National Assessment of Geologic Carbon Dioxide Storage Resources—Summary

The U.S. Geological Survey (USGS) recently completed an evaluation of the technically accessible storage resource (TA_{SR}) for carbon dioxide (CO_2) for 36 sedimentary basins in the onshore areas and State waters of the United States (fig. 1). The TA_{SR} is an estimate of the geologic storage resource that may be available for CO_2 injection and storage and is based on current geologic and hydrologic knowledge of the subsurface and current engineering practices. By using a geology-based probabilistic assessment methodology, the USGS assessment team members obtained a mean estimate of approximately 3,000 metric gigatons (Gt) of subsurface CO_2 storage capacity that is technically accessible below onshore areas and State waters; this amount is more than 500 times the 2011 annual U.S. energy-related CO_2 emissions of 5.5 Gt (U.S. Energy Information Administration, 2012).

In 2007, the Energy Independence and Security Act (Public Law 110–140) directed the U.S. Geological Survey to conduct a national assessment of geologic storage resources for CO_2 in consultation with the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy (DOE), and State

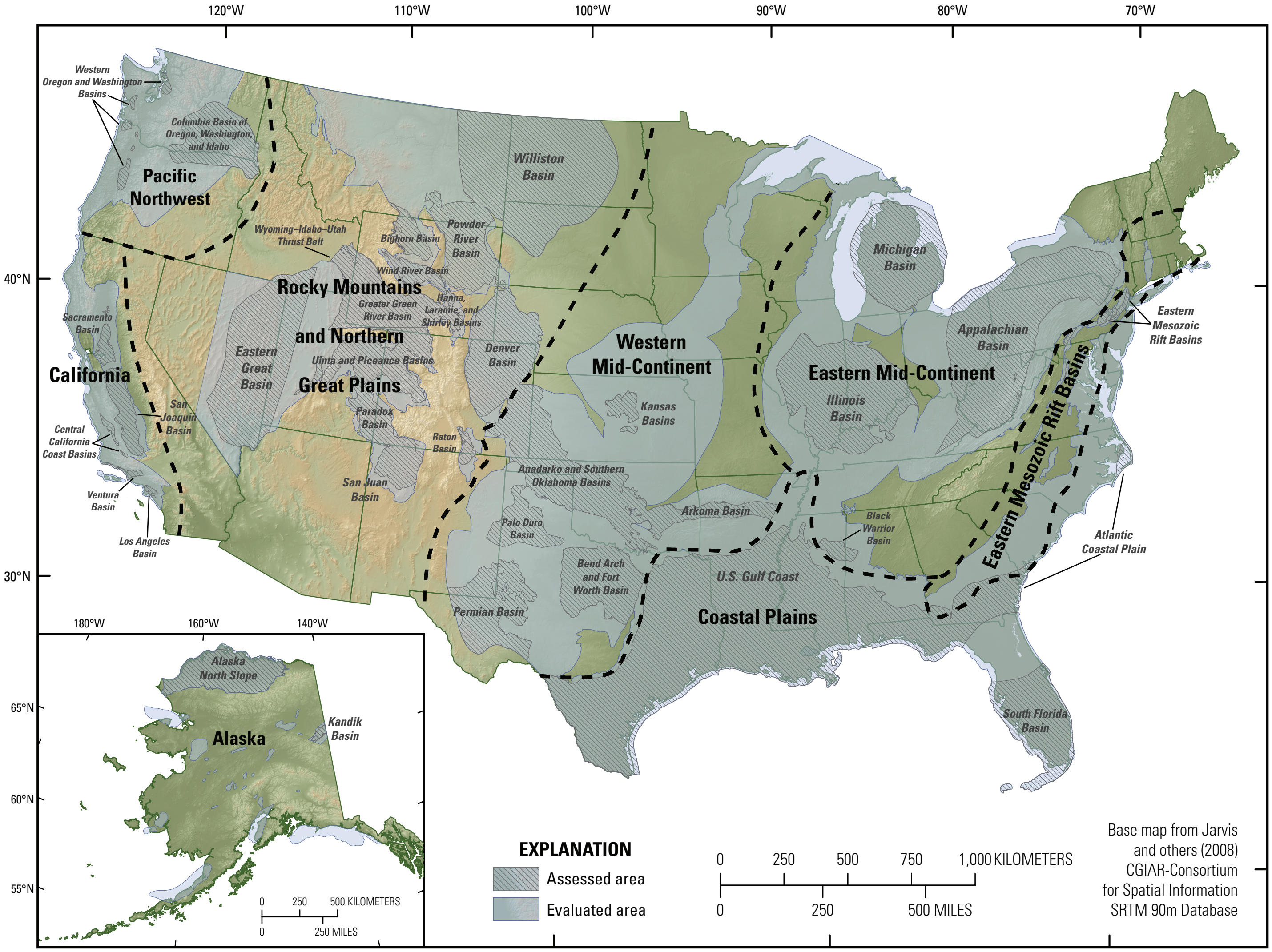

Figure 1. Map of the conterminous United States and Alaska showing 8 regions (separated by bold dashed lines), evaluated areas (bluish gray) that were not assessed, and 36 areas (pattern) that were assessed by the U.S. Geological Survey for carbon dioxide (CO_2) storage. Resources in federally owned offshore areas were not assessed, and Hawaii was considered unlikely to have significant storage resources. Regions and study areas are plotted over a shaded-relief image showing higher elevations in brown and tan and lower elevations in green.

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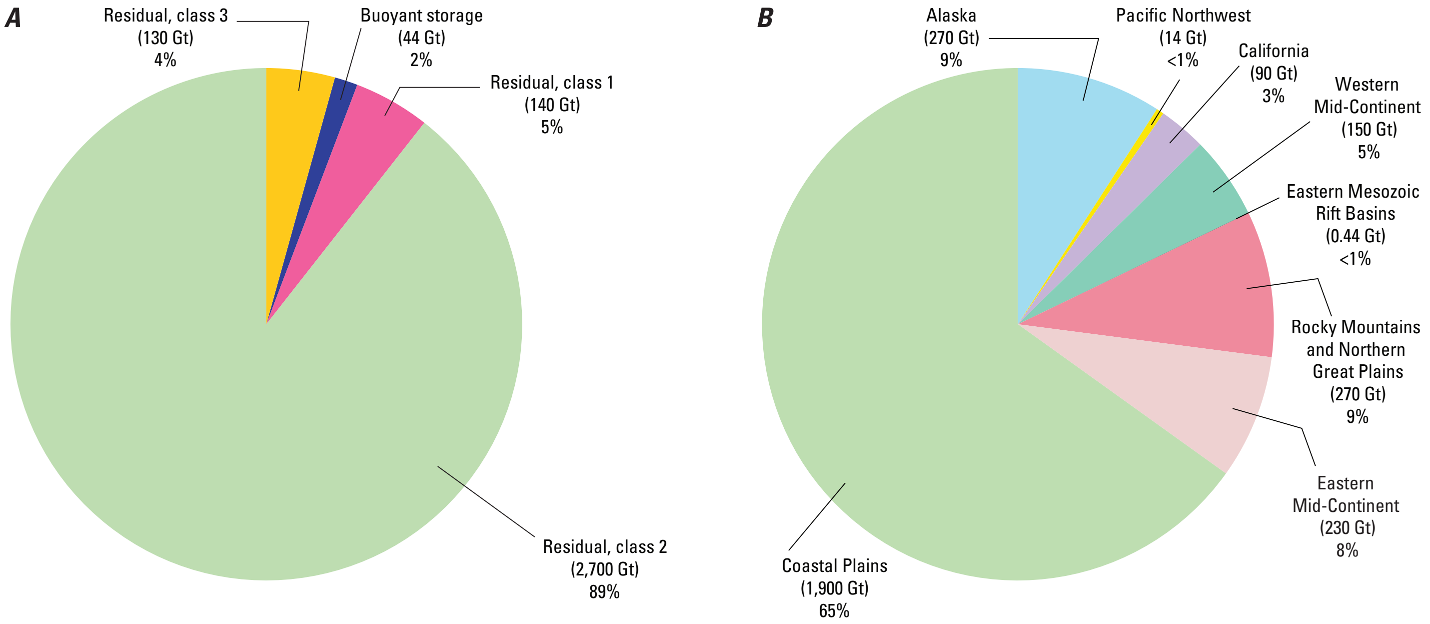

