×10^{-5}	9.0	Hunt and Roddick (1992)

Notes:

[1] internal number (this report); first 3 letter + number combination refer to 1:50 000 NTS area

[2] OLD DATE: original published date using older decay constants

[3] K: wt % K

[4] Ar: radiogenic argon in cm^3/g

[5] ATM: per cent atmospheric argon

NA = not applicable

Table C-3. (cont.)

Field #	Rock type	^{1}No	GSC#	Lab	Material	Date (Ma)	SD	^{2}Old date (Ma)	^{3}K	^{4}Ar	^{5}Atm	Reference
Selwyn Plutonic Suite (cont.)												
GGA-86-5F2(1)	Medium-grained biotite-hornblende granodiorite	K02-1	4015	GSC	Biotite	89.3	9.9	NA	5.85	208.1 x 10^{-7}	5.8	Hunt and Roddick (1991)
GGA-86-5F2(2)	Meduim-grained biotite-hornblende granodiorite	K02-2	4089	GSC	Hornblende	97.81	3.4	NA	0.662	25.86 x 10^{-7}	12.0	Hunt and Roddick (1991)
GGA-86-52A3	Medium-grained biotite-hornblende-quartz diorite	K04-1	4088	GSC	Hornblende	102.7	2.3	NA	0.763	31.34 x 10^{-7}	7.3	Hunt and Roddick (1991)
Rd-64-1003	Fine- to medium-grained biotite granite	K06-2	65-41	GSC	Biotite	95	5	90	7.9	^{40}Ar/^{40}K: 0.0054	29	Wanless et al. (1967)
Rd-64-1011(1)	Medium- to coarse-grained muscovite-biotite granodiorite	K06-3	65-43	GSC	Biotite	89	5	87	7.47	^{40}Ar/^{40}K: 0.0052	29	Wanless et al. (1967)
Rd-64-1011(2)	Medium- to coarse-grained muscovite-biotite granite	K06-4	65-42	GSC	Muscovite	81	6	79	8.49	^{40}Ar/^{40}K: 0.0047	34	Wanless et al. (1967)
TO-68-469(1)	Medium-grained biotite-muscovite granodioritic orthogneiss	K06-7	70-46	GSC	Biotite	97	5	94	7.77	^{40}Ar/^{40}K: 0.0057	33	Wanless et al. (1972)
TO-68-469(2)	Medium-grained biotite-muscovite granodioritic orthogneiss	K06-7	70-45	GSC	Muscovite	96	5	94	8.43	^{40}Ar/^{40}K: 0.0056	30	Wanless et al. (1972)
TO-67-459	Equigranular, massive, biotite granodiorite (from Anvil pit face)	K06-8	72-32	GSC	Biotite	101	4	98	6.17	^{40}Ar/^{40}K: 0.0059	22	Wanless et al. (1974)
Rd-64-1025A	Medium-grained biotite-quartz monzonite	K16-1	65-38	GSC	Biotite	86	7	83	6.85	^{40}Ar/^{40}K: 0.0050	34	Wanless et al. (1967)
Rd-64-1025B	Biotite granite with minor muscovite and garnet	K16-2	65-40	GSC	Biotite	76	7	74	6.20	^{40}Ar/^{40}K: 0.0044	40	Wanless et al. (1967)
Rd-64-1025C	Granodiorite	K16-3	65-39	GSC	Biotite	83	10	81	6.04	^{40}Ar/^{40}K: 0.0084	43	Wanless et al. (1967)
South Fork volcanics												
GGA-86-31H3	Welded hornblende-pyroxene crystal tuff	J03-3	4090	GSC	Hornblende	95.52	2.5	NA	0.513	19.65 x 10^{-7}	13.0	Hunt and Roddick (1991)
GGA-85-21B1(1)	Quartz-biotite-feldspar crystal tuff	J04-2	3839	GSC	Biotite	99.78	2.5	NA	6.34	252.7 x 10^{-7}	3.6	Hunt and Roddick (1992)
GGA-85-21B1(2)	Quartz-biotite-feldspar crystal tuff	J04-3	4092	GSC	Hornblende	95.37	1.7	NA	0.822	31.29 x 10^{-7}	10.0	Hunt and Roddick (1992)
GGA-86-33A3	Welded hornblende-biotite-quartz-feldspar crystal tuff	J04-4	4094	GSC	Hornblende	93.71	2.2	NA	0.877	32.79 x 10^{-7}	7.4	Hunt and Roddick (1991)
WBT-80-15B-318	Hornblende andesite	J04-5	NA	UBC	Hornblende	94.4	3.3	NA	0.583	21.62 x 10^{-7}	27.9	Wood and Armstrong (1982)
GGA-87-13C3	Quartz-feldspar-biotite-hornblende crystal tuff	J04-7	4290	GSC	Biotite	95.4	1.6	NA	6.510	2.478 x 10^{-5}	10.2	Hunt and Roddick (1992)
GGA-87-10G3*	Hornblende porphyry	J04-9	4302 (231)	GSC	Hornblende	100.3	1.9	NA	0.48	Integrated ^{40}Ar/^{39}K	18.3	Hunt and Roddick (1992)
GGAG-86-33D3	Welded biotite-quartz-feldspar crystal tuff	J05-1	4021	GSC	Biotite	97.09	1.4	NA	5.48	212.5 x 10^{-7}	22.0	Hunt and Roddick (1991)
WBT-80-33B	Quartz-plagioclase-biotite-hornblende crystal tuff	J05-2	NA	UBC	Biotite	95.5	3.3	NA	6.64	252.95 x 10^{-7}	6.3	Wood and Armstrong (1982)
GGA-87-14A3*	Quartz-feldspar-biotite crystal lithic tuff	J05-3	4315 (237)	GSC	Biotite	94.3	0.3	NA	4.5	Integrated ^{40}Ar/^{39}K	13.4	Roddick et al. (1992)
WBT-80-39B-6350 ft(1)	Quartz-feldspar-biotite-hornblende-hypersthene crystal tuff	J12-11	NA	UBC	Biotite	94.9	3.3	NA	4.80	181.80 x 10^{-7}	6.2	Wood and Armstrong (1982)
WBT-80-39B-6350 ft(2)	Quartz-feldspar-biotite-hornblende-hypersthene crystal tuff	J12-12	NA	UBC	Hornblende	102	4	NA	0.589	24.02 x 10^{-7}	25.8	Wood and Armstrong (1982)

Table C-3. (cont.)

Field #	Rock type	[1] No	GSC#	Lab	Material	Date (Ma)	SD	[2] Old date (Ma)	[3] K	[4] Ar	[5] Atm	Reference
South Fork volcanics (cont.)												
GGA-85-49A1(1)	Quartz-biotite-hornblende-feldspar crystal tuff	J12-2	3842	GSC	Biotite	100.5	2.4	NA	4.72	1.89×10^{-7}	5.9	Roddick et al. (1992)
GGA-85-49A1(2)	Quartz-biotite-hornblende-feldspar crystal tuff	J12-3	4091	GSC	Hornblende	90.59	1.8	NA	0.805	29.07×10^{-7}	15.0	Roddick et al. (1992)
GGAA-83-18-1(1)	Quartz-feldspar-hornblende-biotite crystal tuff	J12-4	3669	GSC	Biotite	94.6	1.5	NA	5.915	223.33×10^{-7}	9.10	Hunt and Roddick (1987)
GGAA-83-18-1(2)	Quartz-feldspar-hornblende-biotite crystal tuff	J12-5	3670	GSC	Hornblende	94.6	1.5	NA	0.751	28.34×10^{-7}	29.59	Hunt and Roddick (1987)
GGAA-83-9-3	Quartz-feldspar-hornblende-biotite crystal lithic tuff	J12-6	3668	GSC	Hornblende	108.8	1.7	NA	0.701	30.57×10^{-7}	21.59	Hunt and Roddick (1987)
GGAG-86-31C3(1)	Densely welded biotite-hornblende crystal tuff	K08-1	4013	GSC	Biotite	98.39	7.6	NA	5.89	231.4×10^{-7}	3.4	Hunt and Roddick (1991)
GGAG-86-31C3(2)	Densely welded biotite-hornblende crystal tuff	K08-2	4095	GSC	Hornblende	112	3.3	NA	0.68	30.55×10^{-7}	35.0	Hunt and Roddick (1991)
RD-64-1008C	Dacitic quartz-biotite-feldspar crystal tuff (originally interpreted as porphyry)	K08-3	65-44	GSC	Biotite	87	6	86	5.44	$^{40}Ar/^{40}K$: 0.0051	39	Wanless et al. (1967)
GGA-83-26A(1)	Quartz-biotite-hornblende-feldspar crystal tuff	K09-1	3841	GSC	Biotite	100.3	2.5	NA	6.58	263.0×10^{-7}	3.7	Hunt and Roddick (1990)
GGA-83-26A(2)	Quartz-biotite-hornblende-feldspat crystal tuff	K09-2	4093	GSC	Hornblende	99.73	4.1	NA	0.695	27.7×10^{-7}	26.0	Hunt and Roddick (1990)
GGA-83-26C	Quartz-feldspar-biotite-hornblende crystal tuff	K09-3	3794	GSC	Biotite	98.18	2.1	NA	6.82	267.6×10^{-7}	9.4	Hunt and Roddick (1988)
GGA-85-17A2	Quartz-biotite-feldspar-hornblende crystal tuff	K09-4	3840	GSC	Biotite	93.7	2.2	NA	6.66	249.1×10^{-7}	2.3	Hunt and Roddick (1990)
GGA-85-69D1	Biotite-hornblende-quartz crystal tuff	K09-5	3843	GSC	Biotite	97.63	2.3	NA	6.84	266.5×10^{-7}	5.4	Hunt and Roddick (1990)
GGA-86-11E3	Biotite-quartz-feldspar crystal tuff	K10-1	4020	GSC	Biotite	95.6	1.7	NA	6.72	256.6×10^{-7}	5.0	Hunt and Roddick (1991)
GGA-83-24B(1)	Quartz-feldspar-biotite-hornblende cyrstal tuff	K15-1	3797	GSC	Biotite	96.49	2.6	NA	6.59	253.7×10^{-7}	3.6	Hunt and Roddick (1988)
GGA-83-24B(2)	Quartz-feldspar-biotite-hornblende crystal tuff	K15-2	3891	GSC	Biotite	96	2	NA	6.84	261.7×10^{-7}	1.6	Hunt and Roddick (1990)
GGA-83-24B(3)	Quartz-feldspar-biotite-hornblende crystal tuff	K15-3	3892	GSC	Hornblende	102.3	1.8	NA	0.679	27.79×10^{-7}	5.9	Hunt and Roddick (1990)
Schist unit												
PE85-25-1	Micaceous quartzite	K02-3	NA	UBC	Muscovite	256	8	NA	8.51	90.769×10^{-6}	10.9	Erdmer and Armstrong (1988)
TO-73-104	Eclogite	K06-5	76-157	GSC	Muscovite	261	13	255	3.65	$^{40}Ar/^{40}K$: 0.01601	13.5	Wanless et al. (1978); original field number TO67-450; recollected
PE85-25-2	Mica schist	K02-4	NA	UBC	Muscovite	267	8	NA	7.60	84.885×10^{-6}	9.6	Erdmer and Armstrong (1988)

Notes:

[1] internal number (this report); first 3 letter + number combination refer to 1:50 000 NTS area

[2] OLD DATE: original published date using older decay constants

[3] K: wt % K

[4] Ar: radiogenic argon in cm^3/g

[5] ATM: per cent atmospheric argon

NA = not applicable

Table C-4. Uranium-lead analytical data for Selwyn Plutonic Suite and South Fork volcanics.

