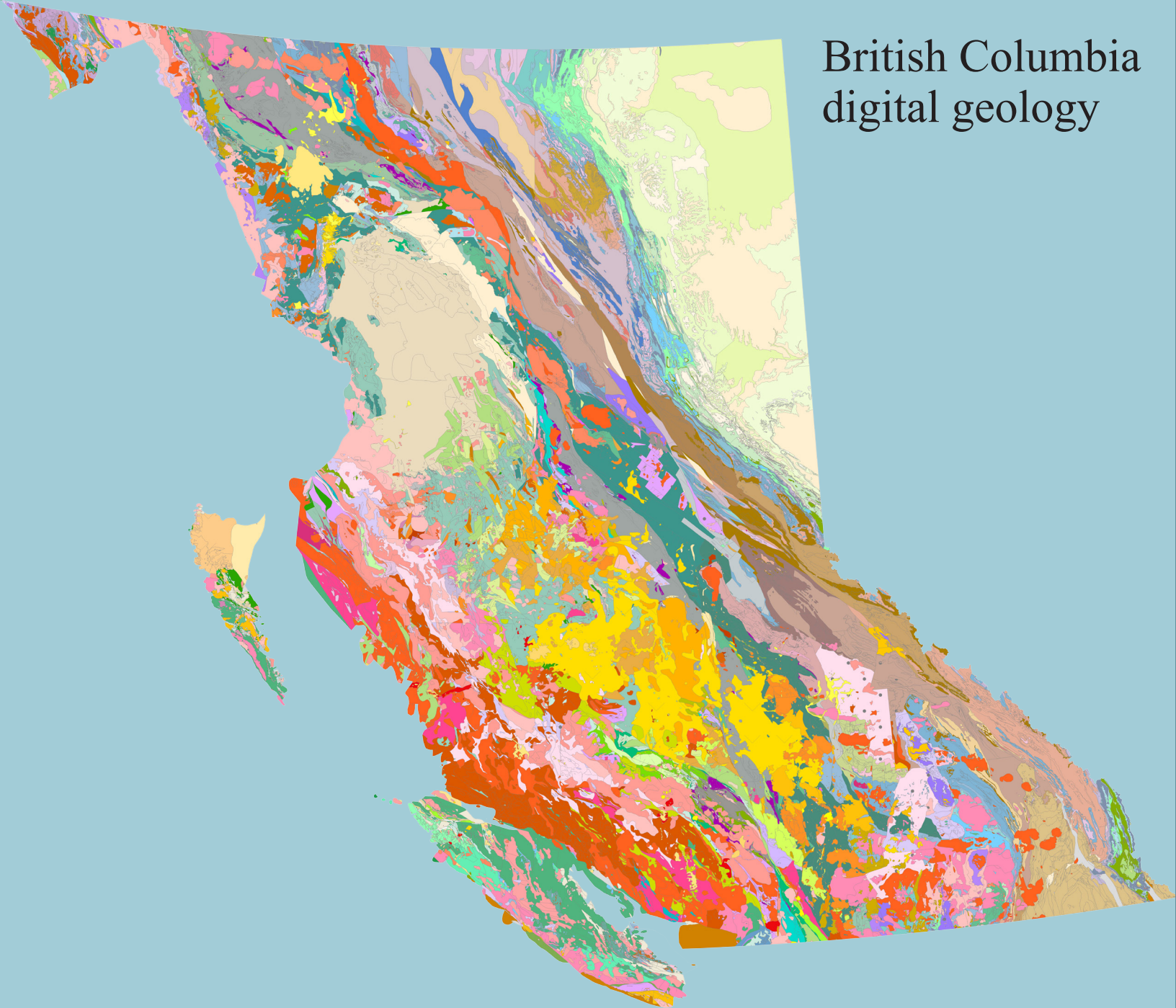


British Columbia digital geology



Y. Cui, D. Miller, P. Schiarizza, and L.J. Diakow



Ministry of
Energy, Mines and
Petroleum Resources



British Columbia Geological Survey Open File 2017-8

Ministry of Energy, Mines and Petroleum Resources
Mines and Mineral Resources Division
British Columbia Geological Survey

Recommended citation: Cui, Y., Miller, D., Schiarizza, P., and Diakow, L.J., 2017. British Columbia digital geology. British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Open File 2017-8, 9p.