Figure 2. Pie charts showing mean estimates by the U.S. Geological Survey in 2012 of technically accessible storage resources (TA_{SR}) for carbon dioxide (CO_2) in the United States by (*A*) type and class and (*B*) region. Resources were estimated for eight geographic regions shown in figure 1. A mean total of 3,000 metric gigatons (Gt) of storage resources was estimated to exist in buoyant and residual storage types. The known recovery replacement storage resource (KRR_{SR}) is not shown in part *A* but is included in the buoyant storage type. Resources in federally owned offshore areas were not assessed. Mean values sum to totals but are reported to only two significant figures. Percentages were calculated from unrounded resource estimates.

Table 1. Estimates by the U.S. Geological Survey in 2012 of national totals for technically accessible storage resources (TA_{SR}) for carbon dioxide (CO_2) in the United States by resource type and class.

[Estimates are in billions of metric tons (gigatons, Gt). P_5, P_{50}, and P_{95} are probability percentiles and represent the 5-, 50-, and 95-percent probabilities, respectively, that the true storage resource is less than the value shown. The terminology used in this report differs from that used by the petroleum industry and follows standard statistical practice (for example, Everitt and Skrondal, 2010), where percentiles, or fractiles, represent the value of a variable below which a certain proportion of observations falls. The percentiles were calculated by using the aggregation method described in U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team (2013b) and in Blondes, Schuenemeyer, and others (2013). Percentile values do not sum to totals because the aggregation procedure used partial dependencies between storage assessment units. The P_{50} (median) values are generally less than mean values because most output distributions are right skewed. The known recovery replacement storage resource (KRR_{SR}) is listed separately as determined from petroleum production volumes; the same type of resource is also included in the buoyant storage type estimated from a geologic model. Mean values sum to totals but are reported to only two significant figures]

CO_2 storage resource type and class		P_5	P_{50}	P_{95}	Mean
Symbol	Name				
	Storage resource estimated from geologic models				
B_{SR}	Buoyant trapping storage resource	19	31	110	44
$R1_{SR}$	Residual trapping class 1 storage resource	97	140	200	140
$R2_{SR}$	Residual trapping class 2 storage resource	2,100	2,600	3,300	2,700
$R3_{SR}$	Residual trapping class 3 storage resource	58	120	230	130
TA_{SR} (total)	Technically accessible storage resource	2,300	3,000	3,700	3,000
	Storage resource estimated from petroleum production volumes				
KRR_{SR}	Known recovery replacement storage resource	11	13	15	13

geological surveys. The USGS developed a methodology to estimate storage resource potential in geologic formations in the United States (Burruss and others, 2009; Brennan and others, 2010; Blondes, Brennan, and others, 2013). In 2012, the USGS completed the assessment, and the results are summarized in this Fact Sheet (fig. 2*A*,*B*; tables 1, 2) and are provided in more detail in companion reports (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a,b).

The goal of this project was to conduct an initial assessment of storage capacity on a regional basis, and results are not intended for use in the evaluation of specific sites for potential CO_2 storage. The national assessment was a geology-based examination of all sedimentary basins in the onshore and State waters area of the United States that contain storage assessment units (SAUs) that could be defined according to geologic and hydrologic characteristics. Although geologic storage of CO_2

Table 2. Estimates by the U.S. Geological Survey in 2012 of basin and regional totals for technically accessible storage resources (TA_{SR}) for carbon dioxide (CO_2) in the United States.

[Estimates are in millions of metric tons (megatons, Mt). P_5, P_{50}, and P_{95} are probability percentiles; see table 1. Mean values sum to totals but are reported to only two significant figures if the value is greater than 1 Mt and are rounded to the nearest 0.1 Mt if the value is less than 1 Mt. Regions are listed from northwest to east, and basins are listed alphabetically]