Sample description[a]	Weight (mg)	U (ppm)	Pb (ppm)[b]	^{206}Pb/^{204}Pb (meas.)[c]	Common Pb (total, pg)	^{208}Pb (%)	^{207}Pb/^{235}U[d]	(± % 1σ)	^{206}Pb/^{238}U[d]	(± % 1σ)	Rho	^{207}Pb/^{206}Pb[d]	(± % 1σ)	^{206}Pb/^{238}U age (Ma)	(± 2σ)	^{207}Pb/^{235}U age (Ma)	(± 2σ)	^{207}Pb/^{206}Pb age (Ma)	(± 2σ)
GGA-85-69D1 (South Fork volcanics - biotite-hornblende-quartz crystal tuff)																			
A: N2,+149,p	0.293	483	9.5	2576	66	11.3	0.195	0.13	0.019	0.1	0.9	0.075	0.06	120.5	0.2	181.1	0.8	1069	4.4
B: N2,+149,p	0.322	448	7.1	2266	63	11.4	0.105	0.13	0.016	0.1	0.87	0.049	0.07	99.5	0.2	100.9	0.6	134.1	6.4
C: N1,105-149,e	0.216	556	12.7	2176	54	19.8	0.101	0.14	0.015	0.1	0.87	0.048	0.07	97.6	0.2	97.8	0.6	101.7	6.6
GGA-85-49A1 (South Fork volcanics - biotite-hornblende-quartz-feldspar crystal tuff)																			
A: N5,-62,u	0.238	721	11,7	556	309	14.3	0.105	0.24	0.015	0.12	0.67	0.049	0.18	98.5	0.2	101	0.4	158.2	8.6
B: N2,+149,c	0.239	724	15.7	1079	216	10.5	0.211	0.13	0.021	0.08	0.74	0.072	0.09	134.6	0.2	194.3	0.4	999	3.6
C: N5,+105,u	0.413	459	7.2	647	291	11.9	0.103	0.21	0.015	0.1	0.66	0.048	0.16	98.3	0.2	99.2	0.4	119.6	7.6
D: N5,-62,u	0.271	664	10.8	689	263	13.8	0.107	0.2	0.016	0.1	0.66	0.050	0.15	99.7	0.2	103.2	0.4	184	7
E: N2,+149	0.487	404	6.7	589	357	10.8	0.116	0.22	0.016	0.1	0.67	0.051	0.17	105.3	0.2	111	0.4	233.9	8
F: N1,+105,e,u	0.353	594	9.2	3130	65	11.4	0.100	0.16	0.015	0.14	0.94	0.048	0.05	96.9	0.6	97.2	0.6	102.7	5
GGA-86-17A2 (South Fork volcanics - quartz-biotite-feldspar-hornblende crystal tuff)																			
A: N2,+105,e,u	0.367	449	7	2535	78	12.1	0.101	0.14	0.015	0.11	0.91	0.048	0.06	97.2	0.4	97.4	0.6	103	5.6
B: N2,74-105,e,u	0.25	583	9	2623	54	11	0.101	0.14	0.015	0.12	0.91	0.048	0.06	97.3	0.4	97.5	0.6	102.2	5.6
C: N2,+149,s,u	0.194	472	8.2	2534	39	9.5	0.148	0.13	0.017	0.11	0.89	0.063	0.06	109.6	0.4	140.5	0.6	701.9	5.2
GGA-83-26A (South Fork volcanics - quartz-biotite-hornblende-feldspar crystal tuff)																			
A: N2,+149,s,u	0.239	408	6.3	1552	104	10.6	0.101	0.19	0.015	0.1	0.67	0.048	0.14	97.9	0.4	97.8	0.8	99.8	13.6
B: N2,+149,e,u	0.161	516	8	1497	54	10.9	0.101	0.19	0.015	0.12	0.68	0.048	0.14	97.5	0.4	976	0.8	100.8	13.4
C: N2,105-149e,u	0.208	493	7.7	1904	52	12	0.101	0.15	0.015	0.12	0.85	0.048	0.08	97.2	0.4	97.4	0.6	101.3	7.6
GGA-83-23E (South Fork volcanics - biotite-hornblende-quartz-feldspar crystal tuff)																			
C: N3,+149	0.656	725	11.8	1541	302	14.2	0.106	0.16	0.015	0.11	0.83	0.050	0.1	98.5	0.2	102.5	0.4	197.3	4.4
D: N1,+149	0.353	477	7.4	1790	91	12	0.101	0.14	0.015	0.1	0.84	0.048	0.08	96.9	0.4	97.2	0.6	105.7	7.4
GGA-85-26G4 (porphyritic hornblende diorite)																			
A: N2,+149,s,u	0.179	382	6	1246	54	12	0.102	0.2	0.015	0.13	0.68	0.048	0.15	98.9	0.4	99	0.8	101.8	14
B: N2,+149,s,u	0.25	477	7.5	2293	51	11.5	0.103	0.15	0.016	0.12	0.84	0.048	0.08	99.2	0.4	99.5	0.6	104.8	7.6
C: N2,105-149,p,u	0.093	508	8	2108	44	11.3	0.102	0.16	0.015	0.12	0.72	0.048	0.11	98.9	0.4	99	0.6	102.5	10.4
GGA-85-17C (porphyritic granite)																			
A: N2,+177m	0.242	501	8.1	1820	68	10.4	0.112	0.13	0.016	0.1	0.87	0.051	0.06	102.6	0.4	108.2	0.6	232.5	6
B: N2,149-177	0.215	390	8	1812	56	13.9	0.178	0.12	0.019	0.1	0.89	0.068	0.05	122	0.4	166.6	0.8	859.3	4.4
C: N5,+149,c	0.101	505	15.8	1450	67	9.8	0.389	0.11	0.030	0.09	0.91	0.094	0.05	189.8	0.6	333.5	1.2	1515.6	3.6
D: monazite	0.029	1230	170	467	78	89.8	0.103	0.27	0.016	0.12	0.7	0.048	0.2	99.8	0.4	99.3	1	88.2	19.2
GGA-85-16B1 (hornblende-biotite granite)																			
A: N2,105-149	0.161	440	8	1524	52	12.5	0.137	0.12	0.017	0.1	0.9	0.057	0.06	111.6	0.4	130.3	0.6	487.6	5
B: N2,1+105,c	0.073	799	14.8	1054	65	10.5	0.158	0.14	0.018	0.11	0.8	0.063	0.09	115.8	0.4	148.6	0.8	710.2	7.4
C: N5,105-149	0.122	391	6.1	982	47	11.7	0.101	0.16	0.015	0.11	0.83	0.048	0.09	97.4	0.4	97.5	0.6	99.6	8.4
D: N2,+149	0.158	402	6.2	827	75	11.8	0.101	0.22	0.015	0.14	0.74	0.048	0.15	97.3	0.6	97.5	0.8	102.4	14
GGA-85-28A1 (biotite granite)																			
A: N5,74-105	0.291	946	15.3	659	449	6.9	0.113	0.22	0.017	0.1	0.72	0.049	0.17	106.3	0.2	108.6	0.4	161.1	7.8
B: N5,74-105,e,u	0.171	1189	18.7	1918	107	8.9	0.106	0.14	0.016	0.1	0.84	0.048	0.08	101.8	0.4	102	0.6	108.6	7
C: N5,-62,u	0.043	1356	21.1	912	277	8.5	0.106	0.17	0.016	0.09	0.73	0.048	0.12	101.1	0.2	101.9	0.4	120.1	5.8
D: N5,105-149,+134	0.03	1021	15.9	809	293	6.1	0.109	0.18	0.016	0.08	0.7	0.049	0.13	103.8	0.2	105.2	0.4	136.1	6.2
GGA-85-30F1 (biotite-hornblende granite)																			
A: N2,+149,s,u	0.208	756	11.3	2720	56	7.8	0.101	0.13	0.015	0.11	0.89	0.048	0.06	97.6	0.4	98	0.4	106.1	5.8
B: N2,+149,e,u	0.178	548	8.4	1030	93	10.7	0.101	0.2	0.015	0.11	0.74	0.048	0.14	97.4	0.4	97.6	0.8	1.0.2	13.4
C: N2,105-149,e.u	0.138	685	10.8	3443	27	10.7	0.109	0.12	0.016	0.1	0.93	0.051	0.05	99.7	0.4	105.1	0.4	229.5	4.4

[a] N2, N3, N5 = nonmagnetic at 2, 3, or 5 degrees side slope on Frantz magnetic separator; grain size given in micrometres; u = abraded; [b] radiogenic Pb; corrected for blank, initial common Pb, and spike; [c] corrected for spike and fractionation as determined from replicate analyses of NBS common Pb standards; meas. = measured; [d] corrected for 9–25 pg blank Pb and 1–3 pg blank U, and initial common Pb (*after* Stacey and Kramers, 1975) . Errors associated with calculated ages were determined using the numerical error propogation method of Roddick (1987) and are given at the 2σ level.

Appendix D

Sample locations

Table D-1. Sample location data for isotopic ages and chemical analyses.

