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Energy & Environmental Research Center (EERC)

# Williston Basin Carbon Ore, Rare Earth, and Critical Minerals (CORE-CM) Program

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John Kay, Jason Laumb, Bruce Folkedahl, Todd Brasel, Charlene Crocker,  
Stacy Kouba, Energy & Environmental Research Center  
Nolan Theaker, Institute for Energy Studies

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# Carbon Ore, Rare Earth, and Critical Minerals Initiative

## CORE-CM

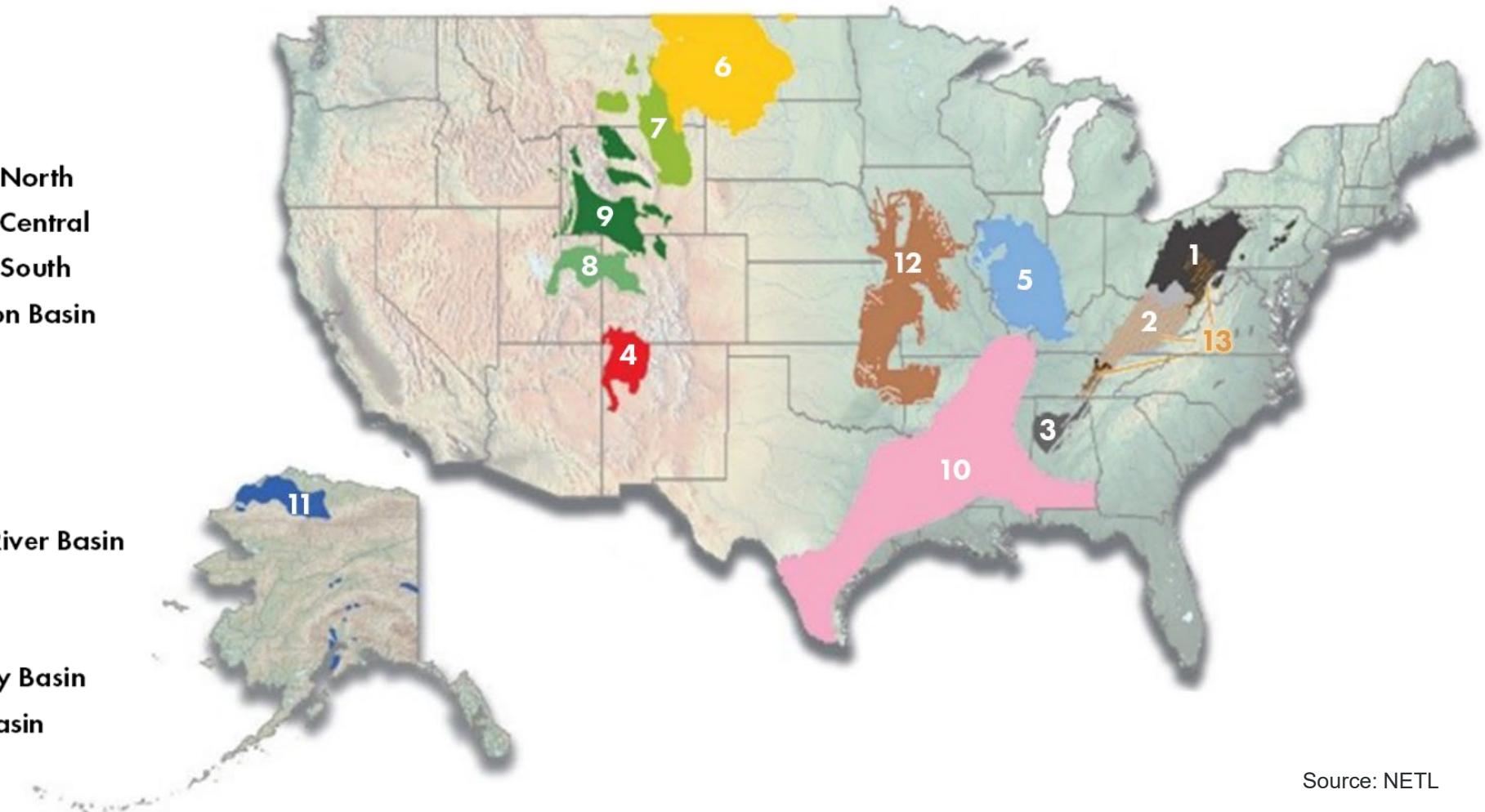
- U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL)-led program
  - Catalyze economic growth.
  - Job creation in energy communities.
  - Energy communities not to be left behind.
  - Domestic production of rare-earth elements (REEs) and critical minerals (CMs).
  - Strengthen our national economy and security.



