Photo by Dr. Sai Wang

State of the State: New Mexico

CUSP-RELATED PROJECTS

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Petroleum Recovery Research Center

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CUSP-Related Projects

- **Detailed Geologic Models**
  - San Juan Basin
  - Delaware Basin – New Mexico & Texas
  - Moving onto other basins
- **CUSP-Data**
  - Provided the University of Utah with the San Juan Basin database for the database project
- **SCO2TPRO Data Inputs – Completed**
- **Focused Projects**
  - Escalante Power Plant – Completed
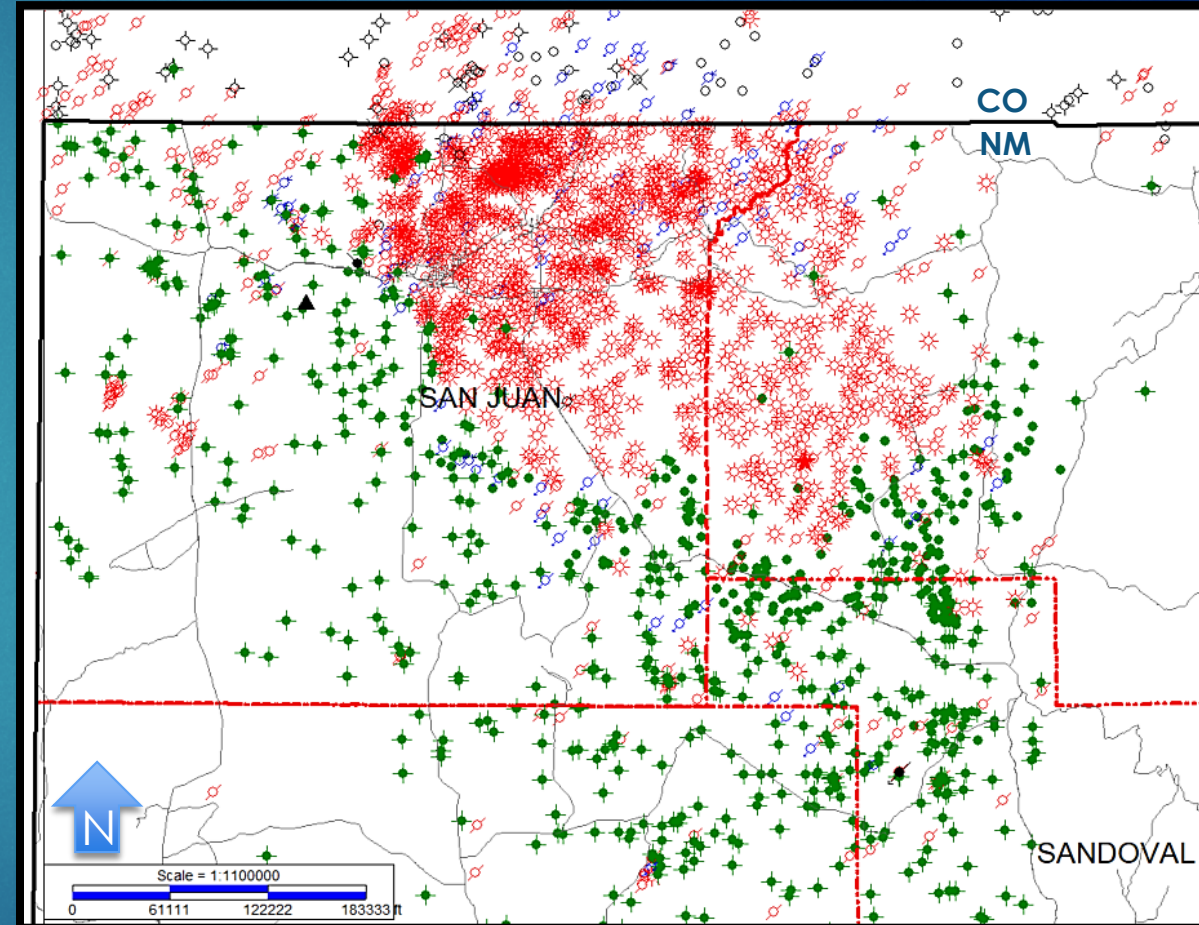 - Coal-Bed Methane CO_2 Sequestration – In progress
