

# **National Assessment of Geologic Carbon Dioxide Storage Resources— Allocations of Assessed Areas to Federal Lands**

Scientific Investigations Report 2015–5021

**U.S. Department of the Interior  
U.S. Geological Survey**

**Cover.** Photograph of the Castle Gardens Scenic Area, which is located in the Wind River Basin, Wyoming, and is representative of Federal lands overlying assessed storage areas. The scenic area is managed by the Bureau of Land Management of the U.S. Department of the Interior. This photograph was accessed March 16, 2015, at [http://commons.wikimedia.org/wiki/File:Castle\\_Gardens\\_Scenic\\_Area\\_by\\_Ten\\_Sleep,\\_Wyoming\\_01.jpg](http://commons.wikimedia.org/wiki/File:Castle_Gardens_Scenic_Area_by_Ten_Sleep,_Wyoming_01.jpg), and the file is licensed under the Creative Commons Attribution-Share Alike 4.0 International license.

# **National Assessment of Geologic Carbon Dioxide Storage Resources— Allocations of Assessed Areas to Federal Lands**

By Marc L. Buursink, Steven M. Cahan, and Peter D. Warwick

Scientific Investigations Report 2015–5021

**U.S. Department of the Interior  
U.S. Geological Survey**

**U.S. Department of the Interior**  
SALLY JEWELL, Secretary

**U.S. Geological Survey**  
Suzette M. Kimball, Acting Director

U.S. Geological Survey, Reston, Virginia: 2015

For more information on the USGS—the Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment—visit <http://www.usgs.gov> or call 1–888–ASK–USGS.

For an overview of USGS information products, including maps, imagery, and publications, visit <http://www.usgs.gov/pubprod/>.

Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Although this information product, for the most part, is in the public domain, it also may contain copyrighted materials as noted in the text. Permission to reproduce copyrighted items must be secured from the copyright owner.

Suggested citation:

Buursink, M.L., Cahan, S.M., and Warwick, P.D., 2015, National assessment of geologic carbon dioxide storage resources—Allocations of assessed areas to Federal lands: U.S. Geological Survey Scientific Investigations Report 2015–5021, 21 p., <http://dx.doi.org/10.3133/sir20155021>.

ISSN 2328–0328 (online)

## Contents

Abstract.....	1
Introduction.....	1
Storage Resources.....	1
Lands Description.....	2
Assessed Areas.....	3
Conclusions.....	4
Additional Assessment Information.....	4
References Cited.....	5
Glossary.....	6

## Figures

[Figures and tables follow the glossary]

1. Maps of the conterminous United States and Alaska showing selected land-ownership and land-management categories, along with the 8 regions and 36 areas assessed in 2012 for geologic carbon dioxide storage.....	7
2. Pie charts showing land categories, along with most likely acreages and percentages for allocations of land overlying areas assessed in 2012 for geologic carbon dioxide storage.....	12
3. Pie charts showing top 10 States (and other remaining States) with the most likely estimates of allocations to four categories of land overlying areas assessed in 2012 for geologic carbon dioxide storage.....	13
4. Pie chart showing top 10 States (and other remaining States) with the most likely estimates of State-lands allocations for land overlying areas assessed in 2012 for geologic carbon dioxide storage.....	15

## Tables

1. U.S. regions and basins assessed in 2012 for geologic carbon dioxide storage, merged storage assessment unit (SAU) footprint areas, and estimated areas for lands overlying storage resources and allocated to general land-ownership categories and Federal land-management categories.....	16
2. Lists of storage assessment units (SAUs) having the largest land allocations by area and percentage for five land-management categories for U.S. areas assessed in 2012 for geologic carbon dioxide storage.....	20

## Conversion Factors

Multiply	By	To obtain
<b>Length</b>		
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
nautical mile (nmi)	1.852	kilometer (km)
<b>Area</b>		
acre	4,047	square meter
square mile	2.590	square kilometer
<b>Mass</b>		
kilogram (kg)	2.205	pound, avoirdupois (lb)
megagram (Mg)=1 metric ton (t) (1,000 kg)	1.102	ton, short (2,000 lb)
billion metric tons= gigaton (Gt)	1.102	billion short tons

## Datum

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

# National Assessment of Geologic Carbon Dioxide Storage Resources—Allocations of Assessed Areas to Federal Lands

By Marc L. Buursink, Steven M. Cahan, and Peter D. Warwick

## Abstract

Following the geologic basin-scale assessment of technically accessible carbon dioxide storage resources in onshore areas and State waters of the United States, the U.S. Geological Survey estimated that an area of about 130 million acres (or about 200,000 square miles) of Federal lands overlies these storage resources. Consequently, about 18 percent of the assessed area associated with storage resources is allocated to Federal land management. Assessed areas are allocated to four other general land-ownership categories as follows: State lands about 4.5 percent, Tribal lands about 2.4 percent, private and other lands about 72 percent, and offshore areas about 2.6 percent.

## Introduction

In 2012, the U.S. Geological Survey (USGS) completed an assessment of the technically accessible geologic storage resources ( $TA_{SR}$ ) for carbon dioxide ( $CO_2$ ) for 36 assessed areas (within one or more sedimentary basins) in 8 regions in the onshore areas and State waters of the United States (fig. 1) (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a,b,c). The  $TA_{SR}$  is an estimate of the subsurface geologic storage resources that may be available for  $CO_2$  injection and is based on current geologic and hydrologic knowledge of the subsurface and on assumptions about current engineering practices (Society of Petroleum Engineers, 2014). By using a geology-based probabilistic assessment methodology, the USGS assessment team members obtained a mean  $TA_{SR}$  estimate of about 3,000 gigatons (Gt) under U.S. onshore areas and State waters. The estimate of the  $TA_{SR}$  includes buoyant trapping storage resources ( $B_{SR}$ ), where  $CO_2$  can be trapped in structural or stratigraphic closures, and residual trapping storage resources ( $R_{SR}$ ), where  $CO_2$  can be held in place by capillary pore pressures in areas outside of buoyant traps. The mean national

$B_{SR}$  is about 44 Gt, whereas the  $R_{SR}$  is divided among three injectivity classes, which are based on reservoir permeability. A large portion of the  $TA_{SR}$  is located under Federal lands, and identifying this fraction of the assessed area is critical to future management decisions.

The Energy Independence and Security Act of 2007 (Public Law 110–140) directed the USGS 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 geological surveys. The USGS subsequently developed and updated a probabilistic methodology to estimate storage resources in U.S. sedimentary basins (Burruss and others, 2009; Brennan and others, 2010; Blondes and others, 2013). The national USGS assessment results were summarized by the U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team (2013c) and were detailed in companion reports (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a,b).

## Storage Resources

The goal of the national assessment by the USGS was to prepare an estimate of subsurface storage capacity on a regional scale; the results are not intended for use in the evaluation of specific sites for potential  $CO_2$  storage. The assessment was a geology-based examination of major sedimentary basins in the onshore areas and State waters of the United States that contain one or more storage assessment units (SAUs) defined according to geologic and hydrologic characteristics required by the USGS assessment methodology. Although geologic storage of  $CO_2$  may be possible in some areas not assessed by the USGS, the SAUs identified in the assessment represent those areas within sedimentary basins that met the assessment criteria. The SAU is a mappable volume of rock that consists of a porous reservoir and a bounding regional sealing formation. A geologic description

## 2 National Assessment of Geologic Carbon Dioxide Storage Resources—Allocations of Assessed Areas to Federal Lands

of each sedimentary basin and the SAUs therein was prepared during the assessment; assessment input parameters for the SAUs in several basins have been released in Warwick and Corum (2012).

Sedimentary rocks of deep formations with saline groundwater and of reservoirs containing existing oil and gas fields were evaluated. Ultimately, 36 sedimentary basins, or combined basin study areas, within 8 regions of the United States were assessed for storage resources (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a,b) (fig. 1). 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. Regions with the largest  $TA_{SR}$  are the Coastal Plains Region (mean estimate of 1,900 Gt, of which about 1,800 Gt, or 95 percent of the resources, is in the U.S. Gulf Coast study area), the Alaska Region (mean estimate of 270 Gt, where the resources are almost entirely in the Alaska North Slope), and the Rocky Mountains and Northern Great Plains Region (mean estimate of 270 Gt) (table 1; fig. 1) (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a,b). No SAUs were identified in Hawaii because geologic conditions were unlikely to meet the USGS methodology requirements.

Storage resources were estimated without consideration of economic viability or of accessibility due to land-management or regulatory restrictions. Thus, if storage of  $CO_2$  within a formation was feasible according to current knowledge of the subsurface and engineering practices, it was considered for the assessment. In the 2012 assessment, allocations to individual States and general land-ownership categories were tabulated for SAUs (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a).

In this report, potential resource accessibility related to general land ownership and Federal land management is now considered. The assessed area is used when allocating the storage resource because the basin geology may be too variable to allocate the  $TA_{SR}$  to general and Federal lands. Furthermore, the individual agencies managing Federal lands overlying the assessed storage areas are now considered. The DOE published a complementary summary report of geologic  $CO_2$  storage resources estimated by multiple public-private partnerships studies, and the report also accounts for Federal lands leasing (Dolence and others, 2009).

### Lands Description

The five general land-ownership categories used in this report are Federal lands, State lands, Tribal lands, private and other lands, and offshore areas. The Federal lands considered in this report include lands where surface or subsurface rights are owned or managed by Federal agencies alone or in cooperation with State or private interests. Typically, officials at individual Federal sites have estimated the percentage of

land on which the Federal Government owns the mineral rights. Also considered are lands held in trust by the Federal Government. In the conterminous United States and Alaska, Federal lands make up about 32 percent of the onshore areas and State waters. About 2.3 percent of the total U.S. area consists of Native American and Alaska Native lands (collectively referred to as Tribal lands; see the glossary), and they are considered in this report; these lands were not all included in the prior allocation by the U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team (2013a). Ultimately, land owners, managers, planners, and storage resource developers may use this report to make decisions about the multiple uses of Federal lands and the scope of future  $TA_{SR}$  development. State lands may have similar access and usage issues as Federal lands.

