Filling in Subsurface Storage Open Data Gaps - Updates to CCS Data Availability on EDX and EDX Spatial (FWP-1022465)
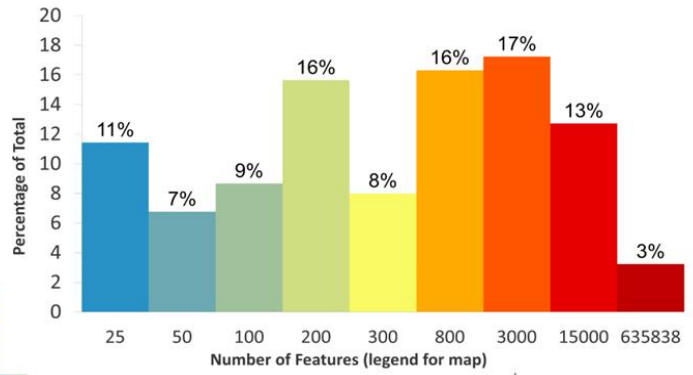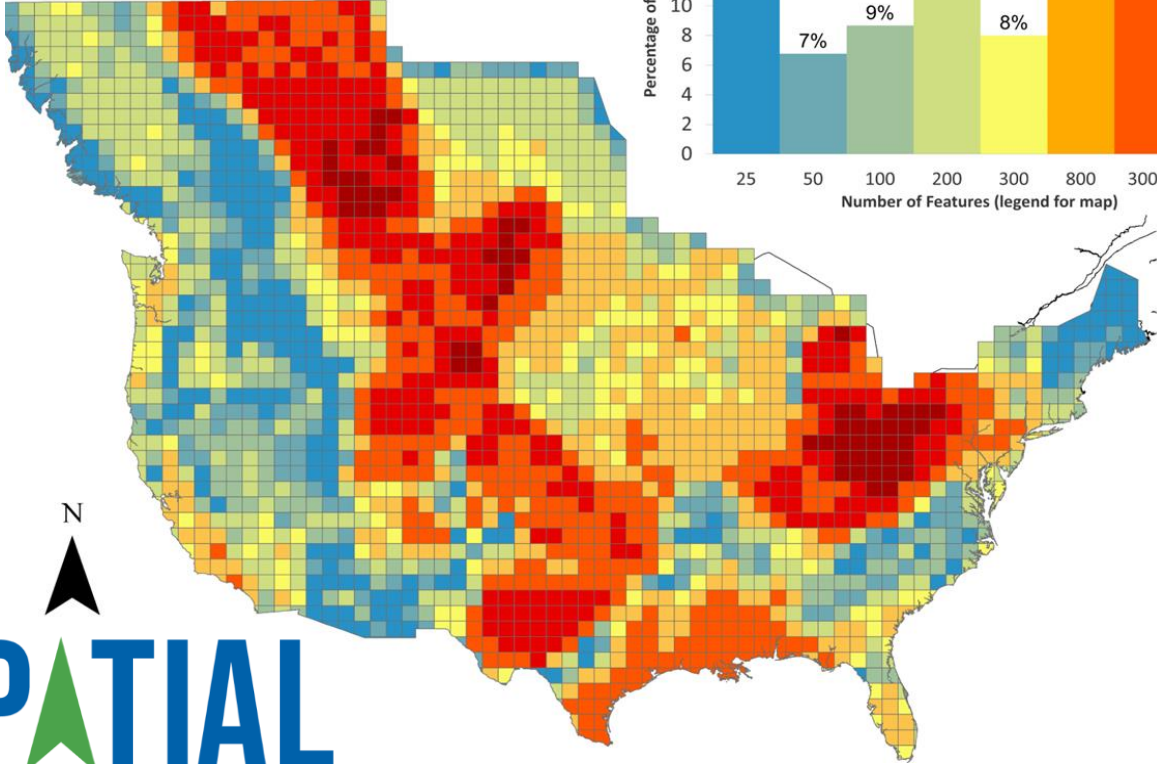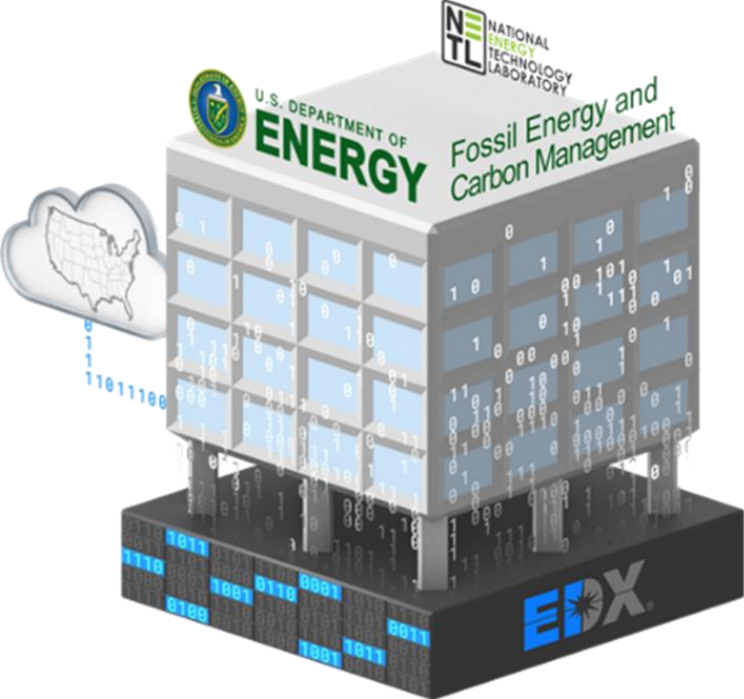
Paige Morkner
Geologist