Field number	Unit	Rock type[1]	No[2]	Chem[3]	($^{87}Sr/^{86}Sr$)i[3]	Lat (N)[4]	Long (W)[4]	UTME[5]	UTMN[5]	Z	NTS
Bimodal volcanic											
GGA-87-9E3	Tv3	Olivine basalt	J04-8	Y		62-2.685	131-58.595	344363	6882738	9	105 J/4
GGA-86-40I3	Tv1	Flow-banded rhyolitic quartz-feldspar porphyry	J05-4	Y		62-27.906	131-55.770	348943	6929420	9	105 J/5
GGA-83-40D	Tv1	Flow-banded quartz-feldspar rhyolite porphyry	J12-1	Y		62-32.043	131-53.143	351543	6936995	9	105 J/12
GGAT-86-14H3	Tv1	Intrusive plug of rhyolitic quartz-feldspar porphyry	J12-7	Y		62-34.722	131-55.585	349675	6942060	9	105 J/12
GGAT-86-15B3	Tv3	Basalt	J12-8	Y		62-39.406	131-53.215	352093	6950660	9	105 J/12
GGAT-86-22C5	Tv1	Rhyolitic quartz-feldspar porphyry	J12-9	Y		62-32.074	131-46.320	357393	6936795	9	105 J/12
GGAT-86-22D7	Tv1	Rhyolitic quartz-feldspar porphyry	J12-10	Y		62-32.326	131-46.489	357268	6937270	9	105 J/12
GGA-86-69F2	Tv3	Basalt	K05-1	Y		62-19.568	133-48.285	561931	6911084	8	105 K/5
GGA-86-66B3	Tv1	Rhyolitic quartz-feldspar porphyry	K06-1	Y		62-26.102	133-2.226	601331	6924184	8	105 K/6
GGA-82-47C1	Tv1	Quartz-feldspar porphyry	K11-1	Y		62-30.222	133-0.236	602806	6931883	8	105 K/11
GGA-83-35F3	Tv1	Fresh, flow-banded obsidian with quartz-feldspar phenocrysts	K11-2	Y		62-30.105	133-0.507	602580	6931659	8	105 K/11
Selwyn Plutonic Suite aureole											
TO67-2a(1)	CG	Fine-grained biotite-muscovite quartz schist (drill core)	K06-9			62-21.661	133-22.519	584081	6915454	8	105 K/6
TO67-2a(2)	CG	Fine-grained biotite-muscovite quartz schist (drill core)	K06-10			62-21.661	133-22.519	584081	6915454	8	105K/6
Selwyn Plutonic Suite											
GGA-85-28A3	KS1	Medium-grained biotite beta granite		Y	Y	62-10.171	131-50.085	352383	6896295	9	105 J/4
GGA-85-27G	KS2	Hornblende diorite		Y	Y	62-10.061	131-50.438	352068	6896105	9	105 J/4
GGA-85-50B1	KS1	Medium-grained biotite granodiorite		Y		63-8.174	130-9.483	441618	7001295	9	105 O/1
GGA-85-30F3	KS1	Biotite beta granite			Y	62-19.794	132-31.501	628206	6913384	8	105 K/7
GGA-85-16B4	KS2	Medium-grained biotite-hornblende beta granite		Y	Y	62-33.088	132-22.985	634556	6938344	8	105 K/9
GGA-85-27A3	KS1	Coarse-grained chloritized (?)biotite beta granite		Y	Y	62-8.040	131-52.131	350433	6892420	9	105 J/4
GGA-86-30E3	KS1	Medium-grained biotite quartz monzodiorite	J03-1	Y		62-4.002	131-19.661	378368	6883795	9	105 J/3
GGA-86-31B3	KS3	Porphyritic biotite granite	J03-2	Y		62-3.483	131-20.913	377243	6882870	9	105 J/3
GGA-83-27F	KS1	Biotite beta granite	J04-1	Y		62-13.304	131-51.823	351133	6902175	9	105 J/4
WBT-80-43D	KS1	Biotite-quartz monzonite	J04-6			62-13.361	131-51.574	351353	6902270	9	105 J/4
GGAG-86-54A3	KS2	Meduim-grained biotite-hornblende quartz monzodiorite	J13-1	Y		62-50.908	131-37.893	366043	6971445	9	105 J/13
GGA-86-92B3	KS1	Medium-grained biotite beta granite	J16-1	Y		62-54.228	130-22.370	430238	6975615	9	105 J/16
GGA-85-17C3	KS3	Quartz-feldspar porphyritic granite	K01-1	Y		62-14.500	132-11.052	646281	6904284	8	105 K/1
GGA-86-7D2	KS2?	Medium-grained biotite beta granite	K01-2	Y		62-4.991	132-14.578	643981	6886509	8	105 K/1
GGA-87-15J3	KS3	Porphyritic biotite-hornblende granite	K01-3	Y		62-14.081	132-5.257	651331	6903729	8	105 K/1
GGA-86-5F2(1)	KS2	Medium-grained biotite-hornblende beta granite	K02-1	Y		62-7.716	132-39.595	622031	6890709	8	105 K/2
GGA-86-5F2(2)	KS2	Medium-grained biotite-hornblende beta granite	K02-2	Y		62-7.716	132-39.595	622031	6890709	8	105 K/2
GGA-86-52A3	KC	Medium-grained biotite-hornblende diorite	K04-1			62-3.999	133-54.592	556971	6882084	8	105 K/4
Rd-64-1003	KS1	Fine- to medium-grained biotite granite	K06-2			62-26.960	133-27.668	579406	6925184	8	105 K/6
Rd-64-1011(1)	KS1	Medium- to coarse-grained muscovite-biotite granodiorite	K06-3			62-17.011	133-3.194	601006	6907284	8	105 K/6
Rd-64-1011(2)	KS1	Medium- to coarse-grained muscovite-biotite granite	K06-4			62-16.978	133-0.883	603006	6907284	8	105 K/6
TO-68-469(1)	KS1	Well foliated, medium-grained biotite-muscovite granodioritic orthogneiss	K06-6			62-17.495	133-16.612	589381	6907854	8	105 K/6
TO-68-469(2)	KS1	Well foliated, medium-grained biotite-muscovite granodioritic orthogneiss	K06-7			62-17.495	133-16.612	589381	6907854	8	105 K/6
TO-67-459	KS1	Equigranular, massive, fresh, biotite granodiorite (from Anvil pit face)	K06-8			62-21.661	133-22.519	584081	6915454	8	105 K/6
Rd-64-1025A	KS1	Medium-grained biotite quartz monzonite	K16-1			62-56.982	132-28.929	627731	6982484	8	105 K/16
Rd-64-1025B	KS1	Biotite granite with minor muscovite and garnet	K16-2			62-56.398	132-27.944	628606	6981434	8	105 K/16
Rd-64-1025C	KS1	Granodiorite	K16-3			62-54.342	132-26.704	629806	6977659	8	105 K/16

Table D-1. (cont.)

Field number	Unit	Rock type[1]	No[2]	Chem[3]	$(^{87}\text{Sr}/^{86}\text{Sr})\text{i}$[3]	Lat (N)[4]	Long (W)[4]	UTME[5]	UTMN[5]	Z	NTS
South Fork volcanics											
GGA-85-50A3	KSF	Quartz-hornblende-feldspar crystal tuff		Y	Y	62-29.856	131-46.720	356873	6932695	9	105 J/5
GGA-85-66B1	KSF	Clay-altered crystal tuff		Y		62-4.370	131-58.116	344923	6885845	9	105 J/4
GGA-83-23E	KSF	Quartz-feldspar-biotite-hornblende cyrstal tuff			Y	62-46.798	132-44.820	614961	6963084	8	105 K/15
GGAT-86-24B3	KSF					62-13.087	131-52.426	350593	6901795	9	105 J/4
GGA-86-31H3	KSF	Welded hornblende-pyroxene crystal tuff	J03-3	Y		62-1.107	131-23.568	374768	6878545	9	105 J/3
GGA-85-21B1(1)	KSF	Quartz-biotite-feldspar crystal tuff	J04-2	Y	Y	62-3.892	131-58.795	344292	6884985	9	105 J/4
GGA-85-21B1(2)	KSF	Quartz-biotite-feldspar crystal tuff	J04-3	Y	Y	62-3.892	131-58.795	344292	6884985	9	105 J/4
GGA-86-33A3	KSF	Welded hornblende-biotite-quartz-feldspar crystal tuff	J04-4	Y		62-4.245	131-36.251	363943	6884795	9	105 J/4
WBT-80-15B-318	KSF	Hornblende andesite	J04-5			62-13.099	131-53.143	349973	6901845	9	105 J/4
GGA-87-13C3	KSF	Quartz-feldspar-biotite-hornblende crystal tuff	J04-7	Y		62-9.470	131-38.382	362483	6894565	9	105 J/4
GGA-87-10G3	KSF	Hornblende porphyry	J04-9	Y		62-4.130	131-34.923	365090	6884535	9	105 J/4
GGAG-86-33D3	KSF	Welded biotite-quartz-feldspar crystal tuff	J05-1	Y		62-18.723	131-59.247	345168	6912520	9	105 J/5
WBT-80-33B	KSF	Quartz-plagioclase-biotite-hornblende crystal tuff	J05-2			62-18.615	131-59.266	345143	6912320	9	105 J/5
GGA-87-14A3	KSF	Quartz-feldspar-biotite crystal lithic tuff	J05-3	Y		62-16.233	131-39.795	361773	6907165	9	105 J/5
GGA-85-49A1(1)	KSF	Quartz-biotite-hornblende-feldspar crystal tuff	J12-2	Y		62-30.807	131-44.278	359043	6934370	9	105 J/12
GGA-85-49A1(2)	KSF	Quartz-biotite-hornblende-feldspar crystal tuff	J12-3	Y		62-30.807	131-44.278	359043	6934370	9	105 J/12
GGAA-83-18-1(1)	KSF	Quartz-feldspar-hornblende-biotite crystal tuff	J12-4			62-31.325	131-44.675	358743	6935345	9	105 J/12
GGAA-83-18-1(2)	KSF	Quartz-feldspar-hornblende-biotite crystal tuff	J12-5			62-31.325	131-44.675	358743	6935345	9	105 J/12
GGAA-83-9-3	KSF	Quartz-feldspar-hornblende-biotite crystal lithic tuff	J12-6			62-32.499	131-46.633	357158	6937595	9	105 J/12
WBT-80-39B-6350 ft(1)	KSF	Quartz-feldspar-biotite-hornblende-hypersthene crystal tuff	J12-11			62-30.775	131-52.577	351923	6934620	9	105 J/12
WBT-80-39B-6350 ft(2)	KSF	Quartz-feldspar-biotite-hornblende-hypersthene crystal tuff	J12-12			62-30.775	131-52.577	351923	6934620	9	105 J/12
GGAG-86-31C3(1)	KSF	Densely welded biotite-hornblende crystal tuff	K08-1			62-24.685	132-9.689	646631	6923234	8	105 K/8
GGAG-86-31C3(2)	KSF	Densely welded biotite-hornblende crystal tuff	K08-2			62-24.685	132-9.689	646631	6923234	8	105 K/8
Rd-64-1008C	KSF	Dacitic quartz-biotite-feldspar crystal tuff (original interpreted as porphyry)	K08-3			62-15.207	132-3.559	652706	6905884	8	105 K/8
GGA-83-26A(1)	KSF	Quartz-biotite-hornblende-feldspar crystal tuff	K09-1	Y		62-32.803	132-19.619	637461	6937934	8	105 K/9
GGA-83-26A(2)	KSF	Quartz-biotite-hornblende-feldspat crystal tuff	K09-2	Y		62-32.803	132-19.619	637461	6937934	8	105 K/9
GGA-83-26C	KSF	Quartz-feldspar-biotite-hornblende crystal tuff	K09-3	Y		62-32.142	132-20.962	636361	6936659	8	105 K/9
GGA-85-17A2	KSF	Quartz-biotite-feldspar-hornblende crystal tuff	K09-4	Y		62-31.319	132-3.412	651471	6935784	8	105 K/9
GGA-85-69D1	KSF	Biotite-hornblende-quartz crystal tuff	K09-5	Y		62-29.796	132-17.360	639631	6932434	8	105 K/9
GGA-86-11E3	KSF	Biotite-quartz-feldspar crystal tuff	K10-1	Y		62-36.653	132-47.204	613581	6944184	8	105 K/10
GGA-83-24B(1)	KSF	Quartz-feldspar-biotite-hornblende cyrstal tuff	K15-1	Y		62-48.025	132-44.761	614931	6965364	8	105 K/15
GGA-83-24B(2)	KSF	Quartz-feldspar-biotite-hornblende crystal tuff	K15-2	Y		62-48.025	132-44.761	614931	6965364	8	105 K/15
GGA-83-24B(3)	KSF	Quartz-feldspar-biotite-hornblende crystal tuff	K15-3	Y		62-48.025	132-44.761	614931	6965364	8	105 K/15
Schist unit											
PE85-25-1	CTNm	Micaceous quartzite	K02-3			62-4.423	132-45.736	616906	6884409	8	105 K/2
PE85-25-2	CTNm	Mica schist	K02-4			62-4.423	132-45.736	616906	6884409	8	105 K/2
TO-73-104	CTNm	Eclogite	K06-5			62-17.672	133-27.073	580331	6907954	8	105 K/6

