

Assessment of CORE-CM Resources in the Greater Green River and Wind River Basins



School of Energy Resources
Center for Economic
Geology Research



Coalgeo, LLC



Resource Assessment Team

Basinal Assessment of CORE-CM Resources

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Task Objectives

“This task will evaluate available historic and current state-of-the-art (SOTA) Carbon Ore, REE, and CM data collected from within the Greater Green River and Wind River Basins, including coal related sediments, coal ash, refuse, acid mine drainage, and other resources. Then build an initial geologic model, propose future modeling, study trends, and identify what information should be learned in later project phases.”

- **Resource Assessment of Coal Sediments**
- **Resource Assessment of Coal Ash, Refuse, AMD, and Other basin materials**
 - Heavy Mineral “Black” Sands & other paleoplacers
 - Ash beds
 - Clay deposits, including bentonite
 - Tailings
 - Trona waste streams
 - Phosphate waste streams
 - Intrusive and related rocks (pegmatites, altered rocks, fault zones, etc.)
- **Geologic Model Development for Coal Sediments**
- **Resource Gap Analysis and Future Characterization Plan**



Resource Assessment of Coal Sediments

Coal feedstocks have been evaluated from across the region:

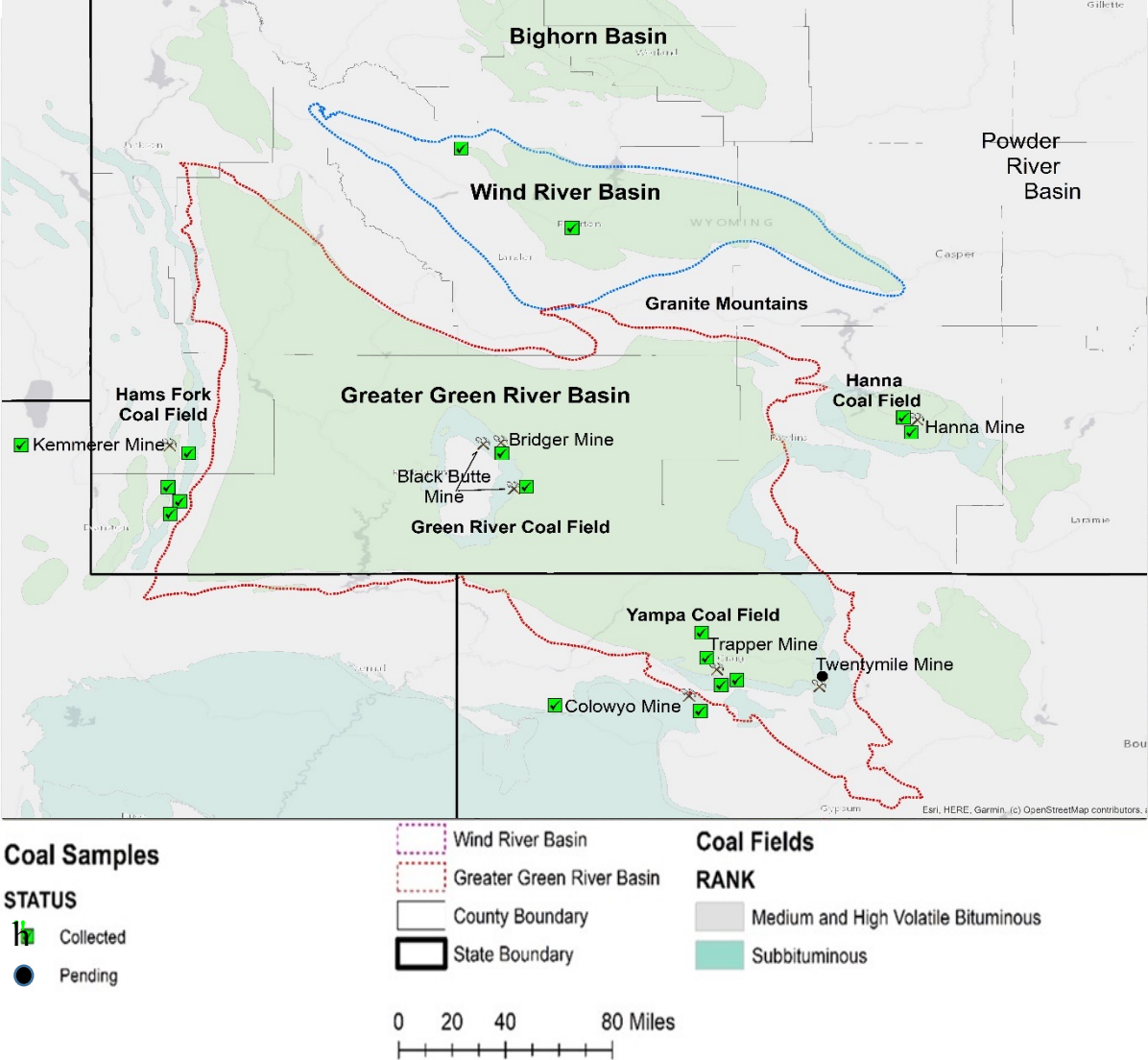
Western Wyoming (Kemmerer Mine & Haystack Mine)
Central Green River Basin (Black Butte & Bridger Mines)
Hannah Coal Field (retired)
Yampa Coal Field (Colowyo, Trapper & Twenty Mile Mines)
Atlantic Rim CBM and exploratory sites
Wind River Basin CBM and exploratory sites