Authors and Contact Information

Paige Morkner[1,2]; Abigail Martin[1,2]; Michael Sabbatino[1,2]; Stephen Leveckis[1,2]; Kelly Rose[1]; Jennifer Bauer[1]

[1] National Energy Technology Laboratory, 1450 Queen Avenue SW, Albany, OR 97321, USA

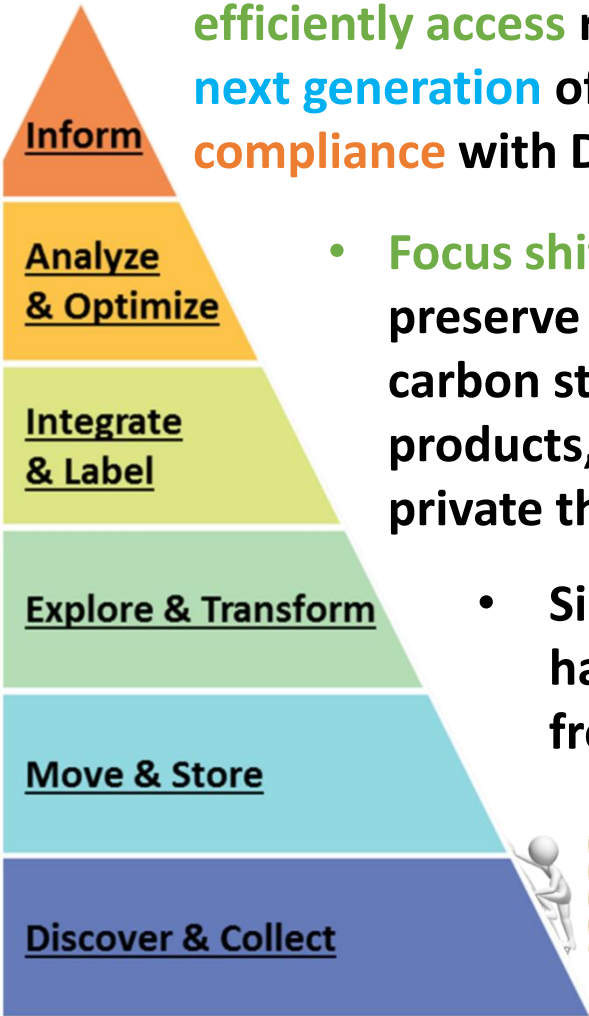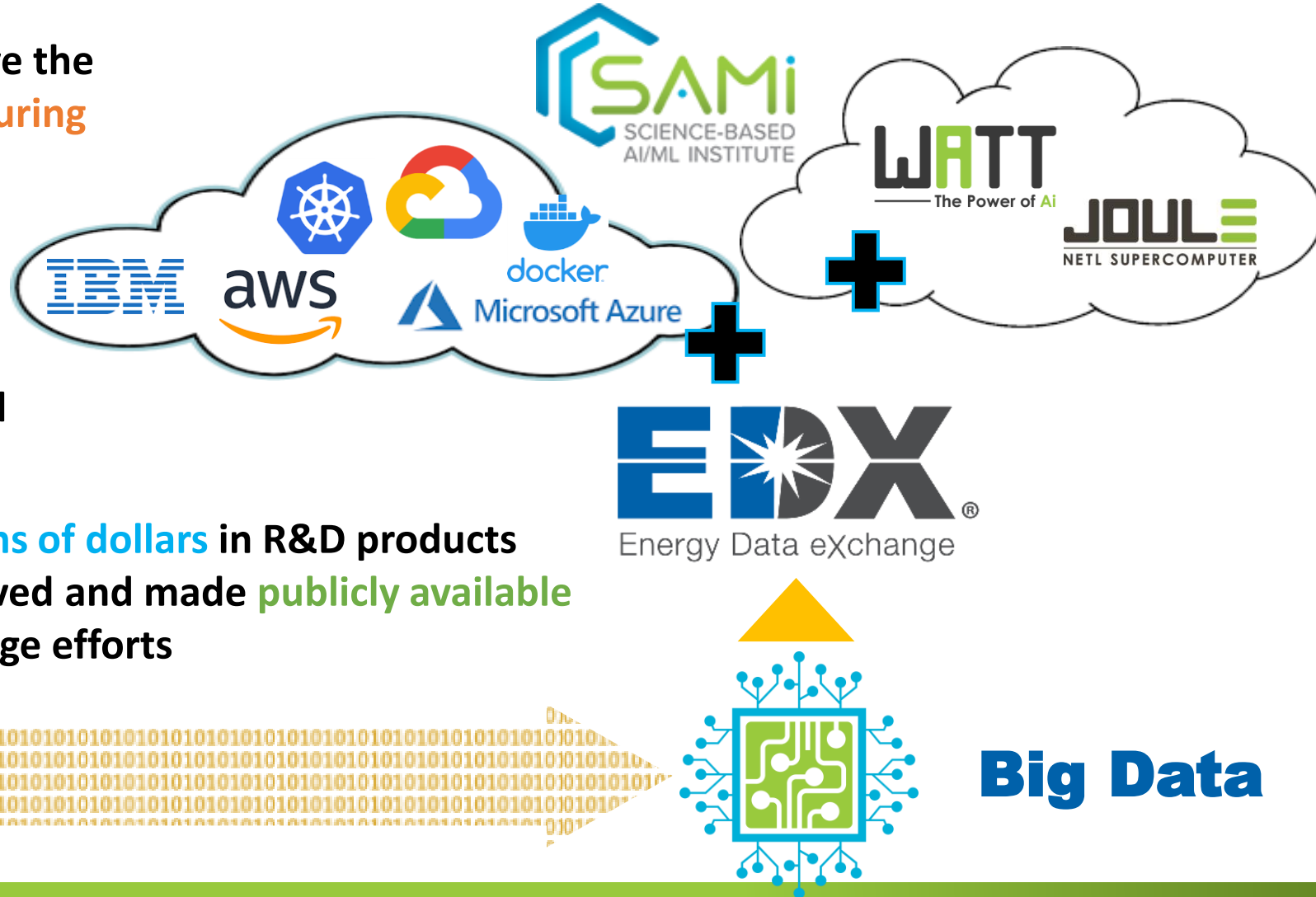[2] NETL Support Contractor, 1450 Queen Avenue SW, Albany, OR 97321, USA

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Leveraging EDX for Carbon Storage Data

- There is a need to **preserve and efficiently access** resources to drive the **next generation** of R&D **while ensuring compliance** with DOE regulations

  - **Focus shifted in 2015** to preserve and curate carbon storage data products, both public and private through the EDX