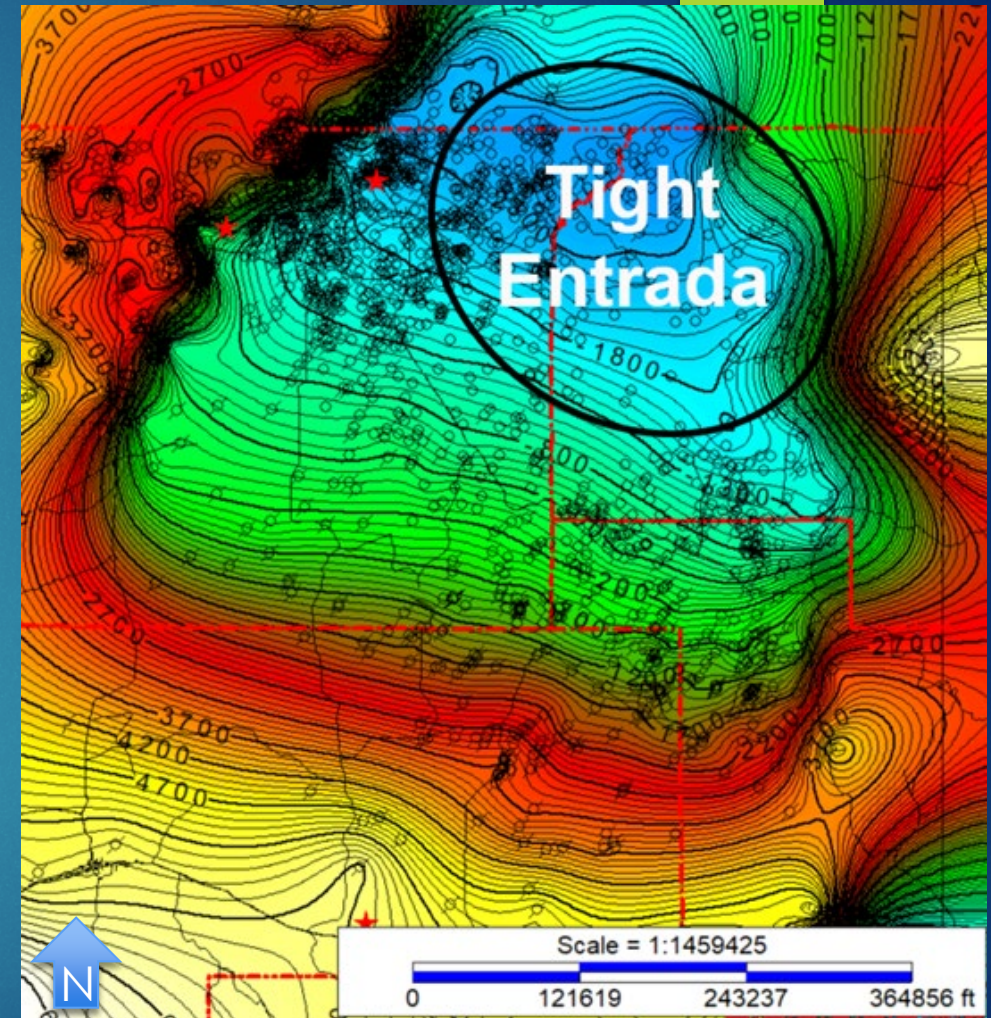
San Juan Basin structure map on the Entrada Sandstone
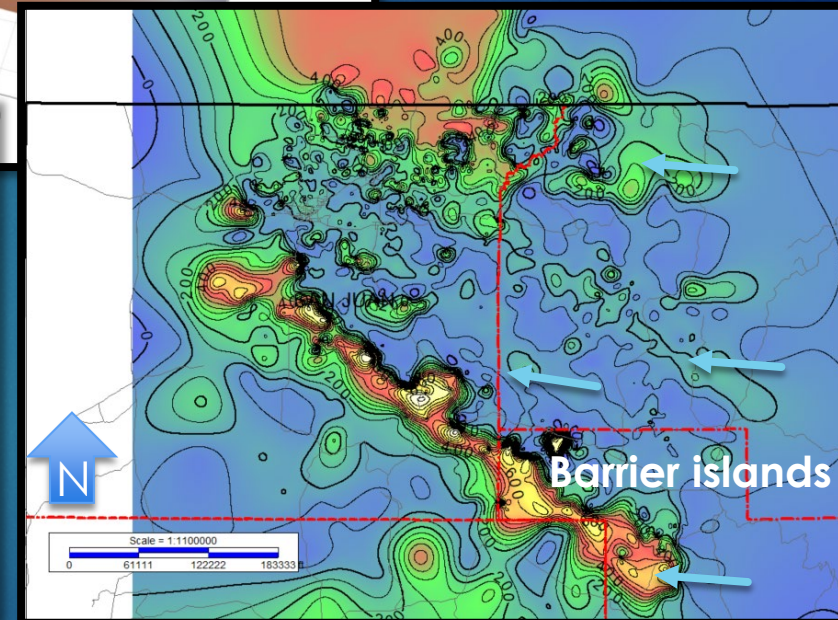
Detailed Geologic Models
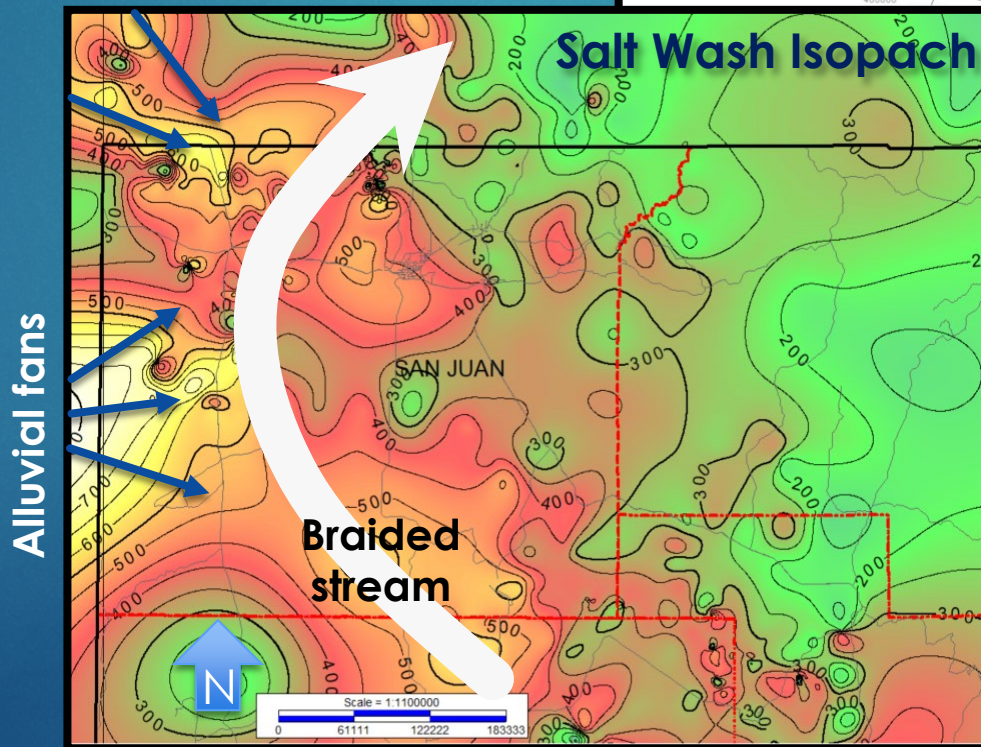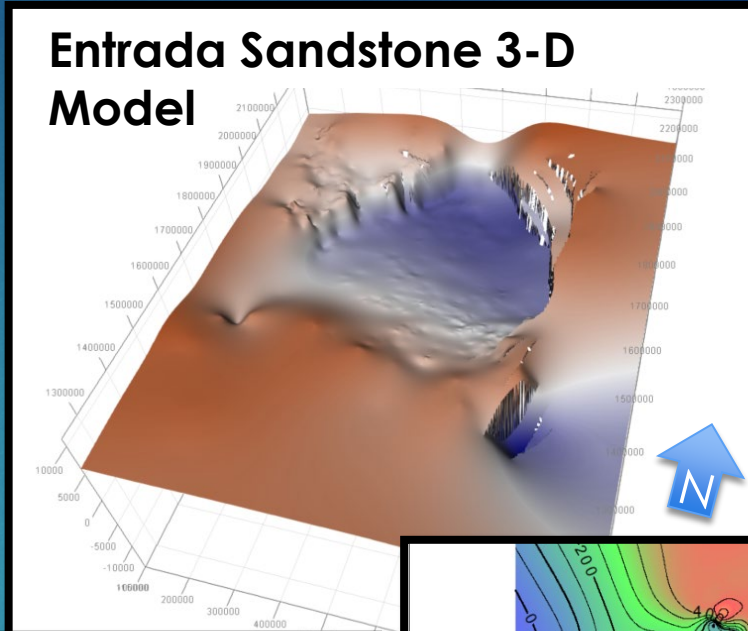
▶ **San Juan Basin**