Sample and Data Sources:

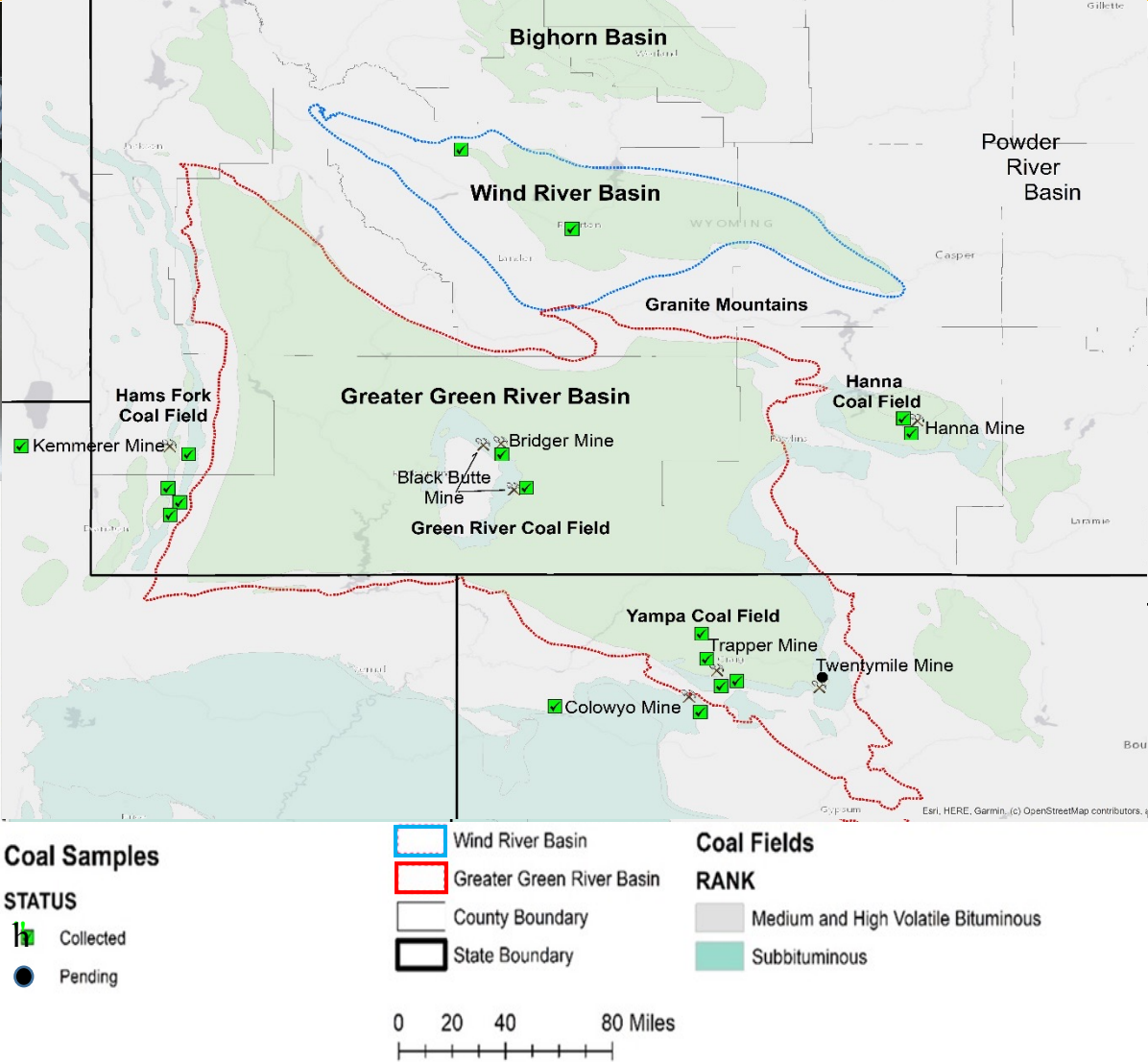
Mines
Outcrops (near and distant from mines)
USGS Core Research Center (Lakewood, CO)
USGS COALQUAL Database
Other Legacy data (State surveys, academic/professional papers, etc.)