    - Since then, **millions of dollars** in R&D products have been preserved and made **publicly available** from carbon storage efforts

Inform

Analyze & Optimize

Integrate & Label

Explore & Transform

Move & Store

Discover & Collect

SAMi SCIENCE-BASED AI/ML INSTITUTE

WATT The Power of Ai

JOULE NETL SUPERCOMPUTER

IBM aws docker Microsoft Azure

EDX® Energy Data eXchange

Big Data

Highlights – How DOE, NETL and EDX have been supporting 25+ years of Carbon Storage

Launch of the 7 Regional Carbon Storage Partnerships

NETL launches the Energy Data eXchange® (EDX)

The CarbonSAFE Initiative begins.

The Bipartisan Infrastructure law is passed

The launch of EDX DisCO2ver platform and EDX Spatial

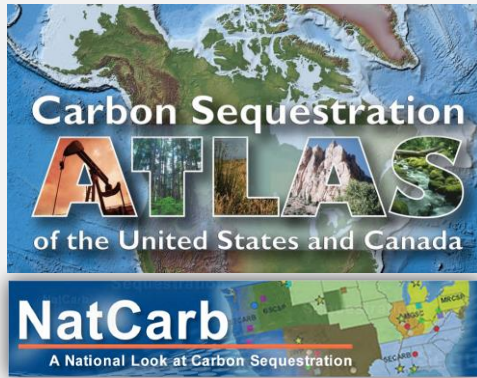**1997** — **2003** — **2007** — **2011** — **2015** — **2016** — **2019** — **2021** — **2023**

DOE's Carbon Storage Research Program was founded

DOE releases the 1st Carbon Storage Atlas of the United States and Canada.
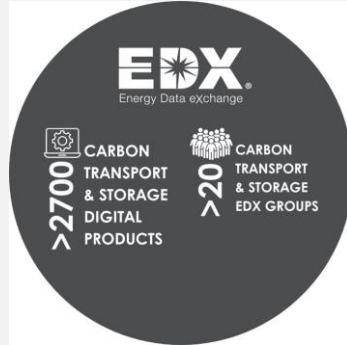
DOE initiates requirements to contribute digital data products from CTS program to EDX
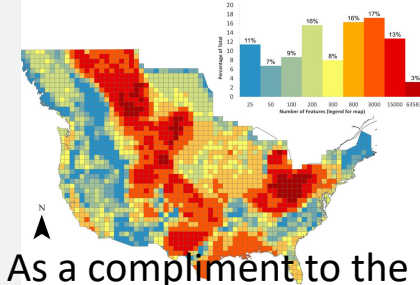
As a compliment to the NATCARB Database, public spatial data from the RCSPs and EDX are published as the Carbon Storage Open Database.

PUBS | SPATIAL LAYERS
1000+ | 700+

DATA & WEB TOOLS
80+

PRODUCTS | GROUPS
>3500k | >20

PUBLIC PRODUCTS*

EDX's role in supporting public CS&T products

EDX discover

NETL Research Carbon Storage Program · BIL

- **Platform with user interface** <u>within</u> the EDX ecosystem
- **Connecting** CCS-community stakeholders to CCS-priority data, tools, and models for use

Demo Tuesday evening!

EDX ®
Energy Data eXchange

Public submissions:

- Data
- Databases
- Geodatabases
- Tools
- Documents
- Links to externally published resources (e.g. GitHub, online databases, datasets, tools)

All CS&T submissions →
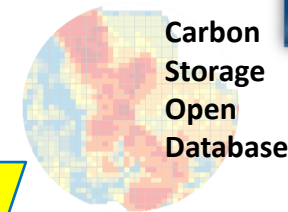
← **Spatial data and tools**

EDX SPATIAL

Carbon Storage Map Collections:
- NATCARB Database
- Carbon Storage Open Database

Tools/Dashboards/Story Maps
- BIL funded (MapIT, PlanIT)
- CONNECT
- Carbon Matchmaker

Carbon Storage Open Database

NatCarb · A National Look at Carbon Sequestration

M PIT Mapping Inquiry Tool

Demo Tuesday evening!