- ▶ Precambrian to Eocene Formations

- ▶ Hand-picked tops concentrated on 2,405 wells that are deeper than the Mancos Shale

- ▶ Created surface grids with 100 – 1000 m spacing

- ▶ Have tied petrographic and core analyses of relevant wells back to potential reservoirs and seals to assess their potential for carbon storage

- ▶ Utilized the model to get the CarbonSAFE Strat Well drilled and multiple DOE projects funded (including CarbonSAFE wells)

Green – Oil
Red – Gas
Blue - SWD

Entrada Sandstone 3-D Model

Salt Wash Isopach

Cliff House Sandstone Isopach

Alluvial fans

Braided stream
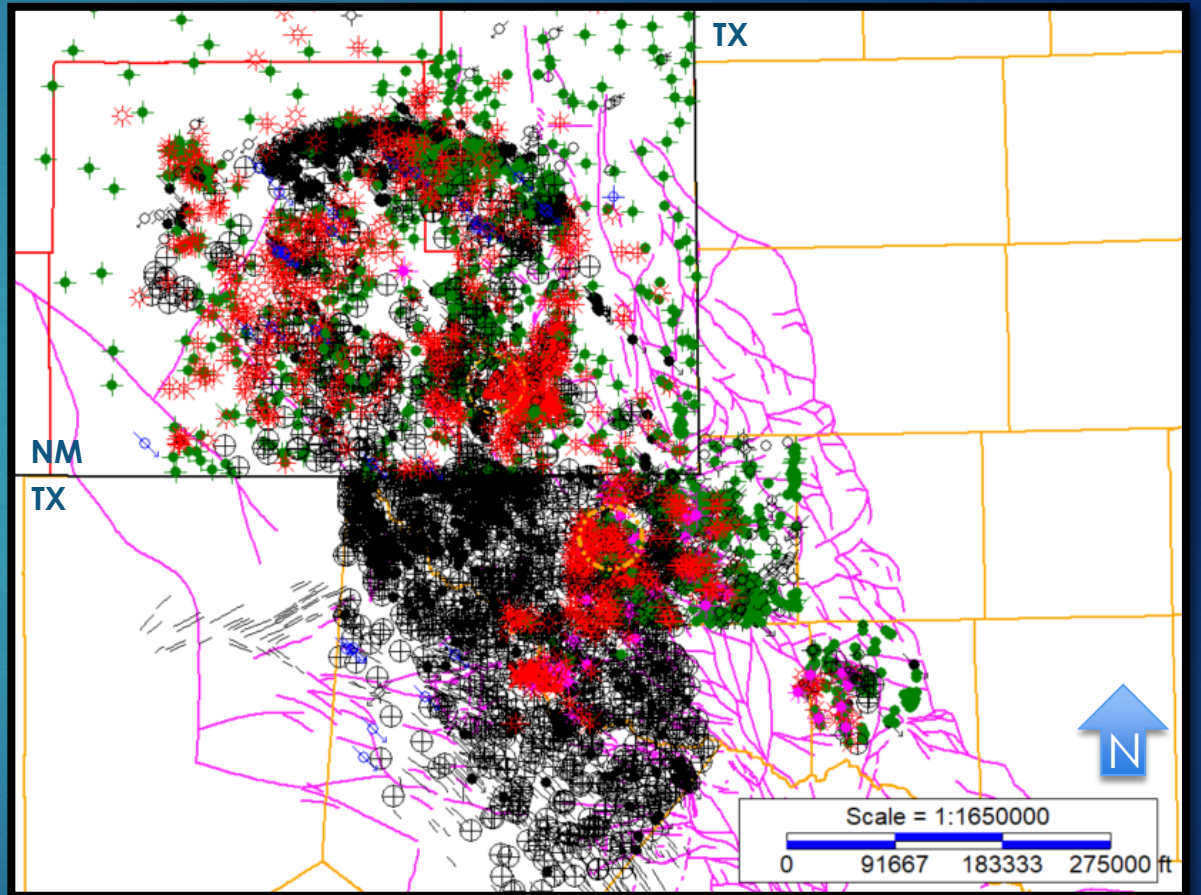
Barrier islands

- **Besides depth and thickness, the model provides:**
  - 3-D basin configuration thru time