Resource Assessment of Coal Sediments

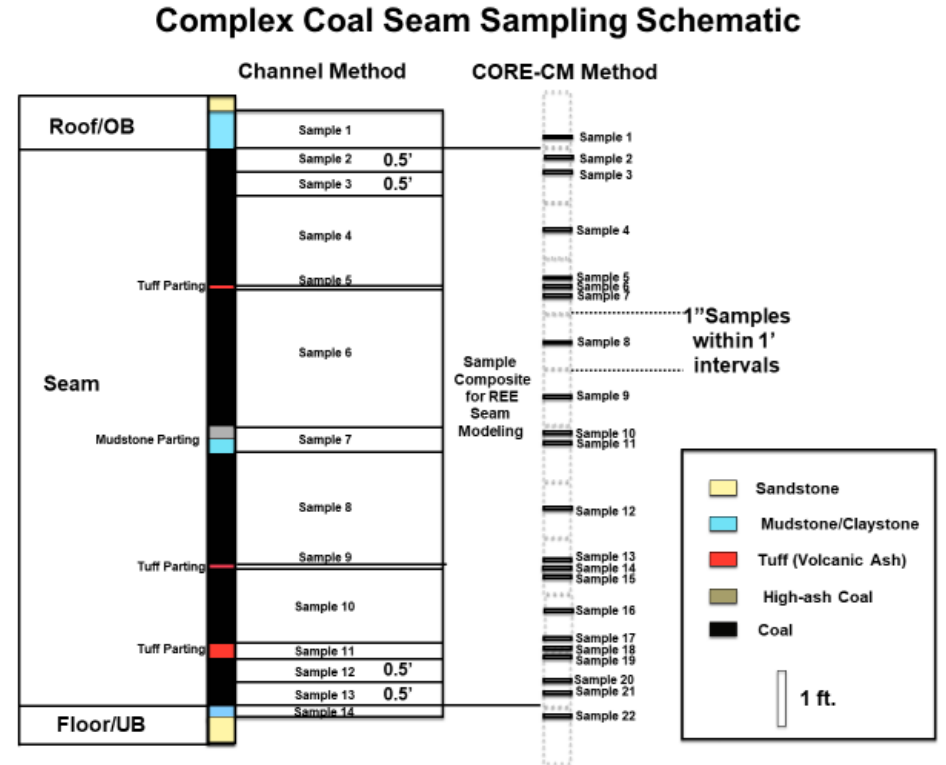


Resource Assessment of Coal Sediments



Resource Assessment of Coal Sediments

- **Preliminary work identifies:** > 450 samples collected and analyzed
- Spatial/Geochemical relationships with bounding rocks
 - Clays, ash beds (tonsteins), shales, etc.
- Mineralogical relationships
 - Formed with coal ?
 - Formed from subsurface fluid/leaching movement ?
 - Associated clay minerals ?