EDX Groups – Increase in Data Volume in Last Year

EY23 Carbon Storage

EDX Groups

Carbon Storage Open Database

This is a group to bring together data resources related to all open carbon storage data on EDX read more

Followers	Submissions
12	394

+ Follow

- 🖴 Data Usage: 14.074 TB
- ⬇ Downloads: 63630
- 🗎 Resources: 2102

EY24 Carbon Storage Review Meeting

EDX Energy Data eXchange

Carbon Storage Open Database

This is a group to bring together data resources related to all open carbon storage data on EDX read more

Followers	Submissions
13	427

+ Follow

- 🖴 Data Usage: 15.081 TB
- ⬇ Downloads: 93052
- 🗎 Resources: 2234

Some EDX Topical Groups:

- Carbon Transport and Storage
- CarbonSAFE
- Core Characterization
- DisCO2ver Datasets and DisCO2ver Tools
- FutureGen Data
- Illinois Basin Decatur Project
- NRAP Datasets and NRAP Applications Catalog
- NRAP Phase II & III Tools
- Offshore Carbon Capture and Storage
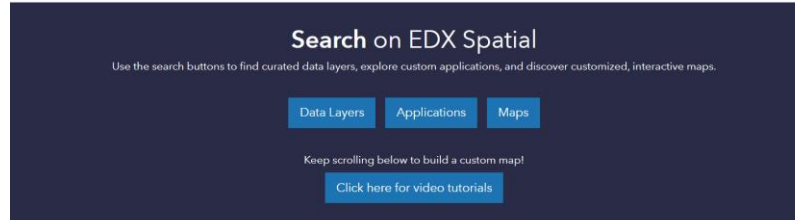- Regional Carbon Sequestration Partnership groups
- Spatial Data Resources
- Water Data Group

EDX SPATIAL

- *EDX Spatial* is a multi-cloud (EDX-Esri-AWS) curated mapping platform for the display of R&D spatial data resources published on EDX

- Supports the visualization of 3349+ spatial data layers

- Guides users back to the original EDX submission for data download

- Enables organization of data into research themes

- Supports hosting of dashboards, tools and other applications

https://edx.netl.doe.gov/dataset/edx-spatial

CM CONNECT

Carbon Matchmaker

Carbon Storage Open Database

NatCarb — A National Look at Carbon Sequestration

CS PlanIT — Carbon Storage Planning Inquiry Tool

MAPIT — Mapping Inquiry Tool
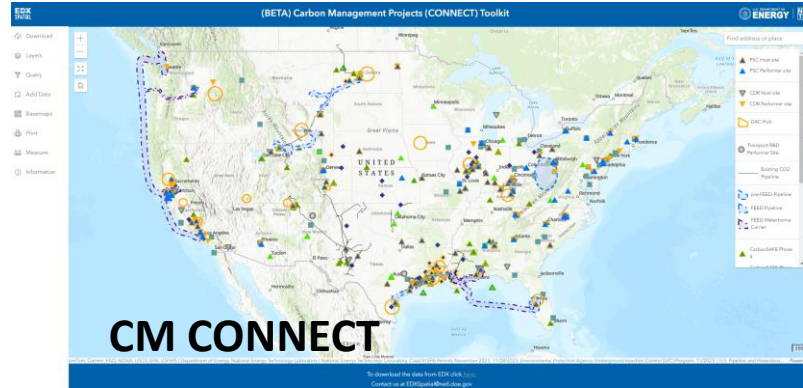
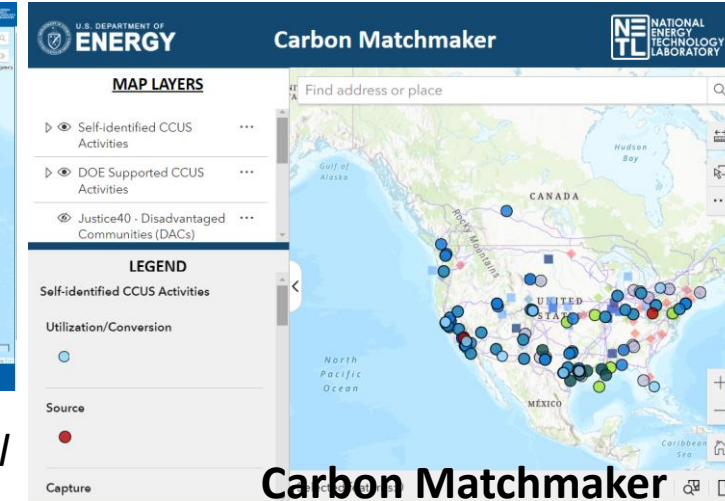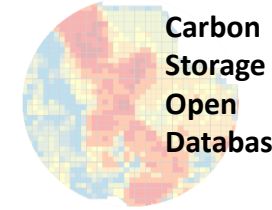# Continuing to Develop EDX Spatial Standards and Workflows