[1] IUGS granitic rock names

[2] Map number of age-date locality

[3] Y= chemistry done

[4] Units in degrees-decimal minutes

[4,5] Co-ordinates in NAD 83

Appendix E

Mineral occurrences

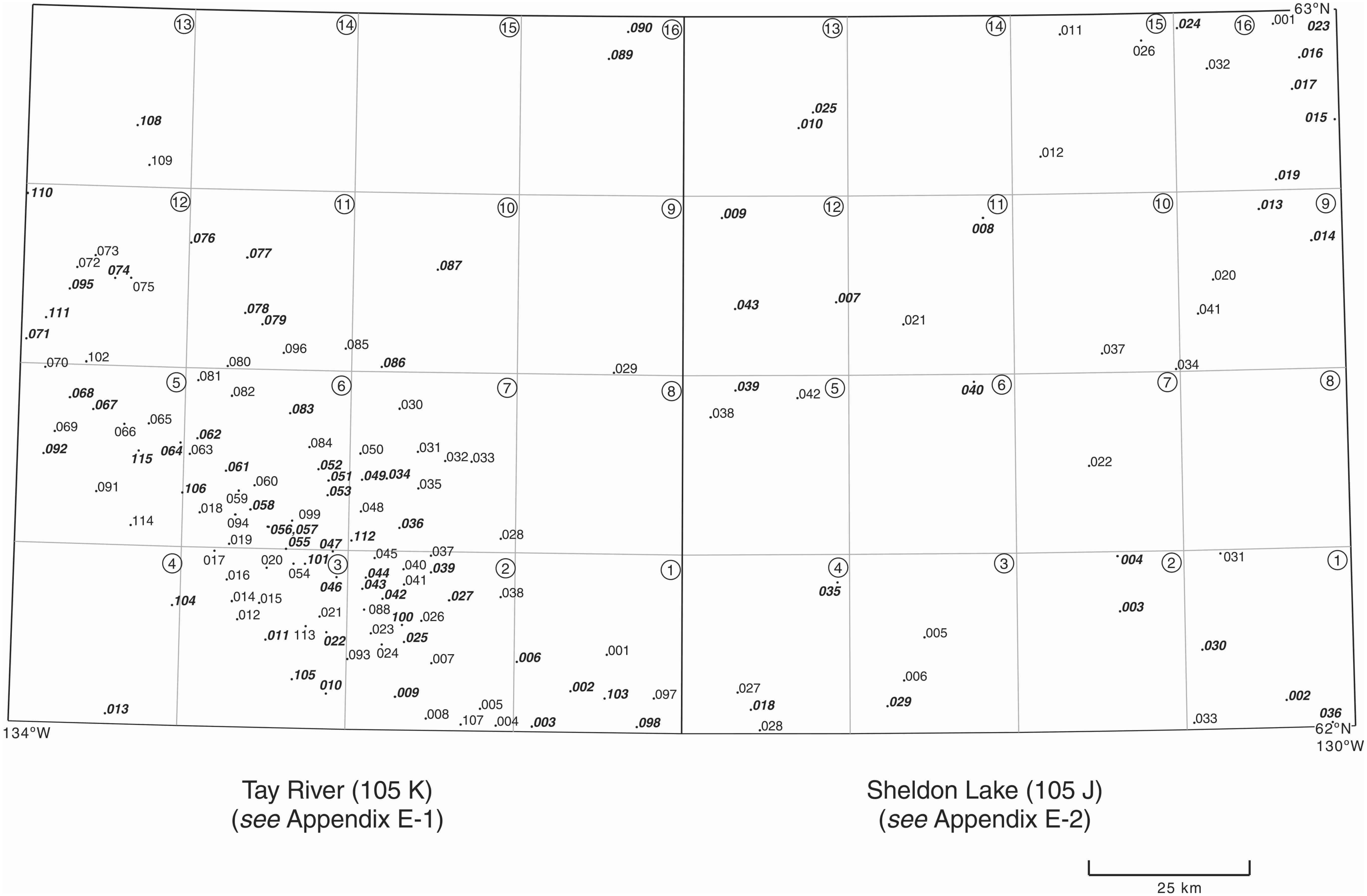

Figure E-1. Index map of mineral occurrence locations, indicated by last three digits of Yukon Minfile number (Deklerk and Traynor, 2005) for Sheldon Lake and Tay river map areas. Occurrences in bold italic font are classified by deposit type in Tables E-1and E-3. The classification of occurrences in normal text remains uncertain.

Table E-1. Mineral occurrence descriptions classified by deposit type for Sheldon Lake (NTS 105 J) map area. Localities shown in Figure E-1; detailed locations in Table E-2.

Deposit type	MINFILno	Name	Status	Commodity			Mineralogy notes
				Major	Minor	Trace	
Cu skarn	105K 006	Olgie	Drilled prospect		Cu		
	105K 062	Flagstone	Drilled prospect		Cu		
	105K 068	Reserve	Drilled prospect		Cu		
Cu±Ag quartz veins	105K 003	Rags	Showing		Cu		Some pyrite and chalcopyrite were seen in (quartz) veins.
	105K 071	Coward	Unknown		Cu		Traces of chalcopyrite occur in narrow quartz veins.
	105K 112	Starlight	Drilled prospect	Cu	Zn		Weakly disseminated pyrite and pyrrhotite; traces of sphalerite and chalcopyrite
Epithermal Au-Ag: low sulphidation	105K 009	Grew Creek	Deposit		Ag, Au		Pyrite, marcasite, arsenopyrite, chalcopyrite, argentite, electrum, silver selenides, galena, and sphalerite; fluorite is also present in the Tarn zone, 2 km southeast of the Main zone; gangue minerals include quartz, adularia, carbonate minerals, and quartz pseudomorphs after calcite.
	105K 091	El Pino	Anomaly			As, Au, Sb	
Epithermal Au-Ag-Cu: high sulphidation	105K 008	Mourne	Prospect				
	105K 015	Eye	Unknown				
	105K 022	Bobcat	Drilled prospect				
	105K 093	Parliament	Anomaly				
	105K 107	Wedekind	Unknown				
	105K 113	Pontoon	Drilled prospect				
Gabbroid Cu-Ni-PGE	105K 025	Orchay	Showing		Cu		Minor chalcopyrite was found in serpentinite.
Pb-Zn skarn	105K 013	Thomas	Prospect	Pb, Sn	Zn		Sphalerite in a skarn zone up to 4.6 m wide and 60 m long
	105K 044	Blackwood	Drilled prospect		Cu, Pb, Zn		Disseminated pyrite and minor traces of chalcopyrite, sphalerite, and galena
	105K 076	Hoot	Anomaly		Pb		Minor galena-bearing vein float
Plutonic-related Au	105K 064	Jacola	Drilled prospect		Pb, Zn, Ag		Several skarn zones with visible pyrite, pyrrhotite, sphalerite, galena, and chalcopyrite
	105K 072	Paige	Anomaly				
	105K 078	Keglovic	Drilled prospect	Pb, Ag	Zn, Cu		Two mineralized zones 610 m apart, consisting of disseminated to massive pyrrhotite and pyrite with lesser amounts of sphalerite, chalcopyrite, and galena
	105K 079	Ivan	Drilled prospect		Pb + Zn, Cu		Sphalerite, pyrrhotite, chalcopyrite, and galena occur in veinlets and as coarse disseminated grains in banded calc-silicate rock
	105K 108	Lady Di	Drilled prospect		Zn, Pb, Ag		Galena, sphalerite, and pyrrhotite zones occur within a sequence of conglomerate, sandstone, and shale.
Polymetallic manto Ag-Pb-Zn	105K 086	Marks	Showing		Zn, Pb		
Polymetallic veins Ag-Pb-Zn±Au	105K 002	Wop	Drilled prospect		Mo, Cu		Pyrrhotite occurs with a trace of chalcopyrite and scheelite in quartz veins and disseminated in phyllite, tuff, and altered volcanic rocks.
	105K 011	Lyn	Drilled prospect		Ag, Pb, Zn		Argentiferous galena, tetrahedrite, sphalerite, and chalcopyrite in quartz-calcite-siderite gangue.

Table E-1. (cont.)

