

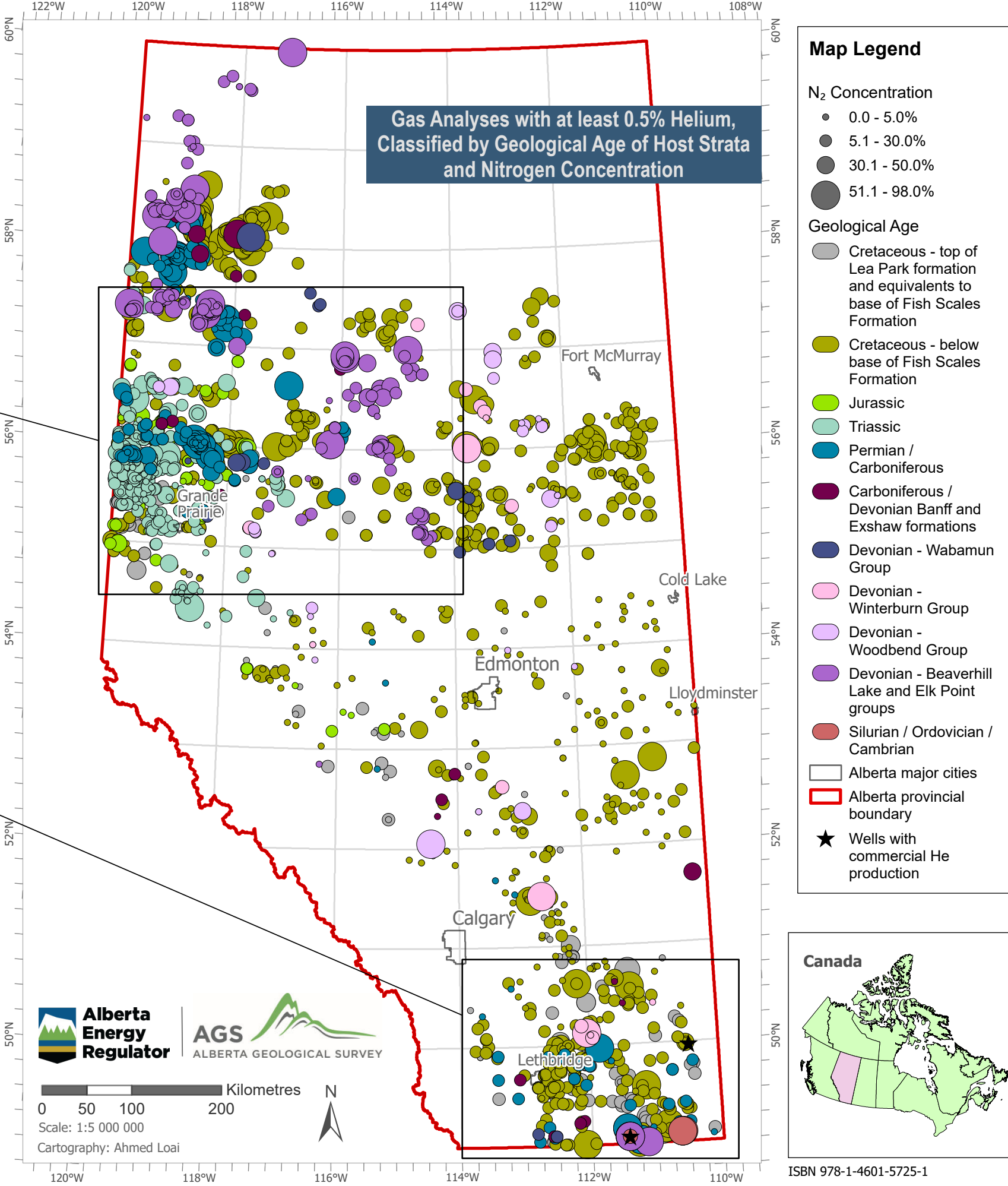
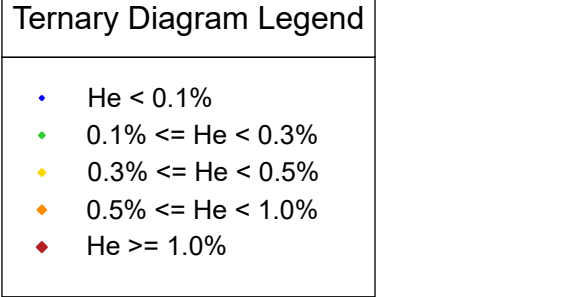
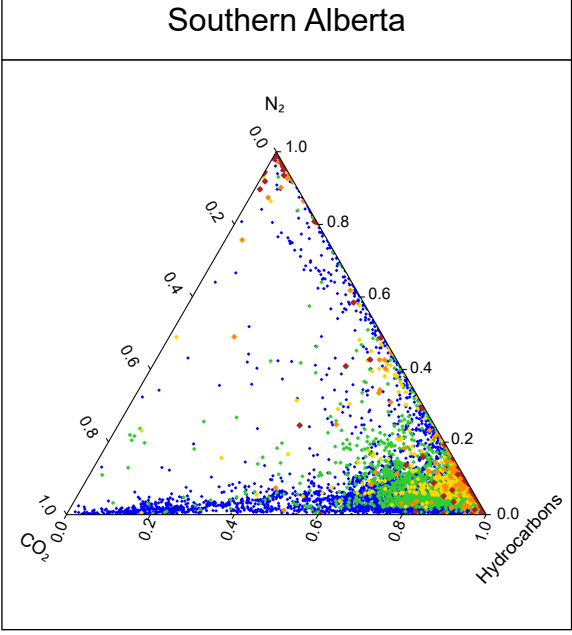
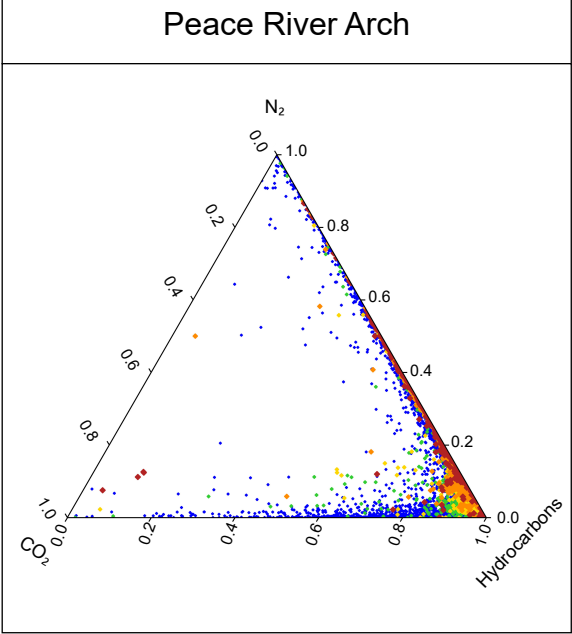
**Helium Data in Alberta**  
 Interest in helium sources has increased significantly both on a world-wide basis and locally within Alberta, mainly due to increased use of helium in different industries and the depletion of the U.S. reserves of helium in storage in the mid-continental U.S. This information sheet provides a brief look at the multivariate relationships in helium concentration data from natural gas analysis results in Alberta, submitted to the Alberta Energy Regulator (AER) by industry. The dataset is an expanded version of the data found in AGS Digital Data 2023-0029 (Lyster, 2023).