- Standardizing and ensuring FGDC compliant metadata standards and symbology standards across data
  - Results: A guide for assigning symbology across online mapping applications within EDX Spatial tailored to CCS-specific data types
- Developing workflow documents – improving data workflows between EDX and EDX Spatial
- Standardizing look + feel of applications hosted

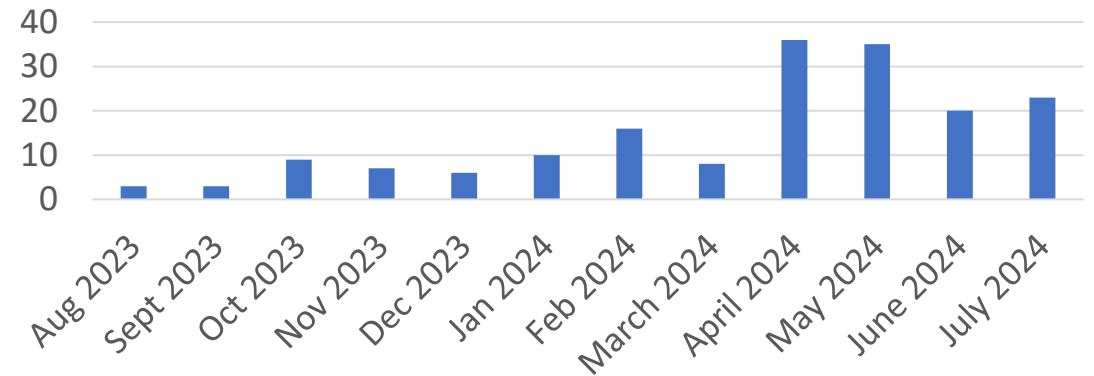| Feature	Geometry	Catalog Format	Fill RGBO	Line RGBO	Fill Hex	Fill T%	Line Hex	Line T%	ArcGIS 2D Symbol	Point Size	Outline/Line Wt	Rotation	FGDC Ref.
			EDX Spatial Symbology Reference Guide										
			Catalog Format Syntax: ['Geometry', 'ArcGIS 2D Symbol Name', 'Point Size', 'Outline/Line Weight', 'Rotation']										
		O&G, MINING, AND CCUS FACILITIES											
Proposed CCS Well	Point	['point', 'Square Diam	[0, 0, 0, 50]	[0, 0, 0, 50]	#000000	50%	#000000	50%	Square Diamond	7	1	None/Default	*19.5.92
Drilled CCS Well	Point	['point', 'Square Diam	[0, 0, 0, 100]	[0, 0, 0, 100]	#000000	0%	#000000	0%	Square Diamond	7	1	None/Default	*19.5.92
CCS Storage Capacity; CO2 Storage Reservoir	Point	['point', 'Square Diam	[216, 255, 0, 50]	[0, 0, 0, 0]	#D8FF00	50%	N/A	100%	Square Diamond	7	1	None/Default	*19.5.92
	Polyline	['polyline', '0.5 Point'	[0, 0, 0, 0]	[216, 255, 0, 100]	N/A	100%	#D8FF00	0%	0.5 Point	N/A	0.5 / Default	None/Default	N/A
	Polygon	['polygon', 'Extent Tr	[216, 255, 0, 25]	[216, 255, 0, 100]	#D8FF00	75%	#D8FF00	0%	Exte				
General CO2 Point Sources	Point	['point', 'Diamond 3',	[255, 0, 0, 100]	[0, 0, 0, 100]	#FF0000	0%	#000000	0%					