Deposit type	MINFILno	Name	Status	Commodity			Mineralogy notes
				Major	Minor	Trace	
Polymetallic veins Ag-Pb-Zn±Au (cont.)	105K 039	Cub	Drilled prospect		Pb		A trace of galena in a series of narrow quartz veins; minor late pyrite and chalcopyrite in thin local pegmatitic quartz veins
	105K 041	Abraham	Drilled prospect				0.4 m of semimassive pyrrhotite associated with a quartz vein
	105K 047	Wann	Showing	Pb, Cu	Zn		Sphalerite and galena were found in quartz veins and chalcopyrite with pyrrhotite in greenstone lenses.
	105K 051	Action	Drilled prospect		Pb, Au, Ag		Float specimens of galena; quartz float with minor tetrahedrite
	105K 052	Mye	Prospect		Ag, Au		Complex assemblage of pyrite, galena, sphalerite, arsenopyrite, tetrahedrite, stannite, canfieldite, acanthite, native silver, semsegite, covellite, diaphorite, pyrargyrite, miargyrite, and high-temperature cassiterite in a gangue of banded colloidal and crystalline quartz and pink rhodochrosite
	105K 053	Mur	Drilled prospect	Au	Pb, Ag, Zn		Complex assemblage of pyrite, galena, sphalerite, arsenopyrite, tetrahedrite, stannite, canfieldite, acanthite, native silver, semsegite, covellite, diaphorite, pyrargyrite, miargyrite, and high-temperature cassiterite in a gangue of banded colloidal and crystalline quartz and pink rhodochrosite
	105K 077	Owl	Drilled prospect	Cu	Pb, Zn, Ag		Galena and sphalerite and lesser amounts of chalcopyrite and arsenopyrite occur in a vein.
	105K 089	Andrew	Drilled prospect	Cu	Pb, Ag, Zn		Silicification associated with chalcopyrite and pyrrhotite; veinlets of galena and sphalerite; coarse sphalerite-galena-calcite-quartz veins and breccia; sphalerite associated with quartz and calcite veins
	105K 090	Solo	Prospect	Sn, Zn, Au	Ag, Pb, Sb		Galena, stibnite, boulangerite, and sphalerite in fractures up to 20 cm wide; massive pyrrhotitic skarn; disseminated and fracture-controlled sulphide mineralization, consisting mainly of fine- to medium-grained auriferous pyrite and arsenopyrite occasionally with lesser amounts of galena and chalcopyrite
	105K 092	Galway	Showing	Hg, As, Au, Pb, Ag, Zn			Quartz veins containing fluorite, arsenopyrite, pyrite, tetrahedrite, sphalerite, and galena
Sedimentary exhalative Zn-Pb-Ag (Sedex)	105K 010	Fargo	Drilled prospect		Ag, Pb, Zn		Discontinuous narrow lenses of galena and straw-coloured sphalerite; massive bands of galena and sphalerite up to 10 cm thick in a 24 m thick section
	105K 012	Casca	Anomaly				
	105K 034	Adamson	Drilled prospect	Pb, Zn	Cu		Minor galena, sphalerite, chalcopyrite, pyrite, and pyrrhotite in the foliation.
	105K 036	Beta	Drilled prospect	Zn	Pb		Minor galena-bearing float; traces of base-metal sulphide minerals containing 5% disseminated pyrite+pyrrhotite with a trace of galena and sphalerite
	105K 042	Sea	Drilled prospect	Cu	Ag, Zn, Pb		Varying amounts of fine-grained disseminated pyrite and/or pyrrhotite
	105K 043	Sb	Drilled prospect	Cu	Ag, Zn, Pb		Lenses of pyrite, pyrrhotite, and magnetite containing some galena, sphalerite, and chalcopyrite in sericitic and graphitic schist

Table E-1. (cont.)

Deposit type	MINFILno	Name	Status	Commodity Major	Minor	Trace	Mineralogy notes
Sedimentary exhalative Zn-Pb-Ag (Sedex) (cont.)	105K 046	Swim	Deposit	Au, Cu	Ag, Pb, Zn		In order of abundance, the sulphide minerals are pyrite, pyrrhotite, sphalerite, galena, minor chalcopyrite, and trace amounts of tetrahedrite, bournonite, and arsenopyrite; quartz is the most abundant gangue mineral, but measurable amounts of gypsum and barite are also present.
	105K 049	St.Lucie	Drilled prospect		Cu		Pyrrhotite-chalcopyrite bands in a 2.6 m wide zone
	105K 054	Shrimp	Drilled prospect				Zones of up to 20% magnetite and minor pyrite
	105K 055	Vangora	Open pit past producer	Ag	Pb, Zn	Au	Massive pyrite and pyrrhotite with quartz-barite gangue; ore minerals are pale yellow sphalerite, galena, minor amounts of chalcopyrite, and traces of tetrahedrite, bournonite, and arsenopyrite.
	105K 056	Grum	Open pit past producer	Ag	Pb, Zn	Au	Sphalerite, galena, pyrite, and minor chalcopyrite, arsenopyrite, and sulphosalt minerals in a gangue of quartz, barite, and small quantities of pyrrhotite and magnetite
	105K 057	Kulan	Drilled prospect		Pb, Zn, Ag		
	105K 061	Faro	Open pit past producer	Ag	Pb, Zn	Au	(In decreasing order of abundance): pyrite, sphalerite, galena, pyrrhotite, chalcopyrite, and marcasite, with patchy barite and traces of tetrahedrite, bournonite, and arsenopyrite in a siliceous gangue; the deposit is surrounded by concentric envelopes of bleaching and silicification, and quartz-muscovite-plagioclase alteration, which affect both the hanging-wall and footwall rocks.
	105K 067	Lorna	Drilled prospect		Pb		The only mineralization seen was a trace of galena in phyllite.
	105K 074	Colt	Drilled prospect		Zn		A 1 cm wide band containing 20% pyrite and pyrrhotite with minor sphalerite
	105K 101	Dy	Deposit	Au	Pb, Ag, Zn		Sphalerite, galena, pyrite, and minor chalcopyrite
	105K 103	Tenas	Prospect	Au	Pb, Zn	Bi, As	22 cm wide horizon containing semimassive pyrrhotite and minor sphalerite
	105K 104	Dev	Drilled prospect	Ag	Zn, Pb		Galena, sphalerite, pyrite, and traces of chalcopyrite occur in sideritic zones in siliceous and graphitic slate
	105K 105	Sir John A.	Drilled prospect	Pb	Zn		Laminated and disseminated sphalerite and minor pyrrhotite occur in bands up to 5 cm thick; small sphalerite-galena showings in siderite-pyrrhotite-magnetite-garnet-actinolite skarns.
Sediment-hosted barite	105K 106	Urn	Showing		Ba		Ten barite showings, representing two or three horizons from 5 m to 12 m thick
	105K 110	Mt. Menzie	Showing		Ba		Bedded barite
Unknown	105K 001	Skeena	Unknown				
	105K 005	Deejay	Anomaly				
	105K 007	Citation	Unknown				
	105K 014	Tillman	Unknown				
	105K 016	Bridge	Unknown				
	105K 017	Fan-Tan	Unknown				
	105K 018	Taku	Anomaly				
	105K 019	Glyn	Unknown				
	105K 020	Nesbitt	Showing		Cu		Small amounts of chalcopyrite were found in trenching.
	105K 021	Spit	Unknown				

Table E-1. (cont.)

Deposit type	MINFILno	Name	Status	Commodity			Mineralogy notes
				Major	Minor	Trace	
Unknown (cont.)	105K 023	Green Valley	Showing	Ag, Cu, Pb, Sb, Zn		Au	Fine-grained massive pyrite mineralization occurs in highly sheared, rusty quartzite breccia cemented by impure calcite.
	105K 024	Holly	Unknown				
	105K 026	Sock	Drilled prospect				
	105K 027	Spur	Drilled prospect		Pb, Ag, Zn		
	105K 028	Domo	Unknown				
	105K 029	Northam	Unknown				
	105K 030	Laurel	Drilled prospect				
	105K 031	Trump	Unknown				
	105K 032	Lodge	Unknown				
	105K 033	Jet	Unknown				
	105K 035	Tel	Drilled prospect				
	105K 037	Blind	Anomaly				
	105K 038	Valray	Unknown				
	105K 040	Nasty	Drilled prospect				
	105K 045	Bea	Drilled prospect				
	105K 048	Elbow	Unknown				
	105K 050	O'Connor	Drilled prospect				
	105K 058	Kim	Prospect		Cu		
	105K 059	Lo	Drilled prospect				
	105K 060	Tay	Unknown				
	105K 063	Briden	Drilled prospect				
	105K 065	Crown	Drilled prospect				Several zones of disseminated pyrite and pyrrhotite
	105K 066	Leon	Unknown				
	105K 069	Paradox	Unknown				Reported quartz veins containing pyrite and chalcopyrite on 'Rose Mountain Ridge', but no mineralization found
	105K 070	Mary	Drilled prospect				
	105K 073	Twopete	Drilled prospect				
	105K 075	Blue	Unknown				
	105K 080	Shannon	Anomaly				
	105K 081	Complication	Unknown				
	105K 082	Try	Drilled prospect				Disseminated pyrite and pyrrhotite in graphite schist
	105K 083	Rebel	Drilled prospect		Zn, Pb, Cu		Galena-siderite vein float; galena-bearing quartz veins
	105K 084	Kangaroo	Drilled prospect				Minor amounts of pyrite and pyrrhotite
	105K 085	Yeti	Anomaly				
	105K 088	Sirola	Drilled prospect				
	105K 094	Cessna	Drilled prospect				
	105K 095	Bunbury	Showing				
	105K 096	Jon	Anomaly				
	105K 097	Petantic	Unknown				
	105K 099	O'Neill	Unknown				
	105K 100	Mor	Drilled prospect		Cu		Weakly disseminated pyrite, pyrrhotite, stringers, and a trace of chalcopyrite
	105K 102	Sellmer	Anomaly				
	105K 109	Prince Charles	Anomaly				
	105K 114	Great Dane	Unknown				
	105K 115	Multi	Drilled prospect				
Volcanogenic massive sulphide - type not determined	105K 004	Pen	Unknown				
	105K 087	Teddy	Drilled prospect	Cu	Zn		Minor disseminated sphalerite, pyrrhotite, and pyrite
	105K 098	Chaplin	Drilled prospect	Au, Cu	Pb, Zn, Ag		Float boulders were described as medium-grained aggregates of pyrite (≤40%), sphalerite (≤5%), galena (≤5%), chalcopyrite (≤3%) and arsenopyrite (≤3%) in a quartz-rich gangue; 2–20 cm wide foliaform massive pyrrhotite bands containing disseminated chalcopyrite; quartz veins containing weak chalcopyrite, galena, sphalerite, and pyrrhotite.
W skarn	105K 111	Union	Showing	Mo	Zn, Ag, Cu		Pyrrhotite, pyrite, chalcopyrite, sphalerite, arsenopyrite, scheelite, and molybdenite

