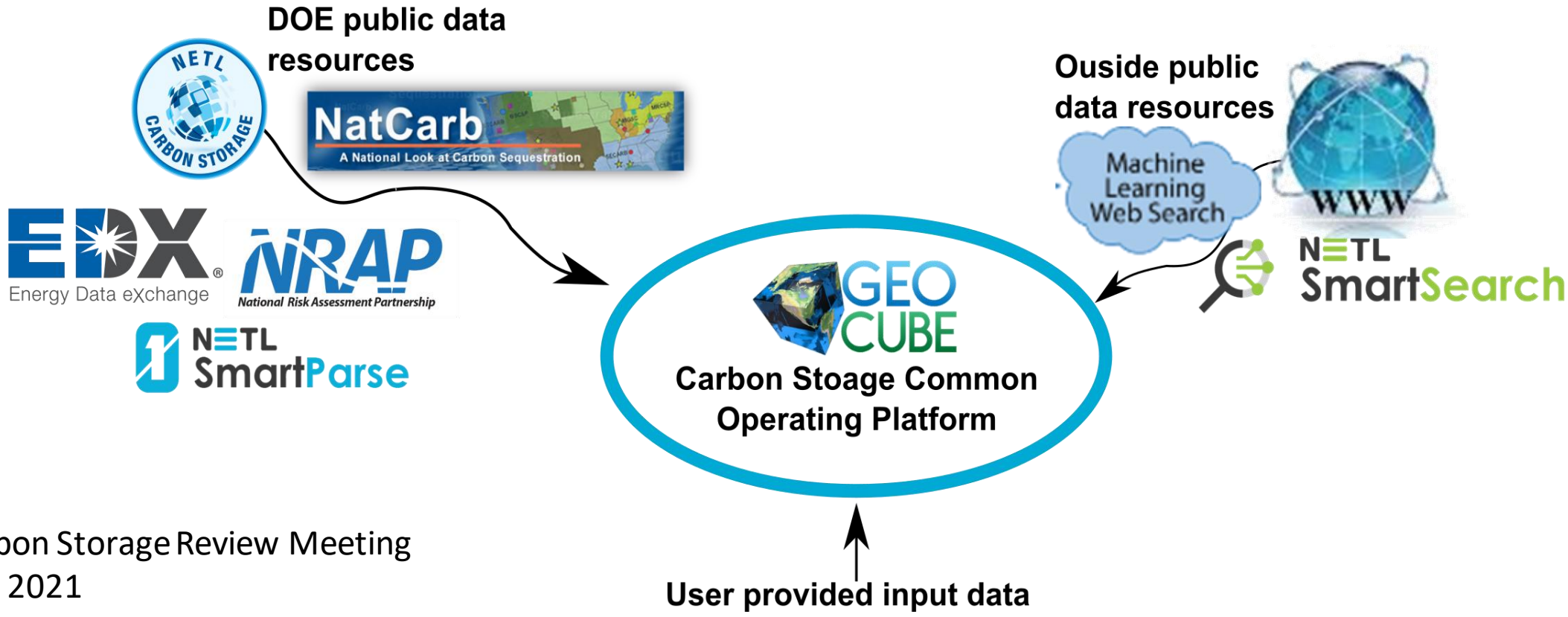
Carbon Storage Data Integration, Visualization and Application via EDX and GeoCube

Aaron Barkhurst[1,2], Jennifer Bauer[1], Paige Morkner[1,3], Chad Rowan[1,3], Kelly Rose[1]