  - Information on depositional environments and sediment sources and basin fluid movement

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Detailed Geologic Models

▶ **San Juan Basin**

▶ **Delaware Basin**

  ▶ Handpicked tops for the Precambrian to Permian Formations in 1591 wells

  ▶ Tied core data to the area

  ▶ Created surface grids with 100 – 1000 m spacing

 ▶ Utilized the Delaware Basin geo-model for DOE and industrial projects

Scale = 1:1650000

0   91667   183333   275000 ft

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The Delaware Basin geologic model provides:

- 2-D and 3-D grids and surfaces for all the formations
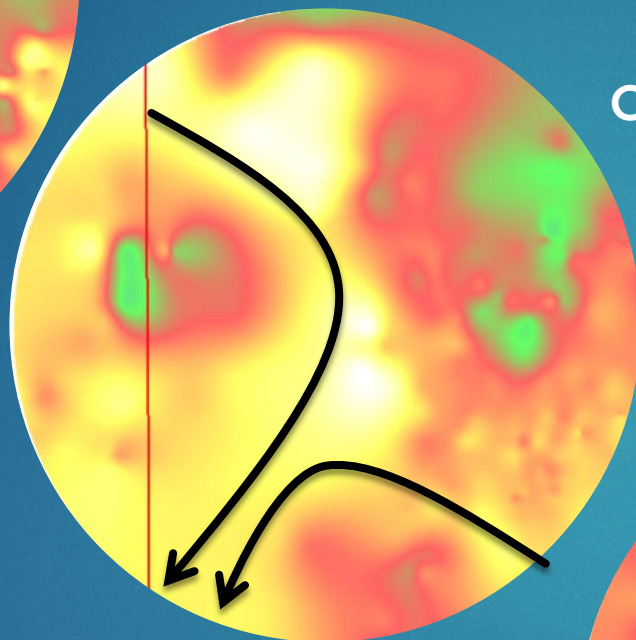
- Help develop fault models for the area