Agencies managing Federal lands within the assessment study areas include multiple U.S. Department of the Interior agencies, the U.S. Department of Agriculture Forest Service (FS), and the U.S. Department of Defense (DOD) (fig. 1). The Interior agencies include the Bureau of Land Management (BLM), the Bureau of Reclamation (BOR), the U.S. Fish and Wildlife Service (USFWS), and the National Park Service (NPS). The U.S. Government does not have title to all the lands within the Federal tracts shown in figure 1. In some areas, such as in legislatively proclaimed administrative boundaries of national forests, Federal and private surface ownerships are intermixed, as in Wyoming (fig. 1). In other areas, such as small national wildlife refuges, the surface may be managed through easements rather than outright Federal ownership. Most of the land to which the U.S. Government holds title within the U.S. Gulf Coast study area was acquired from other owners (States and private) and may be subject to different public land laws and regulations when compared to land retained from the original public domain (Karlsen and others, 2002). Federal lands in the Eastern United States include national forests, U.S. military properties, national parks, the Tennessee Valley Authority (TVA) land, water bodies, other scattered recreational areas, and historical sites (fig. 1). Federal lands in the Western United States include large BLM grazing and conservation areas, dammed water bodies, and extensive national forests.

Offshore areas are defined as State waters, or those submerged areas between the established baseline for the coast and the federally owned offshore areas. State waters extend out to 3 geographic (nautical) miles from the established baseline for the coast; beyond this limit, Federal jurisdiction begins and extends to an outer limit of 200 nautical miles. However, in special cases because of territorial claims existing at the dates of statehood, “Texas and the Gulf Coast of Florida have a proprietary interest in a submerged belt of land, nine geographic miles wide, extending seaward along the coast” (Thormahlen, 1999, p. 1–2). Resource assessments in federally managed areas beyond State waters (see the glossary) are typically done by the Bureau of Ocean Energy Management of the U.S. Department of the Interior.



## Assessed Areas

An assessed area is the merged footprint for all the SAUs in a sedimentary basin or combined basin study area; the SAUs are at least 3,000 feet below the surface. The most likely estimate of assessed area represents the areal extent of the geologic storage resources and does not indicate uniform  $TA_{SR}$  distribution. For example, assessed areas may have overlapping subsurface SAUs, and the thickness of an SAU may vary within a basin. Specific information on each SAU was detailed in previous reports (Warwick and Corum, 2012; U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a,b). Figure 1A shows assessed areas on a map of selected land-ownership and land-management categories, including Federal lands. For clarity, figures 1B, C, and D show the distribution of BLM, FS, and Tribal lands separately relative to the assessed areas.

Table 1A lists the most likely acreage in the merged SAU footprint for each assessed area and includes the allocations of Federal, State, Tribal, and other lands overlying each assessed area. Table 1B lists the most likely acreage of Federal lands overlying assessed areas and managed by different agencies. As shown in table 1A, the three assessed basins having the largest areas of overlying Federal lands are the Eastern Great Basin, the Alaska North Slope, and the Greater Green River Basin. Note that in the Eastern Great Basin, Federal lands overlie a large assessed area, but the basin contains only one quantitatively assessed SAU, which has a relatively low  $TA_{SR}$  (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013b, table 3, p. 30–31).

Figure 2A shows the most likely allocations in acres for five general land-ownership categories overlying assessed areas, whereas figure 2B shows the most likely allocations in acres for Federal land-management categories overlying assessed areas. Federal lands overlie about 18 percent of the assessed acreage, whereas State lands overlie about 4.5 percent; Tribal lands, about 2.4 percent; private and other lands, about 72 percent; and offshore areas, about 2.6 percent. (Allocation areas, in acres and percentages, were calculated from unrounded assessed areas but are reported to two significant figures.) Of the assessed area overlain by Federal lands, 64 percent is managed by the BLM, 21 percent is managed by the FS, 5.7 percent is managed by the DOD, 3.8 percent is managed by the USFWS, and 3.8 percent is managed by the NPS; other agencies manage the remaining 1.7 percent (fig. 2B).

Figures 1B and 2B and tables 1B and 2B show that the largest assessed area underlying Federal lands is allocated to lands administered by the BLM, particularly in the Alaska North Slope of the Alaska Region and in the Greater Green River Basin of the Rocky Mountains and Northern Great Plains Region. Figures 1C and 2B and tables 1B and 2C show that the second largest assessed area underlying Federal lands is allocated to lands administered by the FS, though no regions dominate the allocations.

Alternatively to assessed areas being allocated to land categories, the fraction of selected land categories overlying

assessed areas may be considered. The fraction of all Federal lands overlying assessed areas is 19 percent, whereas the fraction of all BLM lands overlying assessed areas is 31 percent, the fraction of all FS lands overlying assessed areas is 13 percent, and the fraction of all Tribal lands overlying assessed areas is 18 percent.

Figure 3A shows the top 10 States (and other remaining States) having the largest estimated acreages of Federal lands overlying assessed areas, whereas figures 3B through 3D show the top 10 States having the largest estimated acreages of BLM, FS, and Tribal lands, respectively, overlying assessed areas. In general, the western States dominate these rankings. The States that have the most Federal lands overlying assessed areas are Alaska and Nevada, and each has about 26 million acres (or about 41,000 and 40,000 square miles, respectively) of mostly BLM lands. The States that have the least Federal lands overlying assessed areas are Missouri, with about 72 acres (or about 0.11 square mile) allocated to NPS lands, and Maryland, with about 11 acres (or about 0.017 square mile) allocated to DOD lands. Nearly all of the Federal lands in Louisiana overlie assessed areas (fig. 1A). Twelve States have no assessed area and thus no allocations to general and Federal categories.

Nationwide, about 31 million acres (or about 48,000 square miles) of State lands overlie assessed areas. Figure 4 shows the top 10 States (and other remaining States) that have State lands overlying assessed areas; Alaska, Florida, Michigan, and Pennsylvania have the highest acreages for this particular allocation.

Whereas assessed areas are more valid for considering the geologic storage resource allocations, the  $TA_{SR}$  was tabulated for SAUs in the assessment, and understanding how lands overlie these units is also valuable for planning storage projects. Table 2A lists the top 10 SAUs ranked by area of overlying Federal lands. Table 2B lists the top 10 SAUs ranked by area of overlying BLM lands, which make up the largest Federal lands allocation and most commonly overlie assessed areas. Table 2C lists the top 10 SAUs ranked by area of overlying FS lands, and table 2D lists the top 10 SAUs ranked by area of overlying Tribal lands, the second and third largest land allocations in the assessment, respectively. Table 2E lists the top 10 SAUs by area of overlying State lands.

There is commonality when comparing the top 10 SAUs in table 2A by area and the 10 SAUs having the largest  $TA_{SR}$  listed by the U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team (2013b, p. 15 and table 3). This commonality includes the Lower Torok Formation SAU (C50010107 with a  $TA_{SR}$  of 140 Gt), in the Alaska North Slope study area, ranked fifth largest in the 2012 assessment and ranked second in this table of SAUs with the most Federal lands (about 18 million acres or about 27,000 square miles). Additional overlap between the lists includes the Tuscaloosa and Woodbine Formations SAU (C50490116 with a  $TA_{SR}$  of 85 Gt), in the U.S. Gulf Coast, ranked eighth in storage capacity and seventh on the list of SAUs with the most Federal lands (about 5.9 million acres or about 9,100 square miles).

## Conclusions

This report has estimates of acreages in five land-ownership categories (Federal lands, State lands, Tribal lands, private and other lands, and offshore areas) for lands that overlie areas assessed by the USGS in 2012 for geologic carbon dioxide (CO<sub>2</sub>) storage (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013b). The Bureau of Land Management (BLM) is the Federal agency with the most land (about 80 million acres, or about 126,000 square miles) overlying assessed areas and storage assessment units (SAUs), followed by the U.S. Department of Agriculture Forest Service (FS), which has about 27 million acres (or about 42,000 square miles). Also significantly, Tribal lands cover about 17 million acres (about 26,000 square miles). Alaska and Nevada are the States with the most Federal lands overlying assessed areas, which are mostly managed by the BLM. The Lower Torok Formation SAU in the Alaska North Slope and the Tuscaloosa and Woodbine Formations SAU in the U.S. Gulf Coast are examples of units having large amounts of technically accessible storage resources ( $TA_{SR}$ ) underlying Federal lands. The Alaska Region and the Rocky Mountains and Northern Great Plains Region contain the most storage resources area overlain by Federal lands, whereas the Coastal Plains Region contains the most  $TA_{SR}$  regardless of land ownership.

Although officials at individual Federal sites have estimated the mineral rights, the USGS did not distinguish

between mineral rights and pore-space allocation for the geologic CO<sub>2</sub> storage resources assessment. This report should not be used to define title to any specific area because of the complicated nature of surface and subsurface mineral-estate ownership. The scattered geographic distribution of the SAUs and assessed areas, and the existence of legal and surface restrictions on the accessibility of the  $TA_{SR}$  could eliminate much of the estimated resources from consideration for development. Nevertheless, information on Federal management of storage resources in this report and other results included in the 2013 assessment report will assist policymakers and planners in making decisions concerning the multiple uses of Federal lands and the scope of future geologic CO<sub>2</sub> storage development.

## Additional Assessment Information

Assessment results, supporting geologic studies of the storage formations and regional seals composing the storage assessment units, and the methodology used in assessing the national geologic carbon dioxide storage resource are available online at the USGS Energy Resources Program Web site <http://energy.usgs.gov/EnvironmentalAspects/EnvironmentalAspectsofEnergyProductionandUse/GeologicCO2Sequestration.aspx> or more simply at <http://go.usa.gov/8X8>.

