ESTIMATES OF CO_2 STORAGE CAPACITY IN SELECTED OIL FIELDS OF THE NORTHERN GREAT PLAINS REGION OF NORTH AMERICA

Value-Added Report

Prepared for:

Darin Damiani

U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
PO Box 880
Morgantown, WV 26507-0880

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Prepared by:

Steven A. Smith
James A. Sorensen
Edward N. Steadman
John A. Harju

Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

David W. Fischer

Fischer Oil & Gas, Inc.
5749 83rd Street South
Grand Forks, ND 58201

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EXECUTIVE SUMMARY

The carbon dioxide (CO_2) sequestration capacities of selected oil fields in the Williston Basin, Powder River Basin, and Denver–Julesberg Basin in the central interior of North America were estimated as part of the Plains CO_2 Reduction (PCOR) Partnership regional characterization. The estimates were developed using readily available reservoir characterization data obtained from the petroleum regulatory agencies and/or geological surveys from the oil-producing states and provinces of the PCOR Partnership region. Reconnaissance-level sequestration capacities were calculated using two methods, depending on the nature of the readily available reservoir characterization data for each field. Maximum storage capacities were estimated for reservoirs where detailed data on original oil in place, cumulative production, reservoir thickness, porosity, temperature, pressure, and water saturation were available. The initial reconnaissance-level estimates indicate that over 1100 oil fields within the three basins have a capacity to sequester nearly 10 billion tons of CO_2, with the potential to produce over 2 billion barrels of incremental oil through CO_2 flood enhanced oil recovery activities.

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BACKGROUND/INTRODUCTION

As one of seven Regional Carbon Sequestration Partnerships established by the U.S. Department of Energy, the Plains CO_2 Reduction (PCOR) Partnership was tasked with identifying cost-effective carbon dioxide (CO_2) sequestration systems for a 1.3-million-square-mile region in the central interior of North America (Figure 1). In Phase I of the project, the PCOR Partnership was focused on characterizing the technical issues, enhancing the public's understanding of CO_2 sequestration, identifying the most promising opportunities for sequestration in the region, and detailing an action plan for the demonstration of regional CO_2 sequestration opportunities.

The sequestration potential of selected oil fields in the Williston, Powder River, and Denver–Julesberg Basins was evaluated as part of the PCOR Partnership's Phase I activities (Figure 2). Preliminary calculations, based on readily available data sources, were made to determine the quantity of CO_2 that could potentially be sequestered and the amount of incremental oil that could be produced in pools that are currently undergoing secondary recovery or considered to be depleted because they have reached their economic maximum production limit. In the case where fields are considered depleted, it is assumed that a high percentage of the original oil in place (OOIP) is still remaining as a result of the inability to effectively sweep the reservoir using primary and secondary recovery techniques. Because of the physical size of the region and the number of oil pools it contains, a cutoff point based on cumulative production was assigned to begin the screening process. Efforts were focused on those fields with a cumulative oil production history of at least 800,000 barrels. While somewhat arbitrary, this value indicates a field is productive and may hold significant capacity for CO_2 storage. The evaluation was also limited to oil fields that have been unitized for enhanced oil recovery operations. Unitized oil fields are considered to be likely candidates for CO_2-based enhanced oil recovery (EOR) and sequestration because they typically have operational history that demonstrates their ability to