[1]NETL, [2]MATRIC, [3]NETL Site Contractor

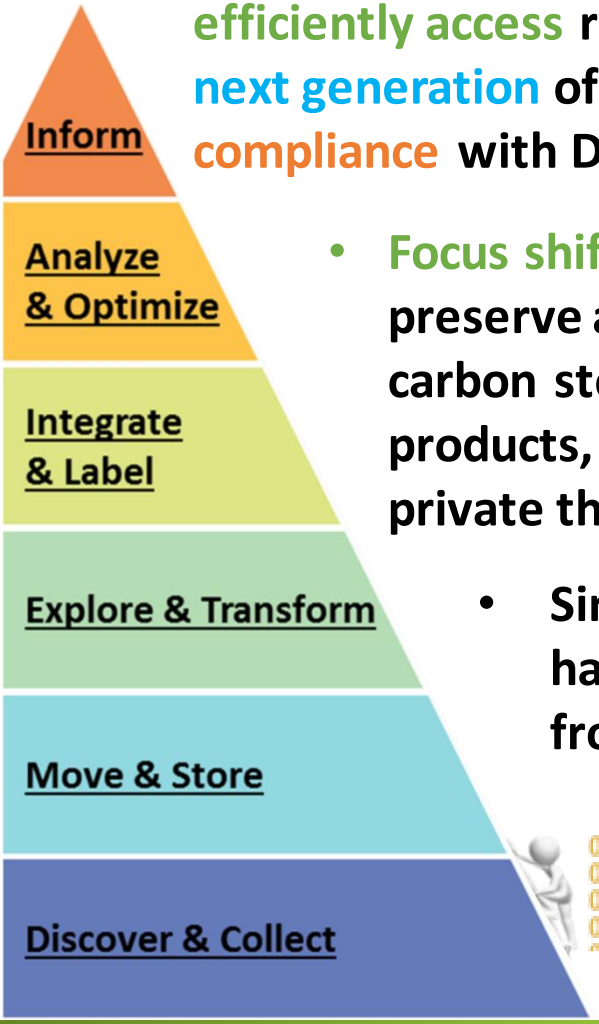


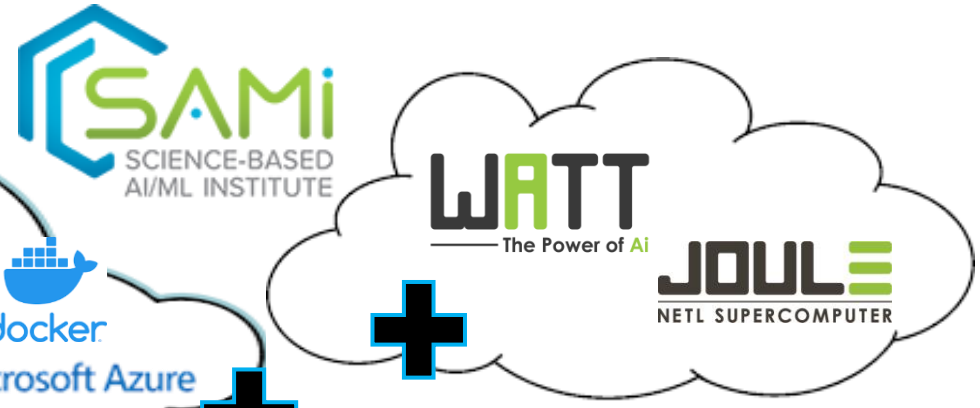
NETL Carbon Storage Review Meeting
August 6, 2021

Leveraging EDX Computing for Carbon Storage Data

NATIONAL ENERGY TECHNOLOGY LABORATORY

- 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 2016 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





EDX
Energy Data eXchange

Big Data

Open Carbon Storage Data Collection

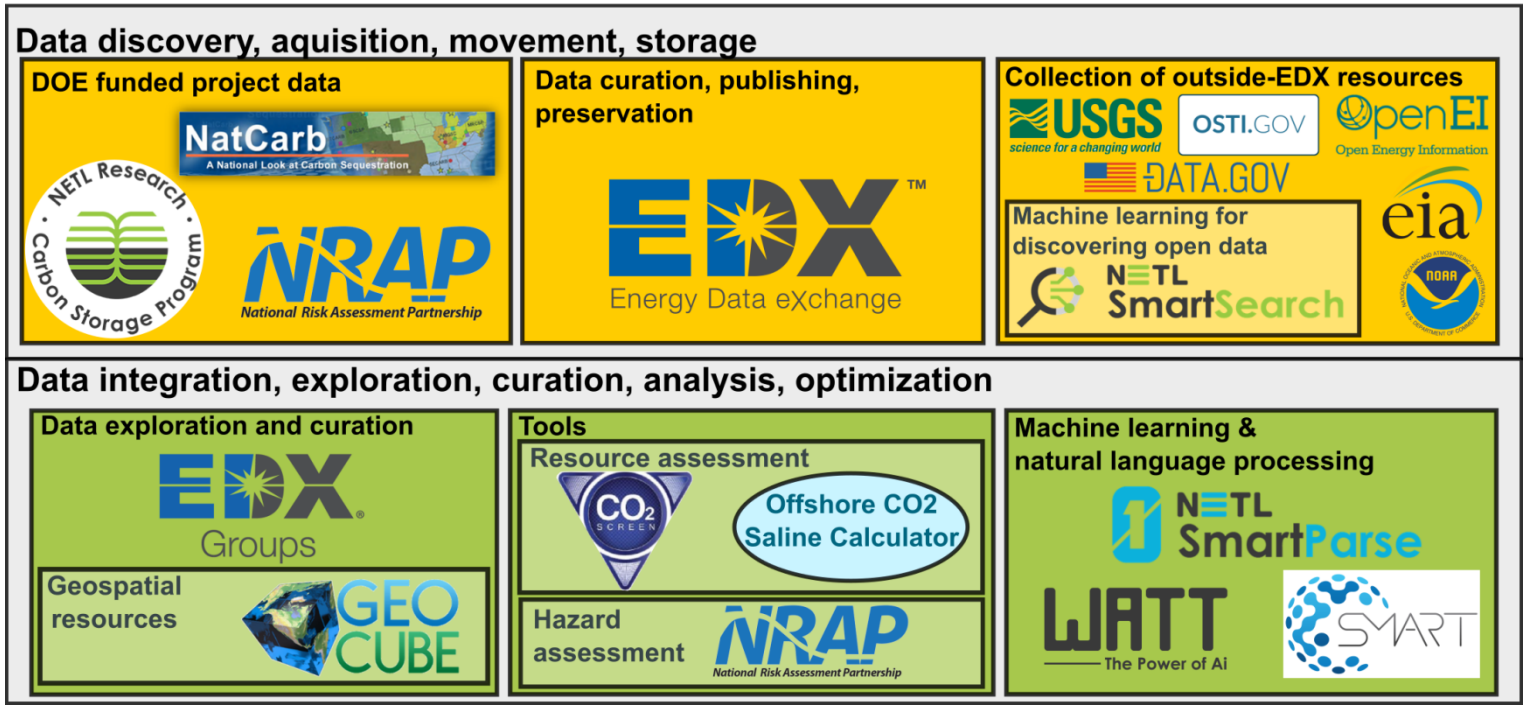
Data sources include:

- National carbon sequestration database – **NATCARB**
- **Carbon Storage open database collection**
- **Regional Carbon Sequestration Partnership data**
- Field projects like **FutureGen 2.0 and CarbonSAFE**
- **National Risk Assessment Partnership** data, models, tools

Data Types:

- **Geospatial (shapefiles and rasters)**
- **Well logs**
- **Seismic data**
- **Text-based resources**
- **Tools, models**
- **Data catalogs**
- **Both surface and subsurface geology**

Carbon storage data computing resources

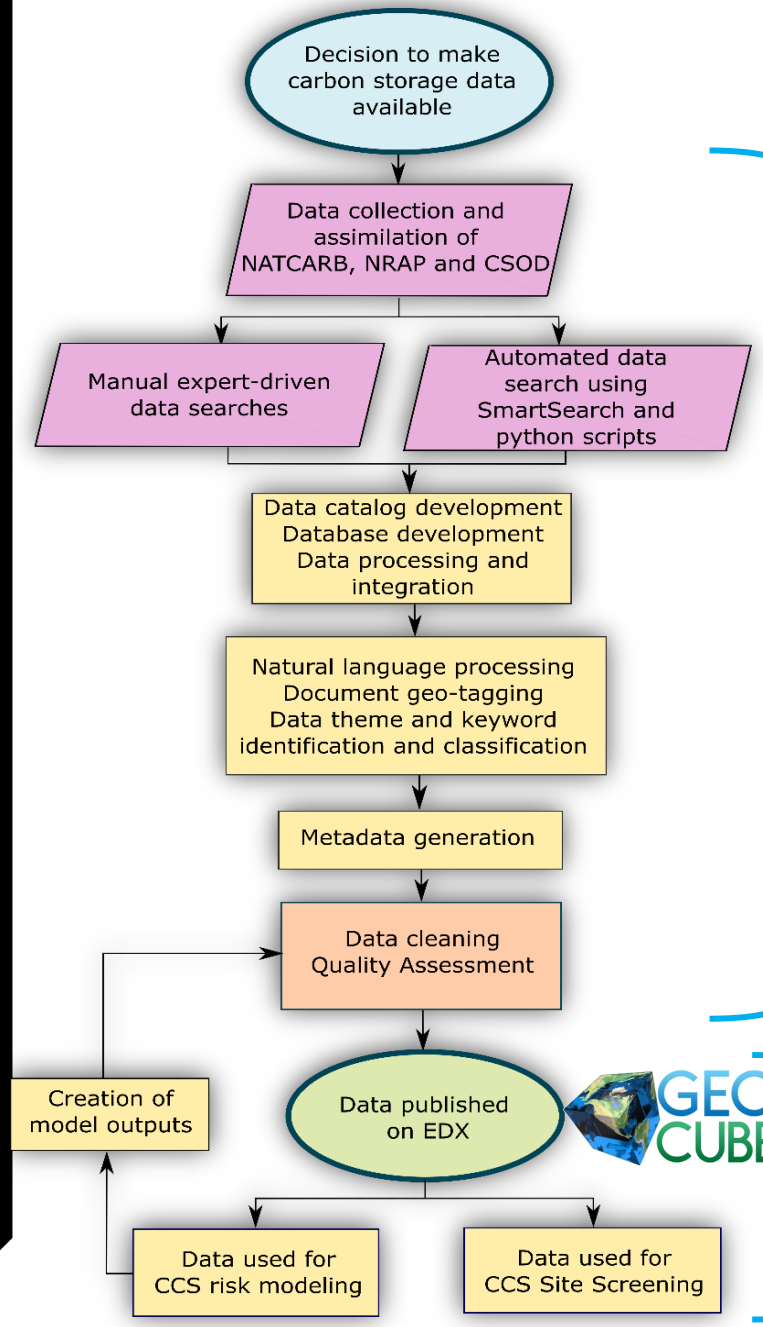


- **85+ TB source data and growing**
- **3455+ resources**
  - *872 Published EDX resources*
  - *632.7 GB of Published EDX resources*
- **1800+ text-based resources on EDX**
- **Data curated into Groups on EDX**

215+ geospatial data records to be integrated into GeoCube in FY2022

The life cycle of data from collection to release to utilization

Challenge: Efficiently collecting, moving, storing, transforming, integrating and labeling data to make data more discoverable, searchable, and easy to reuse



Collection

NETL SmartSearch

- SmartSearch and web scraping
- Expert-driven research
- EDX submissions

Metadata development and capture

- Cataloging
- ReadMe file development
- Natural language processing for keywords, topic modeling, geographic association