Montross, S.N.; Bagdonas, D.; Paronish, T.; Bean, A.; Gordon, A.; Creason, C.G.; Thomas, B.; Phillips, E.; Britton, J.; Quillian, S.; Rose, K. On a Unified Core Characterization Methodology to Support the Systematic Assessment of Rare Earth Elements and Critical Minerals Bearing Unconventional Carbon Ores and Sedimentary Strata. *Minerals* 2022, 12, 1159. <https://doi.org/10.3390/min12091159>

Resource Assessment of Coal Ash, Refuse, AMD, and Other basin materials

- Current areas of interest

- Fly ash, Bottom ash
- Mudstone, Claystone, Sandstone
- Volcanic ash / tuff assoc. w/ coal
- Trona / Halite

- Legacy Data / Samples

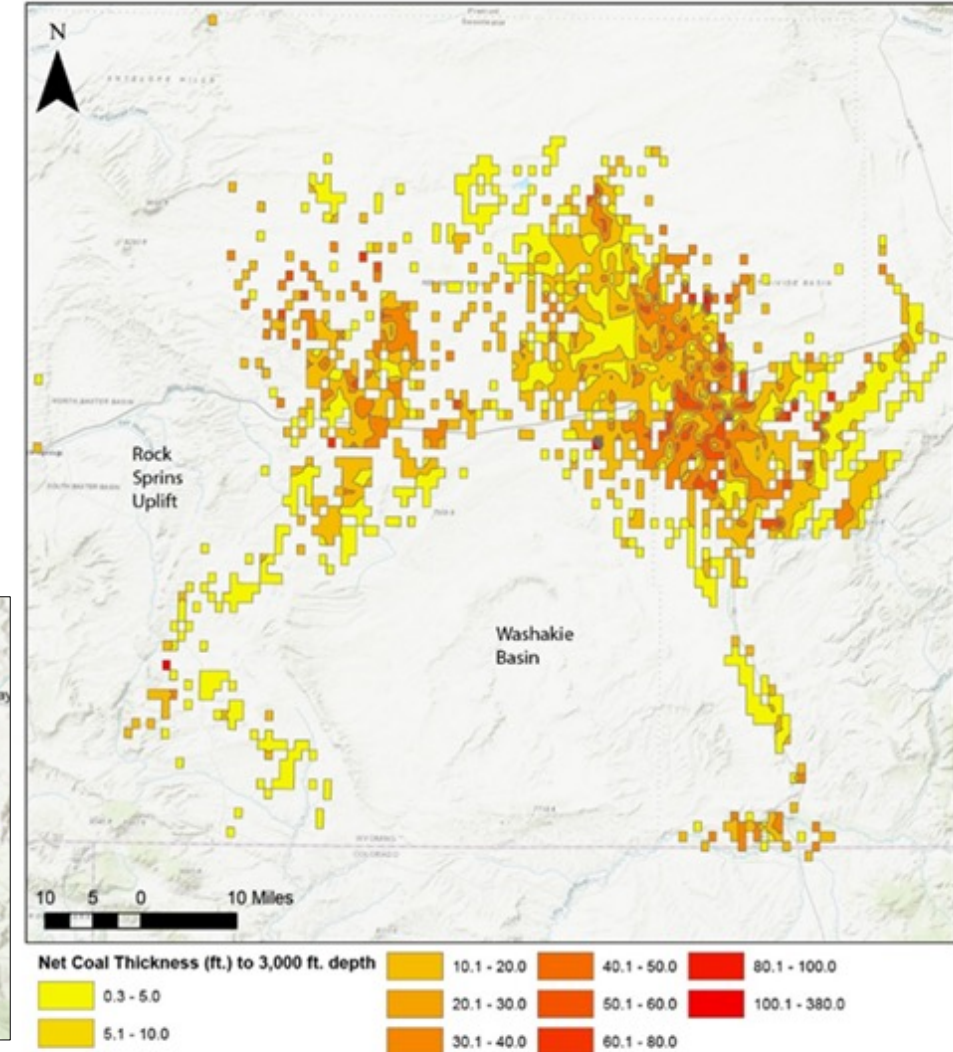
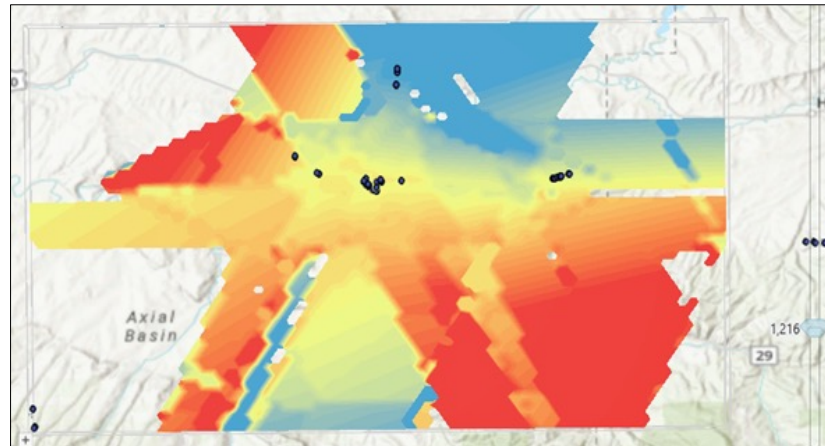
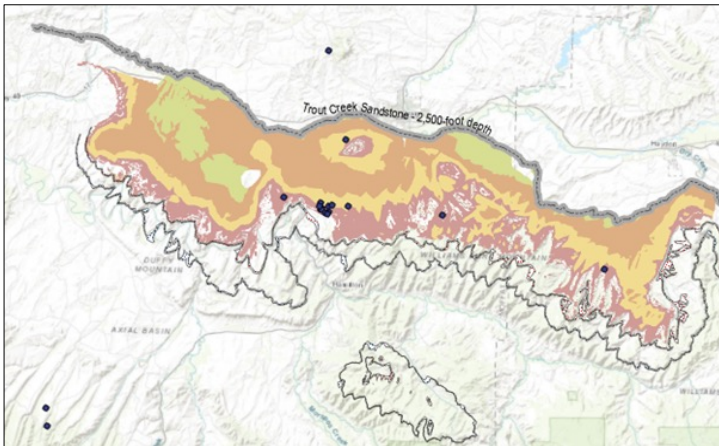
- Paleoplacers & other Sedimentary rocks
- Igneous & Metamorphic rocks (misc.)
 - Intrusives
 - Pegmatites