## 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., <http://pubs.usgs.gov/of/2013/1055/>.
- 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., <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., <http://pubs.usgs.gov/of/2009/1035/>.
- Dolence, R.C., Kirschner, Charles, Babel, Christopher, Findle, Patrick, and Harouff, Steven, 2009, Storage of captured carbon dioxide beneath Federal lands: U.S. Department of Energy, National Energy Technology Laboratory Report DOE/NETL–2009/1358, 75 p., accessed June 23, 2014, at [http://www.netl.doe.gov/File%20Library/Research/Energy%20Analysis/Coal/Fed-Land\\_403-01-02\\_050809.pdf](http://www.netl.doe.gov/File%20Library/Research/Energy%20Analysis/Coal/Fed-Land_403-01-02_050809.pdf).
- Karlsen, A.W., SanFilipo, J.R., and Warwick, P.D., 2002, Coal underlying Federal lands in the Gulf of Mexico Coastal Plain: U.S. Geological Survey Fact Sheet 094–02, 2 p., <http://pubs.usgs.gov/fs/fs094-02/>.
- Minerals Management Service, 2005, Official protraction diagram and leasing map boundaries: National Atlas of the United States, map layer accessed in 2005 at <http://nationalatlas.gov/mld/opdlm0p.html>. [After the National Atlas of the United States was retired in 2014, some of its products were made available at [http://nationalmap.gov/small\\_scale/](http://nationalmap.gov/small_scale/).]
- Society of Petroleum Engineers, 2014, Carbon capture and sequestration: Society of Petroleum Engineers Carbon Capture and Sequestration Committee Web site, accessed September 11, 2014, at <http://www.spe.org/industry/sites/ccs/>.
- Thormahlen, L.F., 1999, Boundary development on the Outer Continental Shelf: Minerals Management Service, Mapping and Boundary Branch OCS report MMS 99–0006, 12 p., accessed February 21, 2013, at <http://www.boem.gov/BOEM-Newsroom/Library/Publications/1999/99-0006-pdf.aspx>.
- U.S. Geological Survey, 2005a, Federal lands of the United States: National Atlas of the United States, map layer accessed in 2005 at <http://www.nationalatlas.gov/mld/fedlanp.html>. [After the National Atlas of the United States was retired in 2014, some of its products were made available at [http://nationalmap.gov/small\\_scale/](http://nationalmap.gov/small_scale/).]
- U.S. Geological Survey, 2005b, Indian lands of the United States: National Atlas of the United States, map layer accessed in 2005 at <http://nationalatlas.gov/mld/indlanp.html>. [After the National Atlas of the United States was retired in 2014, some of its products were made available at [http://nationalmap.gov/small\\_scale/](http://nationalmap.gov/small_scale/).]
- 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/>.
- U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013c, National assessment of geologic carbon dioxide storage resources—Summary (ver. 1.1, September 2013): U.S. Geological Survey Fact Sheet 2013–3020, 6 p., <http://pubs.usgs.gov/fs/2013/3020/>.
- 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, <http://dx.doi.org/10.3133/ofr20121024>. [Chapters A–J were posted by November 1, 2014.]

## Glossary

**Federal lands** One of five land-ownership categories used in this assessment for allocation of resources. Federal lands are lands within the United States owned or administered by the Federal Government. These include parks, national wildlife refuges, military reservations, Federal prisons, and public-domain land. Spatial data for this category came from State-specific spatial resources from the Bureau of Land Management (BLM) available at <http://www.blm.gov> and from the National Atlas of the United States (U.S. Geological Survey, 2005a).

**federally owned offshore areas** Federal jurisdiction begins at 3 geographic (nautical) miles from the established baseline for the coast and extends to an outer limit of 200 nautical miles (Outer Continental Shelf). However, there are special cases. Because of claims existing at the dates of statehood, Texas and the Gulf Coast of Florida have proprietary interest in a submerged belt of land, 9 geographic miles wide, extending seaward along the coast (Thormahlen, 1999). Resource assessments in federally owned offshore areas are typically done by the Bureau of Ocean Energy Management (BOEM).

**offshore areas** One of five land-ownership categories used in this assessment for allocation of resources. In this assessment, offshore areas include State waters (see definition), and some are managed by Federal agencies, such as the BLM. Both State and Federal offshore area boundaries came from the National Atlas of the United States (Minerals Management Service, 2005).

**private and other lands** One of five land-ownership categories used in this assessment for allocation of resources. Lands not owned by Federal, State, or Tribal entities are placed in this category of private and other lands. These lands either belong to private owners or, less commonly, belong to additional BLM-named ownership categories (such as county, city, water, and other) and are grouped together here. Spatial data for this category came primarily from State-specific spatial resources from the BLM available at <http://www.blm.gov>; when data were not available from the BLM, they were obtained from individual State agencies.

**State lands** One of five land-ownership categories used in this assessment for allocation of resources. This ownership category includes lands owned by State entities, as categorized by the BLM in State-specific land-ownership data obtained from <http://www.blm.gov>; when data were not available from the BLM, they were obtained from individual State agencies.

**State waters** State jurisdiction begins at the established baseline for the coast and extends 3 geographic (nautical) miles. However, there are special cases. Because of claims existing at the dates of statehood, Texas and the Gulf Coast of Florida have proprietary interest in a submerged belt of land, 9 geographic miles wide, extending seaward along the coast (Thormahlen, 1999).

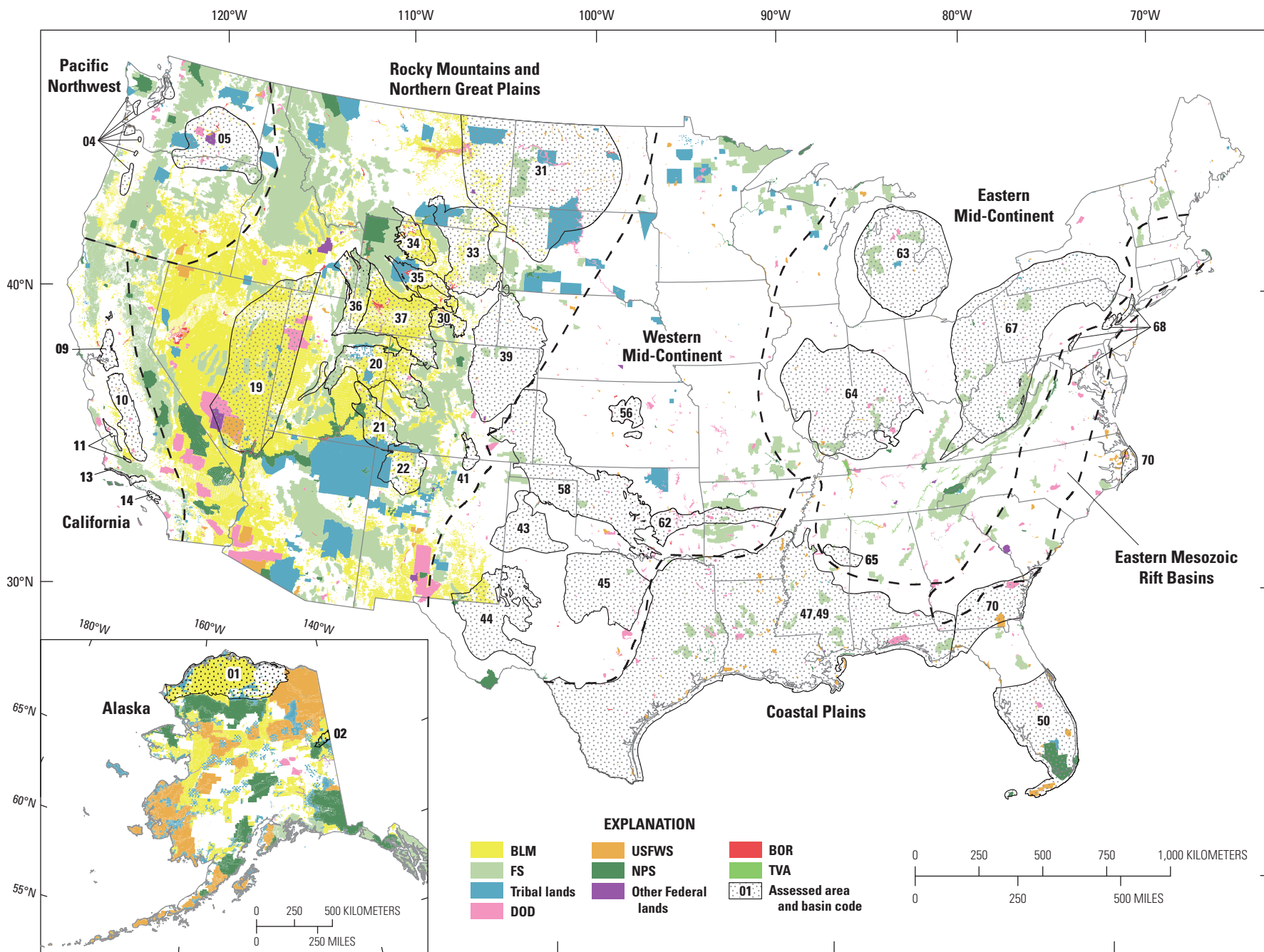
**technically accessible storage resource ( $TA_{SR}$ )** The mass of carbon dioxide ( $CO_2$ ) that may be injected and stored using present-day geologic and hydrologic knowledge of the subsurface and engineering practices. This term is analogous to the term “technically recoverable resource” used in U.S. Geological Survey oil and gas assessments.

**Tribal lands** One of five land-ownership categories used in this assessment for allocation of resources. Indian or Tribal lands within the United States are areas with boundaries established by treaty, statute, and (or) executive or court order, recognized by the Federal Government as territory in which American Indian Tribes have primary governmental authority. Spatial data for this category were revised slightly from data in U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team (2013a) and come from State-specific spatial resources from the BLM available at <http://www.blm.gov> and from the National Atlas of the United States (U.S. Geological Survey, 2005b).