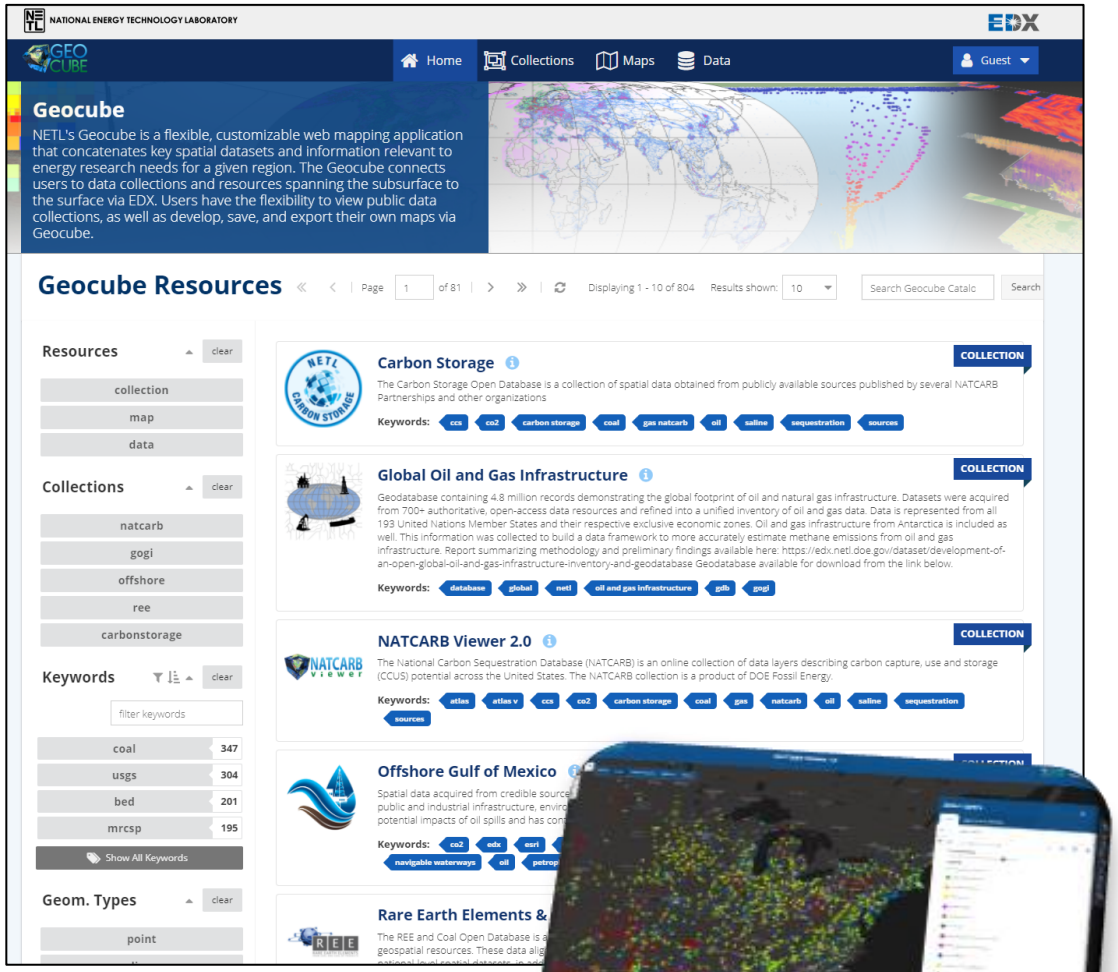
Cleaning and Quality Assessment

- Data ranking
- Data assessment method scoring

Then data can be published and reused for CS applications such as modeling, simulations and site screening

Morkner, P., Bauer, J., Creason, C., Sabbatino, M., Wingo, P, Greenburg, R., Walker, S., Yeates, B., and Rose, K., **in review,** Distilling Data to Drive Carbon Storage Insights, journal: *Computers & Geoscience*

