

Subsurface Devonian Mapping Results from the IEA Weyburn CO₂ Monitoring and Storage Project, Southeastern Saskatchewan

L. K. Kreis*, P. Thomas and S.G. Whittaker
Saskatchewan Industry and Resources, Regina, Saskatchewan
kkreis@ir.gov.sk.ca

and

R.B. Burke
North Dakota Geological Survey, Bismarck, North Dakota

ABSTRACT

The International Energy Agency Weyburn CO₂ Monitoring and Storage Project (The Weyburn Project) is a multi-disciplinary, multi-agency investigation into the storage of anthropogenic CO₂ in Mississippian carbonates of the Midale Beds in southeastern Saskatchewan. Part of the Geoscience Framework component of the involves mapping the Phanerozoic succession over a 200 km x 200 km area centred around the Weyburn Pool and extending approximately 60 km into the United States (*Fig. 1*). The results will be integrated with other geoscience data to develop a 3D model of the geosphere enveloping the CO₂ target rocks of EnCana's Weyburn Pool Midale reservoir. Mapping of Devonian carbonates and evaporites represents an important portion of this work as isopach maps of Devonian salt units indicate areas of salt dissolution that may be susceptible to cross-formational fluid migration. These locations are of particular interest to the Weyburn CO₂ Storage and Monitoring Project. The mapping of Devonian salt units and identification of areas of dissolution may also be important to our understanding of both hydrocarbon migration fairways and the distribution of reservoir rocks and traps.

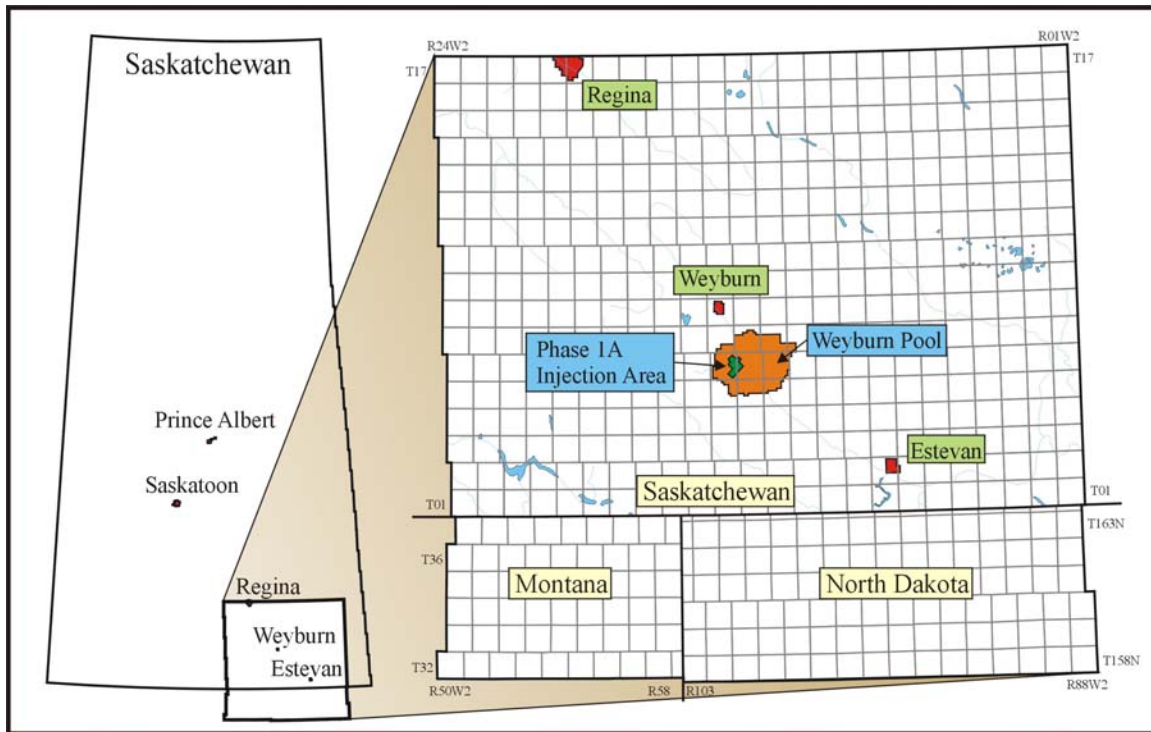


Fig. 1: Location map showing IEA Weyburn CO₂ Monitoring and Storage Project Area in which Devonian mapping has been done.

The subsurface mapping undertaken in Weyburn Project area is part of a Subsurface Mapping Strategy for Saskatchewan. This strategy envisions the eventual mapping of all major Phanerozoic units throughout the province. Devonian mapping results from the Weyburn Project Area have recently been published on a test version of a CD-ROM entitled, "Devonian Isopach and Structure Maps, IEA Weyburn CO₂ Monitoring and Storage Project Area". This product includes computer-generated (Surfer 8) regional isopach maps of the ten formally recognized formations, six halite (salt) subunits and 4 groups comprising the Devonian System in Saskatchewan, along with structure maps of the ten formations (*Fig. 2*). A list of the 30 maps included in this CD is given in Table 1. In addition to the maps, geological tops, a description of the Saskatchewan Land Survey System, and a questionnaire are included. Copies of this CD are available upon request. Comments and suggestions from this questionnaire will be used to help prioritize and format our subsurface mapping products in future.