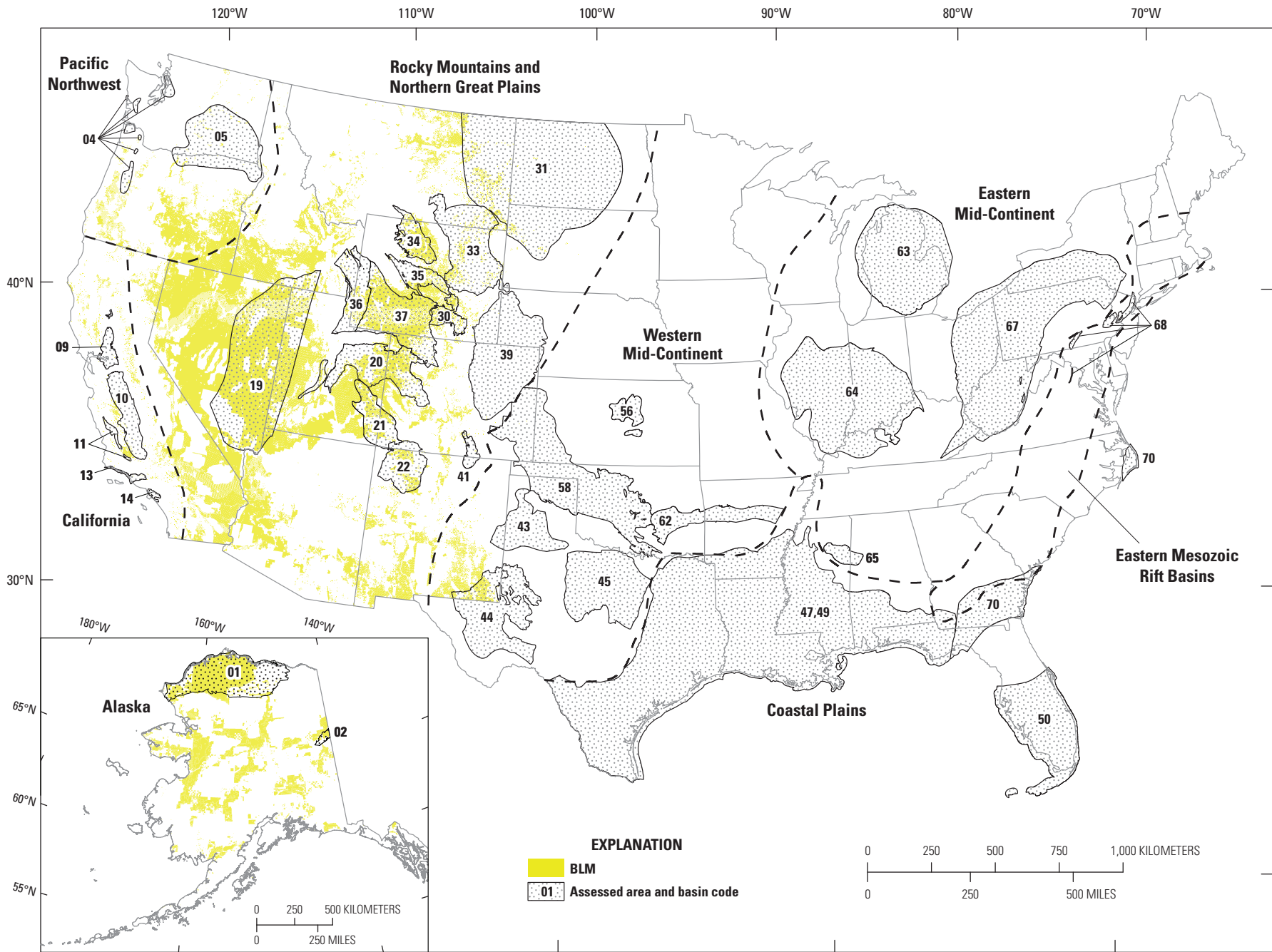
## Figures 1–4 and Tables 1–2

---

**Figure 1 (pages 8–11).** Maps of the conterminous United States and Alaska showing selected land-ownership and land-management categories, along with the 8 regions (separated by bold dashed lines) and 36 areas (pattern) assessed in 2012 for geologic carbon dioxide storage (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013b). Resources underlying federally managed offshore areas were not assessed, and Hawaii was considered unlikely to have significant storage resources. Spatial data came from the Bureau of Land Management’s State-specific spatial resources available at <http://www.blm.gov> and from the National Atlas of the United States (Minerals Management Service, 2005; U.S. Geological Survey, 2005a,b). *A*, Federal lands and lands from selected general land-ownership categories overlying assessed areas listed in order of prevalence, including Bureau of Land Management (BLM), U.S. Department of Agriculture Forest Service (FS), Tribal, Department of Defense (DOD), U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), Bureau of Reclamation (BOR), and Tennessee Valley Authority (TVA) lands. Assessed areas are numbered with the last two digits of the basin codes used in table 1. *B*, BLM lands overlying assessed areas. *C*, FS lands overlying assessed areas. *D*, Tribal lands overlying assessed areas.



**Figure 1A.** Federal lands and lands from selected general land-ownership categories overlying assessed areas listed in order of prevalence (BLM, FS, Tribal, DOD, USFWS, NPS, other, BOR, TVA).



**Figure 1B.** Bureau of Land Management lands overlying assessed areas.

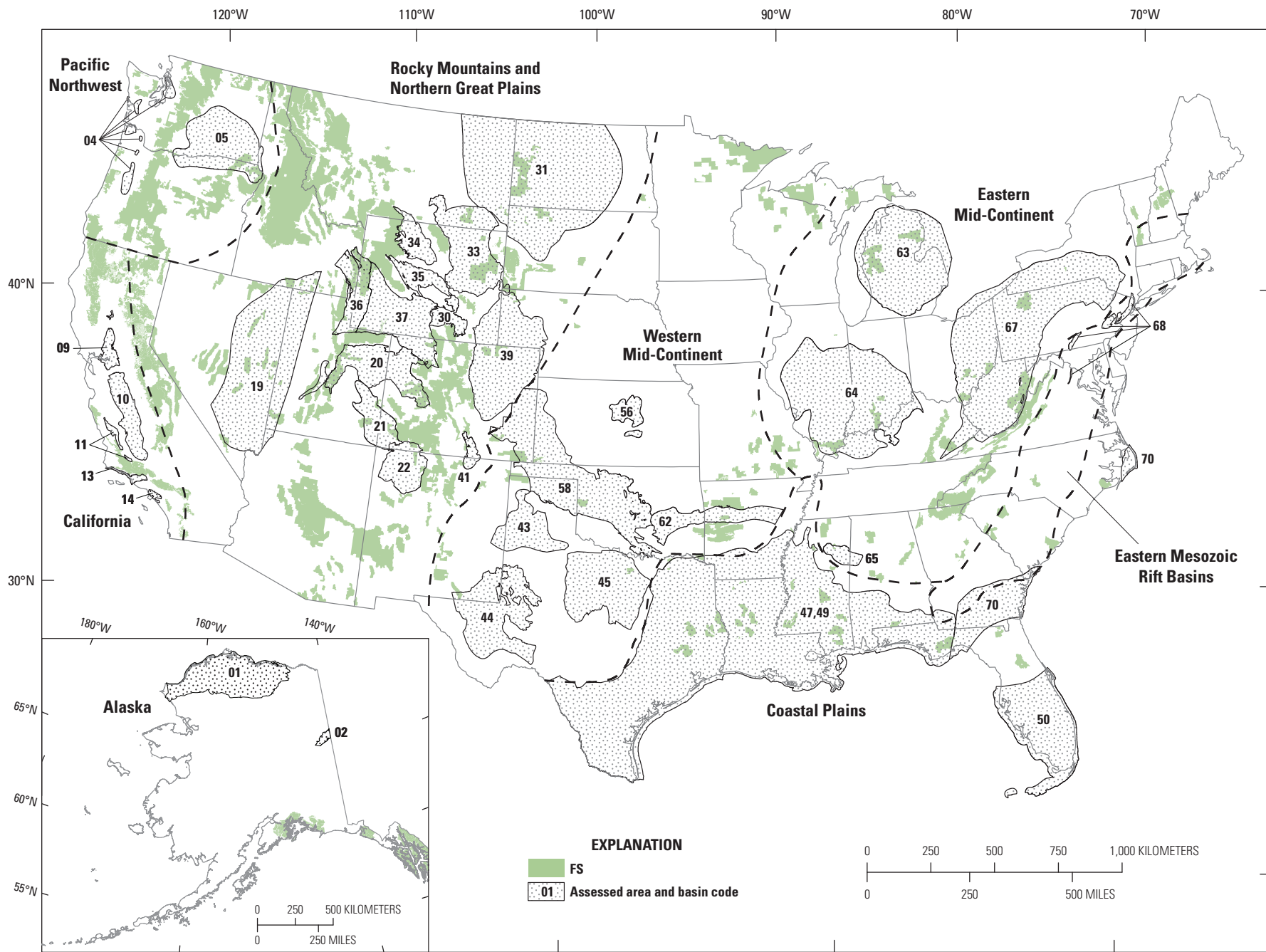


Figure 1C. U.S. Department of Agriculture Forest Service lands overlying assessed areas.