Basin name	KRR_{SR} Known recovery replacement storage resource				B_{SR} Buoyant trapping storage resource				$R1_{SR}$ Residual trapping class 1 storage resource			
	P_5	P_{50}	P_{95}	Mean	P_5	P_{50}	P_{95}	Mean	P_5	P_{50}	P_{95}	Mean
Alaska Region												
Alaska North Slope	700	910	1,100	910	2,400	8,600	62,000	18,000	510	770	1,100	790
Kandik Basin	0.0	0.0	0.0	0.0	1.1	13	150	38	0.0	0.0	0.0	0.0
Aggregated totals	**700**	**910**	**1,100**	**910**	**2,400**	**8,600**	**62,000**	**18,000**	**510**	**770**	**1,100**	**790**
Pacific Northwest Region												
Western Oregon and Washington Basins	0.0	0.0	0.0	0.0	0.1	1.5	35	8.2	860	1,600	2,700	1,700
Aggregated totals	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**1.5**	**35**	**8.2**	**860**	**1,600**	**2,700**	**1,700**
California Region												
Los Angeles Basin	10	13	16	13	43	75	140	81	66	130	230	130
Sacramento Basin	34	48	67	49	42	57	180	80	460	740	1,100	760
San Joaquin Basin	18	24	32	25	31	98	980	270	1,600	2,400	3,400	2,500
Ventura Basin	23	32	43	32	29	52	290	93	76	160	300	170
Aggregated totals	**94**	**120**	**150**	**120**	**180**	**320**	**1,500**	**520**	**2,500**	**3,500**	**4,700**	**3,500**
Rocky Mountains and Northern Great Plains Region												
Bighorn Basin	75	93	110	93	89	120	290	150	0.0	0.0	0.0	0.0
Denver Basin	76	100	130	100	110	170	850	300	35	100	250	120
Eastern Great Basin	0.9	1.2	1.6	1.2	1.2	2.2	23	6.6	0.0	0.0	0.0	0.0
Greater Green River Basin	380	500	650	500	440	580	1,500	740	0.0	0.0	0.0	0.0
Hanna, Laramie, and Shirley Basins	0.9	1.1	1.4	1.1	17	74	370	120	5.2	12.0	23	12
Paradox Basin	36	51	71	52	45	63	160	78	0.0	0.0	0.0	0.0
Powder River Basin	96	120	150	120	120	180	710	280	0.3	1.8	4.1	2.0
San Juan Basin	9.4	12	16	12	11	15	37	19	3.8	8.4	17	9.1
Uinta and Piceance Basins	46	58	75	59	47	73	280	110	0.0	0.0	0.0	0.0
Williston Basin	150	180	230	180	340	710	2,000	880	1,600	2,700	4,400	2,800
Wind River Basin	52	66	81	66	63	86	280	130	0.6	1.4	3.3	1.6
Wyoming-Idaho-Utah Thrust Belt	240	310	390	310	290	370	600	400	0.0	0.0	0.0	0.0
Aggregated totals	**1,300**	**1,500**	**1,800**	**1,500**	**1,800**	**2,700**	**6,300**	**3,200**	**1,700**	**2,900**	**4,600**	**3,000**
Western Mid-Continent Region												
Anadarko and Southern Oklahoma Basins	220	300	420	310	1,000	1,400	3,300	1,700	450	920	1,700	990
Arkoma Basin	3.7	5.2	7.3	5.3	14	25	66	31	0.0	0.0	0.0	0.0
Bend Arch and Fort Worth Basin	210	290	370	290	230	310	500	340	330	660	1,100	680
Kansas Basins	4.5	5.6	6.9	5.7	4.8	6.1	9.2	0.0	0.0	0.0	0.0	0.0
Palo Duro Basin	120	150	190	150	1.6	4.1	32	9.3	72	110	170	120
Permian Basin	1,000	1,300	1,700	1,300	1,600	2,000	4,000	2,400	2,200	3,900	6,700	4,100
Aggregated totals	**1,700**	**2,100**	**2,500**	**2,100**	**3,100**	**3,800**	**7,800**	**4,500**	**3,600**	**5,700**	**8,900**	**5,900**
Eastern Mid-Continent Region												
Appalachian Basin	21	28	37	28	38	79	370	130	160	270	440	280
Black Warrior Basin	14	23	32	23	13	17	30	19	0.0	0.0	0.0	0.0
Illinois Basin	69	85	100	85	94	290	1,300	440	900	1,400	2,300	1,500
Michigan Basin	140	180	220	180	190	280	790	360	2,800	4,500	6,800	4,600
Aggregated totals	**260**	**310**	**370**	**320**	**380**	**740**	**2,200**	**940**	**4,100**	**6,200**	**9,100**	**6,400**
Coastal Plains Region												
Atlantic Coastal Plain	0.0	0.0	0.0	0.0	39	100	270	120	2,000	3,100	4,700	3,200
South Florida Basin	6.7	8.5	10	8.5	21	97	900	240	0.0	0.0	0.0	0.0
U.S. Gulf Coast	6,400	8,000	9,800	8,000	7,800	11,000	39,000	16,000	75,000	120,000	170,000	120,000
Aggregated totals	**6,400**	**8,000**	**9,900**	**8,000**	**8,000**	**11,000**	**40,000**	**17,000**	**78,000**	**120,000**	**180,000**	**120,000**
Eastern Mesozoic Rift Basins Region												
Eastern Mesozoic Rift Basins	0.0	0.0	0.0	0.0	1.3	2.0	19	5.9	0.0	0.0	0.0	0.0
Aggregated totals	**0.0**	**0.0**	**0.0**	**0.0**	**1.3**	**2.0**	**19**	**5.9**	**0.0**	**0.0**	**0.0**	**0.0**