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Y. Cui^{1a}, D. Miller¹, P. Schiarizza¹, and L.J. Diakow¹

¹British Columbia Geological Survey, Ministry of Energy, Mines and Petroleum Resources, Victoria, B.C., V8W 9N3

^acorresponding author: yao.cui@gov.bc.ca

Recommended citation: Cui, Y., Miller, D., Schiarizza, P., and Diakow, L.J., 2017. British Columbia digital geology. British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Open File 2017-8, 9p.

Abstract

British Columbia digital geology contains geological maps integrated at scales from 1:250,000 to 1:50,000. Whereas the stratigraphic nomenclature we adopt resembles the classification and hierarchy specified in the North American Stratigraphic Code, we distinguish bedrock in terms of three units: lithostratigraphic, lithodemic, and lithotectonic. The present edition includes updates to Chilcotin-Bonaparte, northern Vancouver Island, North Coast, Kutchi, QUEST, and Terrace.

Keywords: British Columbia, digital, geology, bedrock, faults, map

1. Introduction

British Columbia digital geology is the province-wide repository of geological maps maintained by the British Columbia Geological Survey (BCGS). It can be used to produce custom geological maps and as the database for applications in visualization, query, and analysis using MapPlace 2 (Cui et al., 2017). This Open File is the latest in a series of updates (Massey et al., 2005; Cui et al., 2013, 2015).

In the present edition, the bedrock geology is integrated from original maps (including ongoing projects) at scales ranging from 1:250,000 to 1:50,000 (Appendix 1), previous province-wide compilations (Massey et al., 2005; Cui et al., 2013, 2015) and recent regional compilations (Fig. 1), including updates for the Chilcotin-Bonaparte area (Schiarizza, 2017), northern Vancouver Island (Nixon et al., 2011a, 2011b, 2011c, 2011d, and 2011e), North Coast (Nelson et al., 2014), Kutchi (Schiarizza, 2012), QUEST (Logan et al., 2010), and Terrace (Nelson, 2009). Most of the geological units have been updated for their terrane designation, based on terrane maps of the northern Cordillera (Colpron and Nelson, 2011) and other publications (Colpron and Nelson, 2009; Colpron et al., 2007; Nelson and Colpron, 2007; Nelson et al., 2013).

Ensuring that the bedrock geology is standardized, consistent and seamless across map sheets is a continuous process. Nevertheless, discontinuities across map sheets ('data boundaries') remain. Some of these artefacts reflect mapping done at different scales or using different unit subdivisions and interpretations.

2. Encoding of stratigraphic nomenclature

The stratigraphic nomenclature we use for encoding resembles that specified in the North American Stratigraphic Code (North American Commission on Stratigraphic Nomenclature, 1983; 2005; Rawson et al., 2002; Easton et al., 2014). Ages are adopted from the International Commission on Stratigraphy (Cohen et al., 2013; International Commission on Stratigraphy, 2017). Listings of formally named geological units in British Columbia are available from WEBLEX Canada at (<http://weblex.nrcan.gc.ca>).

We distinguish three lithological categories in the British Columbia digital geology database: lithostratigraphic, lithodemic, and lithotectonic (Table 1). Lithostratigraphic units are material bodies of sedimentary, extrusive igneous, metasedimentary, or metavolcanic strata that generally conform to the Law of Superposition and are distinguished on the basis of lithic characteristics and stratigraphic position (North American Commission on Stratigraphic Nomenclature, 2005). Lithodemic units are material bodies of predominantly intrusive, highly deformed, and/or highly metamorphosed rocks that generally do not conform to the Law of Superposition and distinguished on the basis of lithic characteristics (North American Commission on Stratigraphic Nomenclature, 2005). Although formation and lithodeme are the most common fundamental units forming mappable bodies in British Columbia, informal terms comparable to formation in rank (succession and sequence) have also been used. Lithotectonic units are not included in the North American Stratigraphic Code. This term is used to define units on basis of structural or deformation features, mutual relations, origin or historical