EDX Spatial & GeoCube

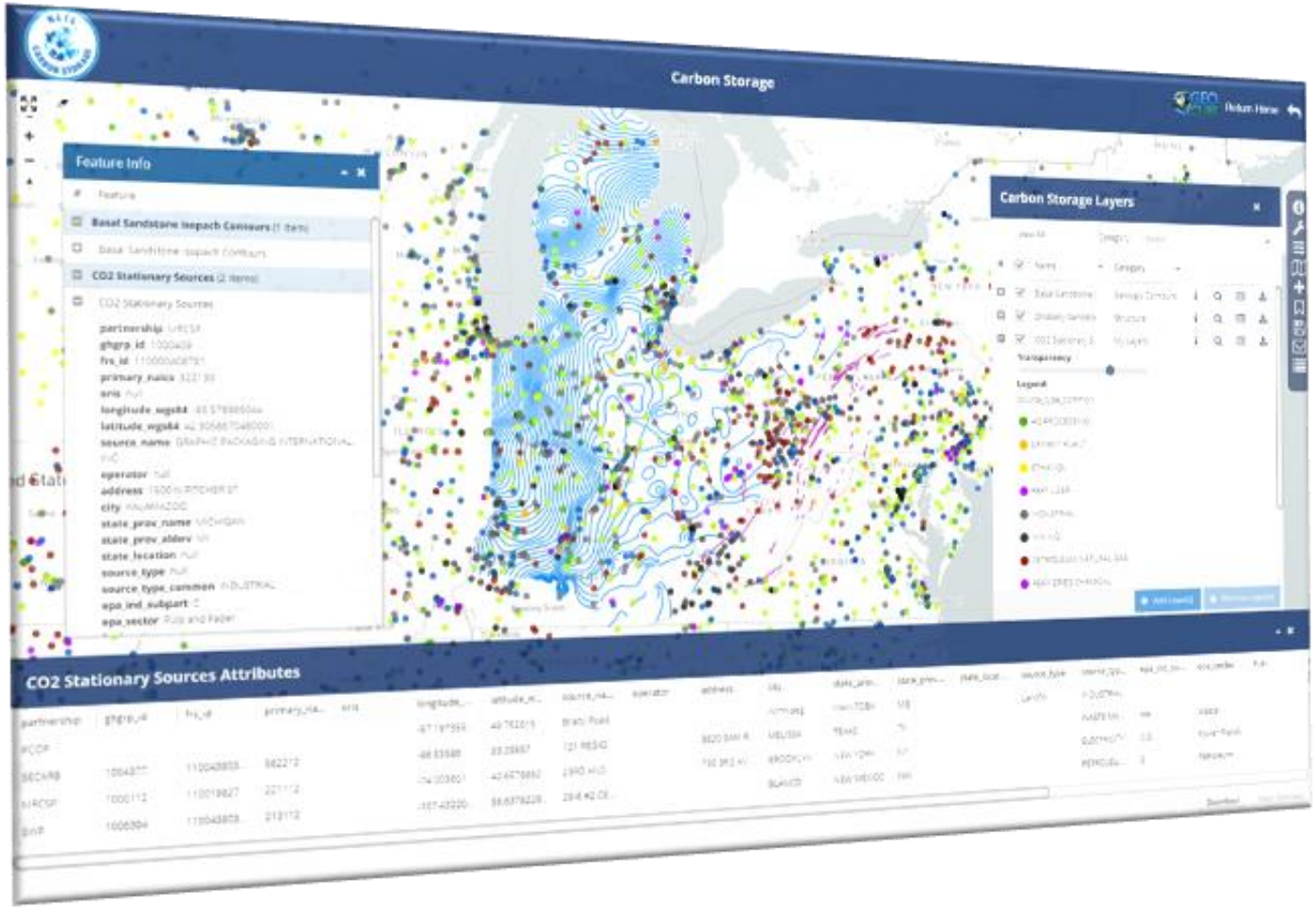


- **Support discovery, access and use of geospatial data & analytical tools**
- **Growing catalog of geospatial resources available**
  - From traditional formats as well as EDX processing to unlock additional place-based insights for EDX resources
- **Serves as a Priority DOE Geospatial Data Repository**
  - Aligns with geospatial management practices outlined in 2021-2025 DOE Geospatial Data Management Strategy, FGDC guidelines, and 2018 GDA covered agency requirements

GeoCube is currently under development to **bring new, state-of-the-art web technologies and mapping features** to its users

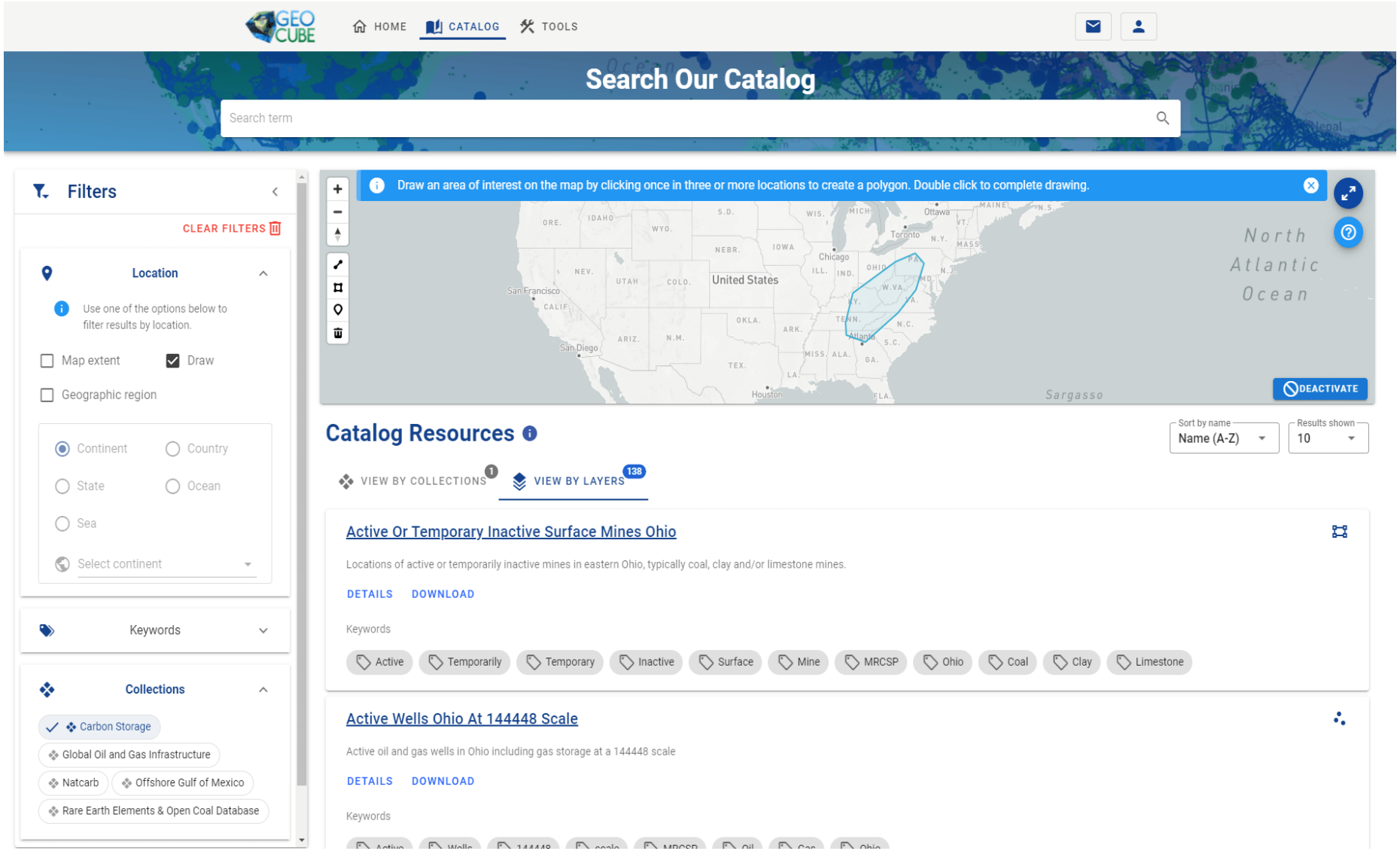
GeoCube Maps: Know Your Place!