# 13 Coalition Teams – CORE-CM Initiative

## US BASINS

- 1 Appalachian Basin, North
- 2 Appalachian Basin, Central
- 3 Appalachian Basin, South
- 4 San Juan River-Raton Basin
- 5 Illinois Basin
- 6 Williston Basin
- 7 Powder River Basin
- 8 Uinta Basin
- 9 Green River-Wind River Basin
- 10 Gulf Coast Basin
- 11 Alaska Basin
- 12 Cherokee-Forest City Basin
- 13 Mid-Appalachian Basin



Source: NETL



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**ENERGY**

NATIONAL  
ENERGY  
TECHNOLOGY  
LABORATORY

# Team Players

## Project Partners

U.S. Department of Energy  
North Dakota Industrial Commission  
Lignite Research Program

## Lead Organization

EERC

## Principal Investigator

J. Kay

## Project Advisors

EERC Leadership Team  
Dan Laudal, UND IES

## Core Team

UND IES; Pacific Northwest National Laboratory;  
UND Nistler College; North Dakota State University;  
Montana Tech; Critical Materials Institute

## Industry, Governmental, and Research Resources

Williston Basin CORE-CM Initiative Members



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ENERGY  
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LABORATORY



**BASIN ELECTRIC  
POWER COOPERATIVE**

A Touchstone Energy® Cooperative 



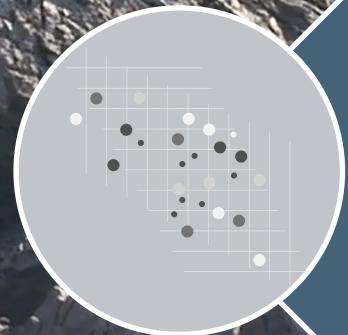
**BNI**  
energy  
AN ALLETE COMPANY



**Minnkota Power**  
COOPERATIVE  
A Touchstone Energy® Cooperative 



**NORTH AMERICAN  
COAL**  
CORPORATION



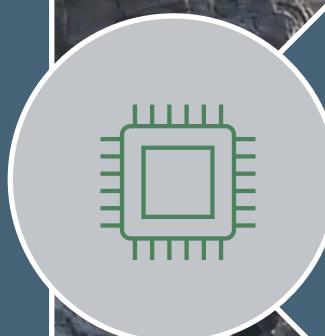
**Assessment of Resources**



**Strategies for Infrastructure, Industries, and Business**



**Strategies for Waste Stream Reuse**



**Technology Innovation Centers**

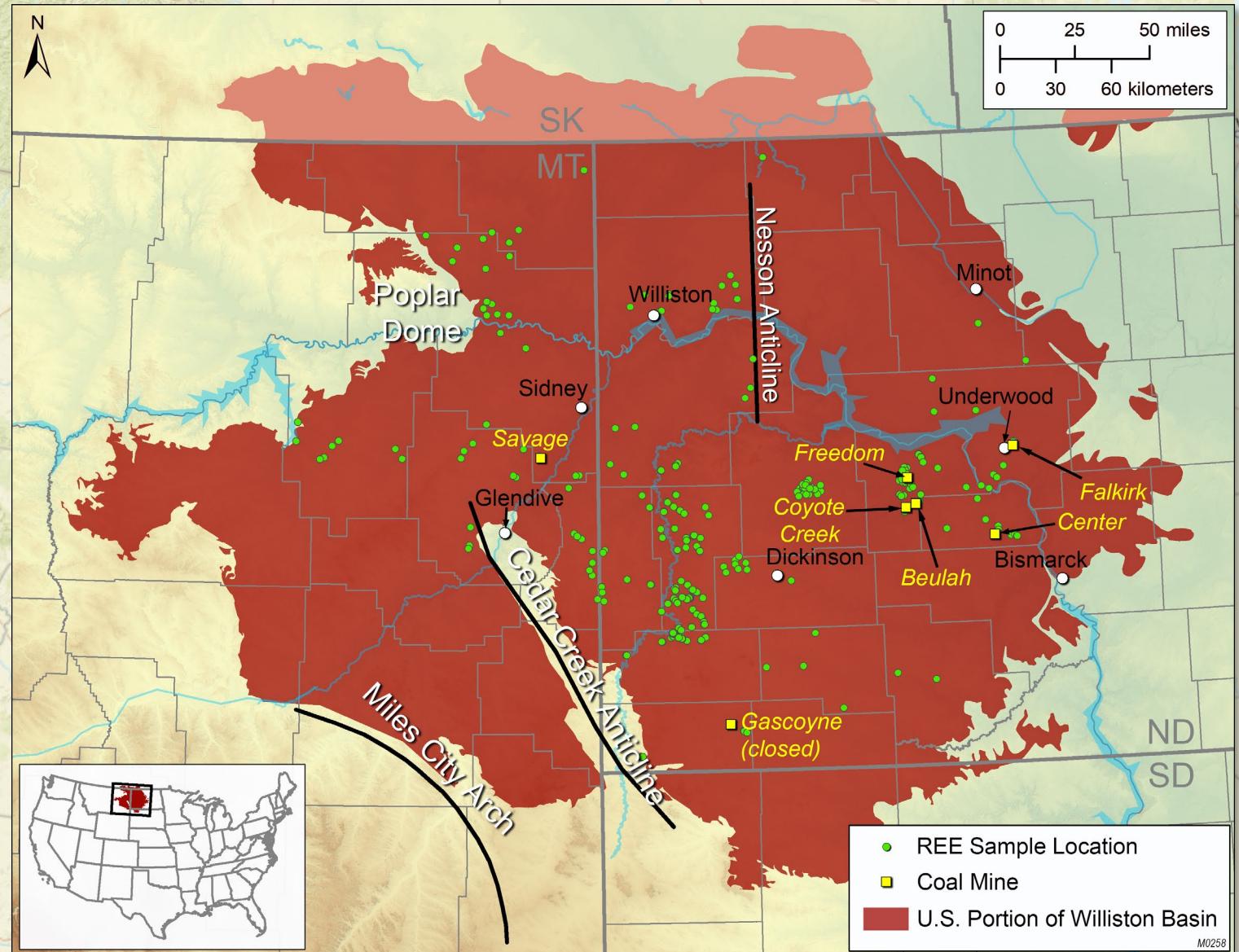