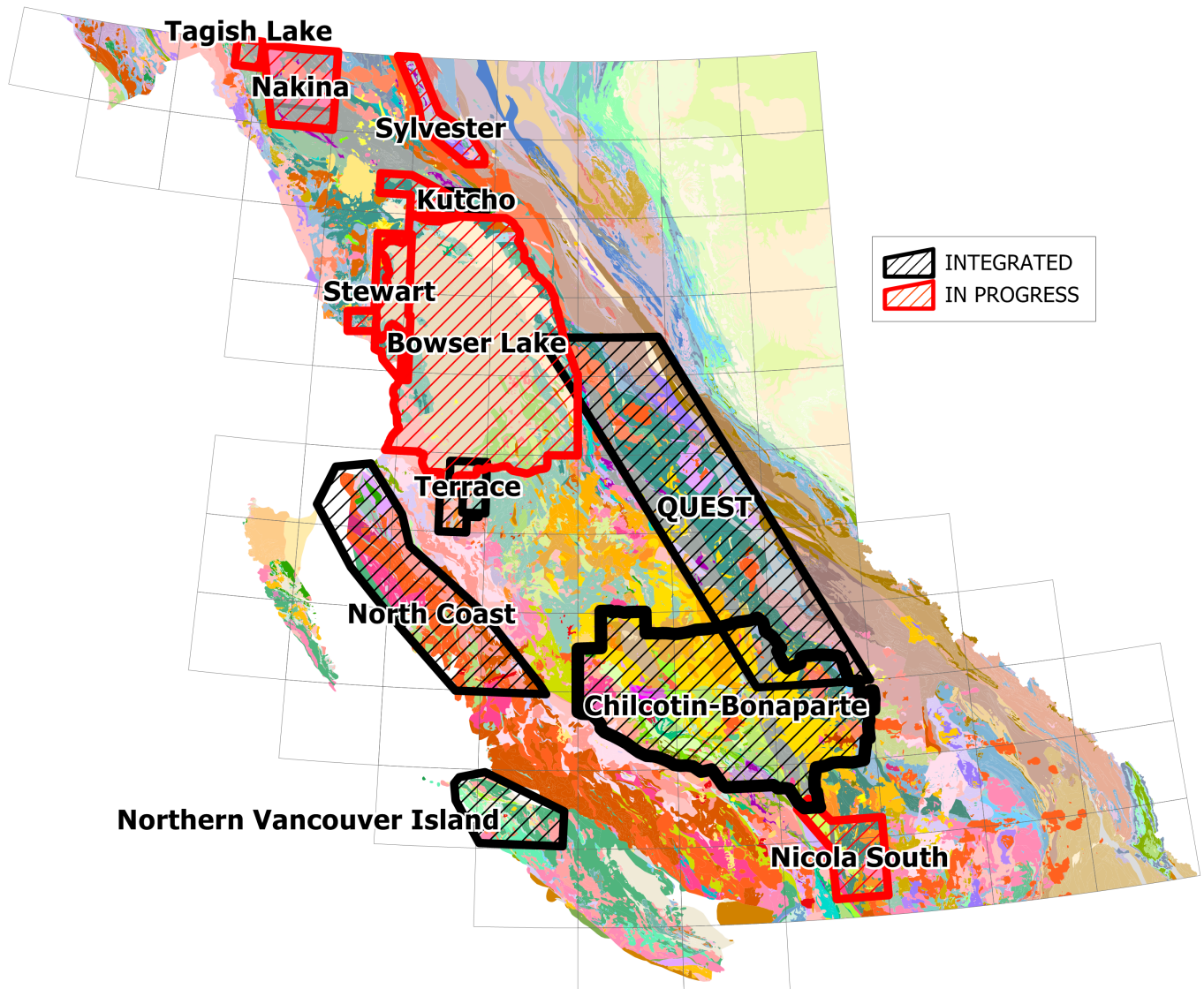


Fig. 1. Regional map compilations and status of data integration.

evolution (North American Geologic Map Data Model Steering Committee 2004; Neuendorf, et al., 2011; Infrastructure for Spatial Information in Europe, 2017). Use of the term assemblage in the lithotectonic category is interchangeable with the term ‘tectonostratigraphic assemblage’ or ‘tectonic assemblage’. Although ‘assemblage’ is strictly a biostratigraphic term, it has also been used in British Columbia for fundamental units in the lithostratigraphic category at the comparable formation rank (e.g., Eaglenest assemblage in the Bowser Lake Group).