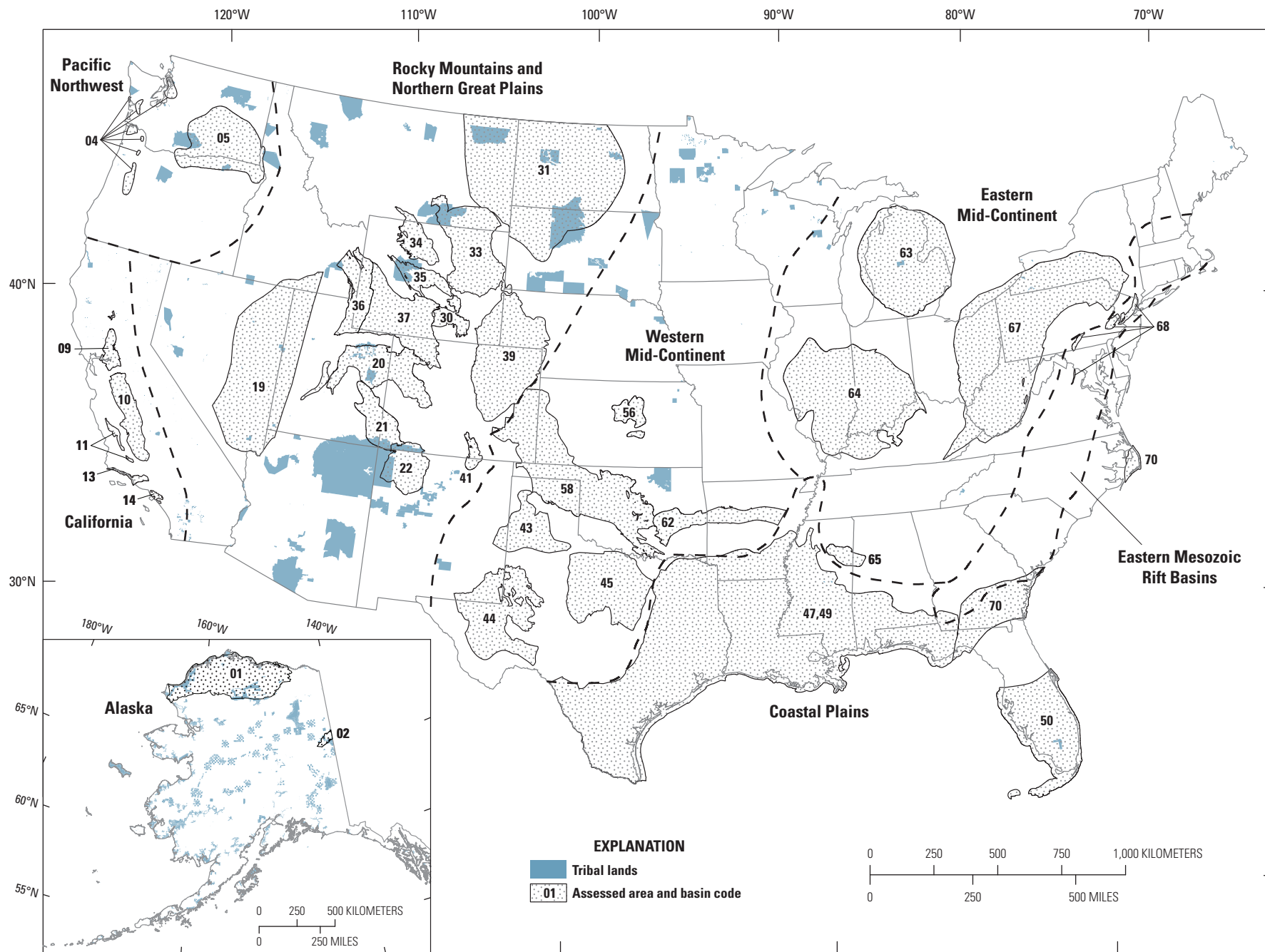
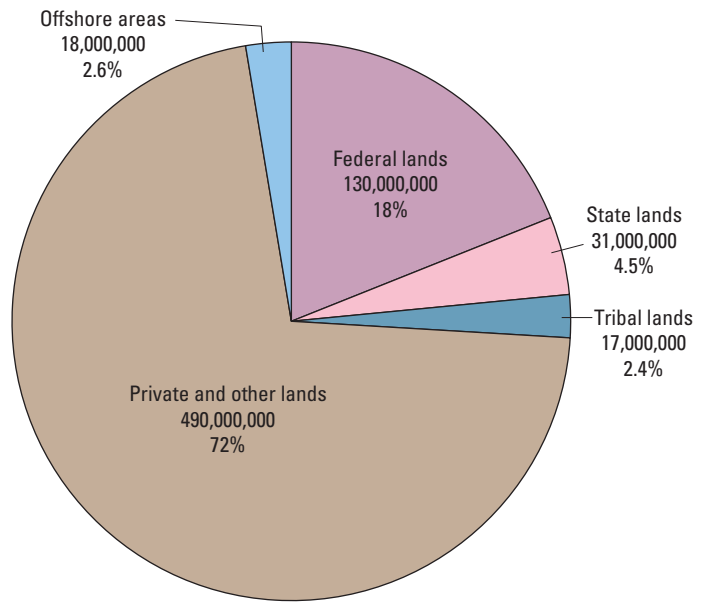


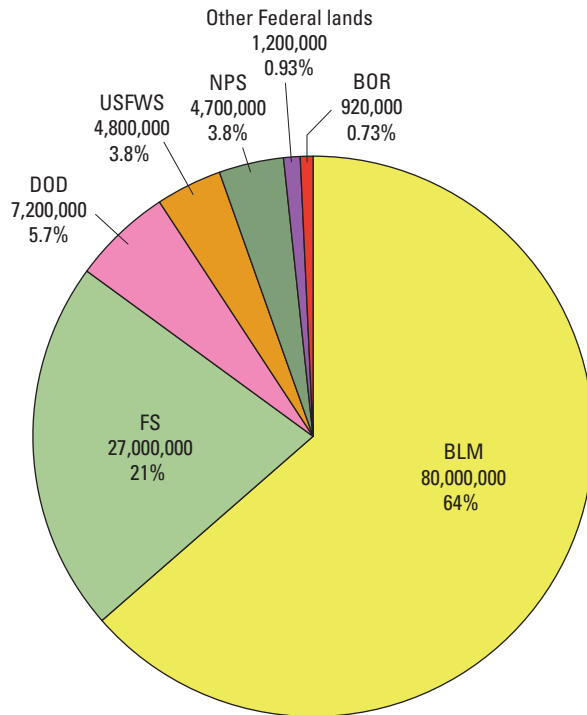
Figure 1D. Tribal lands overlying assessed areas.

**Figure 2.** Pie charts showing land categories, along with most likely acreages and percentages for allocations of land overlying areas assessed in 2012 for geologic carbon dioxide storage (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a). *A*, Allocations to general land-ownership categories; *B*, Allocations to Federal land-management categories. Resources underlying federally managed offshore areas were not assessed. Allocation areas, in acres and percentages, were calculated from unrounded assessed areas but are reported to two significant figures. Terms: BLM, Bureau of Land Management; BOR, Bureau of Reclamation; DOD, Department of Defense; FS, U.S. Department of Agriculture Forest Service; NPS, National Park Service; USFWS, U.S. Fish and Wildlife Service; %, percent.

**A. General land-ownership categories, 690 million acres**

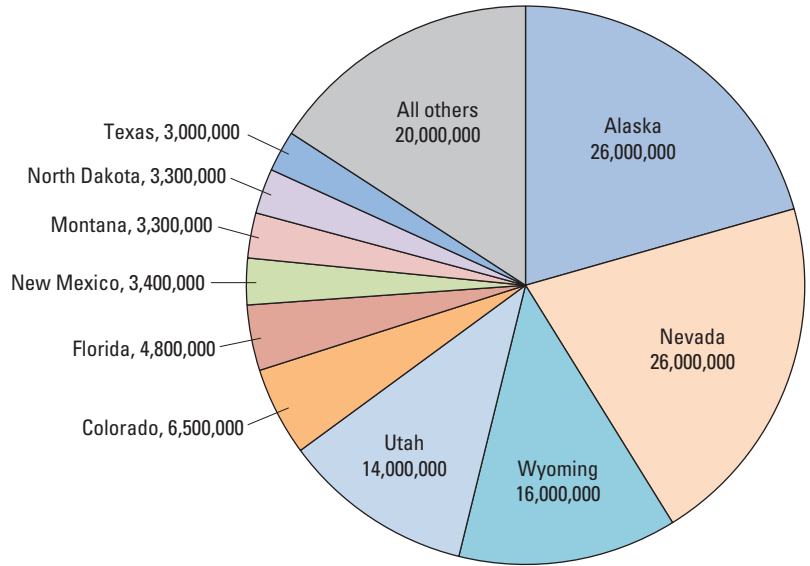


**B. Federal land-management categories, 130 million acres**

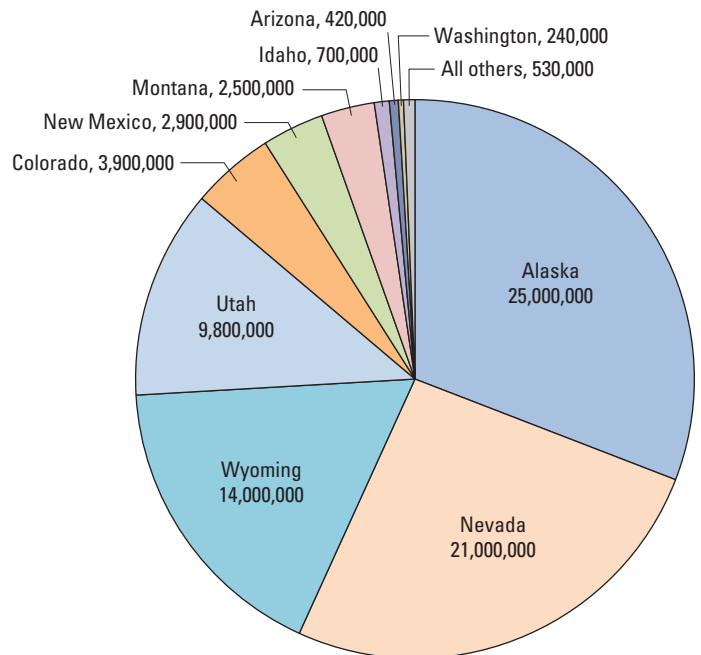


**Figure 3.** Pie charts showing top 10 States (and other remaining States) with the most likely estimates of allocations to four categories of land overlying areas assessed in 2012 for geologic carbon dioxide storage (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a). *A*, Allocations to Federal lands; *B*, Allocations to Bureau of Land Management lands; *C*, Allocations to U.S. Department of Agriculture Forest Service lands; and *D*, Allocations to Tribal lands. Resources underlying federally managed offshore areas were not assessed. Allocation areas, in acres, were calculated from unrounded assessed areas but are reported to two significant figures.