Silurio-Devonian subsea structure map (CI = 500')
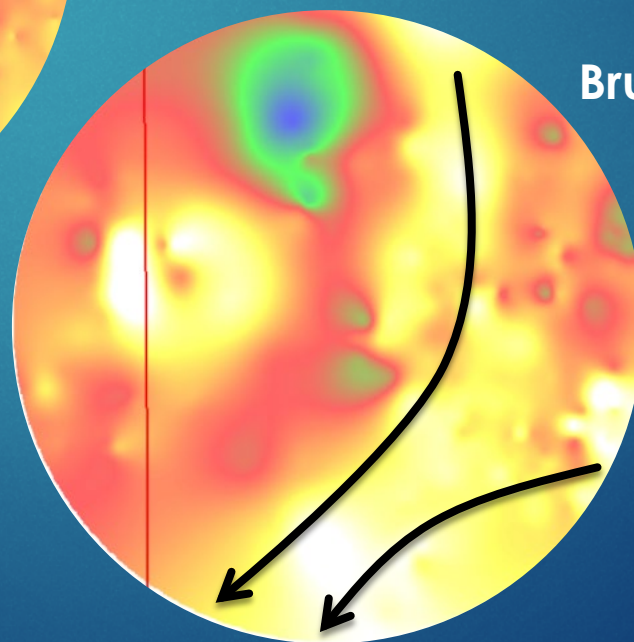
Faults from: Horne et al., 2021)