2.1. Geological unit designations and symbols

Geological unit labels are constructed using 1) bedrock age (Epoch, in uppercase for lithodemic or lithotectonic units) or position (Epoch, in lowercase for lithostratigraphic units); 2) condensed Group/Suite, Formation/Lithodeme, and Member names (all in uppercase); and 3) lithology and characteristics codes (in lowercase), separated by a dot (.).

For example,

- LTrGCSqm: Late Triassic Guichon Creek batholith - Spatsum quartz monzonite
- uTrBPvb.fx: Upper Triassic Bonanza Group - Parson Bay Formation – basalt as flow with megacryst

Codes for lithology types and characteristics are available in the lookup tables included in the data download package (BC_lithology.csv and BC_lithology_characteristics.csv).

A set of true type fonts for the stratigraphic age symbols, modified from Federal Geographic Data Committee (2006), is available for download from the BCGS website (http://webmap.em.gov.bc.ca/mapplace/DL/geology/BCGS_StratAgeSymbols.ttf).

2.2. Geological unit colours and patterns

Colours and patterns are effective to visualize spatial and temporal relationships. We considered lithology, age, and

Table 1. Categories and ranks of lithological units; fundamental units in italics.

Category	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6
Lithostratigraphic	Supergroup	Group	Subgroup	<i>Formation</i>	Member	Bed/Flow
Lithodemic		Suite	Subsuite	<i>Lithodeme</i>	Phase	Zone
		Complex		<i>Lithodeme</i>	Phase	Zone
Lithotectonic		<i>Assemblage</i>				

extent of major stratigraphic units to define colours for the province-wide geological map, taking into account historical usage in British Columbia. The colours we use are modified from Massey et al. (2005), regional compilations, and the tectonic assemblage map by Wheeler and McFeely (1991).

3. Data release

The BC digital geology data is available for download from (<http://www.empr.gov.bc.ca/Mining/Geoscience/BedrockMapping/Pages/BCGeoMap.aspx>). The data download package consists of

- 1) geological units as polygons, in geographic and BC Albers coordinate systems
- 2) faults as linework, in geographic and BC Albers coordinate systems
- 3) a Quaternary layer: mostly as fluvial coverage, in geographic and BC Albers coordinate systems
- 4) lookup tables for lithology, characteristics and code (BC_lithology.csv and BC_lithology_characteristics.csv)
- 5) lookup tables for geological units and their colours in RGB and hexadecimal (BC_strat_unit_colour_rgb.csv and BC_strat_unit_colour_hex.csv)
- 6) an ESRI layer file for ArcGIS versions 10.1 or more recent (BC_strat_unit_colour_arc10_1x.lyr)

3.1. Metadata

Descriptions and content of British Columbia digital geology is provided in Table 2. ISO 19115-compliant metadata are available from (<http://catalogue.data.gov.bc.ca/dataset/ef8476ed-b02d-4f5c-b778-0d44c9126144/resource/31f6fbb1-fa5c-477e-b252-0ddfe4201f3f/download/bedrockgeology.xml>).

In addition to the British Columbia Geological Survey Publication Catalogue, this release can be downloaded at the DataBC Data Catalogue, licensed under BC Open Government License.

3.2. Descriptions of bedrock and fault attributes

The descriptions for columns in the shapefiles for bedrock and faults are in Tables 3 and 4. Only two units have been assigned Supergroup rank in British Columbia (Purcell and Windermere) and no units have a Subgroup rank. For this reason, and to simplify query and other computational applications, supergroup, group, subgroup and units at equivalent ranks are stored in the same column (gp_suite) in the database. There are few subdivisions of units below the formation and equivalent rank, so units in the member, bed and equivalent ranks are also stored in the same column (mem_phase). If a specific rank is sought, key words such as supergroup, subsuite, and phase can be used to search combined entries in strat_name.

4. Licensing

The British Columbia digital geology and its derived or equivalent data products (such as ‘BC bedrock geology’ and ‘BC faults’), are licensed under the BC Open Government License (<http://www.data.gov.bc.ca/local/dbc/docs/license/OGL-vbc2.0.pdf>).

Table 2. Descriptions of British Columbia digital geology.