Table 2. Estimates by the U.S. Geological Survey in 2012 of basin and regional totals for technically accessible storage resources (TA_{SR}) for carbon dioxide (CO_2) in the United States.—Continued

$R2_{SR}$ Residual trapping class 2 storage resource				$R3_{SR}$ Residual trapping class 3 storage resource				TA_{SR} Technically accessible storage resource			
P_5	P_{50}	P_{95}	Mean	P_5	P_{50}	P_{95}	Mean	P_5	P_{50}	P_{95}	Mean
Alaska Region—Continued											
150,000	200,000	280,000	210,000	7,600	38,000	110,000	45,000	170,000	260,000	400,000	270,000
480	1,100	2,200	1,200	22	170	630	230	570	1,400	2,700	1,500
150,000	**200,000**	**280,000**	**210,000**	**7,700**	**39,000**	**110,000**	**45,000**	**180,000**	**260,000**	**410,000**	**270,000**
Pacific Northwest Region—Continued											
6,600	12,000	20,000	12,000	0.6	10	43	14	7,500	14,000	22,000	14,000
6,600	**12,000**	**20,000**	**12,000**	**0.6**	**10**	**43**	**14**	**7,500**	**14,000**	**22,000**	**14,000**
California Region—Continued											
2,000	3,300	5,600	3,500	0.1	1.6	6.2	2.2	2,200	3,500	5,800	3,700
19,000	28,000	39,000	29,000	0.0	2.3	10	3.2	20,000	29,000	40,000	29,000
33,000	48,000	65,000	48,000	25	120	300	130	36,000	51,000	69,000	51,000
3,100	5,500	9,200	5,700	0.5	9.0	35	12	3,200	5,700	9,600	6,000
63,000	**85,000**	**110,000**	**86,000**	**35**	**130**	**320**	**150**	**67,000**	**90,000**	**120,000**	**90,000**
Rocky Mountains and Northern Great Plains Region—Continued											
890	1,500	2,400	1,500	21	86	230	100	1,100	1,700	2,800	1,800
1,000	2,700	5,900	3,000	37	210	830	300	1,400	3,300	7,200	3,700
80	170	360	190	1.9	24	97	34	98	210	430	230
21,000	30,000	43,000	31,000	1,700	6,200	17,000	7,400	26,000	38,000	57,000	39,000
1,100	2,000	3,200	2,100	25	91	240	110	1,300	2,200	3,600	2,300
1,000	2,500	5,300	2,800	28	380	1,600	530	1,300	3,100	6,300	3,400
11,000	17,000	25,000	18,000	39	170	510	210	11,000	18,000	26,000	18,000
380	640	1,100	670	5.2	30	94	37	430	710	1,200	740
1,300	2,200	3,300	2,200	290	1,200	3,300	1,400	2,000	3,500	6,300	3,800
99,000	140,000	180,000	140,000	1,100	5,200	14,000	6,000	110,000	140,000	190,000	150,000
4,100	7,100	11,000	7,300	150	580	1,500	670	4,600	7,800	12,000	8,100
26,000	39,000	55,000	39,000	780	3,800	12,000	4,700	28,000	43,000	63,000	44,000
180,000	**240,000**	**310,000**	**240,000**	**7,300**	**19,000**	**43,000**	**22,000**	**200,000**	**270,000**	**350,000**	**270,000**
Western Mid-Continent Region—Continued											
34,000	55,000	88,000	57,000	670	2,500	6,100	2,800	38,000	60,000	96,000	62,000
3,500	7,000	13,000	7,400	39	360	1,300	480	3,800	7,500	13,000	7,900
7,000	13,000	20,000	13,000	170	1,100	3,800	1,400	8,600	15,000	24,000	15,000
160	280	480	300	1.5	12	48	17	180	300	510	320
4,900	6,900	9,400	7,000	9.0	56	170	67	5,100	7,100	9,600	7,200
31,000	48,000	75,000	50,000	460	2,200	6,400	2,600	37,000	57,000	89,000	59,000
93,000	**130,000**	**190,000**	**130,000**	**2,600**	**6,800**	**15,000**	**7,500**	**110,000**	**150,000**	**210,000**	**150,000**