**A. Federal lands, 130 million acres**

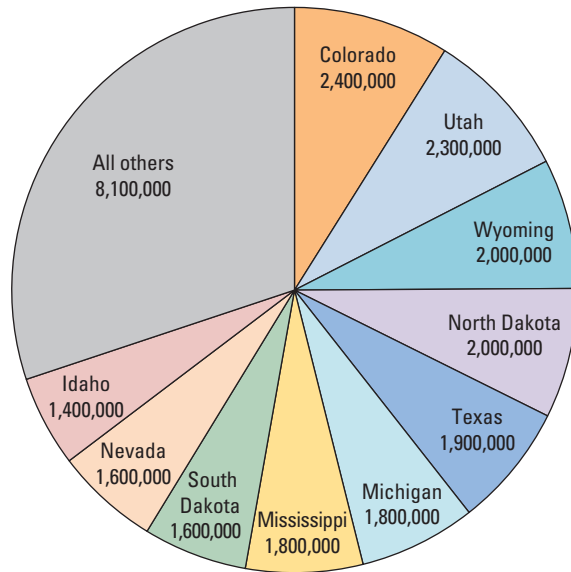


**B. Bureau of Land Management lands, 80 million acres**

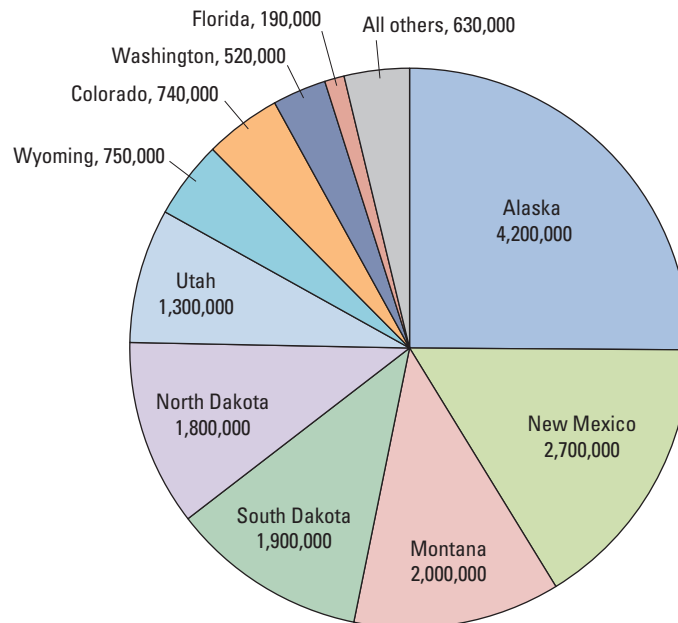


**Figure 3.** Pie charts showing top 10 States (and other remaining States) with the most likely estimates of allocations to four categories of land overlying areas assessed in 2012 for geologic carbon dioxide storage (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a). *A*, Allocations to Federal lands; *B*, Allocations to Bureau of Land Management lands; *C*, Allocations to U.S. Department of Agriculture Forest Service lands; and *D*, Allocations to Tribal lands. Resources underlying federally managed offshore areas were not assessed. Allocation areas, in acres, were calculated from unrounded assessed areas but are reported to two significant figures.—Continued

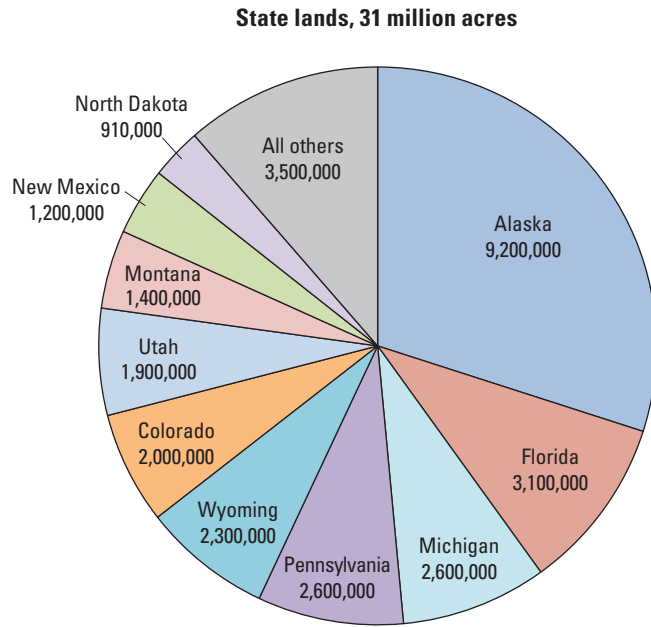
**C. Forest Service lands, 27 million acres**



**D. Tribal lands, 17 million acres**



**Figure 4.** Pie chart showing top 10 States (and other remaining States) with the most likely estimates of State-lands allocations for land overlying areas assessed in 2012 for geologic carbon dioxide storage (U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team, 2013a, b). Resources underlying federally managed offshore areas were not assessed. Allocation areas, in acres, were calculated from unrounded assessed areas but are reported to two significant figures.



## 16 National Assessment of Geologic Carbon Dioxide Storage Resources—Allocations of Assessed Areas to Federal Lands

**Table 1.** U.S. regions and basins assessed in 2012 for geologic carbon dioxide storage, merged storage assessment unit (SAU) footprint areas, and estimated areas for lands overlying storage resources and allocated to (A) general land-ownership categories and (B) Federal land-management categories.

[The 2012 assessment data are from the U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team (2013a). Resources underlying federally managed offshore areas were not assessed. Allocations were calculated from unrounded assessed areas but are reported to two significant figures. The assessed areas may underlie (table 1A) general land-ownership categories including Tribal lands or (table 1B) Federal lands, including in order of prevalence, lands managed by the Bureau of Land Management (BLM), U.S. Department of Agriculture Forest Service (FS), U.S. Department of Defense (DOD), U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), and Bureau of Reclamation (BOR). For completeness, Tennessee Valley Authority lands are shown in figure 1; because they do not overlie assessed areas, they are omitted from this table. —, no allocation occurrence]

A. General land-ownership categories						
Assessed area (assessment basin code)	Merged SAU footprint (most likely), in acres	Allocations (most likely) to general land-ownership categories, in acres				
		Federal lands	State lands	Tribal lands	Private and other lands	Offshore areas
Alaska Region						
Alaska North Slope (C5001)	41,000,000	25,000,000	9,200,000	4,000,000	23,000	2,400,000
Kandik Basin (C5002)	1,200,000	940,000	23,000	230,000	—	—
<b>Total</b>	<b>42,000,000</b>	<b>26,000,000</b>	<b>9,200,000</b>	<b>4,200,000</b>	<b>23,000</b>	<b>2,400,000</b>
Pacific Northwest Region						
Columbia Basin of Oregon, Washington, and Idaho (C5005)	16,000,000	2,300,000	380,000	660,000	13,000,000	—
Western Oregon and Washing- ton Basins (C5004)	2,100,000	47,000	88,000	11,000	1,800,000	230,000
<b>Total</b>	<b>18,000,000</b>	<b>2,400,000</b>	<b>470,000</b>	<b>670,000</b>	<b>15,000,000</b>	<b>230,000</b>
California Region						
Central California Coast Basins (C5011)	570,000	77,000	740	—	490,000	—
Los Angeles Basin (C5014)	270,000	3,100	250	—	270,000	3.3
Sacramento Basin (C5009)	1,800,000	19,000	63,000	—	1,700,000	—
San Joaquin Basin (C5010)	5,500,000	180,000	58,000	40	5,300,000	—
Ventura Basin (C5013)	580,000	18,000	4,000	—	370,000	190,000
<b>Total</b>	<b>8,700,000</b>	<b>300,000</b>	<b>130,000</b>	<b>40</b>	<b>8,100,000</b>	<b>190,000</b>
Rocky Mountains and Northern Great Plains Region						
Bighorn Basin (C5034)	4,300,000	2,600,000	280,000	6,500	1,400,000	—
Denver Basin (C5039)	24,000,000	460,000	1,400,000	—	23,000,000	—
Eastern Great Basin (C5019)	42,000,000	35,000,000	900,000	230,000	5,600,000	—
Greater Green River Basin (C5037)	15,000,000	9,300,000	640,000	—	4,800,000	—
Hanna, Laramie, and Shirley Basins (C5030)	2,600,000	860,000	180,000	—	1,600,000	—
Paradox Basin (C5021)	6,100,000	3,600,000	350,000	830,000	1,300,000	—
Powder River Basin (C5033)	17,000,000	2,500,000	1,100,000	1,000,000	12,000,000	—
Raton Basin (C5041)	1,300,000	66,000	36,000	—	1,200,000	—
San Juan Basin (C5022)	6,500,000	2,100,000	280,000	3,000,000	1,100,000	—
Uinta and Piceance Basins (C5020)	12,000,000	7,200,000	790,000	850,000	3,000,000	—
Williston Basin (C5031)	62,000,000	7,500,000	2,500,000	4,600,000	48,000,000	—
Wind River Basin (C5035)	3,600,000	1,400,000	200,000	740,000	1,200,000	—
Wyoming-Idaho-Utah Thrust Belt (C5036)	7,000,000	3,500,000	430,000	110,000	2,900,000	—
<b>Total</b>	<b>200,000,000</b>	<b>76,000,000</b>	<b>9,200,000</b>	<b>11,000,000</b>	<b>110,000,000</b>	<b>—</b>