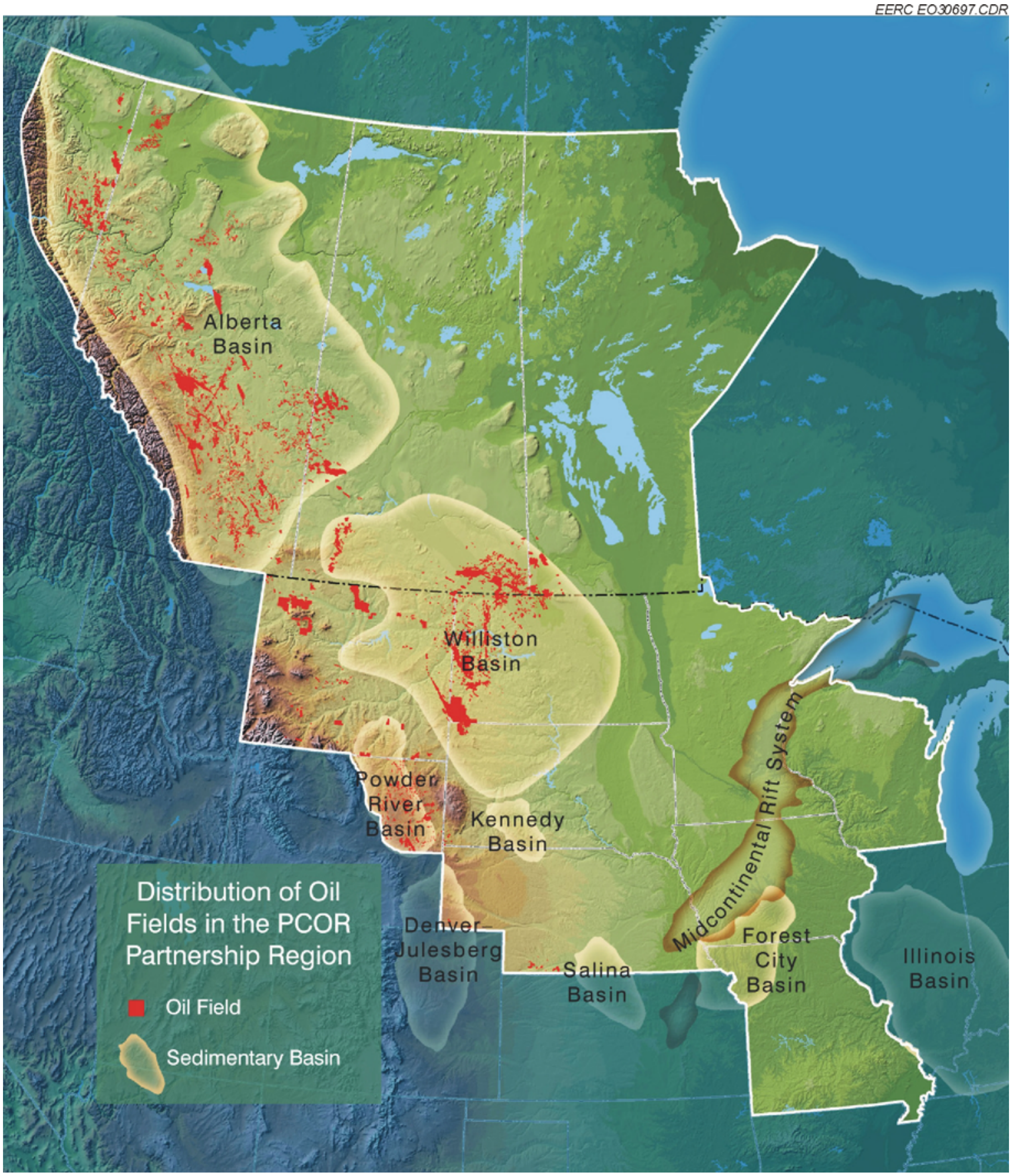

Figure 1. PCOR Partnership region. The region includes nine U.S. states and four Canadian provinces. Most of the region is home to significant oil production.