Eastern Mid-Continent Region—Continued											
13,000	18,000	27,000	19,000	180	840	2,500	1,000	14,000	20,000	29,000	20,000
170	280	450	290	0.2	2.1	7.2	2.7	180	300	480	310
110,000	140,000	200,000	150,000	1,000	5,100	14,000	6,100	110,000	150,000	210,000	150,000
33,000	47,000	66,000	48,000	560	3,300	11,000	4,200	40,000	56,000	78,000	57,000
160,000	**210,000**	**280,000**	**210,000**	**2,700**	**9,900**	**25,000**	**11,000**	**170,000**	**230,000**	**300,000**	**230,000**
Coastal Plains Region—Continued											
6,900	11,000	16,000	11,000	0.0	0.1	4.7	1.1	9,200	14,000	20,000	14,000
120,000	160,000	200,000	160,000	1,400	7,600	21,000	9,000	120,000	160,000	210,000	170,000
1,100,000	1,600,000	2,200,000	1,600,000	6,600	30,000	83,000	35,000	1,300,000	1,700,000	2,400,000	1,800,000
1,300,000	**1,700,000**	**2,400,000**	**1,800,000**	**11,000**	**38,000**	**96,000**	**44,000**	**1,400,000**	**1,900,000**	**2,600,000**	**1,900,000**
Eastern Mesozoic Rift Basins Region—Continued											
130	280	510	290	7.6	100	410	140	180	400	830	440
130	**280**	**510**	**290**	**7.6**	**100**	**410**	**140**	**180**	**400**	**830**	**440**

may be possible in some areas not assessed by the USGS, the SAUs identified in this assessment represent those areas within sedimentary basins that met the assessment criteria. A geologic description of each SAU was prepared; descriptions for SAUs in several basins are in Warwick and Corum (2012).

The resources were estimated without consideration either of accessibility due to land-management or regulatory restrictions or of economic viability. Thus, if storage of CO_2 within a formation is feasible with current technology, it was considered for this report. Because the legislation that mandated this assessment (Public Law 110–140) required that the assessment incorporate EPA regulations about underground sources of drinking water, a substantial percentage of potential storage formations containing water with less than 10,000 milligrams per liter (mg/L) of total dissolved solids (TDS) (considered freshwater for the purpose of this assessment) was disqualified as a protected underground source of potential drinking water.

The SAU is a mappable volume of rock that consists of a porous reservoir and a bounding regional sealing formation. The upper vertical limit chosen for this assessment was 3,000 feet (914 meters) because CO_2 at this depth is typically subjected to temperatures and pressures that maintain the CO_2 in a supercritical state and maximize the storage resource per unit volume. The lower vertical limit for the SAU of 13,000 ft (3,962 m) is based on the potential CO_2 injection depth at pipeline pressures without additional compression at the surface. *Standard SAUs* are between depths of 3,000 ft (914 m) and 13,000 ft (3,962 m). If reservoir rock properties suggested that a viable storage resource is present at depths below 13,000 ft (3,962 m), the assessment geologist may have added an additional *deep SAU* for this deeper reservoir.