Updates on the Carbon Storage Open Database

- Updated version of CSOD published on EDX in 2023
- Available as full geodatabase, but also split into 17 topic-specific and region-specific geodatabases
- Available to view and interact with on EDX Spatial

Carbon Storage Open Database Map Collections

Geologic Contours	CO2 Point Sources
Geology Central/Northwest Region	Groundwater
Geology - Southeast Region	Mines
Geology - National and Basins	Offshore CCS Geology and Projects
Geology – Western/ Southwest Region	Oil and Gas Field Operations
CCS Projects and Field Data	Remote Sensing Data
Boundaries, Roads, and Utilities	Surface Hydrology
Well Data	Raster Data

EDX NETL's Energy Data eXchange

Find data products on EDX...

Q Search | Contribute | Groups | Portfolios | Workspaces | Tools | Users

/ Submissions / Carbon Storage Open Database

Dataset | Groups | Activity | Provide Feedback | View Metadata | Add Resource | Options

Carbon Storage Open Database
doi 10.18141/1671320

License(s):
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Open Data Commons Attribution License

The Carbon Storage Open Database is a collection of spatial data obtained from publicly available sources published by several NATCARB Partnerships and other organizations. The carbon storage open database was collected from open-source data on ArcREST servers and websites in 2018, 2019, 2021, and 2022. The original database was published on the former GeoCube, which is now EDX Spatial, in July 2020, and has since been updated with additional data resources from the Energy Data eXchange (EDX) and external public data resources.

The shapefile geodatabase is available in total, and has also been split up into multiple databases based on the maps produced for EDX spatial. These are topical map categories that describe the type of data, and sometimes the region for which the data relates. The data is separated in case there is only a specific area or data type that is of interest for download.

https://edx.netl.doe.gov/dataset/carbon-storage-open-database

Number of downloads - Full CSOD Geodatabase on EDX in last year

Looking Ahead – Advanced Storage MYRP

Where are we going next?

- Produce finalized symbology standards reference guide

- Explore ML/AI tools for automating document geotagging

- Updating the Carbon Storage Open Database with data added to EDX in EY23, EY24 (since last update)