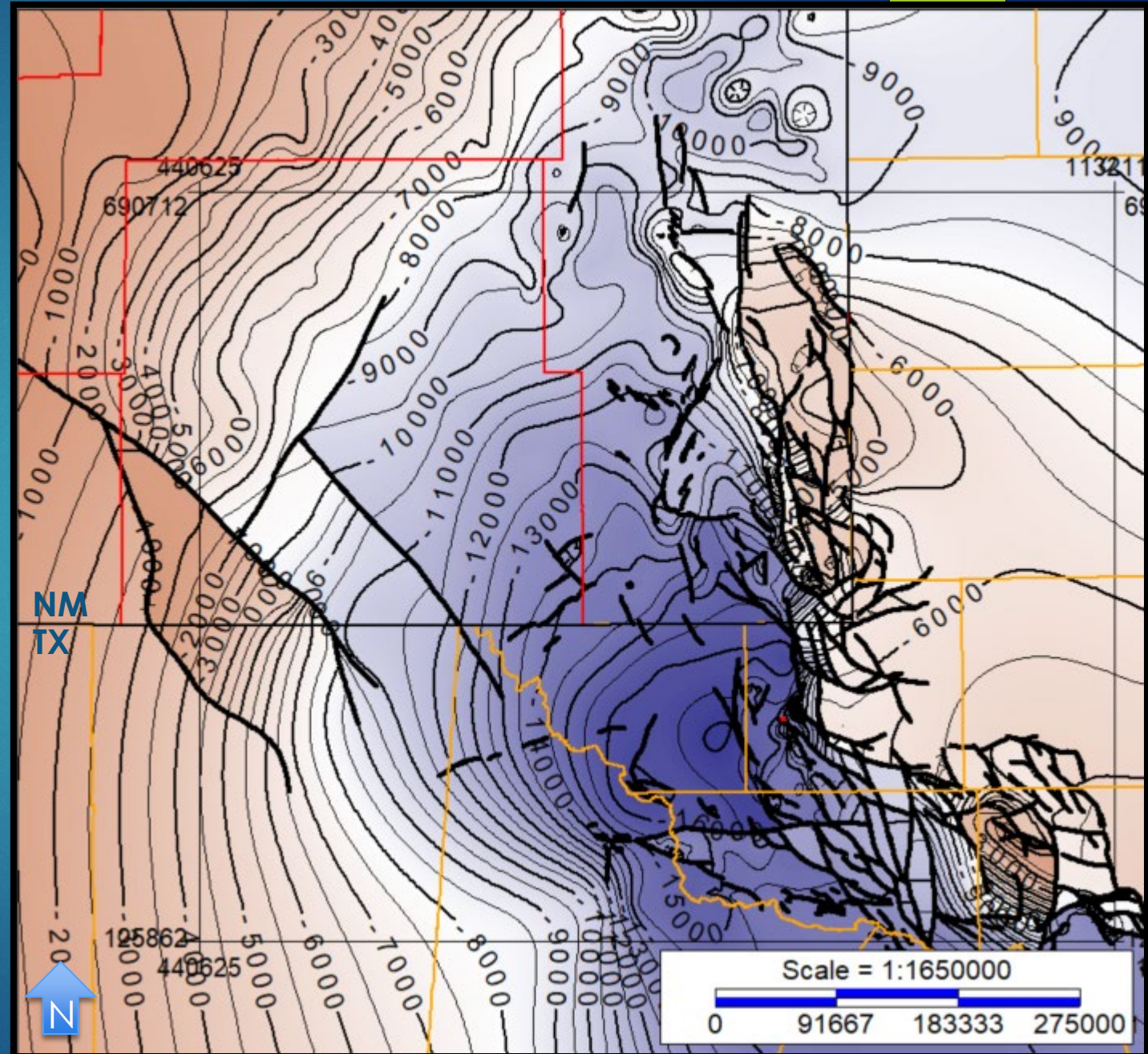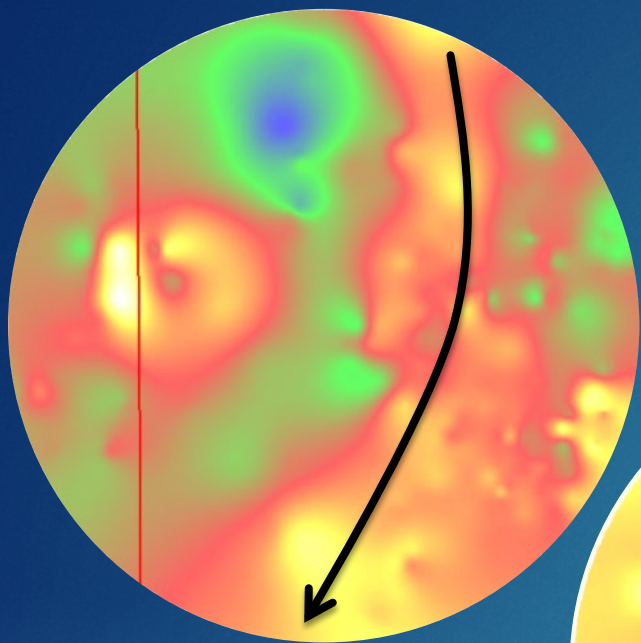
Bell Canyon Formation