Content	Description
Data format	ESRI® shapefile format and CSV files
Coordinates of spatial data	Decimal degrees in geographic coordinates (suffix _ll83 in file names) Decimetre in BC Albers projection (suffix _alb in file names)
Mapping scales	Varying from 1:50 000 to 1:250 000
Recommended use	General use of geological maps, a base to compile more detailed maps, or as database for query, analysis, and display on the web
Edition date	July 7, 2017

Table 3. Descriptions for bedrock attributes.

Attribute	Description
upid	Unique ID for bedrock polygons
strat_unit	Recommended geological unit code in standard label format consisting of age/position at Epoch level, named lithostratigraphic or lithodemic unit, lithology, and other characteristics, e.g., uTrBPvb.fx: Upper Triassic Bonanza Group - Parson Bay Formation – basalt as flow with megacryst
area_m2	Area size of a bedrock unit polygon in square metres
era	Geological Era within which the unit lies
period	Geological Period within which the unit lies
strat_age	Stratigraphic age or age range of unit
strat_name	Stratigraphic name of unit
gp_suite	Supergroup, group, subgroup, and equivalent ranks
fm_lithodm	Formation, lithodeme and equivalent rank
mem_phase	Subdivision of unit at member, phase, bed, flow, facies, and other equivalent ranks
rock_class	Main lithology classes: intrusive, volcanic, sedimentary, metamorphic, ultramafic
rock_type	Generalized to specific lithological name or description
rk_char	Distinct characteristics of bedrock unit or lithology: mineralogy, texture/fabric (grain sizes, pillowed, columns, flow), structure (e.g., schistose and gneissic), colours, alteration, weathering, and environment.
unit_desc	Original description of the unit from map compilation
age_max	Maximum age of unit (for numerical age, visit http://www.stratigraphy.org)
age_min	Minimum age of unit (for numerical age, visit http://www.stratigraphy.org)
belt	Morphotectonic belt
terrane	Name of tectono-stratigraphic terrane
basin	Name of sedimentary basin
basin_age	Age of basin
Project	Project name of regional map compilation
map_comp	Map compilation reference: author(s), year, and named project or area
src_ref_s	Short reference to source data of map compilation: author(s), year, project or area, organization, and publication number: e.g., Schiarizza et al., 2013, Chilcotin-Bonaparte, BCGS, Open File 2013-5
src_url	URL to source data of map compilation
edit_date	Publication date of a data edition
pub_org	Organization of data publication: British Columbia Geological Survey

Table 4. Descriptions for fault attributes.

Attribute	Description
ulid	Unique line ID
fault_type	Type of fault
confidence	Confidence or reliability of survey observation or measurement of faults
fault_name	Fault name, if available
Length_m	Length of fault line in metres
edit_date	Publication date of this data edition
pub_org	Organization of this data publication

Acknowledgements

The British Columbia digital geology is the result of mapping by many previous and current British Columbia Geological Survey geologists, including Dani Alldrick, Chris Ash, Kim Bellefontaine, Jim Britton, Derek Brown, Neil Church, John Cunningham, D.J. Dawson, Pat Desjardins, Larry Diakow, Kathryn Dunne, Travis Ferbey, Fil Ferri, Bob Gaba, Gordon Gibson, Keith Glover, Brian Grant, Trygve Höy, Wayne Jackaman, Andrew Legun, Ray Lett, Jim Logan, Nick Massey, Don MacIntyre, Bill McMillan, Mitch Mihalynuk, JoAnne Nelson, Graham Nixon, Andre Panteleyev, Gerry Ray, Janet Riddell, Paul Schiarizza, and Ian Webster. Invaluable contributions were also made by Geological Survey of Canada geologists including Bob Anderson, Carol Evenchick, Jim Haggart, Murray Journeay, P. McFeely, Peter S. Mustard, Andy Okulitch, Michael J. Orchard, Terry P. Poulton, Peter B. Read, Jim Roddick, Margaret E. Rusmore, Jim Souther, Don F. Stott, Bert Struik, Howard W. Tipper, Edward Tim Tozer, John Wheeler, Glen Woodsworth, Chris J. Yorath, and Alex Zagorevski, and by University of British Columbia geologists Richard M. Friedman, Steve Israel, Peter Lewis, Jim Mortensen, and Peter van der Heyden.

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