**Table 1.** U.S. regions and basins assessed in 2012 for geologic carbon dioxide storage, merged storage assessment unit (SAU) footprint areas, and estimated areas for lands overlying storage resources and allocated to (A) general land-ownership categories and (B) Federal land-management categories.—Continued

[The 2012 assessment data are from the U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team (2013a). Resources underlying federally managed offshore areas were not assessed. Allocations were calculated from unrounded assessed areas but are reported to two significant figures. The assessed areas may underlie (table 1A) general land-ownership categories including Tribal lands or (table 1B) Federal lands, including in order of prevalence, lands managed by the Bureau of Land Management (BLM), U.S. Department of Agriculture Forest Service (FS), U.S. Department of Defense (DOD), U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), and Bureau of Reclamation (BOR). For completeness, Tennessee Valley Authority lands are shown in figure 1; because they do not overlie assessed areas, they are omitted from this table. —, no allocation occurrence]

<b>A. General land-ownership categories—Continued</b>						
<b>Assessed area (assessment basin code)</b>	<b>Merged SAU footprint (most likely), in acres</b>	<b>Allocations (most likely) to general land-ownership categories, in acres</b>				
		<b>Federal lands</b>	<b>State lands</b>	<b>Tribal lands</b>	<b>Private and other lands</b>	<b>Offshore areas</b>
<b>Western Mid-Continent Region</b>						
Anadarko and Southern Oklahoma Basins (C5058)	35,000,000	770,000	480,000	—	33,000,000	—
Arkoma Basin (C5062)	7,900,000	470,000	61,000	—	7,300,000	—
Bend Arch and Fort Worth Basin (C5045)	19,000,000	210,000	12,000	—	18,000,000	—
Kansas Basins (C5056)	2,800,000	29,000	—	—	2,800,000	—
Palo Duro Basin (C5043)	8,600,000	22,000	120,000	—	8,500,000	—
Permian Basin (C5044)	19,000,000	1,500,000	840,000	—	16,000,000	—
<b>Total</b>	<b>91,000,000</b>	<b>3,000,000</b>	<b>1,500,000</b>	<b>—</b>	<b>87,000,000</b>	<b>—</b>
<b>Eastern Mid-Continent Region</b>						
Appalachian Basin (C5067)	60,000,000	3,000,000	2,900,000	62,000	52,000,000	2,400,000
Black Warrior Basin (C5065)	1,900,000	40,000	3,900	—	1,900,000	—
Illinois Basin (C5064)	42,000,000	1,800,000	—	—	40,000,000	—
Michigan Basin (C5063)	30,000,000	1,900,000	2,600,000	130,000	19,000,000	6,600,000
<b>Total</b>	<b>130,000,000</b>	<b>6,700,000</b>	<b>5,600,000</b>	<b>200,000</b>	<b>110,000,000</b>	<b>9,000,000</b>
<b>Coastal Plains Region</b>						
Atlantic Coastal Plain (C5070)	14,000,000	990,000	270,000	—	11,000,000	2,000,000
South Florida Basin (C5050)	22,000,000	3,300,000	2,300,000	190,000	12,000,000	4,400,000
U.S. Gulf Coast (C5047 and C5049)	150,000,000	7,800,000	2,100,000	19,000	140,000,000	4,700
<b>Total</b>	<b>190,000,000</b>	<b>12,000,000</b>	<b>4,600,000</b>	<b>210,000</b>	<b>160,000,000</b>	<b>6,400,000</b>
<b>Eastern Mesozoic Rift Basins Region</b>						
Eastern Mesozoic Rift Basins (C5068)	1,300,000	13,000	30,000	—	1,300,000	—
<b>Total</b>	<b>1,300,000</b>	<b>13,000</b>	<b>30,000</b>	<b>—</b>	<b>1,300,000</b>	<b>—</b>
<b>Grand total</b>	<b>690,000,000</b>	<b>130,000,000</b>	<b>31,000,000</b>	<b>17,000,000</b>	<b>490,000,000</b>	<b>18,000,000</b>

**18 National Assessment of Geologic Carbon Dioxide Storage Resources—Allocations of Assessed Areas to Federal Lands**

**Table 1.** U.S. regions and basins assessed in 2012 for geologic carbon dioxide storage, merged storage assessment unit (SAU) footprint areas, and estimated areas for lands overlying storage resources and allocated to (A) general land-ownership categories and (B) Federal land-management categories.—Continued

[The 2012 assessment data are from the U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team (2013a). Resources underlying federally managed offshore areas were not assessed. Allocations were calculated from unrounded assessed areas but are reported to two significant figures. The assessed areas may underlie (table 1A) general land-ownership categories including Tribal lands or (table 1B) Federal lands, including in order of prevalence, lands managed by the Bureau of Land Management (BLM), U.S. Department of Agriculture Forest Service (FS), U.S. Department of Defense (DOD), U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), and Bureau of Reclamation (BOR). For completeness, Tennessee Valley Authority lands are shown in figure 1; because they do not overlie assessed areas, they are omitted from this table. —, no allocation occurrence]

<b>B. Federal land-management categories</b>							
<b>Assessed area (assessment basin code)</b>	<b>Allocations (most likely) to Federal land-management categories, in acres</b>						
	<b>BLM</b>	<b>FS</b>	<b>DOD</b>	<b>USFWS</b>	<b>NPS</b>	<b>Other</b>	<b>BOR</b>
<b>Alaska Region</b>							
Alaska North Slope (C5001)	25,000,000	—	45	420,000	120,000	—	—
Kandik Basin (C5002)	560,000	—	—	—	380,000	—	—
<b>Total</b>	<b>25,000,000</b>	<b>—</b>	<b>45</b>	<b>420,000</b>	<b>500,000</b>	<b>—</b>	<b>—</b>
<b>Pacific Northwest Region</b>							
Columbia Basin of Oregon, Washington, and Idaho (C5005)	360,000	970,000	410,000	57,000	87	380,000	160,000
Western Oregon and Washing- ton Basins (C5004)	42,000	—	1,300	2,800	—	130	—
<b>Total</b>	<b>400,000</b>	<b>970,000</b>	<b>410,000</b>	<b>60,000</b>	<b>87</b>	<b>380,000</b>	<b>160,000</b>
<b>California Region</b>							
Central California Coast Basins (C5011)	16,000	22,000	39,000	—	—	—	—
Los Angeles Basin (C5014)	—	—	2,100	950	—	—	—
Sacramento Basin (C5009)	1,700	—	9,900	3,600	—	3,700	98
San Joaquin Basin (C5010)	70,000	—	81,000	30,000	—	—	—
Ventura Basin (C5013)	2,800	12,000	1,500	1,900	—	—	—
<b>Total</b>	<b>90,000</b>	<b>34,000</b>	<b>130,000</b>	<b>36,000</b>	<b>—</b>	<b>3,700</b>	<b>98</b>
<b>Rocky Mountains and Northern Great Plains Region</b>							
Bighorn Basin (C5034)	2,300,000	150,000	350	—	—	—	78,000
Denver Basin (C5039)	29,000	300,000	62,000	49,000	7,000	3,900	1,800
Eastern Great Basin (C5019)	27,000,000	2,700,000	3,300,000	810,000	340,000	570,000	30,000
Greater Green River Basin (C5037)	8,100,000	920,000	—	23,000	—	—	210,000
Hanna, Laramie, and Shirley Basins (C5030)	820,000	17,000	—	1,200	—	—	23,000
Paradox Basin (C5021)	2,500,000	630,000	1,600	—	440,000	—	89,000
Powder River Basin (C5033)	1,700,000	830,000	13,000	—	760	—	1,200
Raton Basin (C5041)	29,000	37,000	—	—	—	—	—
San Juan Basin (C5022)	1,700,000	360,000	—	—	34,000	—	31,000
Uinta and Piceance Basins (C5020)	4,700,000	2,400,000	54,000	9,000	18,000	—	—
Williston Basin (C5031)	2,300,000	3,700,000	610,000	710,000	73,000	91,000	130,000
Wind River Basin (C5035)	1,300,000	19,000	1,200	—	—	—	120,000
Wyoming-Idaho-Utah Thrust Belt (C5036)	1,200,000	2,200,000	—	6,300	8,300	40,000	9,700
<b>Total</b>	<b>54,000,000</b>	<b>14,000,000</b>	<b>4,100,000</b>	<b>1,600,000</b>	<b>920,000</b>	<b>710,000</b>	<b>720,000</b>



**Table 1.** U.S. regions and basins assessed in 2012 for geologic carbon dioxide storage, merged storage assessment unit (SAU) footprint areas, and estimated areas for lands overlying storage resources and allocated to (A) general land-ownership categories and (B) Federal land-management categories.—Continued

[The 2012 assessment data are from the U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team (2013a). Resources underlying federally managed offshore areas were not assessed. Allocations were calculated from unrounded assessed areas but are reported to two significant figures. The assessed areas may underlie (table 1A) general land-ownership categories including Tribal lands or (table 1B) Federal lands, including in order of prevalence, lands managed by the Bureau of Land Management (BLM), U.S. Department of Agriculture Forest Service (FS), U.S. Department of Defense (DOD), U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), and Bureau of Reclamation (BOR). For completeness, Tennessee Valley Authority lands are shown in figure 1; because they do not overlie assessed areas, they are omitted from this table. —, no allocation occurrence]