**Technology Assessment, Development, and Field Testing**



**Stakeholder Education and Outreach**

# Williston Basin Has...

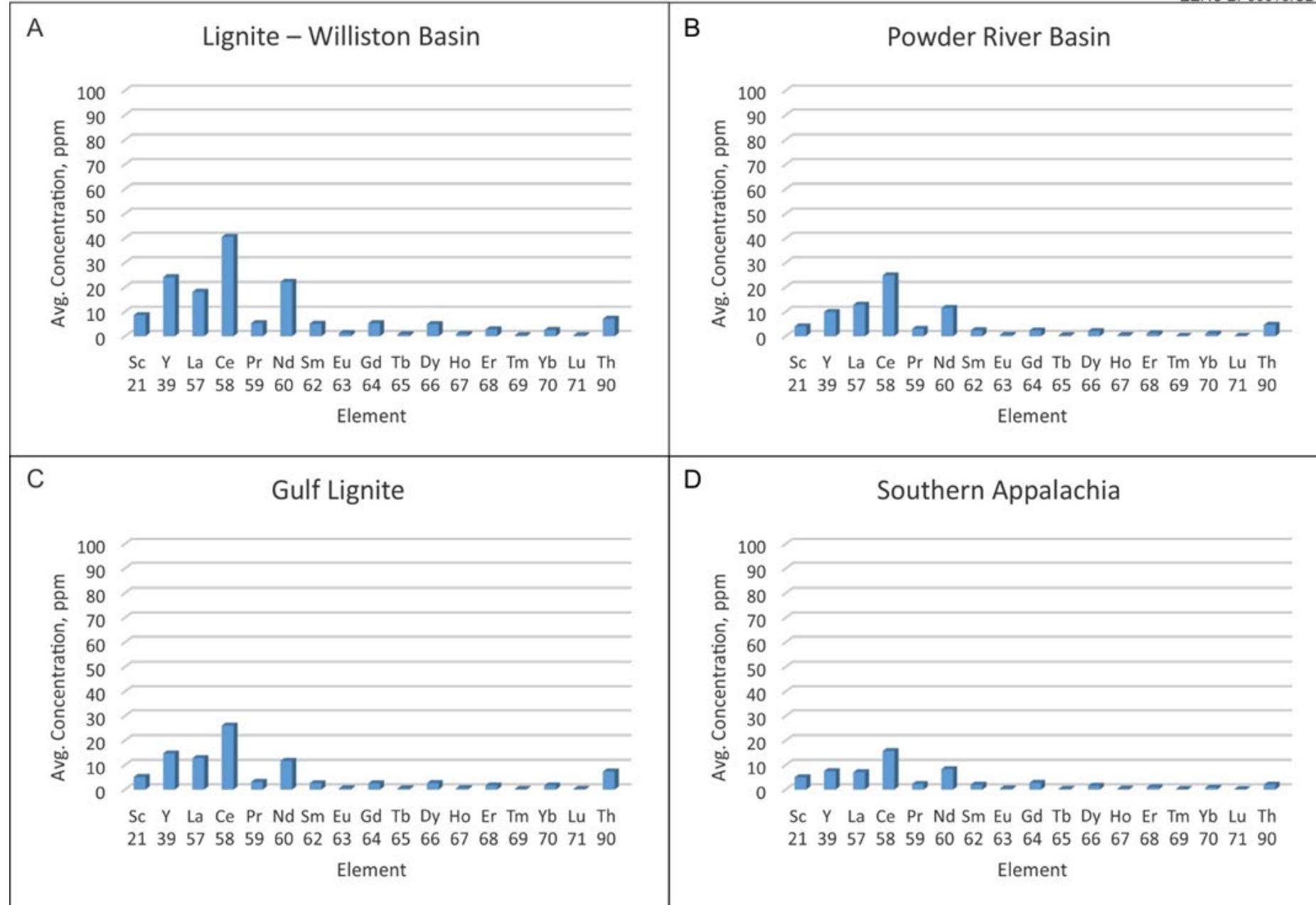


Resources

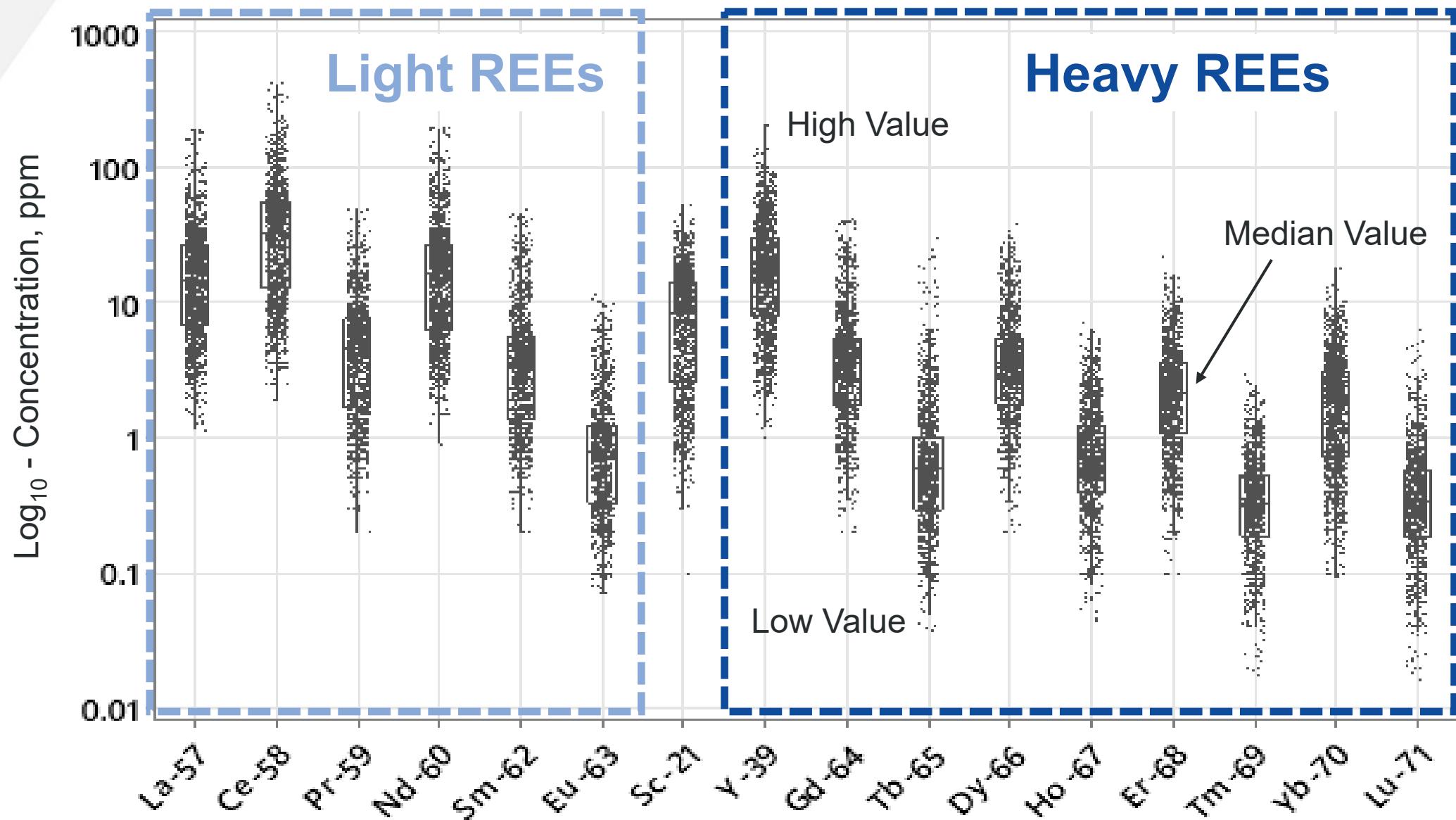
Infrastructure

Knowledge

# Average ppm concentration of REEs in coal samples on a dry mass basis by region



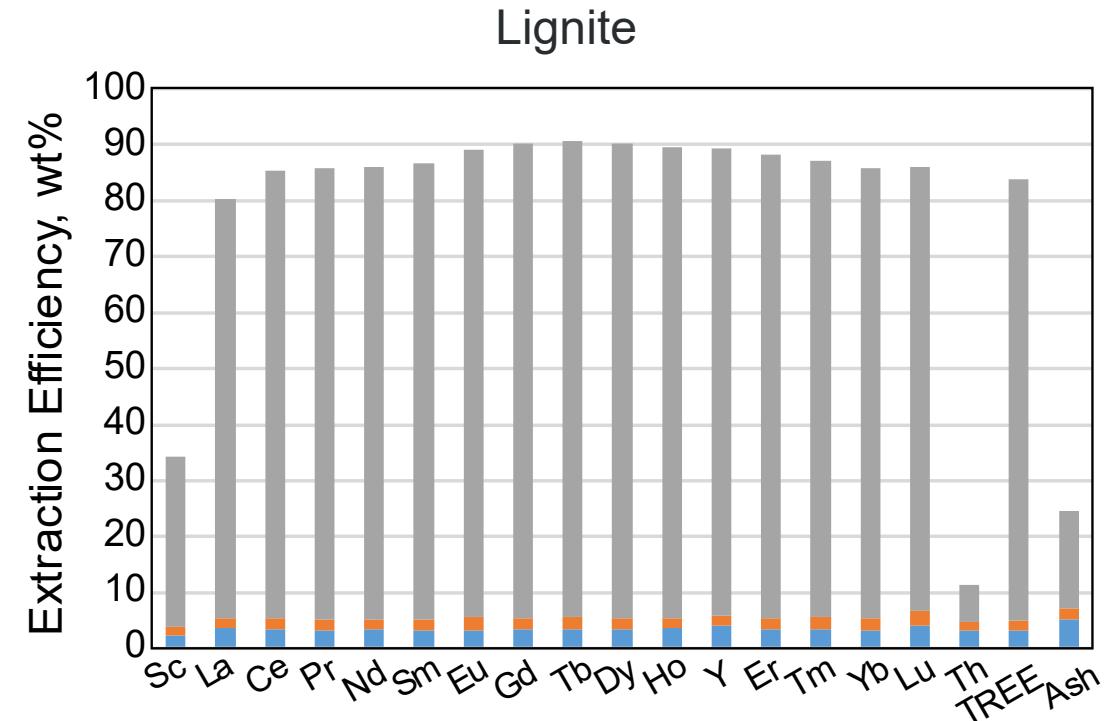
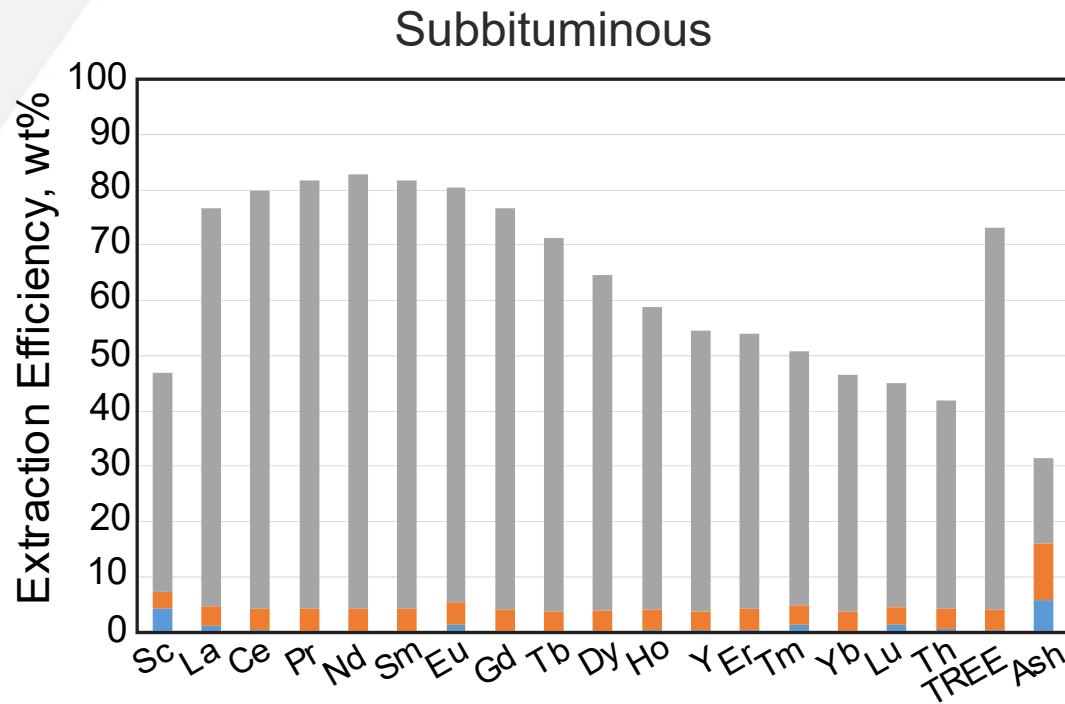
# REE Concentration Data



# HARMAN, HANSON, AND H BED COAL SEAM OUTCROPS



# REE EXTRACTION EFFICIENCY AND MODE OF OCCURRENCE



■ Water-Soluble   ■ Ion-Exchangeable   ■ Dilute Acid-Soluble/Organic Coordination

# Strategy

Raw REEs/CM?

Final Products?

- Magnets
- Aggregate
- Computer components
- Graphite/graphene
- Sensors

# STAKEHOLDER MEETINGS





**John P. Kay**  
**Principal Engineer**  
**[jkay@undeerc.org](mailto:jkay@undeerc.org)**

# THANK YOU

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

[www.undeerc.org](http://www.undeerc.org)  
Tel: 701.777.5000  
Fax: 701.777.5181



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