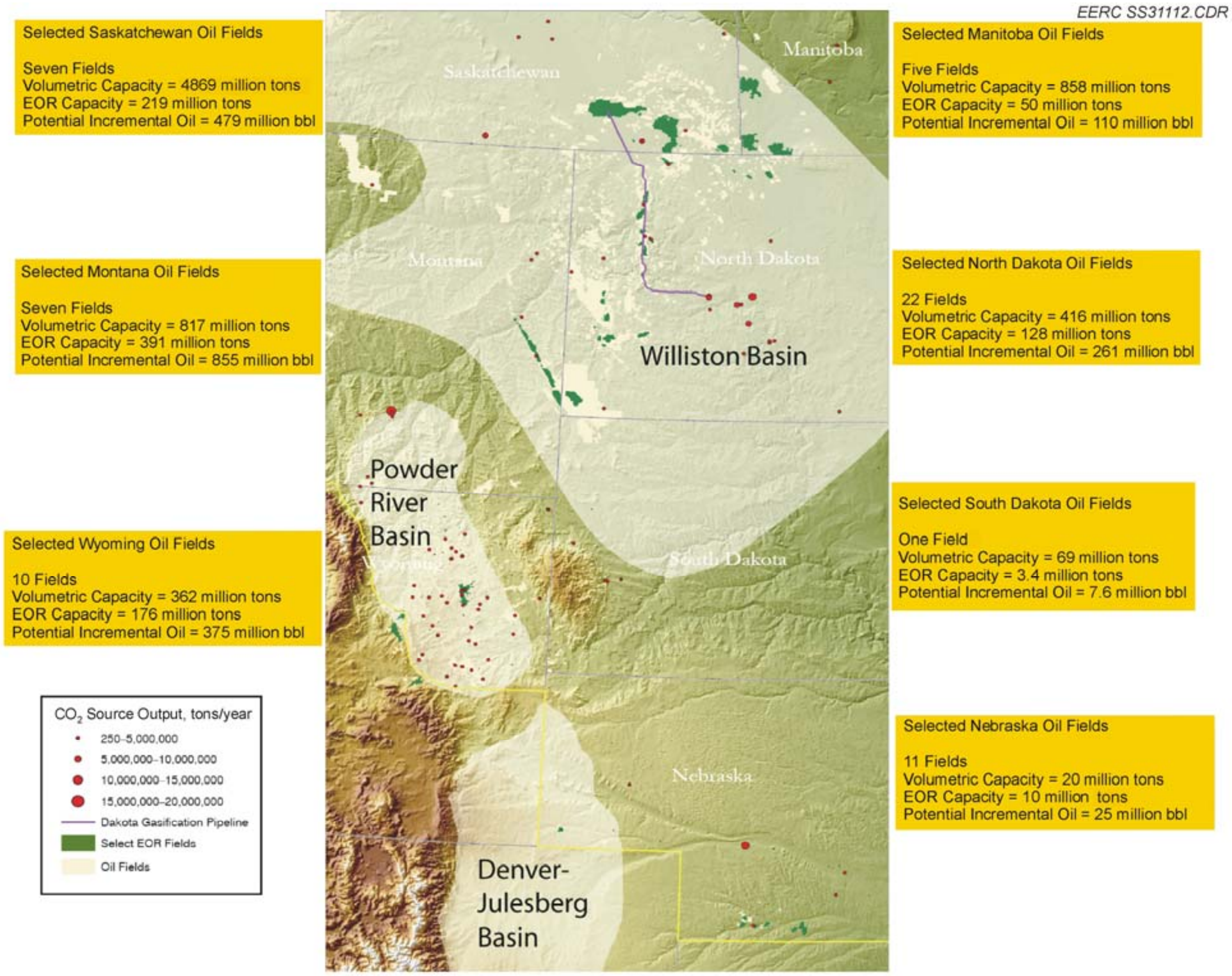

Figure 2. Summary of CO_2 EOR and sequestration potential in the Williston, Powder River, and Denver–Julesberg Basins.

support large-scale operations. As EOR and sequestration opportunities arise, fields will be evaluated with regard to additional factors, including production and injection history, reservoir operation data, and its proximity to the source and storage capacity relative to the quantity of CO_2 available.

The results of this report are primarily based on the present status of oil production and provide a reconnaissance-level determination of 1) how much CO_2 can potentially be sequestered in geologic reservoirs and 2) how much incremental oil might be produced from sequestration activities. Two methods were used to determine the capacity of oil fields throughout the region. Tables found in this paper have been compiled from the regional analysis and are generally a reflection of the pools that are considered to have the greatest potential to be considered for CO_2 sequestration. These tables offer a comparison of selected fields through potential EOR activities and CO_2 sequestration activities.

SEQUESTRATION THROUGH ENHANCED OIL RECOVERY

Carbon sequestration through EOR is one of the first mechanisms to be used as a long-term strategy for reducing anthropogenic CO_2 from greenhouse gas emissions. Over the past decade, anthropogenic CO_2 has been used for EOR at the Salt Creek Field in Wyoming and the Weyburn Field in Saskatchewan. The oil and gas industry has also been involved in EOR through miscible flooding using natural sources of CO_2 for over 30 years in Texas (Jarrell and others, 2002). This knowledge has direct application to CO_2 sequestration. Historically, CO_2 EOR schemes have been engineered to reduce the amount of CO_2 needed for injection while maximizing incremental oil production. Based on rock and fluid properties, it has been estimated that about 80% of the oil reservoirs worldwide would be candidates for CO_2-based EOR (Kovscek, 2002). Given favorable market conditions and the appropriate regulation of CO_2, these reservoirs will become prime candidates for sequestration.