**Data Source**  
 The AER's gas analyses data holdings were queried in February 2024 applying the criteria used by Lyster (2023) but without the constraint of having helium concentration of at least 0.1% (see metadata for full details).

**Map of Gas Analyses**  
 The map shows helium gas analyses with at least 0.5% He. This is relatively high compared to most of the analyses in the data set, above what is typically considered an economic cutoff of 0.3% (Lyster et al., 2021). The colours show the geological age of the host strata that the analyses were taken from, assigned using the middle of the reported depths of the tests, the well deviation surveys (if any), and the Geological Framework of Alberta, version 3 (Alberta Geological Survey, 2021). Most of the data are from Cretaceous-aged strata due to the large number of oil and gas wells completed in these strata. There are elevated He values in samples from Devonian, Permian, Carboniferous, and Triassic-aged strata, in particular in the Peace River Arch area. The southern Alberta area has elevated helium in many wells, but there are fewer samples in general from wells completed deeper than the Cretaceous. The helium wells in Alberta as of August 2024 are in southern Alberta (Alberta Energy Regulator, 2024). The size of the bubbles on the map shows nitrogen (N<sub>2</sub>) concentration to illustrate where there is elevated He associated with elevated N<sub>2</sub>. Nitrogen is thought to be a major carrier gas of helium in the subsurface, as seen in the Alberta data and those from related strata in Saskatchewan (Yurkowski, 2021). The clusters of many elevated He samples also feature many large bubbles, indicating also relatively high levels of N<sub>2</sub>.

**Multivariate Relationships**  
 The ternary diagrams show helium concentration of all gas analyses with no minimum threshold. The diagrams illustrate the relationship between helium and three potential carrier gases: nitrogen, hydrocarbons, and carbon dioxide. Hydrocarbons are primarily methane but also include other larger carbon chains in smaller amounts. The ternary diagrams are for the portions of the data in two areas of interest for helium (Lyster et al., 2022). The higher concentrations of He tend to be along the axis between hydrocarbons and N<sub>2</sub>, showing that nitrogen is the likely carrier gas for helium. This is particularly notable in the Peace River Arch area. The southern Alberta data also show elevated He along the hydrocarbons-N<sub>2</sub> axis, but many intermediate values (0.1–0.3%) with a mix of hydrocarbons, N<sub>2</sub>, and CO<sub>2</sub>. Few of the samples have low hydrocarbons concentrations because most are taken from oil and gas wells, reflecting a bias in the data.

**References**  
 Alberta Energy Regulator (2024): ST37: List of wells in Alberta; <https://www.aer.ca/providing-information/data-and-reports/statistical-reports/st37>.  
 Alberta Geological Survey (2021): Geological Framework of Alberta, version 3 (interactive app and map, methodology, model, dataset, StoryMaps, web maps); Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Interactive Application, <https://gfa-v3-ags-aer.hub.arcgis.com>.  
 Lyster, S. (2023): Helium concentrations from natural gas analysis tests in Alberta - 2023 update (tabular data, tab-delimited format); Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Digital Data 2023-0029, <https://ags.aer.ca/publications/all-publications/dig-2023-0029>.  
 Lyster, S., Hauck, T.E., Lopez, G.P., Playter, T.L., Reimert, C., Palombi, D. and Schultz, S.K. (2022): Lithium and helium in Alberta: data compilation and preliminary observations; Alberta Energy Regulator / Alberta Geological Survey, AER/AGS Open File Report 2021-04, 36 p.  
 Yurkowski, M.M. (2021): Helium in southern Saskatchewan: geological setting and prospectivity; Saskatchewan Ministry of Energy and Resources, Saskatchewan Geological Survey, Open File Report 2021-2, 77 p. and two Microsoft® Excel® files.



**Map Legend**

**N<sub>2</sub> Concentration**

- 0.0 - 5.0%
- 5.1 - 30.0%
- 30.1 - 50.0%
- 51.1 - 98.0%

**Geological Age**

- Cretaceous - top of Lea Park formation and equivalents to base of Fish Scales Formation
- Cretaceous - below base of Fish Scales Formation
- Jurassic
- Triassic
- Permian / Carboniferous
- Carboniferous / Devonian Banff and Exshaw formations
- Devonian - Wabamun Group
- Devonian - Winterburn Group
- Devonian - Woodbend Group
- Devonian - Beaverhill Lake and Elk Point groups
- Silurian / Ordovician / Cambrian

□ Alberta major cities  
 □ Alberta provincial boundary  
 ★ Wells with commercial He production

Alberta Energy Regulator | AGS ALBERTA GEOLOGICAL SURVEY

0 50 100 200 Kilometres  
 Scale: 1:5 000 000  
 Cartography: Ahmed Loai

Canada

ISBN 978-1-4601-5725-1