

Building On a Strong Foundation: Progress on the 2027 Geological Atlas of the Western Canada Sedimentary Basin

Simon R. Haynes

Atlas 2027 Steering Committee / CSPG

Kelsey E. MacCormack

Atlas 2027 Steering Committee / Alberta Geological Survey / Alberta Energy Regulator

Ben J. McKenzie

Atlas 2027 Steering Committee / Tarheel Exploration

Greg Lynch

Atlas 2027 Steering Committee / CSPG

Summary

This talk will provide an overview and update the project status for the Geological Atlas of the Western Canada Sedimentary Basin, which will be formally published in 2027 (“Atlas 2027”). New work will expand on the stratigraphy described in the 1994 edition, and provide additional information on topics such as; pore space resources, including hydrogen, helium, lithium, carbon capture storage, and groundwater. This edition will also aim to leverage modern online and interactive digital platforms to improve the access to the chapters and associated 2D and 3D data products.

Introduction

The original Geological Atlas of the Western Canada Sedimentary Basin (WCSB) was published nearly 30 years ago (Mossop et al., 1994). It is still considered a milestone geological publication, consisting of 35 chapters organized into sections detailing

1. crustal architecture and structure of the WCSB,
2. Precambrian through Recent stratigraphy,
3. hydrocarbon and mineral resources, and
4. special topics such as geothermal regime, and geological history of specific basins within the greater superbasin framework.

Since that time, there have been significant advances in overall scientific knowledge, data acquisition methods and quantity, computing power, and a substantial change in focus by the oil and gas industry towards unconventional play types (shale gas, oil sands). Much more recently, with the societal desire to move into a low-carbon economy, there has been a paradigm shift towards emerging energies (geothermal, hydrogen), strategic minerals (lithium), helium, and

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carbon capture and storage (CCUS) in the basin. The 2027 Atlas will not merely be an “update” of the previous work but will serve as guide as we navigate the Energy Transition and aim to better characterize, utilize, and understand the integrated nature of our pore space resources across this multi-jurisdictional superbasin.

The project is a collaborative effort between the CSPG (Canadian Society of Petroleum Geologists), GSC (Geological Survey of Canada) and the AGS (Alberta Geological Survey), and involves hundreds of contributors from government geological surveys and agencies, private companies, academia, and interested individuals.

Timeline / Scope / Workflow

Timeline: The Atlas 2027 project was formally proposed in 2020, with a decision to proceed by all major partners in early 2021. The bulk of the technical work will be completed between 2022 and 2025, review and editing of all materials occurring in 2026, and the “final” version delivered in 2027 (Fig.1). “Final” being a loose term, as the Atlas is intended to function as a live document, with additional updates in the future as more data becomes available.



Figure 1. Flowchart of project milestones from 2020 through 2027.

Scope: The original 1994 Atlas focused primarily on Alberta, Saskatchewan and parts of eastern British Columbia and western Manitoba and utilized data from ~300,000 wells and large scale 2D seismic lines. The updated 2027 Atlas will expand the geographic area into the Mackenzie Corridor area of northern Canada to the shores of the Beaufort Sea (Fig.2), benefit by almost tripling the number of well bores (anticipate ~900,000 by 2027), and incorporate much more extensive 2D and 3D seismic into the regional geological interpretations.