To estimate the potential for CO_2 sequestration through EOR, it was first necessary to perform a reconnaissance-level examination of the geologic and engineering characteristics of many of the oil fields within the Williston, Powder River, and Denver–Julesberg Basins. These data were acquired from state agencies that regulate oil and gas and state geological organizations that have compiled volumes of oil field characteristics. The data include the key variables needed for evaluating the use of CO_2 for EOR and additional rock and fluid properties necessary for determining geologic sequestration in depleted reservoirs. The level of detail within each data set was widely variable between each of the states and provinces. Some agencies were able to readily provide detailed geologic and engineering reports for each pool within every field in their jurisdiction, while other agencies were only able to provide very basic reservoir data.

METHODOLOGY

Methods Used for CO_2 Sequestration Capacity Through EOR—"The Enhanced Oil Recovery Method"

The EOR method employs a two-step approach to develop estimates of 1) the amount of CO_2 that could theoretically be sequestered and 2) the volume of incremental oil that could be produced as a result of CO_2 flood EOR activities. The following list of reservoir and fluid properties was suggested by Bachu and others (2004) and provides a simple guideline for screening reservoirs for CO_2 EOR:

- Oil gravity between 27° and 48° (American Petroleum Institute)
- Temperature between 32° and 121°C (90° and 250°F)
- Reservoir pressure greater than 77.3 kg/cm^2 (1100 psi)
- Pressure greater by at least 14 kg/cm^2 (200 psi) than the minimum miscibility pressure (102–153 kg/cm^2 [1450–2175 psi])
- Oil saturation greater than 25%

Reservoirs that met the minimum cumulative production requirement but whose characteristics were outside these ranges were not included in the evaluation. This study also considered the overall production history of the field, secondary recovery performance, depth to production, rock properties, and characteristics of the produced fluid.

In evaluating the CO_2 sequestration capacity for unitized pools, some assumptions had to be made. The first major assumption was to simplify the process for projecting the oil recovery potential from injection of CO_2. Shaw and Bachu (2002) noted that incremental recovery could be between 7% and 23% of the OOIP through successful miscible flooding techniques, while Nelms and Burke (2004) suggest a value of 7% to 11%. The calculations used herein assume an average value of 12% incremental recovery of the OOIP. Where OOIP was not available, cumulative production was used to estimate potential incremental recovery from CO_2 EOR. This was estimated by assuming that 25% incremental recovery from cumulative production is achievable (Petroleum Technology Transfer Council, 1999). Next, the quantity of CO_2 necessary to recover the incremental oil was needed. Nelms and Burke (2004) discuss the quantity of CO_2 required for EOR. The purchase requirement they used was 13 thousand cubic feet (13 Mcf) per barrel of oil recovered. Of this purchase quantity, about 3 to 5 Mcf per barrel of oil will be recovered at the surface and reinjected after separation. This evaluation, therefore, assumes a relationship of 8 Mcf per bbl incremental oil recovered. The total quantity of CO_2 injected for tertiary recovery should be the amount left in the reservoir for long-term storage.

The calculation used to estimate CO_2 sequestration capacity through EOR is as follows:

$$Q = (OOIP) * (0.12) * (8000)$$

Where:
$Q = CO_2$ remaining in the reservoir after the flooding process is complete, ft^3
OOIP = Original oil in place, stb
12 = Estimated recovery of oil from CO_2 flood, %
8000 = CO_2 purchase requirement to produce 1 barrel of oil from CO_2 flooding, ft^3

Storage of CO_2 through EOR can be increased through alternate engineering practices that vary the injection schemes utilized, use horizontal wells rather than vertical, and use completion techniques favorable for long-term storage while enhancing production (Jessen and others, 2004). Jessen suggests several additional methods for increasing storage through EOR including the optimization of water injection rates and water alternating gas ratios, aquifer injection of recycled gas, and using CO_2 to repressurize fields in postproduction. Since none of these factors was considered in this reconnaissance-level evaluation, it is possible that the results may be conservative in their estimates of both CO_2 sequestration and incremental oil recovery potential. Ultimately, market factors including CO_2 availability, price of oil, price of steel, development of carbon credit markets, and overall demand will greatly influence the implementation and magnitude of CO_2 EOR projects in the future.