<b>B. Federal land-management categories—Continued</b>							
<b>Assessed area (assessment basin code)</b>	<b>Allocations (most likely) to Federal land-management categories, in acres</b>						
	<b>BLM</b>	<b>FS</b>	<b>DOD</b>	<b>USFWS</b>	<b>NPS</b>	<b>Other</b>	<b>BOR</b>
<b>Western Mid-Continent Region</b>							
Anadarko and Southern Oklahoma Basins (C5058)	11,000	560,000	150,000	19,000	6,400	—	21,000
Arkoma Basin (C5062)	—	150,000	280,000	36,000	43	5,900	—
Bend Arch and Fort Worth Basin (C5045)	—	120,000	96,000	—	—	—	—
Kansas Basins (C5056)	—	—	29,000	—	—	—	—
Palo Duro Basin (C5043)	—	—	3,500	18,000	—	—	—
Permian Basin (C5044)	1,200,000	120,000	—	—	120,000	10,000	410
<b>Total</b>	<b>1,200,000</b>	<b>950,000</b>	<b>560,000</b>	<b>73,000</b>	<b>130,000</b>	<b>16,000</b>	<b>21,000</b>
<b>Eastern Mid-Continent Region</b>							
Appalachian Basin (C5067)	—	2,700,000	41,000	30,000	220,000	310	—
Black Warrior Basin (C5065)	—	26,000	11,000	—	2,700	—	—
Illinois Basin (C5064)	—	1,300,000	400,000	110,000	720	1,000	—
Michigan Basin (C5063)	—	1,800,000	16,000	9,900	59,000	—	—
<b>Total</b>	<b>—</b>	<b>5,800,000</b>	<b>470,000</b>	<b>150,000</b>	<b>280,000</b>	<b>1,300</b>	<b>—</b>
<b>Coastal Plains Region</b>							
Atlantic Coastal Plain (C5070)	—	32,000	360,000	520,000	75,000	1,500	—
South Florida Basin (C5050)	—	200	140,000	640,000	2,500,000	—	—
U.S. Gulf Coast (C5047 and C5049)	—	5,000,000	1,100,000	1,300,000	320,000	67,000	17,000
<b>Total</b>	<b>—</b>	<b>5,000,000</b>	<b>1,600,000</b>	<b>2,500,000</b>	<b>2,900,000</b>	<b>68,000</b>	<b>17,000</b>
<b>Eastern Mesozoic Rift Basins Region</b>							
Eastern Mesozoic Rift Basins (C5068)	—	—	1,800	—	11,000	—	—
<b>Total</b>	<b>—</b>	<b>—</b>	<b>1,800</b>	<b>—</b>	<b>11,000</b>	<b>—</b>	<b>—</b>
<b>Grand total</b>	<b>80,000,000</b>	<b>27,000,000</b>	<b>7,200,000</b>	<b>4,800,000</b>	<b>4,700,000</b>	<b>1,200,000</b>	<b>920,000</b>

**20 National Assessment of Geologic Carbon Dioxide Storage Resources—Allocations of Assessed Areas to Federal Lands**

**Table 2.** Lists of storage assessment units (SAUs) having the largest land allocations by area and percentage for five land-management categories for U.S. areas assessed in 2012 for geologic carbon dioxide storage.

[The 2012 assessment data are from the U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team (2013a). Resources underlying federally managed offshore areas were not assessed. Allocations were calculated from unrounded assessed areas but are reported to two significant figures. The top 10 SAUs having the largest total land allocations are listed for Federal lands, Bureau of Land Management (BLM) lands, U.S. Department of Agriculture Forest Service (FS) lands, Tribal lands, and State lands]

Rank	Assessed area (assessment basin code)	SAU code	SAU name	Land allocation (most likely)	
				Acres	Percent
<b>A. Federal lands</b>					
1	Alaska North Slope (C5001)	C50010104	Lower Ellesmerian Deep	19,000,000	65
2	Alaska North Slope (C5001)	C50010107	Lower Torok Formation	18,000,000	73
3	Alaska North Slope (C5001)	C50010106	Beaufortian and Upper Ellesmerian	10,000,000	59
4	Williston Basin (C5031)	C50310107	Lower Swift Formation	6,600,000	14
5	Greater Green River Basin (C5037)	C50370102	Paleozoic Composite Deep	6,500,000	68
6	Williston Basin (C5031)	C50310108	Inyan Kara Group	6,200,000	14
7	U.S. Gulf Coast (C5047 and C5049)	C50490116	Tuscaloosa and Woodbine Formations	5,900,000	7.1
8	Greater Green River Basin (C5037)	C50370105	Muddy Sandstone and Cloverly Formation	5,500,000	60
9	Greater Green River Basin (C5037)	C50370109	Hilliard, Baxter, and Mancos Shales	5,300,000	63
10	Williston Basin (C5031)	C50310109	Newcastle Formation	5,300,000	15
<b>B. Bureau of Land Management (BLM) lands</b>					
1	Alaska North Slope (C5001)	C50010104	Lower Ellesmerian Deep	18,000,000	64
2	Alaska North Slope (C5001)	C50010107	Lower Torok Formation	17,000,000	72
3	Alaska North Slope (C5001)	C50010106	Beaufortian and Upper Ellesmerian	10,000,000	59
4	Greater Green River Basin (C5037)	C50370102	Paleozoic Composite Deep	5,700,000	61
5	Greater Green River Basin (C5037)	C50370105	Muddy Sandstone and Cloverly Formation	4,800,000	52
6	Greater Green River Basin (C5037)	C50370109	Hilliard, Baxter, and Mancos Shales	4,800,000	56
7	Alaska North Slope (C5001)	C50010103	Lower Ellesmerian	4,700,000	52
8	Greater Green River Basin (C5037)	C50370108	Frontier Sandstone Deep	4,400,000	62
9	Greater Green River Basin (C5037)	C50370104	Nugget Sandstone Deep	3,400,000	57
10	Greater Green River Basin (C5037)	C50370107	Frontier Sandstone	3,100,000	52
<b>C. U.S. Department of Agriculture Forest Service (FS) lands</b>					
1	U.S. Gulf Coast (C5047 and C5049)	C50490116	Tuscaloosa and Woodbine Formations	4,300,000	5.2
2	Williston Basin (C5031)	C50310107	Lower Swift Formation	3,700,000	7.9
3	U.S. Gulf Coast (C5047 and C5049)	C50490117	Navarro, Taylor, and Austin Groups	3,500,000	7.7
4	U.S. Gulf Coast (C5047 and C5049)	C50490104	Smackover Formation Deep	3,400,000	5.5
5	Williston Basin (C5031)	C50310108	Inyan Kara Group	3,100,000	7.1
6	Williston Basin (C5031)	C50310109	Newcastle Formation	2,700,000	8.0
7	Appalachian Basin (C5067)	C50670102	Clinton, Medina, and Tuscarora Formations	2,500,000	5.2
8	U.S. Gulf Coast (C5047 and C5049)	C50490102	Norphlet Formation Deep	2,400,000	5.5
9	U.S. Gulf Coast (C5047 and C5049)	C50490107	Sligo and Hosston Formations and Cotton Valley Group	2,200,000	4.2
10	Williston Basin (C5031)	C50310105	Kibbey Formation and Madison Group	2,200,000	6.6

**Table 2.** Lists of storage assessment units (SAUs) having the largest land allocations by area and percentage for five land-management categories for U.S. areas assessed in 2012 for geologic carbon dioxide storage.—Continued

[The 2012 assessment data are from the U.S. Geological Survey Geologic Carbon Dioxide Storage Resources Assessment Team (2013a). Resources underlying federally managed offshore areas were not assessed. Allocations were calculated from unrounded assessed areas but are reported to two significant figures. The top 10 SAUs having the largest total land allocations are listed for Federal lands, Bureau of Land Management (BLM) lands, U.S. Department of Agriculture Forest Service (FS) lands, Tribal lands, and State lands]

Rank	Assessed area (assessment basin code)	SAU code	SAU name	Land allocation (most likely)	
				Acres	Percent
<i>D. Tribal lands</i>					
1	Alaska North Slope (C5001)	C50010104	Lower Ellesmerian Deep	3,400,000	65
2	Williston Basin (C5031)	C50310107	Lower Swift Formation	3,400,000	14
3	Alaska North Slope (C5001)	C50010107	Lower Torok Formation	3,200,000	73
4	Williston Basin (C5031)	C50310101	Deadwood and Black Island Formations	3,000,000	9.1
5	San Juan Basin (C5022)	C50220102	Dakota Sandstone	2,800,000	33
6	Williston Basin (C5031)	C50310108	Inyan Kara Group	2,700,000	14
7	Williston Basin (C5031)	C50310109	Newcastle Formation	2,000,000	15
8	San Juan Basin (C5022)	C50220103	Gallup Sandstone	1,900,000	38
9	Williston Basin (C5031)	C50310105	Kibbey Formation and Madison Group	1,600,000	13
10	San Juan Basin (C5022)	C50220101	Entrada Sandstone	1,500,000	42
<i>E. State lands</i>					
1	Alaska North Slope (C5001)	C50010104	Lower Ellesmerian Deep	5,800,000	20
2	Alaska North Slope (C5001)	C50010106	Beaufortian and Upper Ellesmerian	4,900,000	28
3	Alaska North Slope (C5001)	C50010108	Upper Torok Formation	3,300,000	89
4	Alaska North Slope (C5001)	C50010103	Lower Ellesmerian	2,900,000	32
5	Appalachian Basin (C5067)	C50670102	Clinton, Medina, and Tuscarora Formations	2,900,000	5.9
6	Alaska North Slope (C5001)	C50010107	Lower Torok Formation	2,800,000	12
7	Appalachian Basin (C5067)	C50670104	Oriskany Sandstone	2,700,000	7.1
8	Michigan Basin (C5063)	C50630101	Ordovician and Cambrian Composite	2,600,000	8.6
9	South Florida Basin (C5050)	C50500105	Cedar Keys and Lawson Formations	2,300,000	10
10	Michigan Basin (C5063)	C50630102	Salina Group and Middle Silurian Composite	2,300,000	10



Manuscript approved February 11, 2015

Prepared by the USGS Science Publishing Network

Publishing Service Centers

Edited by Elizabeth Good, Reston

Layout and illustrations by Caryl J. Wipperfurth, Raleigh

For more information concerning this report, contact:

Director, Eastern Energy Resources Science Center

U.S. Geological Survey

Mail Stop 956

12201 Sunrise Valley Drive

Reston, VA 20192

<http://energy.usgs.gov/>

<http://energy.usgs.gov/GeneralInfo/ScienceCenters/Eastern.aspx>