Geologic Model Development for Coal Sediments

Develop a CORE-CM specific geologic model to show the basin's large-scale stratigraphy

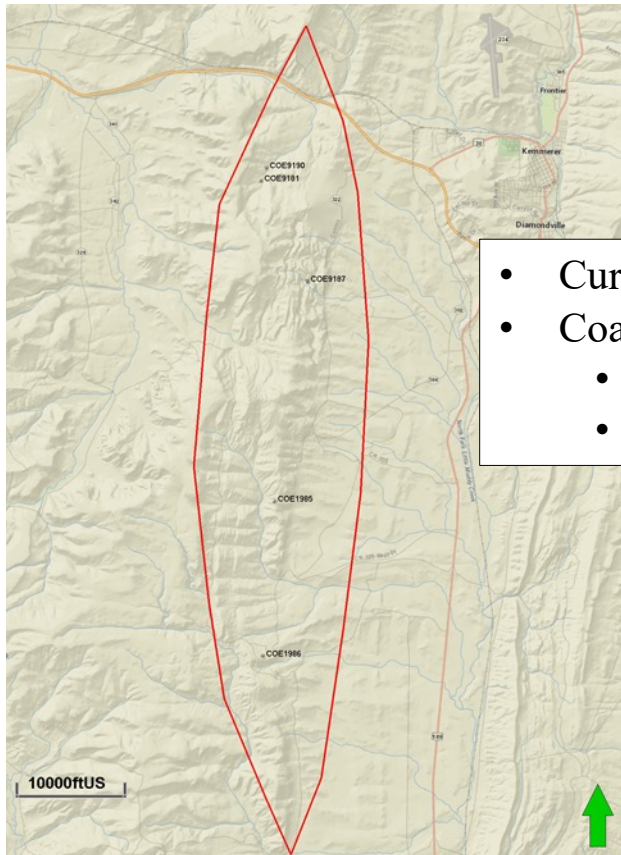
- ArcGIS based models are complete for the Greater Green River Basin and Yampa Coal Fields
 - Testing geochemical data in these models is ongoing
- Statistically based modeling, dependent on geophysical log data was initiated and developed for the Kemmerer region