Sequestration in Oil Reservoirs Not Currently Undergoing EOR – "The Volumetric Method"

Carbon sequestration through EOR may be economically feasible in the near future and, in turn, may help develop the network of infrastructure necessary to transmit CO_2 to potential storage sites. The PCOR Partnership region includes many thousands of pools in thousands of oil fields, many of which may not be suitable for enhanced recovery options. In this case, it is important to consider the potential for CO_2 storage in the available pore space. This is the focus of the volumetric method for estimating storage capacity. As in many oil-producing basins, the basins in this study area have many levels of producing horizons stacked one atop the next, generally separated by impermeable strata. If utilized for storage of anthropogenic CO_2, these stacked reservoirs hold tremendous potential for sequestration. The method of estimating the capacity is based on the available pore space and assumes that injected CO_2 will replace the existing fluid.

This approach is a starting point for estimating capacity and will reflect a maximum theoretical value. In practice, the actual sequestration capacity of these fields will be much lower. Sweep efficiency, which must be determined on a reservoir-by-reservoir basis, will be the primary factor affecting the actual capacity of oil fields.

Using the same cumulative production criterion of 800,000 barrels that was used on the EOR pools, a database of geologic and fluid characteristics was developed for oil fields throughout the region. Data that were compiled for the EOR study were also utilized in this portion of the evaluation. In calculating the sequestration capacity, the following criteria were used:

- Field surface area
- Average pay thickness
- Average porosity
- Reservoir temperature
- Initial reservoir pressure

Field area, thickness, and porosity were used to determine the pore volume of the producing reservoir. Reservoir temperature and pressure were used to determine the density of CO_2 at reservoir conditions.

The calculation used to estimate the maximum theoretical volumetric CO_2 sequestration capacity of oil fields is as follows:

$$Q = (A) * (T) * (\varphi) * (\rho_{CO_2}) * (1 - S_w)$$

Where:
Q = Storage capacity of the oil reservoir, lb CO_2
A = Field area, ft^2
T = Producing interval thickness, ft
Φ = Average reservoir porosity, %
ρ_{CO_2} = Density of CO_2, lb/ft^3
$(1 - S_w)$ = Saturation of oil, where S_W is the initial reservoir water saturation, %

This calculation yields the maximum storage capacity of an oil-bearing reservoir in pounds of CO_2 which, in turn, has been converted to tons.

The volumetric methodology also considers the following: 1) the estimated capacity represents the sum of each producing pool within a field; 2) this calculation yields the maximum storage capacity of an oil-bearing reservoir; 3) the field area considered represents the entire boundary of the oil field; 4) the thickness, porosity, and water saturation figures used represent the reported reservoir thickness; 5) CO_2 density has been estimated based on reported temperature and pressure values; 6) where temperature and pressure were not available, depth was used to estimate their value based on known pressure and temperature gradients; and 7) in the absence of water saturation data, the water saturation was estimated to be 50%. While actual sequestration volumes will be significantly less, this means of developing approximate order-of-magnitude sequestration capacities has been used in prior studies (Bradshaw and others, 2004).

WILLISTON BASIN SEQUESTRATION CAPACITIES

North Dakota

The North Dakota Department of Mineral Resources Oil and Gas Division maintains relatively detailed reservoir characteristics in user-friendly digital, Web-based format. For EOR, only those unitized fields that have gone through or are currently in a secondary recovery phase were considered. In general, secondary performance data are necessary to accurately predict tertiary performance. The specific pools were selected through a joint meeting between the Energy & Environmental Research Center, the North Dakota Department of Mineral Resources Oil and Gas Division, and the North Dakota Geological Survey as being good candidates for CO_2 EOR. Table 1 lists the top 22 unitized pools in North Dakota and shows the results of each methodology as applied. It indicates the volumetric storage capacity and the potential for incremental oil recovery as well as the volume of CO_2 that can be sequestered through the process. Over 600 pools have currently been evaluated in North Dakota using the volumetric method. The large CO_2 storage capacity and tremendous incremental oil recovery potential of these oil fields, coupled with their relatively close proximity to large industrial sources of CO_2, make North Dakota an ideal location for large-scale CO_2 EOR projects.