Sedimentary rocks of deep saline formations and of existing oil and gas fields were evaluated. Specifically, 33 sedimentary basins, or combined basin areas, within 8 regions of the United States were assessed (table 2). Numerous other basins (study areas shown in bluish gray in fig. 1) were evaluated but not assessed because existing geologic conditions and available data indicated that the areas failed to meet the minimum requirements for CO_2 storage as outlined in Brennan and others (2010). Within the assessed basins, 202 SAUs were identified as having good storage potential because of the presence of a robust regional seal, adequate reservoir rock, and sufficient areas containing saline formation waters. Ten of the SAUs did not have sufficient data to build a robust geologic model to accurately estimate the storage resource and were designated as nonquantitative SAUs; no storage resources were estimated for the 10 nonquantitative SAUs. Three basins (Central California Coast Basins; Columbia Basin of Oregon, Washington, and Idaho; and Raton Basin) contain only nonquantitative SAUs, bringing the total number of basins shown in figure 1 to 36. For nonquantitative SAUs, surficial geographic boundaries were defined and a geologic description was prepared.

Two general storage types, buoyant and residual, were defined in the methodology used in this assessment. Buoyantly trapped CO_2 can be held in place in porous formations by top and lateral seals. Residually trapped CO_2 can be held in porous formations as individual droplets within pores by capillary forces. The residual storage resource consists of three injectivity classes based on reservoir permeability: residual trapping class 1 ($R1_{SR}$) represents storage in rocks with permeability greater than 1 darcy (D); residual trapping class 2 ($R2_{SR}$) represents storage in rocks with moderate permeability, defined as permeability between 1 millidarcy (mD) and 1 D; and residual trapping class 3 ($R3_{SR}$) represents storage in rocks with low permeability, defined as permeability less than 1 mD.

The known recovery replacement storage resource (KRR_{SR}) is the mass of CO_2 that can be stored in existing hydrocarbon reservoirs. The KRR_{SR} is a minimum range of values that represent the amount of CO_2 at subsurface conditions that could replace the volume of known hydrocarbons in petroleum reservoirs. KRR_{SR} is determined from production volumes rather than the geologic model of buoyant and residual resources that make up the TA_{SR}. The same type of resource is also included in the buoyant storage type estimated from a geologic model.

Regions with the largest technically accessible storage resources (TA_{SR}) are the Coastal Plains Region (mean estimate of 1,900 Gt, of which about 1,800 Gt, or 91 percent, is in the U.S. Gulf Coast) and the Alaska Region (mean estimate of 270 Gt), where the resource is almost entirely in the Alaska North Slope. Most (89 percent) of the TA_{SR} is in the residual trapping class 2 storage resource category (mean estimate of 2,700 Gt; fig. 2*A*). Residual trapping classes 1 and 3 account for 5 and 4 percent of the TA_{SR}, respectively. The USGS team obtained a mean estimate of 44 Gt for storage in buoyant traps, B_{SR}. The mean estimate for KRR_{SR} storage resources available in petroleum reservoirs within the assessed areas is 13 Gt (table 1).

The 44 Gt (mean estimate) of buoyant trapping storage resources includes non-hydrocarbon-bearing reservoir formations, but most of the resources are well defined by hydrocarbon exploration data. Existing oil in hydrocarbon reservoirs may be produced in the near future by using enhanced-oil-recovery technology that utilizes anthropogenic CO_2 (fig. 3), and then the reservoirs could be used for CO_2 storage. Because of the depth of knowledge about the hydrocarbon reservoirs, buoyant trapping storage resources in these reservoirs may be more attractive for storage of CO_2 than residual trapping storage resources.

Figure 3. CO_2 injection well at the Pump Canyon test site in New Mexico. The well was drilled by the Southwest Regional Partnership on Carbon Sequestration (sponsored by the U.S. Department of Energy) to test the effectiveness of storing CO_2 in deep, unminable coal seams (Koperna and others, 2009). Similar wells could inject CO_2 for storage in depleted oil and gas reservoirs. Photograph by Eelco Kruizinga; used with permission.