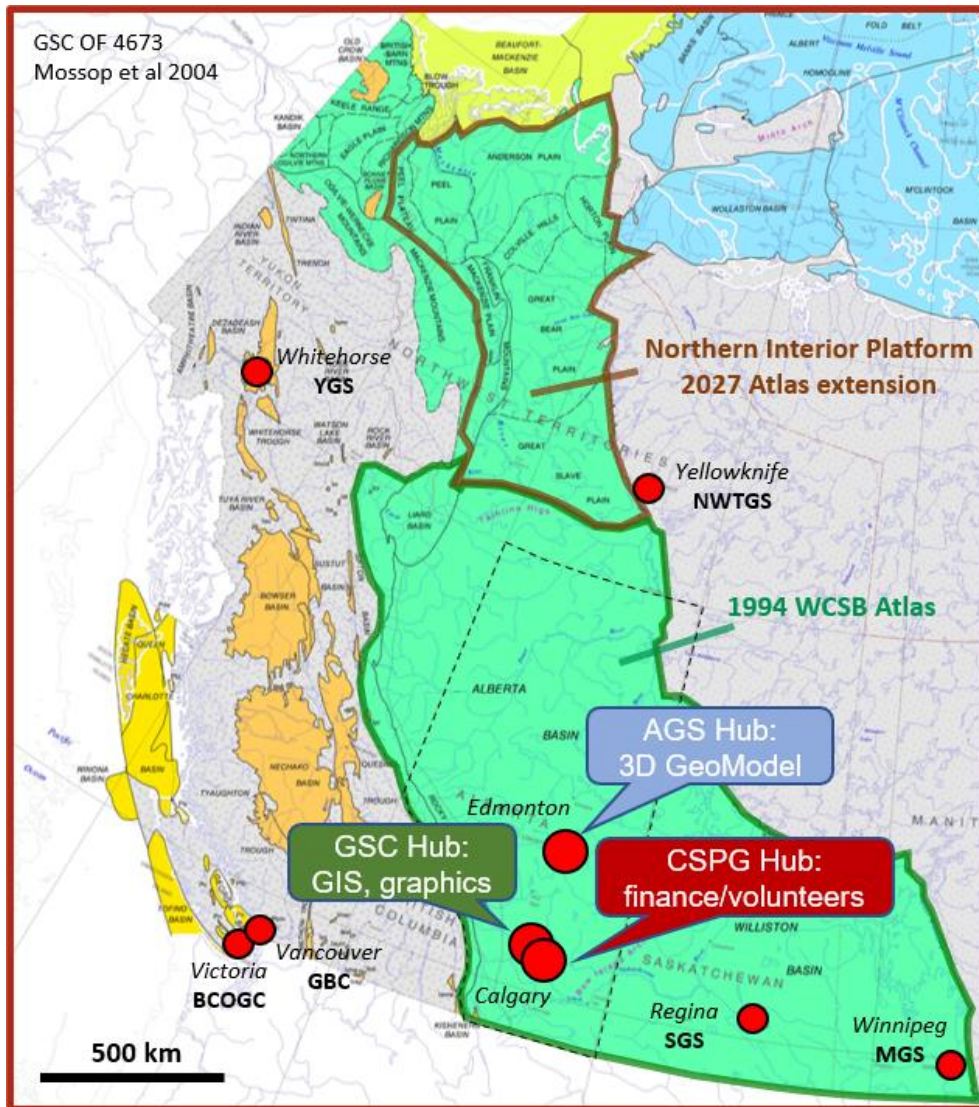


Figure 2. Original extent of the 1994 Atlas (solid line, dark green) and locations of the Steering Committee parent organizations indicated as red circles. Atlas 2027 will extend into the Northern Interior Platform, outlined in brown.

Types of data being prepared include,

1. Point data for well locations, tops, and outcrop locations,
2. Grids for structures/stratigraphy, facies belts, and isopachs (vertical thickness grids),
3. Modeled elevations surfaces for structure maps, and

4. Vector files for erosional edges and other line data.

An objective for this enhanced version will be to integrate all geospatial data within a consistent 3D environment to ensure consistency amongst the data provided within the various chapters. Cross sections used in the original Atlas will be enhanced with new wells with modern geophysical borehole data where applicable.

Currently, there are 59 planned chapters and 140 authors who will contribute to the 2027 Atlas, and will include new, dedicated chapters on paleontology, impact structures, and neotectonics. A larger section entitled “Pore Space Resources” will encompass chapters on groundwater, geothermal resources, carbon capture utilization and storage, coal and mineral resources (including potash, lithium, helium, hydrogen and uranium) to more accurately reflect the energy potential in the WCSB. Nineteen chapters in the 1994 Atlas were dedicated to describing the stratigraphy of the WCSB, which will now be amended and expanded to 25 chapters in the new version. As an example, the Upper Devonian section will benefit from advanced seismic stratigraphy analyses and incorporate 3rd and 4th order sequence boundaries interpreted from core, well logs and new outcrop studies into basin-wide correlations. Contributions such as these will help to further refine our knowledge of the basin architecture and provide an increasingly broader regional perspective of the WCSB and the complex nature of the integrated resources within.

The Atlas 2027 project is organized with three main committees (Technical Support, Authors, Administrative Support) overseen by a Steering Committee composed of participants from NRCAN, CSPG, and various provincial and territorial geological surveys. Each of these committees’ responsibilities will be briefly described to detail how this multijurisdictional organization is operating.

Notable Additions to the 2027 WCSB Atlas

- Extended coverage of the WCSB (previously only included British Columbia, Alberta, Saskatchewan, Manitoba) to include the Northern Interior Platform within the Northwest Territories and Yukon.
- The geological units mapped across the WCSB will be modeled and geospatially cross-referenced with one another to ensure consistency and support integration of data from various chapters. The Alberta Geological Survey’s 3D Geologic Framework of Alberta model (<https://gfa-v3-ags-aer.hub.arcgis.com>) will serve as a template. This will result in one of the largest, most regionally extensive and detailed 3D models of a superbasin in the world.
- 6 additional chapters characterizing the WCSB geology

- Additional information on topics such as; pore space resources, including hydrogen, helium, lithium, carbon capture storage, and groundwater
- All data associated with Atlas 2027 will be hosted online as open access and interactive format, and will be available for digital download without restrictions.
- Project updates for Atlas 2027 will be available on the website: <https://atlas2027.ca/>

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References

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