- Assisting with a case study looking at field data integration with other national CS datasets from DOE
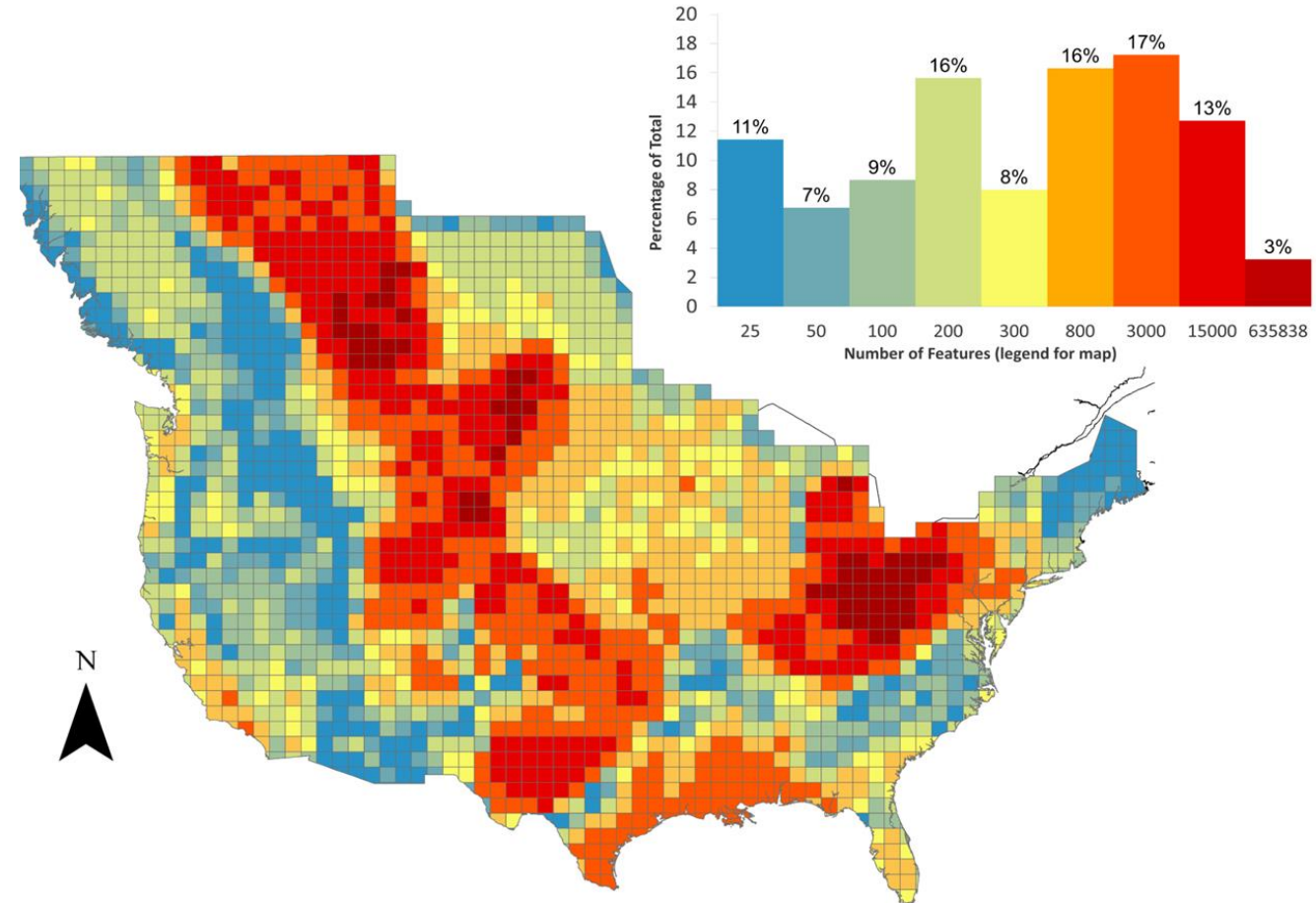
Carbon Storage Open Database Data Density Map, Morkner et al. 2022

DEMO & POSTER SESSION

TUESDAY, AUGUST 6, 2024
5:45 PM - 7:45PM
BALLROOM GALLERY

EDX Spatial
EDX DisCO2ver

disCO2ver

CARBON TRANSPORT & STORAGE DATA AND
INNOVATION TO BRIDGE THE DIGITAL DIVIDE

Additional Information

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Abigail Martin, Abigail.Martin@netl.doe.gov
Jennifer Bauer, Jennifer.Bauer@netl.doe.gov

Data resources and important URLs:

Morkner, P., Sabbatino, M., Choisser, A., Creason, C., Wingo, P., DiGiulio, J., Jones, K., Greenburg, R., Bauer, J., and Rose, K, Carbon Storage Open Database, 7/14/2023, https://edx.netl.doe.gov/dataset/carbon-storage-open-database, DOI: 10.18141/1671320
https://edx.netl.doe.gov/

Citations:

Morkner, P., Bauer, J., Creason, C., Sabbatino, M., Wingo, P., Greenburg, R., Walker, S., Yeates, D., Rose, K. 2022. Distilling Data to Drive Carbon Storage Insights. Computers & Geosciences. https://doi.org/10.1016/j.cageo.2021.104945

Morkner, P., Bauer, J., Shay, J., Sabbatino, M., and Rose, K. An Updated Carbon Storage Open Database - Geospatial Data Aggregation to Support Scaling -Up Carbon Capture and Storage. United States: N. p., 2022. Web. https://www.osti.gov/biblio/1890730

Morkner, P., Rose, K., Bauer, J., Rowan, C., Barkhurst, A., Baker, D.V., Sabbatino, M., Bean, A., Creason, C.G., Wingo, P., and Greenburg, R. Tools for Data Collection, Curation, and Discovery to Support Carbon Sequestration Insights. United States: N. p., 2020. Web. https://www.osti.gov/biblio/1777195

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