Table E-2. Detailed location data for mineral occurrences in Sheldon Lake (NTS 105J) map area. Corresponding index map shown in Ffigure E-1 and descriptions in Table E-1 (summarized from Yukon MINFILE; Deklerk and Traynor, 2005)

MINFILENo.	Name	NTS	Lat.	Long.	UTM zone	UTM east	UTM north	Revised
105K 001	Skeena	105 K\1	62°6'30"N	132°13'34"W	8	644740	6889346	5/26/1992
105K 002	Wop	105 K\1	62°3'28"N	132°19'54"W	8	639467	6883486	5/26/1992
105K 003	Rags	105 K\1	62°0'26"N	132°26'46"W	8	633709	6877616	5/26/1992
105K 004	Pen	105 K\2	62°0'29"N	132°33'14"W	8	628065	6877492	10/16/2002
105K 005	Deejay	105 K\2	62°1'54"N	132°36'2"W	8	625525	6880029	10/16/2002
105K 006	Olgie	105 K\1	62°5'50"N	132°29'33"W	8	630893	6887542	5/26/1992
105K 007	Citation	105 K\2	62°5'38"N	132°44'54"W	8	617556	6886681	10/16/2002
105K 008	Mourne	105 K\2	62°1'1"N	132°45'42"W	8	617156	6878088	1/22/2004
105K 009	Grew creek	105 K\2	62°2'47"N	132°51'15"W	8	612207	6881204	10/25/2004
105K 010	Fargo	105 K\3	62°2'57"N	133°3'36"W	8	601437	6881174	5/26/1992
105K 011	Lyn	105 K\3	62°7'20"N	133°14'37"W	8	591618	6889037	5/25/1998
105K 012	Casca	105 K\3	62°9'2"N	133°19'46"W	8	587060	6892074	5/26/1992
105K 013	Thomas	105 K\4	62°0'50"N	133°42'54"W	8	567271	6876393	5/26/1992
105K 014	Tillman	105 K\3	62°10'30"N	133°20'44"W	8	586151	6894775	2/16/1996
105K 015	Eye	105 K\3	62°10'25"N	133°15'53"W	8	590363	6894731	2/16/1996
105K 016	Bridge	105 K\3	62°12'18"N	133°21'43"W	8	585213	6898095	3/2/1993
105K 017	Fan-tan	105 K\3	62°14'42"N	133°24'6"W	8	583037	6902498	10/16/2002
105K 018	Taku	105 K\6	62°17'56"N	133°26'55"W	8	580454	6908441	11/25/2002
105K 019	Glyn	105 K\6	62°15'18"N	133°21'30"W	8	585259	6903669	10/16/2002
105K 020	Nesbitt	105 K\3	62°13'21"N	133°14'34"W	8	591358	6900206	10/16/2002
105K 021	Spit	105 K\3	62°9'23"N	133°5'1"W	8	599849	6893078	5/28/1998
105K 022	Bobcat	105 K\3	62°8'6"N	133°3'45"W	8	601020	6890729	2/16/1996
105K 023	Green Valley	105 K\2	62°8'7"N	132°55'46"W	8	607955	6890975	10/18/2002
105K 024	Holly	105 K\2	62°7'9"N	132°53'47"W	8	609736	6889236	10/16/2002
105K 025	Orchay	105 K\2	62°7'23"N	132°49'46"W	8	613213	6889784	10/16/2002
105K 026	Sock	105 K\2	62°9'9"N	132°46'43"W	8	615752	6893153	10/21/2002
105K 027	Spur	105 K\2	62°10'56"N	132°41'51"W	8	619859	6896610	10/21/2002
105K 028	Domo	105 K\7	62°16'9"N	132°32'48"W	8	627341	6906579	5/26/1992
105K 029	Northan	105 K\9	62°30'7"N	132°12'39"W	8	643647	6933201	5/26/1992
105K 030	Laurel	105 K\7	62°26'55"N	132°51'17"W	8	610693	6925995	5/26/1992
105K 031	Trump	105 K\7	62°23'20"N	132°47'52"W	8	613857	6919443	5/26/1992
105K 032	Lodge	105 K\7	62°22'37"N	132°42'54"W	8	618182	6918261	5/28/1998
105K 033	Jet	105 K\7	62°22'34"N	132°38'12"W	8	622236	6918314	5/26/1992
105K 034	Adamson	105 K\7	62°21'2"N	132°53'20"W	8	609287	6915017	10/16/2002
105K 035	Tel	105 K\7	62°20'15"N	132°47'39"W	8	614239	6913726	10/16/2002
105K 036	Beta	105 K\7	62°16'55"N	132°50'59"W	8	611568	6907443	10/16/2002
105K 037	Blind	105 K\2	62°14'39"N	132°45'11"W	8	616728	6903406	10/16/2002
105K 038	Valray	105 K\2	62°11'15"N	132°32'37"W	8	627845	6897492	5/26/1992
105K 039	Cub	105 K\2	62°13'14"N	132°45'12"W	8	616805	6900777	10/16/2002
105K 040	Nasty	105 K\2	62°13'27"N	132°50'5"W	8	612562	6901035	10/16/2002
105K 041	Abraham	105 K\2	62°12'9"N	132°50'2"W	8	612686	6898623	10/21/2002
105K 042	Sea	105 K\2	62°10'58"N	132°53'45"W	8	609535	6896321	10/21/2002
105K 043	Sb	105 K\2	62°11'45"N	132°57'27"W	8	606280	6897672	10/21/2002
105K 044	Blackwood	105 K\2	62°12'42"N	132°56'55"W	8	606687	6899450	10/16/2002
105K 045	Bea	105 K\2	62°14'23"N	132°55'20"W	8	607958	6902618	10/16/2002
105K 046	Swim	105 K\3	62°12'43"N	133°02'00"W	8	602276	6899352	3/25/2004
105K 047	Wann	105 K\3	62°14'50"N	133°2'46"W	8	601498	6903253	10/16/2002
105K 048	Elbow	105 K\7	62°18'15"N	132°57'56"W	8	605482	6909723	10/16/2002
105K 049	St. Lucie	105 K\7	62°20'55"N	132°57'52"W	8	605384	6914675	10/16/2002
105K 050	O'Connor	105 K\7	62°23'6"N	132°58'13"W	8	604954	6918718	10/16/2002
105K 051	Action	105 K\6	62°20'47"N	133°3'54"W	8	600186	6914267	11/25/2002
105K 052	Mye	105 K\6	62°21'45"N	133°5'47"W	8	598508	6916013	11/25/2002
105K 053	Mur	105 K\6	62°19'31"N	133°4'3"W	8	600127	6911912	11/25/2002
105K 054	Shrimp	105 K\3	62°13'44"N	133°9'49"W	8	595453	6901032	10/16/2002
105K 055	Vangora	105 K\6	62°15'00"N	133°11'19"W	8	594095	6903351	3/25/2004
105K 056	Grum	105 K\6	62°16'47"N	133°14'29"W	8	591253	6906565	3/25/2004
105K 057	Kulan	105 K\6	62°16'47"N	133°14'29"W	8	591253	6906565	3/25/2004

Table E-2. (cont.)