South Dakota

While there are several productive oil fields in South Dakota, only the Buffalo Field met the criteria for inclusion in this evaluation. Cumulative production in the state is approaching 40 million barrels of oil from which nearly 30 million barrels of oil comes from the Buffalo Field. With only the southern edge of the Williston Basin extending into South Dakota, production in this state is relatively minor compared to its neighbors. This does not mean that opportunities for EOR and sequestration through CO_2 flooding in South Dakota do not exist. The Buffalo Field is undergoing a high-pressure air injection flood (fireflood), which has increased production dramatically. Similar potential for increased production may be possible using CO_2, without the risk of damaging the reservoir. Table 2 shows the potential for CO_2 sequestration in the Buffalo Field.

Table 1. North Dakota Oil Pools Evaluated for CO_2 Sequestration Capacity and Potential Incremental Oil Production

Field Name	Producing Pool(s)	Volumetric Capacity, million tons	EOR Capacity, million tons	Incremental Oil Production, million stb
Beaver Lodge	Madison Devonian Silurian Ordovician	111	21	44
Cedar Hills South	Red River 'B'	49	21	43
Tioga	Madison	39	13	26
Big Stick	Madison	31	10	20
Charlson North	Madison	30	5	10
Antelope	Madison Devonian	19	7	14
Newburg	Spearfish–Charles	18	6	12
Dickinson	Heath	15	4	7
North Elkhorn	Madison	14	3	7
Charlson South	Madison	11	1	1
Rough Rider East	Madison	11	2	4
Rival	Madison	11	5	9
Clear Creek	Madison	10	2	3
Blue Buttes	Madison	9	5	11
Fryburg	Heath–Madison	9	9	19
Lignite	Madison	7	2	4
Wiley	Glenburn	5	5	12
Bear Creek	Duperow	5	1	2
Medora	Heath–Madison	4	3	7
Fryburg South	Tyler	3	1	3
Mohall	Madison	3	1	2
Tracy Mountain	Tyler	2	0.5	1
Total		**416**	**128**	**261**

Montana

One of the greatest opportunities for CO_2-based EOR in Montana exists in the Cedar Creek Anticline. This relatively large structure in the southeast corner of the state has historically been the major oil-producing site in Montana. Additional production is seen to the north of the Cedar Creek Anticline, primarily along the North Dakota border. This provides an ideal situation for a CO_2 pipeline network that delivers CO_2 to a central location and disperses it to fields ready for CO_2 EOR. Results indicate that, with the current level of production and drilling activity, the Montana portion of the Williston Basin holds significant reserves and can clearly benefit from CO_2 EOR. Table 3 shows the selected Montana fields and their producing formations, with their approximate sequestration capacity.

Table 2. South Dakota Oil Pools Evaluated for CO_2 Sequestration Capacity and Potential Incremental Oil Production

Field Name	Producing Formation	Volumetric Capacity (million tons)	EOR Capacity, million tons	Incremental Oil Production, million stb
Buffalo	Red River	69	3.4	7.6

Table 3. Montana Oil Pools Evaluated for CO_2 Sequestration Capacity and Potential Incremental Oil Production

Field Name	Producing Pool(s)	Volumetric Capacity, million tons	EOR Capacity, million tons	Incremental Oil Production, million stb
Pine	Interlake Red River	282	133	292
Cabin Creek	Interlake Red River Madison	189	80	174
Little Beaver, East	Red River Madison	118	52	114
Poplar, East	Kibbey Madison	90	66	144
Pennel	Interlake Red River Madison	84	37	81
Monarch	Interlake Red River	34	15	34
Dwyer	Madison	19	7	16
Total		**817**	**391**	**855**

Manitoba

Manitoba's CO_2 sequestration capacity is based on the OOIP figures for the best-producing unitized pools. Manitoba may warrant serious consideration as a candidate for CO_2 sequestration because of the physical size of the fields on production. Table 4 shows the selected Manitoba unitized pools and their EOR and sequestration potentials.

