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Atlas 2027 1:5 MM Scale GIS Bedrock Map Compilation

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Abstract

Geographic information systems (GIS) comprise a powerful modern tool which are well adapted to maximizing and manipulating geologic map information, as well as capturing and displaying data. Mapping, whether it be from boots-and-hammer field expeditions, or through remote sensing and geophysical surveys, is at the core of geology and earth sciences, in which case GIS provide a step change for earth sciences. The Atlas 2027 project uses GIS technology as a unifying tool for the many chapters, providing a common platform for building an integrated product and database. Note, an Atlas by definition is a bound collection of maps often including illustrations, informative tables, or textual matter; and the update of the Geologic Atlas of the Western Canada Sedimentary Basin (Mossop and Shetsen, 1994) into Atlas 2027, also marks a modernization into the unbound digital world.

Although much of Atlas 2027 is focused on the subsurface of the WCSB, a key component of the Atlas features a bedrock compilation from across the full extent of the project. Previous bedrock maps that cover the WCSB are thirty years old (Mossop and Shetsen, 1994, their Figure 1.1; Wheeler et al., 1996), and with the advent of new technology, as well as the publication of new maps, a much-needed upgrade is in order. Of particular note is the current availability of regional digital maps from each of the four western provincial geological surveys, as well as from the Northwest Territories, and Yukon (Figure 1). This provides a distinct advantage in the creation of a basin-wide compilation. However, the integration is also problematic in that each of the maps from the various jurisdictions was created independently, and so norms, groupings, data structures, and colour schemes vary so that considerable work is required to bring them together into a reasonable map that can be viewed and interpreted. Fortunately scaling of the various component maps is similar, with 1:5,000,000 being the standard that accommodates the relatively flat-lying strata of the plains; however, steeper, closely stacked thrust slices in the mountains are better viewed at a 1:1,000,000 scale. The ability to zoom on a screen makes the dual scaling workable on a computer screen, although visibility on hard copies can be problematic. For the purposes of Atlas 2027, the component maps were edited to a common colour scheme, so that stratigraphy would stand out at a regional scale across the entirety of the basin. Here, chronographic coloring now approximately follows the standard established by the Commission for the Geological Map of the World (Cohen et al., 2013). This at first may appear to be a simple task, but a close scrutiny of the stratigraphy across a vast region and the creation of meaningful groupings that correlate (approximately) in time, requires a lot of decision making as well as a good basic knowledge of the stratigraphy from within the entire basin. Nonetheless, the flexibility inherent in the GIS

systems will permit the user to modify the colour palette and groupings as needed or according to preferences and varying insights.

The western limit to the compilation was set to rocks of North America affinity or designation, within British Columbia and Yukon, as well as, and including the fold and thrust belt; whereas exotic terranes and far travelled units to the west were not included.

The structure of polygon attribute tables and contained data varies greatly across the individual component maps. Consequently, these were not modified and have been left intact, as is. No effort has been made to normalize into a single master database, which would be beyond the scope of this project and resources. Also, no effort has been made to alter sharp geological discontinuities, or discrepancies in stratigraphic alignment across provincial and territorial boundaries. Such discrepancies do stand out in some areas with the normalized colour scheme, but are left as focus areas for new research from the participating neighbors.

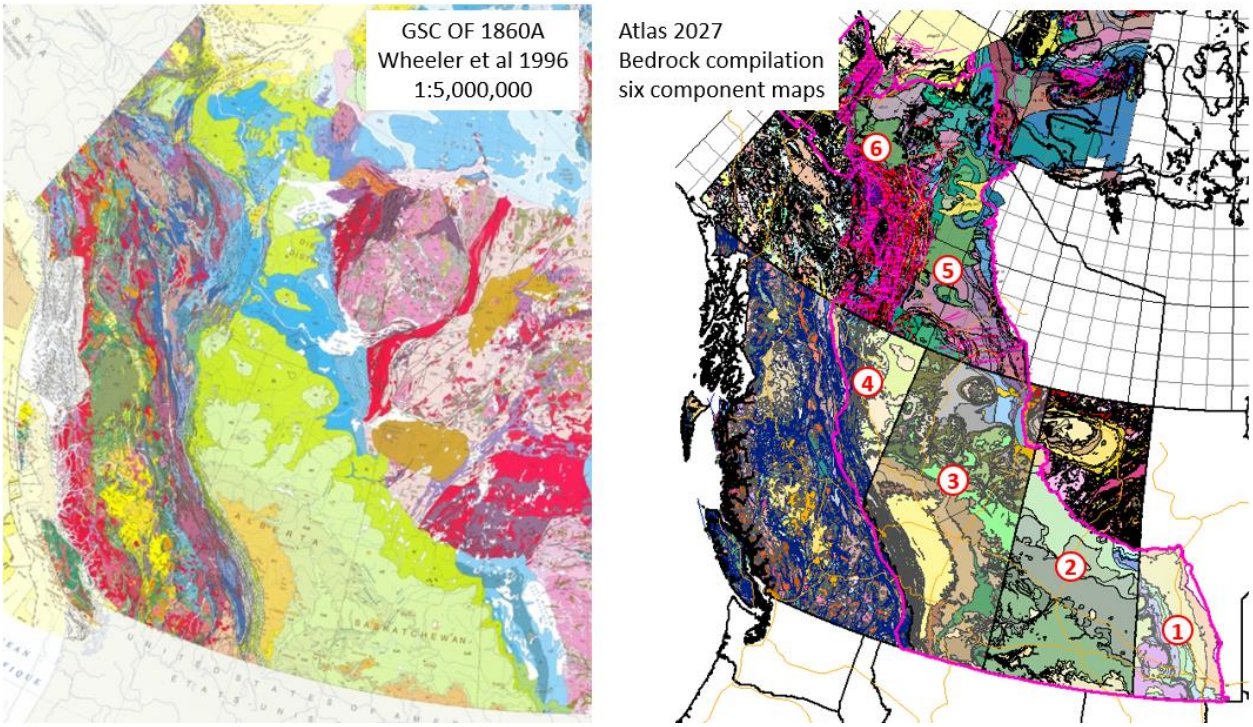

Figure 1. Example of Wheeler (1996) Canada 1:5,000,000 compilation, including WCSB; and six-component digital maps (1) Manitoba (Nicolas et al., 2010), (2) Saskatchewan (Macdonald and Slimmon, 1999), (3) Alberta (Prior et al, 2013), (4) British Columbia (Cui et al., 2017), (5) Northwest Territories (Okulitch and Irwin, 2017), (6) Yukon (Colpron et al, 2016), used in current GIS compilation. Need for colour normalization becomes evident along provincial boundaries. Atlas 2027 Project outline for cropping shown as thick magenta line.

The regional compilation of bedrock geology across the entirety of the WCSB has many uses, particularly in visualizing and understanding the basin at a regional scale across the full extent,

essentially gaining the big picture. The display of bedrock polygons from selected stratigraphy can also frame subsurface maps of the same units, to capture for the first time the entire story, and generate a better overall regional understanding of the basin.

Acknowledgements

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