Intuitively find, visualize, filter, and extract key spatial datasets and features



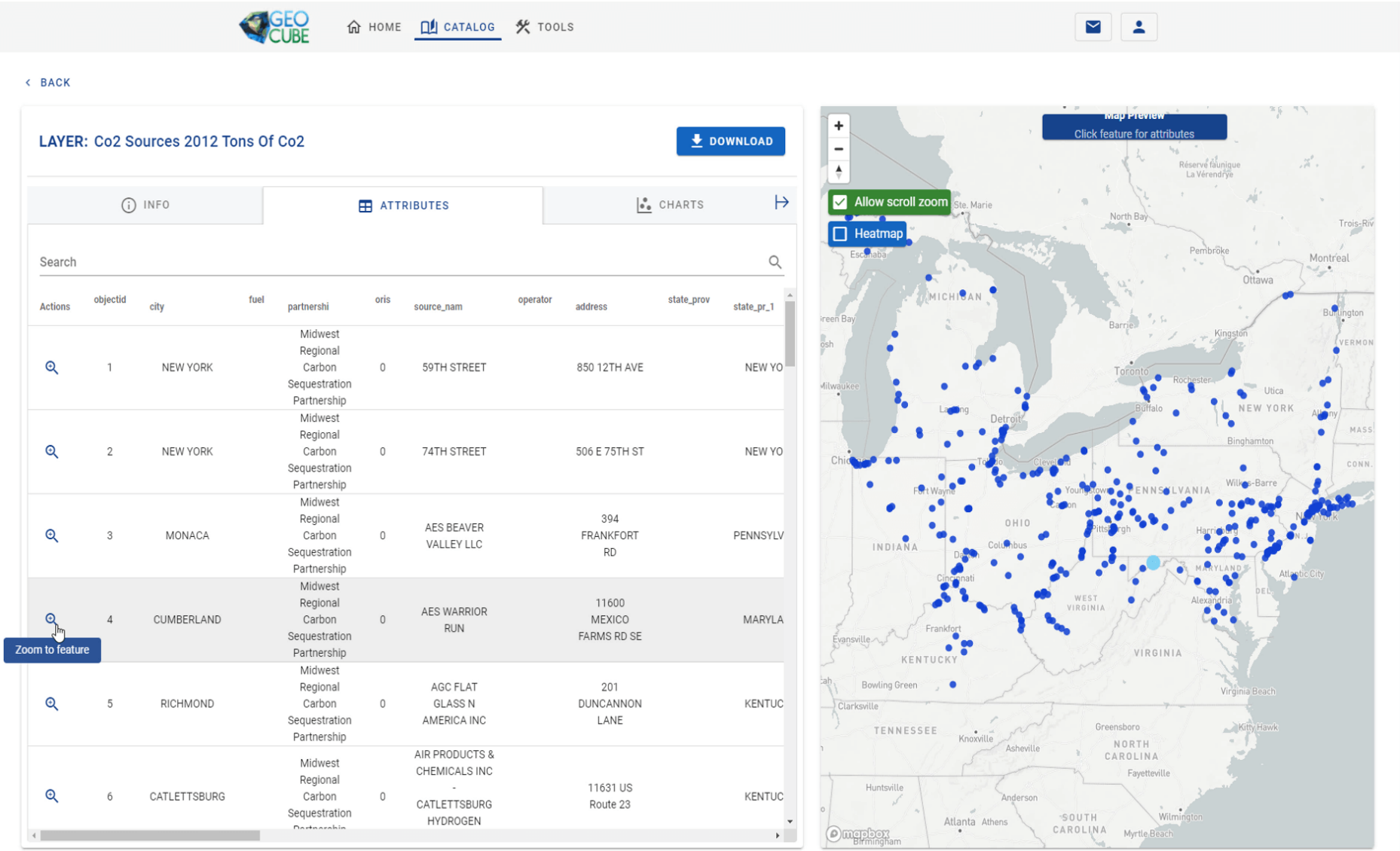
- **Filter map features** based on attribute values
- **Download layers** based on current map extent or custom drawn region of interest
- **Add third party layers** via REST service URL, WMS URL, or local GeoJSON file
- **Save custom maps** with valid EDX account login