MINFILENo.	Name	NTS	Lat.	Long.	UTM zone	UTM east	UTM north	Revised
105K 058	Kim	105 K\6	62°18'14"N	133°17'49"W	8	588304	6909196	10/18/2002
105K 059	Lo	105 K\6	62°19'48"N	133°19'58"W	8	586371	6912056	10/18/2002
105K 060	Tay	105 K\6	62°20'16"N	133°17'11"W	8	588751	6912985	11/5/2003
105K 061	Faro	105 K\6	62°21'26"N	133°22'23"W	8	584209	6915035	11/5/2003
105K 062	Flagstone	105 K\6	62°24'4"N	133°27'42"W	8	579506	6919811	10/25/2002
105K 063	Briden	105 K\6	62°22'45"N	133°28'57"W	8	578487	6917341	10/18/2002
105K 064	Jacola	105 K\5	62°23'44"N	133°30'41"W	8	576951	6919132	10/21/2002
105K0 65	Crown	105 K\5	62°25'12"N	133°36'34"W	8	571824	6921742	11/5/2003
105K 066	Leon	105 K\5	62°25'8"N	133°41'0"W	8	568011	6921538	10/16/2002
105K 067	Lorna	105 K\5	62°26'14"N	133°46'40"W	8	563094	6923485	10/16/2002
105K 068	Reserve	105 K\5	62°27'12"N	133°51'0"W	8	559334	6925211	10/16/2002
105K 069	Paradox	105 K\5	62°24'19"N	133°53'29"W	8	557291	6919821	10/16/2002
105K 070	Mary	105 K\5	62°29'40"N	133°55'36"W	8	555303	6929723	10/16/2002
105K 071	Coward	105 K\12	62°32'0"N	133°59'12"W	8	552143	6934005	5/26/1992
105K 072	Paige	105 K\12	62°38'7"N	133°50'14"W	8	559628	6945491	5/26/1992
105K 073	Twopete	105 K\12	62°39'9"N	133°47'7"W	8	562256	6947458	5/26/1992
105K 074	Colt	105 K\12	62°37'19"N	133°43'18"W	8	565583	6944118	5/26/1992
105K 075	Blue	105 K\12	62°37'25"N	133°40'32"W	8	567945	6944351	5/26/1992
105K 076	Hoot	105 K\11	62°40'30"N	133°29'45"W	8	577030	6950277	5/26/1992
105K 077	Owl	105 K\11	62°39'17"N	133°19'29"W	8	585850	6948235	5/26/1992
105K 078	Keglovic	105 K\11	62°34'39"N	133°19'36"W	8	585974	6939631	6/3/1992
105K 079	Ivan	105 K\11	62°33'42"N	133°16'23"W	8	588775	6937940	5/26/1992
105K 080	Shannon	105 K\11	62°30'15"N	133°22'33"W	8	583653	6931398	5/28/1992
105K 081	Complication	105 K\6	62°28'57"N	133°27'46"W	8	579233	6928875	10/16/2002
105K 082	Try	105 K\6	62°27'41"N	133°21'36"W	8	584590	6926654	10/16/2002
105K 083	Rebel	105 K\6	62°26'24"N	133°11'02"W	8	593747	6924508	3/25/2004
105K 084	Kangaroo	105 K\6	62°23'34"N	133°7'26"W	8	596988	6919344	10/16/2002
105K 085	Yeti	105 K\11	62°31'53"N	133°1'11"W	8	601898	6934942	5/28/1992
105K 086	Marks	105 K\10	62°30'22"N	132°54'38"W	8	607605	6932304	5/28/1992
105K 087	Teddy	105 K\10	62°38'36"N	132°44'43"W	8	615581	6947871	5/28/1992
105K 088	Sirola	105 K\2	62°10'0"N	132°57'6"W	8	606686	6894433	10/18/2002
105K 089	Andrew	105 K\16	62°56'26"N	132°13'55"W	8	640462	6981988	10/18/2005
105K 090	Solo	105 K\16	62°58'41"N	132°10'26"W	8	643223	6986291	5/3/2005
105K 091	El Pino	105 K\5	62°19'25"N	133°45'39"W	8	564211	6910846	5/28/1992
105K 092	Galway	105 K\5	62°22'28"N	133°55'16"W	8	555812	6916360	7/10/1991
105K 093	Parliament	105 K\2	62°5'53"N	132°59'51"W	8	604536	6886718	10/25/2004
105K 094	Cessna	105 K\6	62°17'49"N	133°20'32"W	8	585976	6908362	10/21/2002
105K 095	Bunbury	105 K\12	62°36'19"N	133°51'36"W	8	558519	6942128	5/28/1992
105K 096	Jon	105 K\11	62°31'25"N	133°12'27"W	8	592262	6933793	5/28/1992
105K 097	Petantic	105 K\1	62°2'53"N	132°5'8"W	8	652373	6882957	5/28/1992
105K 098	Chaplin	105 K\1	62°0'27"N	132°8'6"W	8	649989	6878327	3/7/2002
105K 099	O'Neil	105 K\6	62°17'23"N	133°10'20"W	8	594814	6907795	3/7/2002
105K 100	Mor	105 K\2	62°8'47"N	132°50'14"W	8	612721	6892369	10/18/2002
105K 101	Dy	105 K\3	62°13'47"N	133°07'49"W	8	597189	6901187	3/5/2004
105K 102	Sellmer	105 K\12	62°30'16"N	133°48'9"W	8	561679	6930949	5/28/1992
105K 103	Tenas	105 K\1	62°2'54"N	132°13'54"W	8	644736	6882654	3/6/2002
105K 104	Dev	105 K\4	62°10'3"N	133°31'28"W	8	576856	6893715	7/10/1991
105K 105	Sir John A.	105 K\3	62°4'6"N	133°9'42"W	8	596061	6883154	5/28/1992
105K 106	Urn	105 K\5	62°19'32"N	133°30'09"W	8	577589	6911343	3/25/2004
105K 107	Wedekind	105 K\2	62°0'33"N	132°39'31"W	8	622579	6877413	2/19/1996
105K 108	Lady Di	105 K\13	62°50'6"N	133°40'6"W	8	567829	6967906	5/28/1992
105K 109	Prince Charles	105 K\13	62°46'52"N	133°37'42"W	8	569994	6961946	5/28/1992
105K 110	Mt. Menzie	105 K\12	62°44'12"N	133°59'49"W	8	551262	6956648	5/28/1992
105K 111	Union	105 K\12	62°33'51"N	133°55'43"W	8	555074	6937488	5/28/1992
105K 112	Starlight	105 K\7	62°15'48"N	132°59'33"W	8	604226	6905132	10/18/2002
105K 113	Pontoon	105 K\3	62°8'33"N	133°7'26"W	8	597796	6891470	6/7/2005
105K 114	Great Dane	105 K\5	62°16'40"N	133°39'17"W	8	569816	6905851	5/28/1992
105K 115	Multi	105 K5	62°22'56"N	133°38'13"W	8	570500	6917500	10/21/2002

Table E-3. Mineral occurrence descriptions classified by deposit type for Tay River (NTS 105K) map area. Localities shown in Figure E-1; detailed locations in Table E-4 (summarized from Yukon MINFILE 2005, Deklerk and Traynor, 2005).

Deposit type	MINFILE no.	Name	Status	Commodity			Mineralogy notes
				Major	Minor	Trace	
Au-quartz veins	105J 039	Wendy	Showing	Au, Ag		As	Minor quartz, quartz-calcite, and calcite veining
	105J 043	Vg	Showing	Ag, Au			Visible gold hosted by quartz stringers; drusy quartz stringers, minor silicification, pervasive clay to propyllitic alteration and pyritization±pyrrhotite.
Coal	105J 018	Carolyn	Unknown	Coal			Possible that the staking was based on coal float found in a creek.
Cu skarn	105J 019	Variscite	Showing	Cu			Trace of chalcopyrite was found with disseminated pyrite and pyrrhotite in a hornfels-skarn zone.
Cu±Ag quartz veins	105J 003	Pike	Deposit	Cu, Ag	Pb, Au, Zn		Pyrrhotite, arsenopyrite, chalcopyrite, tetrahedrite, galena, and sphalerite with lesser enstatite and bornite occur in both zones as disseminations and veinlets accompanied by hydrothermal alteration and silicification.
Epithermal Au-Ag: low sulphidation	105J 038	Flood	Anomaly		Ag, Au		Zeolite minerals–calcite-quartz-gypsum veining and associated bleaching and hematization
Mantos and stockwork Sn	105J 016	Itsi	Drilled prospect	Zn, Pb, Ag, Sn	Au, Cu, W		Galena, sphalerite, and chalcopyrite occur in lenses of pyrite and pyrrhotite in a 3 m wide shear zone.
Mo skarn	105J 035	Sask	Showing	Cu, Mo	Ag, Zn, Pb, Au		Disseminated molybdenite and chalcopyrite occur in quartz-veined and hornfelsed zone; sphalerite, chalcopyrite, and molybdenite also occur in diopside skarns.
Pb-Zn skarn	105J 009	Riddel	Drilled prospect	Pb+Zn, Cu	Ag, Au		Heavily disseminated galena, sphalerite, pyrite, and pyrrhotite in a poorly exposed zone of silicification; finely disseminated pyrite and chalcopyrite
	105J 015	Gun	Showing	Cu, Zn	Ba		Sphalerite and chalcopyrite occur with pyrrhotite, pyrite, barite, witherite, and several rare barium silicate minerals (pellyite, gillespite, sanbornite, and taramellite) in pyroxene-garnet-quartz skarn lenses; narrow barite veins.
	105J 029	Hench	Drilled prospect	Ag, Zn, Pb	Cu		Galena, sphalerite, and minor chalcopyrite occur in veins and a thin skarn zone; chalcopyrite-bearing quartz vein in shale.
	105J 030	Marylou	Prospect	Ag, Zn, Pb	Au, Mo, Cu, W		Massive pyrrhotite and pyrite with lesser galena and sphalerite and rare chalcopyrite, arsenopyrite, and molybdenite occur in pods up to 5 m long; minor scheelite; scheelite, with associated lenses of pyrrhotite and sphalerite; massive sulphide lenses contain coarse-grained pyrite>galena>arsenopyrite>chalcopyrite>sphalerite>pyrrhotite; coarse-grained pyrite>galena>sphalerite>chalcopyrite>arsenopyrite>pyrrhotite.
	105J 040	Narl	Showing		Zn, Pb, Cu		Minor chalcopyrite occurs with pyrrhotite and traces of sphalerite and galena in narrow veins.

Table E-3. (cont.)

Deposit type	MINFILE no.	Name	Status	Commodity			Mineralogy notes
				Major	Minor	Trace	
Polymetallic veins Ag-Pb-Zn±Au	105J 002	Bill	Showing	Pb+Zn	Cu, Ag		
	105J 004	Norken	Prospect	Pb, Ag, Cu, Zn			Finely laminated sphalerite and galena in shale has been found as float on the claims, but the source has not been located; quartz veins containing traces of galena and arsenopyrite.
	105J 010	Spearhead	Showing	Cu	Au		Traces of chalcopyrite and pyrrhotite occur on unidirectional dry fractures within the stock, and pyrite and arsenopyrite occur in xenoliths and schlieren.
	105J 017	Costin	Showing	Zn, Pb, Ag	Au		Galena and sphalerite occur in narrow veins.
Porphyry Mo (low F-type)	105J 006	Tac	Anomaly	Cu, Mo			
Sedimentary exhalative Zn-Pb-Ag (Sedex)	105J 011	Ivor	Prospect	Ag	Cu, Au, Zn		Narrow gold-bearing arsenopyrite veins and vein breccia units
	105J 012	Rog	Drilled prospect		Zn		
	105J 013	Clyde	Prospect	Zn, Pb	Cu, W, Zn		A pyrrhotite-rich boulder containing scheelite, chalcopyrite, and sphalerite; minor bedded barite
	105J 025	St. Godard	Showing	Ba			Barite occurs in chert or shale.
	105J 034	Dyak	Anomaly				
Sediment-hosted Ba	105J 023	Pete	Drilled prospect	Ba	Pb+Zn		Two barite layers are interbedded with a sequence of metamorphosed siliceous and carbonaceous shale; minor mineralization consisting of hydrozincite, sphalerite, galena, and pyrite occurs in the upper barite horizon.
	105J 024	Coco	Showing	Ba			Bedded barite occurs in shale.
Unknown	105J 001	Fuller	Anomaly				
	105J 005	Big timber	Anomaly				
	105J 008	Mt. Sheldon	Showing	Cu, Sn, W, Au	As, Bi, Ag, Te, W		Gold occurs with arsenopyrite in quartz veins; arsenopyrite, pyrite, pyrrhotite, and chalcopyrite.
	105J 020	Macrae	Anomaly				
	105J 021	Syndicate	Unknown				
	105J 022	Rich	Anomaly		Zn, Pb, Cu, Ba		
	105J 026	Prism	Unknown				
	105J 027	Marilyn	Unknown				
	105J 028	Bojo	Anomaly				
	105J 031	Greggie	Anomaly				
	105J 032	Canol	Anomaly				
	105J 033	Fortin	Unknown	Au			
	105J 037	Rudy	Unknown				
	105J 041	Liberal	Unknown				
	105J 042	Pandora	Unknown				
W skarn	105J 007	Dragon	Drilled prospect	W, Ag, Cu, Au	Pb, As, Au, Ag		Chalcopyrite and scheelite both occur in pyrrhotite-magnetite-pyroxene skarn, whereas scheelite also occurs along quartz veins and dry fractures within the stock; sphalerite and galena were also found in one minor showing; arsenopyrite-quartz-sericite veins; thick bands of actinolite skarn and calc-silicate rock containing up to 5% pyrrhotite.
	105J 014	Prevost	Prospect	W			Scheelite occurs in quartz veins.
	105J 036	Gulf	Showing	W, Cu			Minor amounts of chalcopyrite and scheelite occur in skarn.