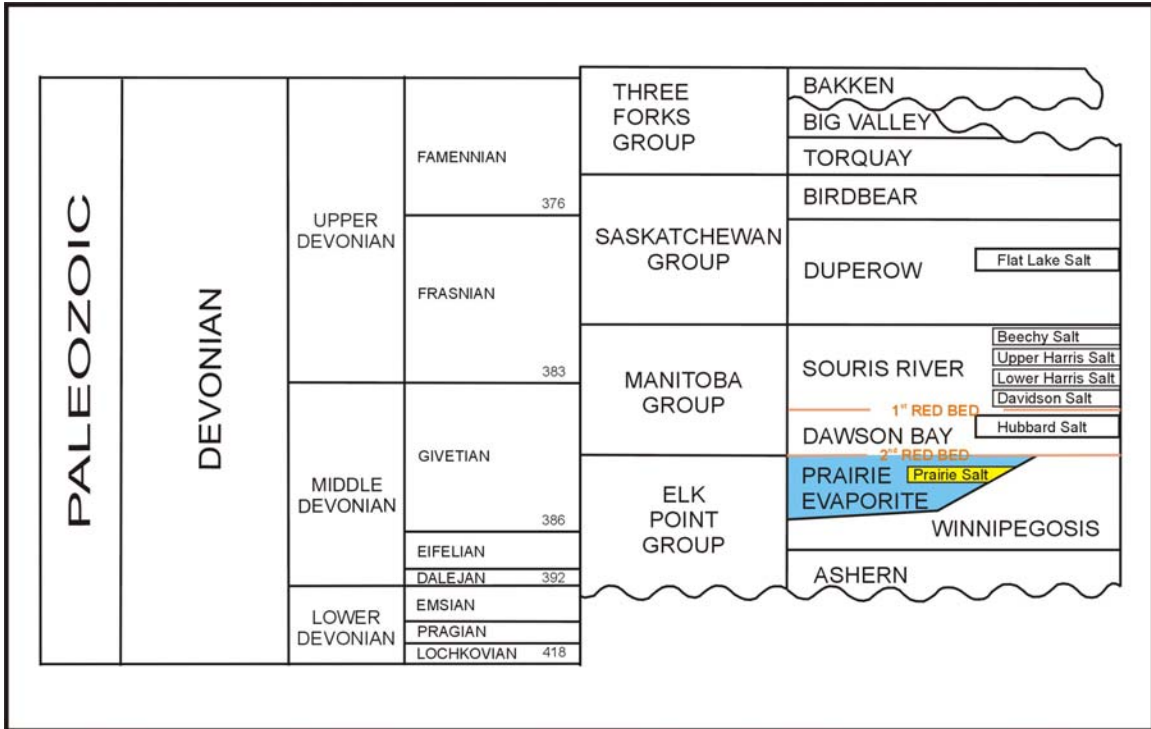


Fig. 2: Chart showing Devonian stratigraphy in southeastern Saskatchewan.

Seven salt deposits are found within Devonian rocks in Saskatchewan; all except the Beechy salt are found within the Weyburn Project area. The Prairie Formation is the thickest Devonian salt unit present ranging in thickness from 0 to almost 200 m. In some areas, anomalous thinning is noted in the Prairie, and in overlying Devonian salt units like the Davidson, Lower Harris and Flat Lake. Some of these localities show depositional thickening of overlying Devonian rocks indicating that deposition occurred contemporaneously with dissolution of one or more of the underlying salt units. Other indications of dissolution and collapse are disrupted and non-correlatable stratigraphy in overlying beds suggesting faulting and brecciation over that interval.

Isopach Maps	Structure Maps
Elk Point Group (Ashern, Winnipegosis and Prairie Formations)	
Ashern Formation	Ashern Formation
Winnipegosis Formation	Winnipegosis Formation
Prairie Evaporite (Prairie Formation)	Prairie Evaporite
Prairie Salt	
Manitoba Group (Dawson Bay and Souris River Formations)	
Dawson Bay Formation	Dawson Bay Formation
Hubbard Salt	
Souris River Formation	Souris River Formation
Upper Harris Salt	
Lower Harris Salt	
Davidson Salt	
Saskatchewan Group (Duperow and Birdbear Formations)	
Duperow Formation	Duperow Formation
Flat Lake Salt	
Birdbear Formation	Birdbear Formation
Three Forks Group (Torquay, Big Valley and Bakken Formations)	
Torquay Formation	Torquay Formation
Big Valley Formation	Big Valley Formation
Bakken Formation	Bakken Formation

Table 1: List of Devonian isopach and structure maps included on test version of a CD-ROM entitled, "Devonian Isopach and Structure Maps, IEA Weyburn CO₂ Monitoring and Storage Project Area".