References Cited

Blondes, M.S., Brennan, S.T., Merrill, M.D., Buursink, M.L., Warwick, P.D., Cahan, S.M., Cook, T.A., Corum, M.D., Craddock, W.H., DeVera, C.A., Drake, R.M., II, Drew, L.J., Freeman, P.A., Lohr, C.D., Olea, R.A., Roberts-Ashby, T.L., Slucher, E.R., and Varela, B.A., 2013, National assessment of geologic carbon dioxide storage resources—Methodology implementation: U.S. Geological Survey Open-File Report 2013–1055, 26 p., accessed May 10, 2013, at http://pubs.usgs.gov/of/2013/1055/.

Blondes, M.S., Schuenemeyer, J.H., Olea, R.A., and Drew, L.J., 2013, Aggregation of carbon dioxide sequestration storage assessment units: Stochastic Environmental Research and Risk Assessment, DOI:10.1007/s00477-013-0718-x, 21 p., accessed May 31, 2013, at http://link.springer.com/article/10.1007%2Fs00477-013-0718-x.

Brennan, S.T., Burruss, R.C., Merrill, M.D., Freeman, P.A., and Ruppert, L.F., 2010, A probabilistic assessment methodology for the evaluation of geologic carbon dioxide storage: U.S. Geological Survey Open-File Report 2010–1127, 31 p., accessed September 19, 2012, at http://pubs.usgs.gov/of/2010/1127.

Burruss, R.C., Brennan, S.T., Freeman, P.A., Merrill, M.D., Ruppert, L.F., Becker, M.F., Herkelrath, W.N., Kharaka, Y.K., Neuzil, C.E., Swanson, S.M., Cook, T.A., Klett, T.R., Nelson, P.H., and Schenk, C.J., 2009, Development of a probabilistic assessment methodology for evaluation of carbon dioxide storage: U.S. Geological Survey Open-File Report 2009–1035, 81 p., accessed September 19, 2012, at http://pubs.usgs.gov/of/2009/1035/.

Everitt, B.S., and Skrondal, Anders, 2010, The Cambridge dictionary of statistics (4th ed.): Cambridge, England, Cambridge University Press, 478 p.

Jarvis, A., Reuter, H.I., Nelson, Andrew, and Guevara, Edward, 2008, Hole-filled SRTM [Shuttle Radar Topographic Mission] for the globe, version 4: available from the CGIAR [Consultative Group for International Agricultural Research]-Consortium for Spatial Information SRTM 90m Database; accessed January, 15, 2012, at http://www.cgiar-csi.org/data/srtm-90m-digital-elevation-database-v4-1#acknowledgements.

Koperna G.J., Jr., Oudinot, A.Y., McColpin, G.R., Liu, Ning, Heath, J.E., Wells, Arthur, and Young, G.B., 2009, CO_2-ECBM/storage activities at the San Juan Basin's Pump Canyon test site: Society of Petroleum Engineers Annual Technical Conference and Exhibition, 4–7 October 2009, New Orleans, Louisiana, Conference Paper 124002–MS, 13 p., http://www.onepetro.org/mslib/servlet/onepetropreview?id=SPE-124002-MS.

U.S. Energy Information Administration, 2012, U.S. energy-related carbon dioxide emissions, 2011: U.S. Energy Information Administration Web site, accessed December 20, 2012, at http://www.eia.gov/environment/emissions/carbon/.

U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a, National assessment of geologic carbon dioxide storage resources—Data (ver. 1.1, September 2013): U.S. Geological Survey Data Series 774, 13 p., plus 2 appendixes and 2 large tables in separate files, http://pubs.usgs.gov/ds/774/.

U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013b, National assessment of geologic carbon dioxide storage resources—Results (ver. 1.1, September 2013): U.S. Geological Survey Circular 1386, 41 p., http://pubs.usgs.gov/circ/1386/.

Warwick, P.D., and Corum, M.D., eds., 2012, Geologic framework for the national assessment of carbon dioxide storage resources: U.S. Geological Survey Open-File Report 2012–1024, accessed February 21, 2013, at http://pubs.usgs.gov/of/2012/1024/. (Chapters A–C were posted by November 1, 2012.)

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