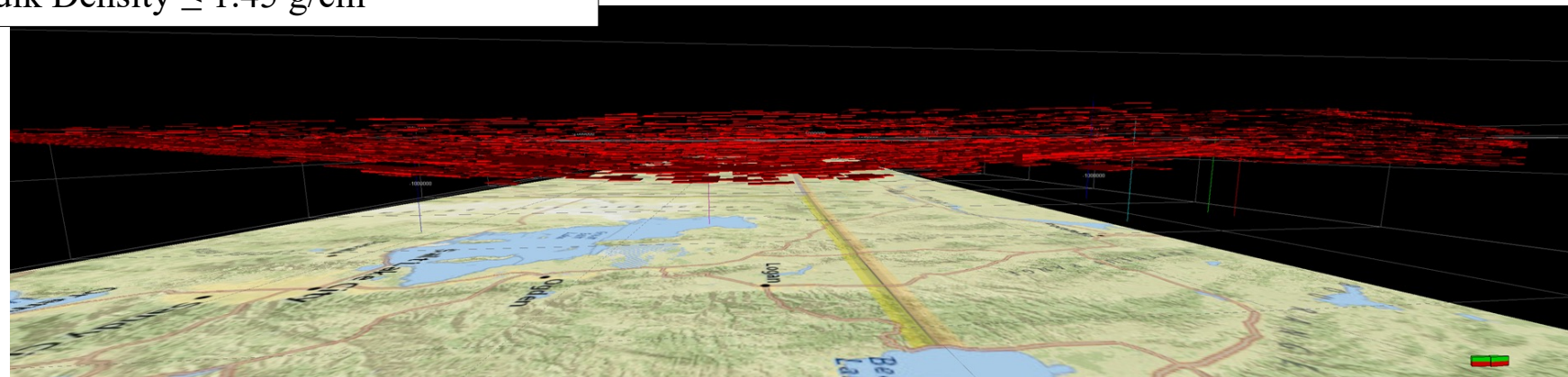
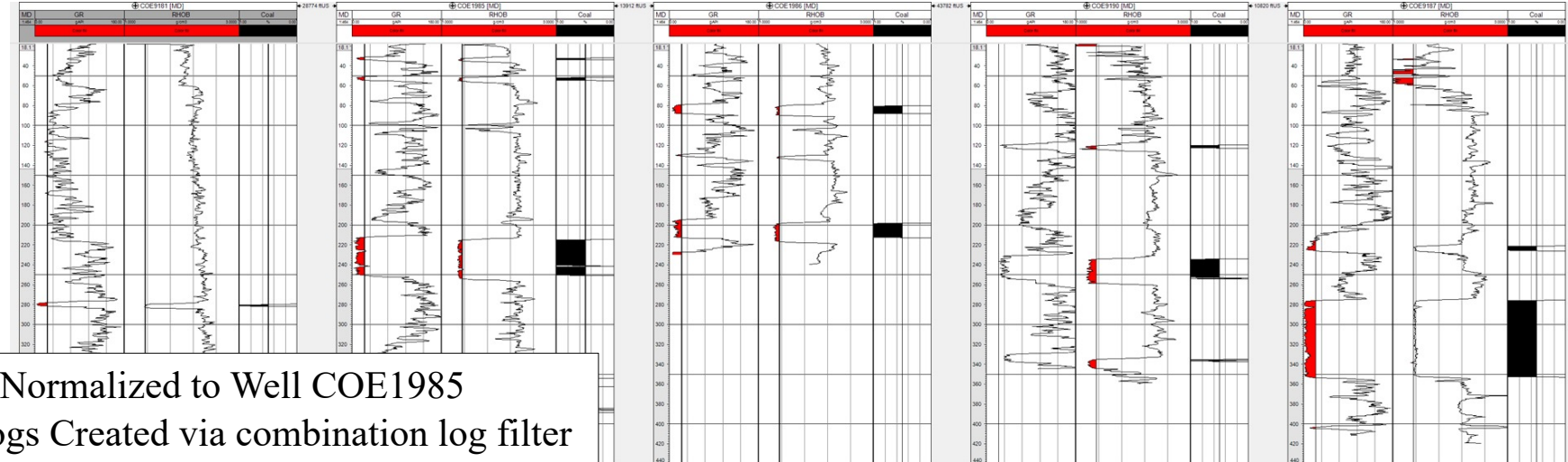
Geologic Model Development for Coal Sediments