Saskatchewan

CO_2 sequestration associated with EOR is being conducted in Saskatchewan by Encana Corporation and Dakota Gasification Company (DGC), in conjunction with the International

Table 4. Manitoba Oil Pools Evaluated for CO_2 Sequestration Capacity and Potential Incremental Oil Production

Field Name	Producing Pool(s)	Volumetric Capacity, million tons	EOR Capacity, million tons	Incremental Oil Production, stb
Waskada	Lower Amaranth	448	14	30
Daly	Lodgepole Bakken	158	7	15
Virden	Lodgepole	150	24	53
	Lower Amaranth	86	4	9
Pierson	Mission Canyon			
Tilston	Mission Canyon	16	2	3
Total		**858**	**50**	**110**

Energy Agency Weyburn CO_2 Monitoring and Storage Project. It is estimated that approximately 22 million metric tons of CO_2 from the DGC Great Plains Synfuels Plant in Beulah, North Dakota, will be injected by Encana Corporation into the Mississippian Midale reservoir of the Weyburn Field in southern Saskatchewan. The result of injection will be the net storage of approximately 15 million metric tons when considering the combustion of the oil produced by the flood and the CO_2 produced in compression and transmission of CO_2 to the site (Whittaker, 2004). With this in mind, several additional unitized oil fields that traverse the Saskatchewan portion of the Williston Basin were examined to calculate their CO_2 sequestration potential. A general cross section across the Saskatchewan portion of the Williston Basin was chosen, and the larger fields were evaluated based on OOIP value. Table 5 shows the quantities determined from the calculation and is based on data collected from the 2002 Reservoir Annual produced by Saskatchewan Energy and Mines (Reservoir Annual, 2002).

POWDER RIVER BASIN SEQUESTRATION CAPACITIES

Wyoming

Data for Wyoming oil fields was obtained from the Wyoming Geological Association and the Wyoming Oil and Gas Conservation Commission. Like the Williston Basin, the Powder River Basin (PRB) holds tremendous potential for EOR through CO_2 miscible flooding and, in turn, CO_2 sequestration. DeBruin (2001) summarized the potential for CO_2 EOR in Wyoming and recommended many fields as good candidates. Table 6 shows these fields and their potential for CO_2 EOR and sequestration. With the large number of sources and CO_2 pipelines in place and the continuing success of CO_2 EOR operations in the Salt Creek field in the PRB, which uses CO_2 from the Shute Creek gas plant in the southwestern corner of the state, Wyoming will likely continue to be a target for large-scale EOR-based CO_2 sequestration.

Table 5. Saskatchewan Oil Pools Evaluated for CO_2 Sequestration Capacity and Potential Incremental Oil Production

Field Name	Producing Pool(s)	Volumetric Capacity, million tons	EOR Capacity, million tons	Incremental Oil Production, million stb
Steelman	Frobisher Midale Winnipegosis	2101	58	126
Weyburn	Frobisher Midale	1597	85	187
Midale	Frobisher Midale Red River	699	49	108
Benson	Frobisher Midale Winnipegosis	270	9	20
Pinto	Frobisher Midale	99	8	19
Workman	Frobisher Midale	91	9	19
Tableland	Winnipegosis	13	0	1
Total		**4869**	**219**	**479**

DENVER–JULESBERG BASIN SEQUESTRATION CAPACITIES

Nebraska

The Nebraska CO_2 market will benefit from the production of ethanol which produces a relatively pure stream of CO_2. Data for this evaluation were obtained from the Nebraska Oil and Gas Conservation Commission. With production declining in the state, CO_2 EOR can provide the economic incentive that may boost production. Table 7 shows the selected Nebraska oil fields and their potential for EOR and sequestration.

Key Issues to Consider

With respect to the results generated by the volumetric method, the volumes of potentially sequestered CO_2 estimated here represent the theoretical maximum and are intended to be general reconnaissance values. Actual sequestration capacities will be significantly smaller. To calculate a more exact sequestration capacity for a reservoir, a case-by-case systematic analysis, including detailed geologic characterization, production history, and modeling efforts, is necessary. The process of oil field unitization, prior to waterflooding, can be looked to as a guide for developing specific geological sequestration targets. Specifically, a detailed production history, including updated OOIP, projected cumulative primary and cumulative secondary

Table 6. Wyoming PRB Oil Pools Evaluated for CO_2 Sequestration Capacity and Potential Incremental Oil Production