Table E-4. Detailed location data for mineral occurrences in Tay River (NTS 105K) map area. Corresponding index map shown in Figure E-1 and descriptions in Table E-3 (summarized from Yukon MINFILE 2005, Deklerk and Traynor, 2005).

MINFILENo.	Name	NTS	Lat.	Long.	UTM zone	UTM east	UTM north	Revised
105J 001	Fuller	105 J\16	62°58'57"N	130°11'45"W	9	439394	6984202	5/26/1992
105J 002	Bill	105 J\1	62°2'19"N	130°12'14"W	9	437025	6879065	5/26/1992
105J 003	Pike	105 J\2	62°10'1"N	130°41'42"W	9	411713	6893933	3/10/2001
105J 004	Norken	105 J\2	62°14'38"N	130°41'57"W	9	411721	6902508	10/19/1999
105J 005	Big Timber	105 J\3	62°8'2"N	131°16'42"W	9	381208	6891184	5/26/1992
105J 006	Tac	105 J\3	62°4'27"N	131°20'19"W	9	377826	6884645	5/26/1992
105J 007	Dragon	105 J\12	62°36'8"N	131°32'13"W	9	369776	6943831	3/22/2002
105J 008	Mt. Sheldon	105 J\11	62°43'6"N	131°5'29"W	9	393060	6955942	2/20/1996
105J 009	Riddel	105 J\12	62°43'11"N	131°53'1"W	9	352575	6957660	5/27/1998
105J 010	Spearhead	105 J\13	62°50'43"N	131°39'3"W	9	365046	6971129	5/24/2002
105J 011	Ivor	105 J\15	62°58'23"N	130°50'57"W	9	406258	6983934	5/21/2002
105J 012	Rog	105 J\15	62°48'9"N	130°54'46"W	9	402469	6965032	6/2/1992
105J 013	Clyde	105 J\9	62°43'28"N	130°15'8"W	9	435977	6955510	4/19/2002
105J 014	Prevost	105 J\9	62°40'44"N	130°5'44"W	9	443900	6950289	6/2/1992
105J 015	Gun	105 J\16	62°50'50"N	130°0'51"W	9	448363	6968973	5/26/1992
105J 016	Itsi	105 J\16	62°56'2"N	130°7'3"W	9	443269	6978716	7/10/1991
105J 017	Costin	105 J\16	62°53'28"N	130°8'36"W	9	441873	6973973	5/26/1992
105J 018	Carolyn	105 J\4	62°2'1"N	131°47'43"W	9	353784	6881075	5/26/1992
105J 019	Variscite	105 J\16	62°45'53"N	130°11'52"W	9	438844	6959944	5/26/1992
105J 020	Macrae	105 J\9	62°37'41"N	130°23'48"W	9	428360	6944924	7/10/1991
105J 021	Syndicate	105 J\11	62°34'15"N	131°20'5"W	9	380026	6939944	5/26/1992
105J 022	Rich	105 J\7	62°22'15"N	130°46'46"W	9	407940	6916759	5/26/1992
105J 023	Pete	105 J\16	62°59'44"N	130°3'24"W	9	446470	6985533	7/10/1991
105J 024	Coco	105 J\16	62°58'44"N	130°29'20"W	9	424534	6984110	5/26/1992
105J 025	St. Godard	105 J\13	62°52'0"N	131°36'21"W	9	367432	6973417	6/26/1998
105J 026	Prism	105 J\15	62°57'44"N	130°36'1"W	9	418843	6982389	5/26/1992
105J 027	Marilyn	105 J\4	62°3'28"N	131°50'5"W	9	351840	6883855	5/26/1992
105J 028	Bojo	105 J\4	62°0'21"N	131°46'3"W	9	355105	6877920	2/28/1996
105J 029	Hench	105 J\3	62°2'18"N	131°23'24"W	9	374995	6880753	5/26/1992
105J 030	Marylou	105 J\1	62°6'40"N	130°27'4"W	9	424276	6887405	2/27/1998
105J 031	Greegie	105 J\1	62°14'43"N	130°23'24"W	9	427785	6902280	11/7/1991
105J 032	Canol	105 J\16	62°55'20"N	130°24'1"W	9	428887	6977697	5/26/1992
105J 033	Fortin	105 J\1	62°0'34"N	130°28'45"W	9	422554	6876115	11/7/1991
105J 034	Dyak	105 J\10	62°30'14"N	130°30'48"W	9	422053	6931229	5/26/1992
105J 035	Sask	105 J\4	62°12'41"N	131°32'8"W	9	368139	6900311	5/26/1992
105J 036	Gulf	105 J\1	62°0'22"N	130°4'6"W	9	444056	6875321	11/7/1991
105J 037	Rudy	105 J\10	62°31'38"N	130°44'3"W	9	410750	6934113	5/26/1992
105J 038	Flood	105 J\5	62°26'31"N	131°55'0"W	9	349487	6926812	3/14/2005
105J 039	Wendy	105 J\5	62°28'46"N	131°50'30"W	9	353539	6930814	5/26/1992
105J 040	Narl	105 J\6	62°29'26"N	131°7'21"W	9	390635	6930627	5/26/1992
105J 041	Liberal	105 J\9	62°34'49"N	130°26'34"W	9	425876	6939654	5/26/1992
105J 042	Pandora	105 J\5	62°28'8"N	131°39'14"W	9	363165	6929227	5/26/1992
105J 043	Vg	105 J\12	62°35'32"N	131°50'31"W	9	354074	6943366	10/8/2003

Appendix F

Analytical chemistry methods

Table F-1. Analytical chemistry methods and detection limits.

Oxide	Year	Method	Detect limit (%)	Element	Year	Method	Detect limit (ppm)	Element	Year	Method	Detect limit (ppm)
				Rb	1996	ICP-ES	0.05	**Cu**	1996	ICP-ES	10
				Cs	1996	ICP-MS	0.02	**Pb**	1996	ICP-MS	2
SiO_2	1996	XRF-WDS	0.40	**Ba**	1996	ICP-ES	10	**Zn**	1996	ICP-ES	5
Al_2O_3	1996	XRF-WDS	0.02	**Sr**	1996	ICP-ES	10	**As**	1986	XRF-EDS	30
TiO_2	1996	XRF-WDS	0.40	**Ga**	1996	ICP-MS	0.1	**Ag**	1996	ICP-MS	0.1
Fe_2O_3t	1996	XRF-WDS	0.02	**Ta**	1996	ICP-MS	0.2	**Bi**	1996	ICP-MS	0.5
Fe_2O_3	1996	Calculated	0.10	**Nb**	1996	ICP-MS	0.05	**Mo**	1996	ICP-MS	0.2
FeO	1996	Titrimetric	0.20	**Hf**	1996	ICP-MS	0.05	**Br**	1986	XRF-EDS	10
MnO	1996	XRF-WDS	0.01	**Zr**	1996	ICP-ES	0.5	**La**	1996	ICP-MS	0.1
MgO	1996	XRF-WDS	0.10	**Y**	1996	ICP-MS	0.02	**Ce**	1996	ICP-MS	0.1
CaO	1996	XRF-WDS	0.10	**Th**	1996	ICP-MS	0.02	**Pr**	1996	ICP-MS	0.02
Na_2O	1996	XRF-WDS	0.50	**U**	1996	ICP-MS	0.02	**Nd**	1996	ICP-MS	0.1
K_2O	1996	XRF-WDS	0.05	**Au**	1986	FANA	1 ppb	**Sm**	1996	ICP-MS	0.02
P_2O_5	1996	XRF-WDS	0.02	**In**	1996	ICP-MS	0.05	**Eu**	1996	ICP-MS	0.02
H_2Ot	1996	IRS	0.10	**Tl**	1996	ICP-MS	0.02	**Gd**	1996	ICP-MS	0.02
CO_2t	1996	IRS	0.10	**Be**	1996	ICP-ES	0.5	**Tb**	1996	ICP-MS	0.02
St	1996	IRS	0.02	**Cd**	1996	ICP-MS	0.2	**Dy**	1996	ICP-MS	0.02
Cl	1986,87	Pyrohydrolysis	50 ppm	**Cr**	1996	ICP-ES	10	**Ho**	1996	ICP-MS	0.02
F	1986,87	Pyrohydrolysis	50 ppm	**Ni**	1996	ICP-ES	10	**Er**	1996	ICP-MS	0.02
				Co	1996	ICP-ES	5	**Tm**	1996	ICP-MS	0.02
				Sc	1996	ICP-ES	0.5	**Yb**	1996	ICP-MS	0.05
				V	1996	ICP-ES	5	**Lu**	1996	ICP-MS	0.02

Notes:

Year: samples originally analyzed in 1986–1987, reanalyzed in 1996; only values for F, Cl, Br, and As derive from the earlier period.
Sample preparation: samples were prepared by jaw crushing to 1.5 cm, subsampling and pulverizing in a Bico ceramic disc grinder followed by reduction to less than 100 mesh powder in a ceramic ball mill. Final product was a 20 g vial of representative powder suitable for acid dissolution or fusion. Approximately 5 g of total rock powder was required for a standard whole-rock and trace-metal analysis.
XRF-WDS: method used for major-element analysis (fused-disk wavelength dispersive X-ray fluourescence).
XRF-EDS: method used for analysis for bromine and arsenic (energy dispersive X-ray fluourescence using Compton scatter)
ICP-ES or ICP-MS: methods used for trace-element analysis; determinations based on total dissolution of the sample using nitric, perchloric, and hydrofluouric acids followed by a lithium metaborate fusion of any residual material; ICP-ES (ICP emission spectroscopy); ICP-MS (ICP mass spectrometry).
FANA: method used to analyze for gold (fire assay concentration followed by neutron activation analysis).
IRS: H_2O_{total}, and CO_{2total}, S_{total} were determined by combustion followed by infrared spectrometry.
Pyrohydrolysis: F and Cl were determined by a pyrohydrolysis method followed by ion chromatography.
Titrimetric: ferrous iron determined using the Wilson method (titrimetric).
Calculated: Fe_2O_3 calculated from Fe_2O_3total-1.11134FeO.
Acknowledgment: analyses done at the Geological Survey of Canada (Analytical Chemistry Section, Mineral Resources Division); gold analyses at X-Ray Assay Laboratories Limited, Don Mills, Ontario.