Kemmerer Region

- Statistically based modeling

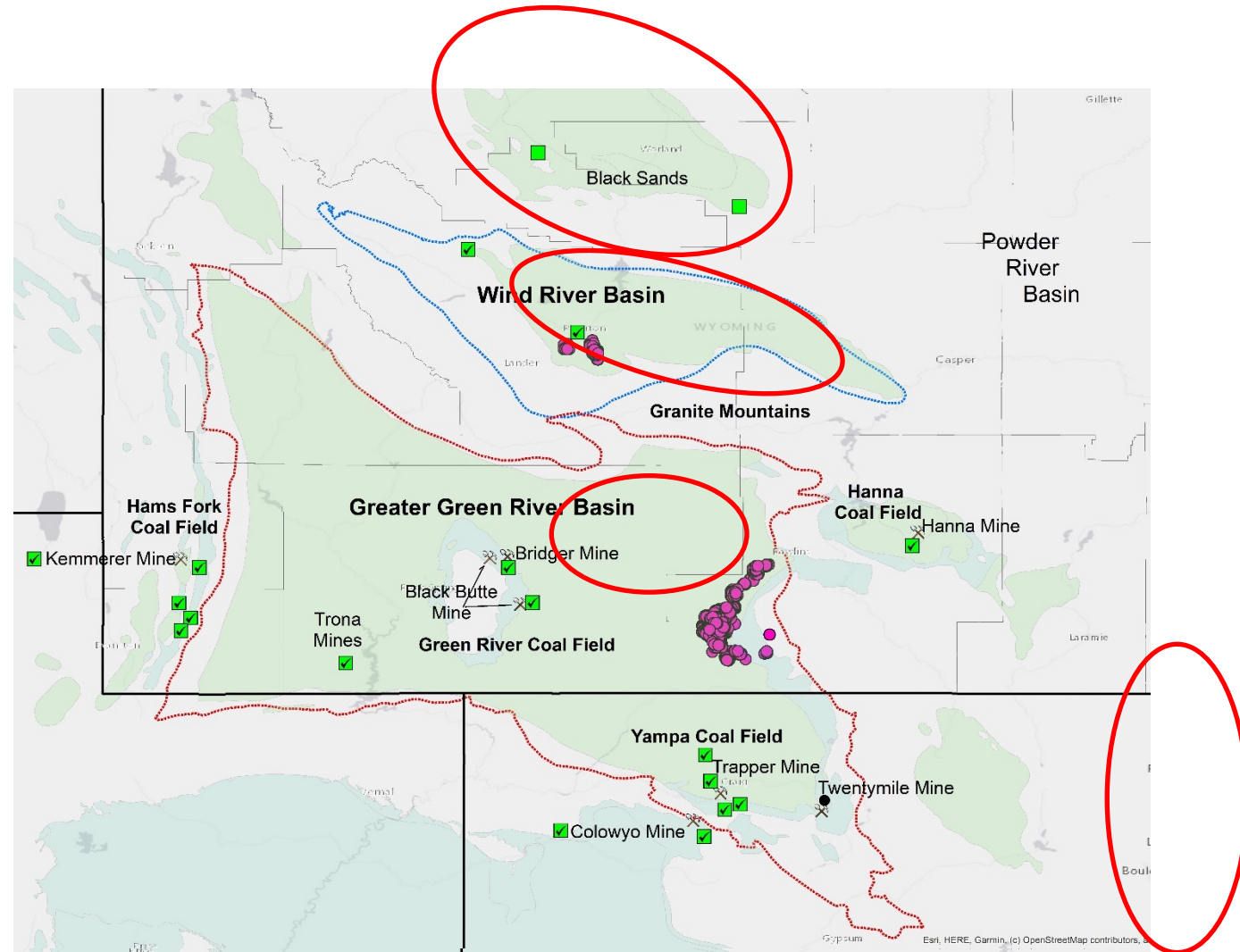


- Curves Normalized to Well COE1985
- Coal Logs Created via combination log filter
 - $\text{Gamma Ray} \leq 30 \text{ GAPI}$
 - $\text{Bulk Density} \leq 1.45 \text{ g/cm}^3$



Resource Gap Analysis and Future Characterization Plan

- **Current Gaps:**
 - **CBM fields**
 - Nearly 800 wells drilled and logged (Atlantic Rim, WRB)
 - Evaluating availability of core samples
 - **Coals not within mines**
 - Denver Basin
 - Wind River Basin
 - Bighorn Basin
 - Great Divide Basin
 - **Outcrops Throughout Study Area**



Future Characterization Plan (→ Fill as many gaps as possible)