Field Name	Producing Formation(s)	Volumetric Capacity, million tons	EOR Capacity, million tons	Incremental Oil Production, million stb
Glenrock South	Dakota Dakota (Glenrock) Lower Muddy Muddy Muddy (Unit B)	97	43	94
Sussex	1st Frontier 2nd Frontier Lakota Parkman Shannon Sussex Teapot	56	31	67
Hilight	Minnelusa Muddy	55	24	53
Hartzog Draw	Shannon	53	19	42
Meadow Creek	1st Frontier 2nd Frontier Lakota Shannon Sussex Tensleep	38	26	56
Salt Creek	Lakota Sundance Tensleep	25	13	23
Raven Creek	Minnesula	14	7	15
Rozet	Minnesula Muddy	13	8	15
House Creek	Sussex	6	2	5
Gas Draw	Muddy	4	2	5
Total		**362**	**176**	**375**

recovery, injection statistics, and produced-water chemistry, must be obtained. In addition, from a regulatory and royalty standpoint, a detailed protocol regarding mineral value will need to be developed prior to permanent sequestration in abandoned fields and units. The protocol will include 1) value to mineral owners for produced fluid, 2) value to mineral owners for storage, 3) liability in ownership of sequestered CO_2, and 4) liability for leakage through preexisting properly and improperly abandoned wellbores. These risk assessment and economic feasibility

Table 7. Nebraska Oil Pools Evaluated for CO_2 Sequestration Capacity and Potential Incremental Oil Production

Field Name	Producing Pool(s)	Volumetric Capacity, million tons	EOR Capacity, million tons	Incremental Oil Production, million stb
Culbertson	Lansing–Kansas City	4.9	1.2	2.6
Kleinholz	Wykert Sandstone	3.3	1.4	3.0
Meeker Canal	Lansing–Kansas City	2.8	1.0	2.2
Dry Creek	Lansing–Kansas City	2.7	1.4	3.0
Bush Creek	Lansing–Kansas City	1.6	1.0	5.2
Silver Creek	Lansing–Kansas City	1.1	0.9	2.0
Boevau Canyon	Lansing–Kansas City	1.1	0.9	1.9
Ackman	Lansing–Kansas City	0.8	0.7	1.6
Husker	Lansing–Kansas City	0.7	0.6	1.3
Dry Creek North	Lansing–Kansas City	0.6	0.5	1.2
Bishop	Lansing–Kansas City	0.3	0.3	0.6
Total		**20**	**10**	**25**

studies will need to be part of a thorough evaluation. Furthermore, CO_2 source proximity, availability, and industry support must be considered as crucial aspects of the successful implementation of geologic sequestration.

CONCLUSION

Screening criteria for field candidates were based on cumulative recovery of the oil reservoir. Fields that have been unitized and have had success in the secondary phase of recovery are considered good candidates for CO_2 sequestration through EOR. Estimates developed in this evaluation are based in part on the assumption that all of the injected gas will remain in the reservoir for long-term storage when tertiary recovery ends. The remaining nonunitized fields may be excellent candidates for additional storage and could potentially have the fluid in the pore space replaced by CO_2, with revenue from any incremental oil recovery helping to offset the cost of injection.

Sequestration capacity estimates were developed for more than 1000 oil fields in north-central North America as part of the PCOR Partnership's regional CO_2 sequestration characterization activities. The results generated by the volumetric method indicate that there may be over 10 billion tons of CO_2 storage capacity in the 1091 fields evaluated (Table 8). The results of the EOR-based evaluations for 63 fields in the Williston, Powder River, and Denver–Julesberg Basins, shown in this paper, suggest that over 950 million tons of CO_2 could be sequestered by CO_2 flood EOR operations, possibly resulting in over 2 billion barrels of incremental oil production (Figure 2). If these same fields are used for CO_2 sequestration purposes (volumetric method), the total storage potential would account for two-thirds, or 2 billion tons, of the previously mentioned 1 billion tons available. These CO_2 sequestration capacity estimates are reconnaissance-level only and are based on a theoretical maximum, best-case scenario approach to the evaluation of geologic sinks and are meant to illustrate the potential value of these types of sinks with respect to their ultimate storage. The estimates generated during Phase I of the PCOR Partnership provide order-of-magnitude-level CO_2 capacity estimates for over 1000 geologic locations in the PCOR Partnership region that were previously unavailable.

Table 8. Total Storage Capacity of Pools Evaluated Using the Volumetric Methodology

Basin	Number of Pools Evaluated	Potential Storage Capacity in Evaluated Fields
Williston	845	>9 billion tons
Powder River	225	>1 billion tons
Denver–Julesberg	21	>14 million tons

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