Find What You Need



Rich data filters including location-based searching

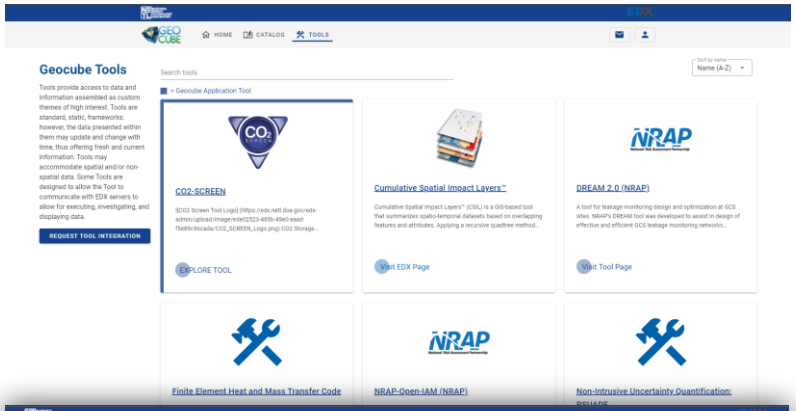
Understanding The Data

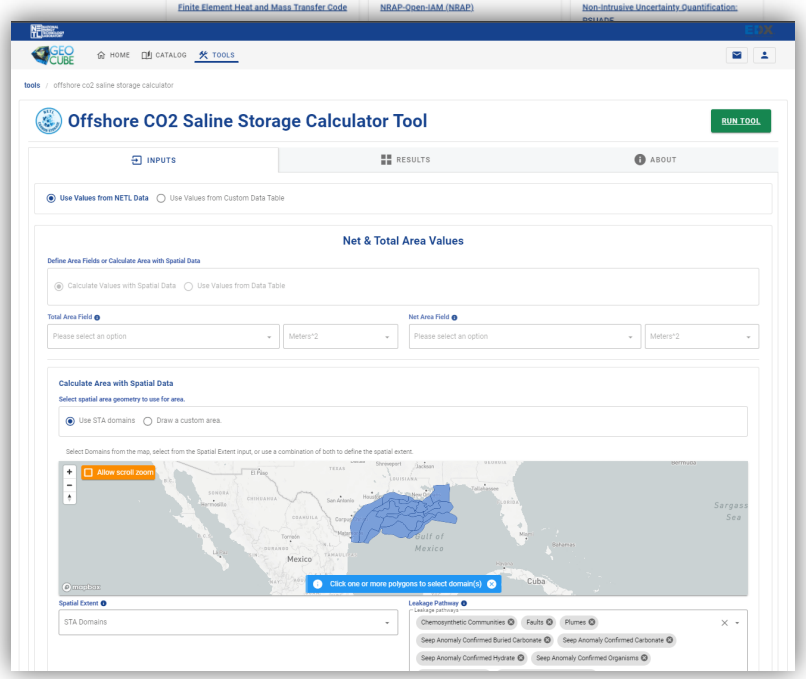


Investigate data via metadata, attributes, heatmaps, and charting

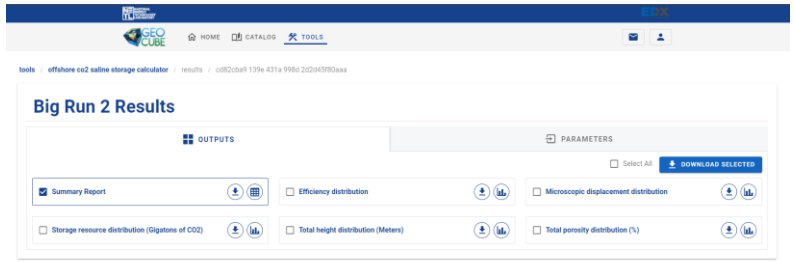
EDX Hosted Tools

Discover and interact with EDX hosted geospatial related tools

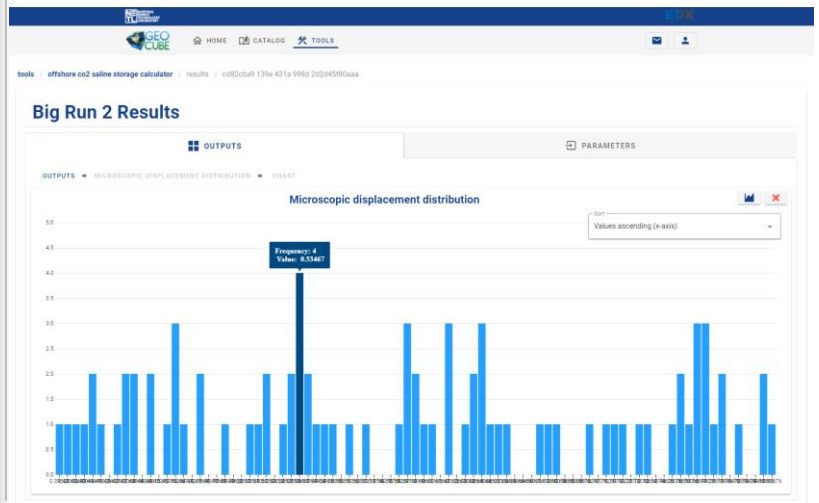




Tool Outputs



Visualize, interact with, and export tool output data



Request Your Tool to be Integrated into GeoCube for Public/Private Access

Carbon Storage program investments into data curation and management has led to the development of GeoCube to support finding, visualizing and downloading relevant Geospatial research products which benefits ongoing and future carbon storage research. This has led to:

- A better understanding of CS relevant open- data density – and scope to meet data gaps
- Improved access through the integration of CS data resources on EDX into GeoCube for further searchability with spatial searches and keyword searches
- Applications of available geospatial data by groups such as the National Risk Assessment Partnership, universities, and industry
- Increasing numbers of CS data inquiries that have been easily addressed through GeoCube data access

Thank you!

NETL RESOURCES

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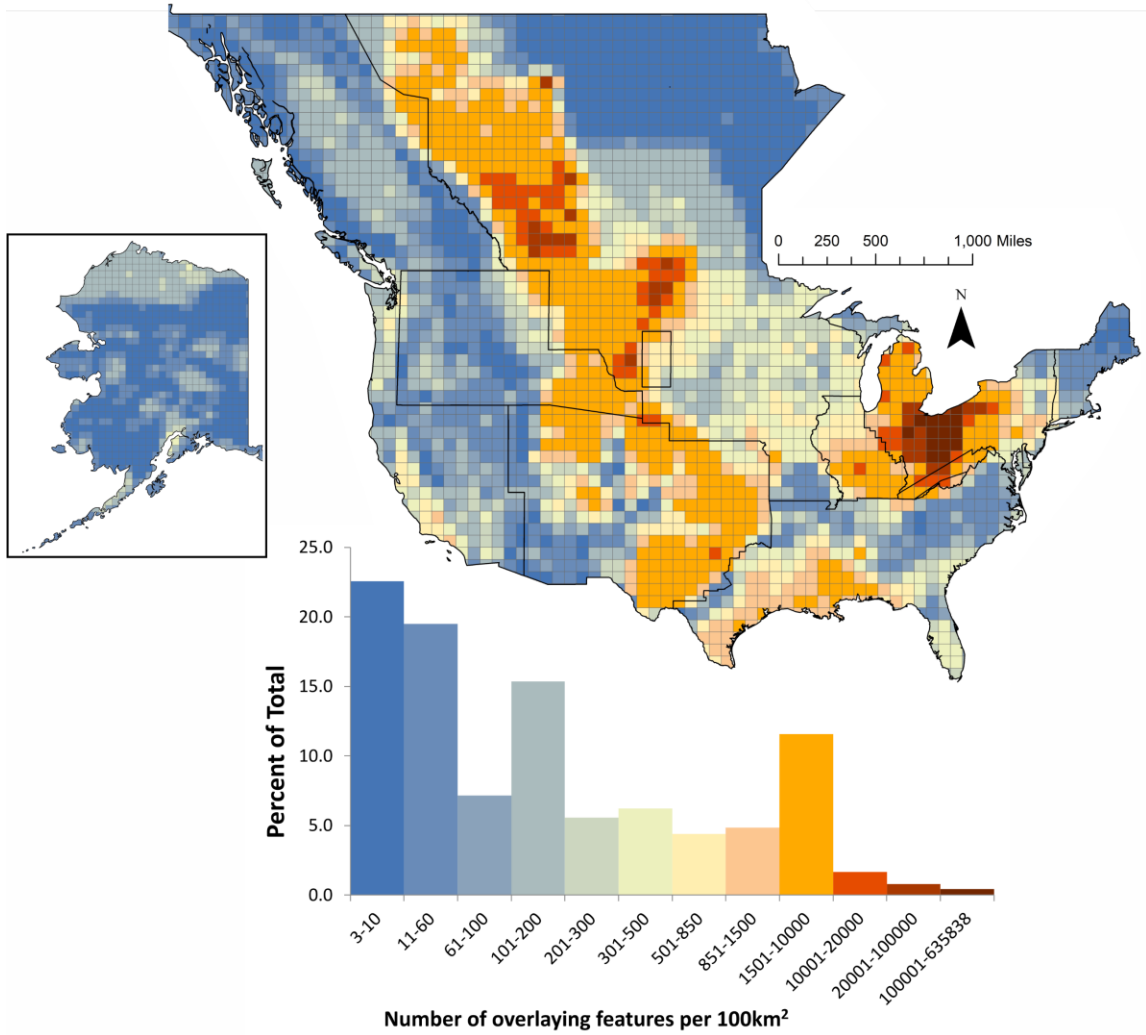

CONTACT:
Aaron Barkhurst, Jennifer Bauer
Aaron.Barkhurst@netl.doe.gov, Jennifer.Bauer@netl.doe.gov

EDX Support
edxsupport@netl.doe.gov

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