- **Additional samples from all coal mines**

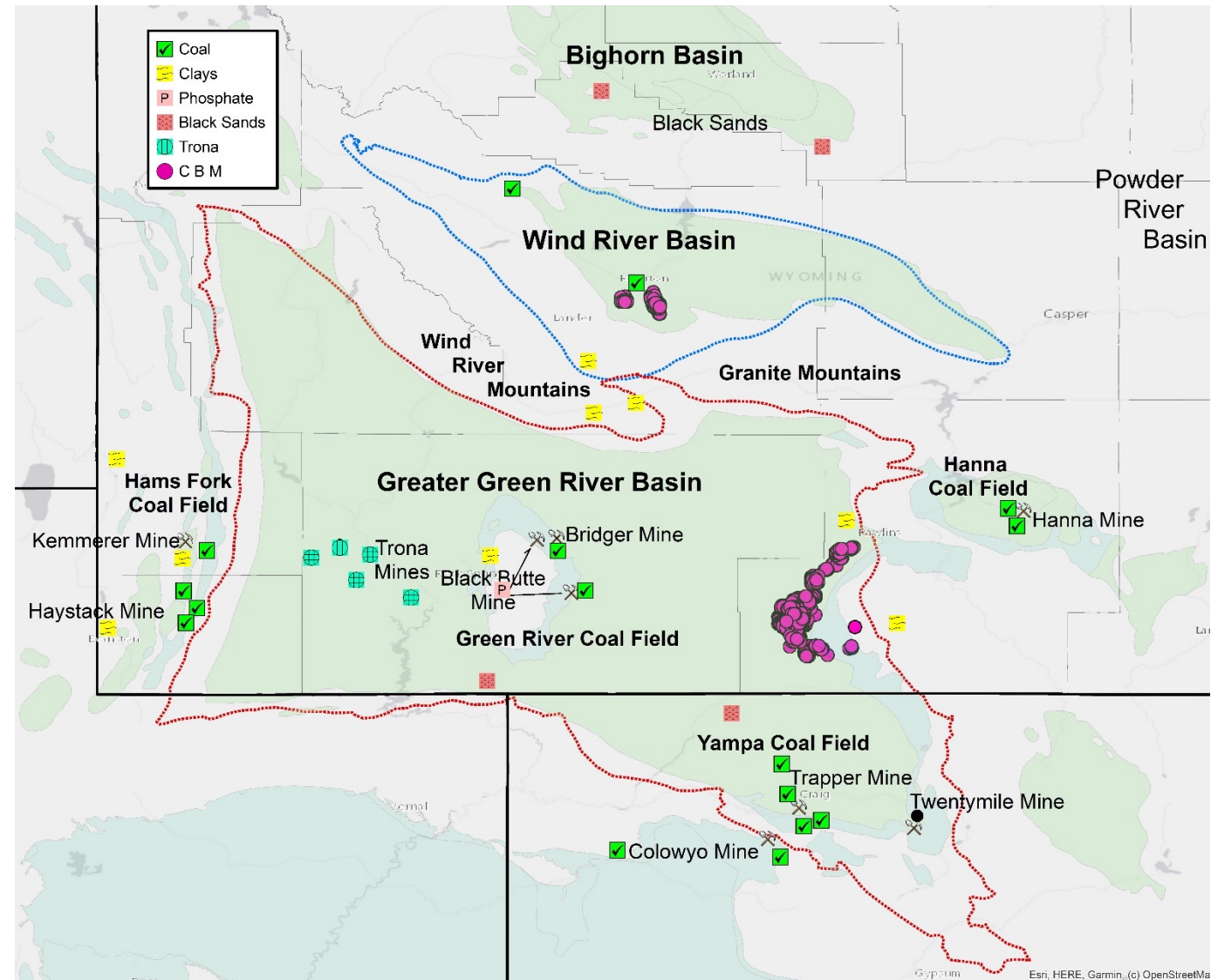
- Especially from new, more distal X-Y-Z
 - Coal core
- Wireline logs from core holes
- Proximal analysis of individual seams

- **Non-coal materials**

- Clay deposits (Li and REE)
- Phosphates
- Trona & other evaporites
- Hard rock mines & tailings
- Black sands
- Produced water

- **Modeling Needs:**

- Mine-scale data
- Integration of Mine & CORE-CM data



Thank You!



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To be added to stakeholder updates:

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