Cherry Canyon Formation

**Brushy Canyon Formation**

Arrows mark channels and thicks

Thickness (ft)

> 1600
1568
1536
1504
1472
1444
1412
1380
1348
1320
1288
1256
1224
1196
1164
1132
1100
1068
1040
1008
976
944
916
884
852
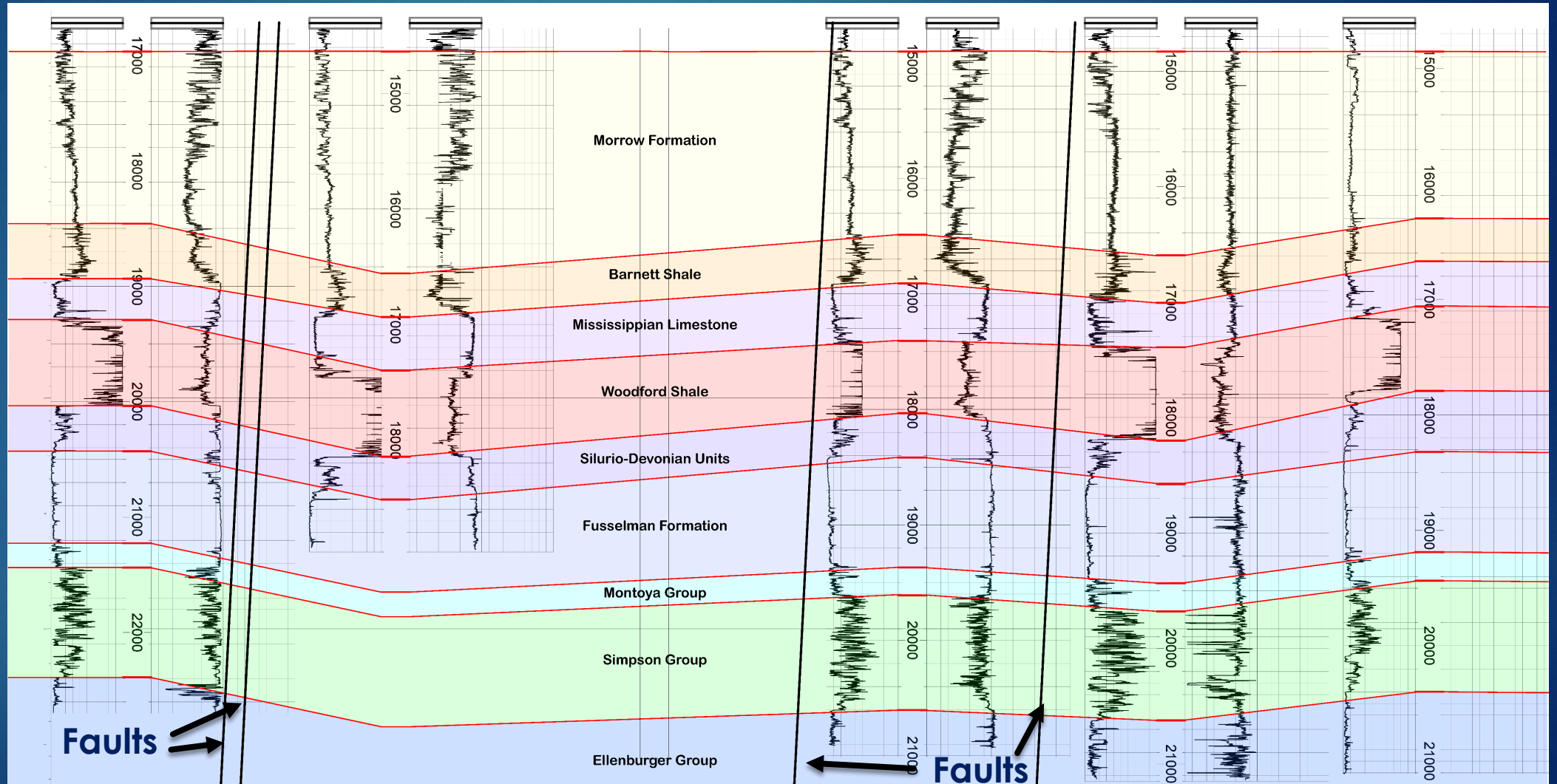800

Scale = 1:300000
0   16667   33333   50000 ft

▶ **Based on the geologic model, subsea structure and isopach maps are easily generated and can provide information on sedimentologic facies & site location**

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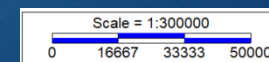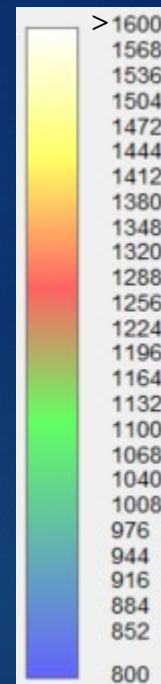
The construction of cross sections and the display of regional relationships is relatively simple

Focused Projects

▶ **Coal-Bed Methane CO_2 Sequestration**

  ▶ Collaborating with Lagos Operating, LLC in the Basin Fruitland Coal Field

▶ **Addresses the challenge of long-term CO_2 sequestration in coal:**

  ▶ Permeability and injectivity reduction near wellbore regions due to coal matrix swelling induced by CO_2 adsorption

▶ **This study strives to understand and mitigate the current limitations of CO_2 sequestration in coal seams**

  ▶ Measuring how different CO_2 phase properties limit/enhance adsorption effects for long term injection
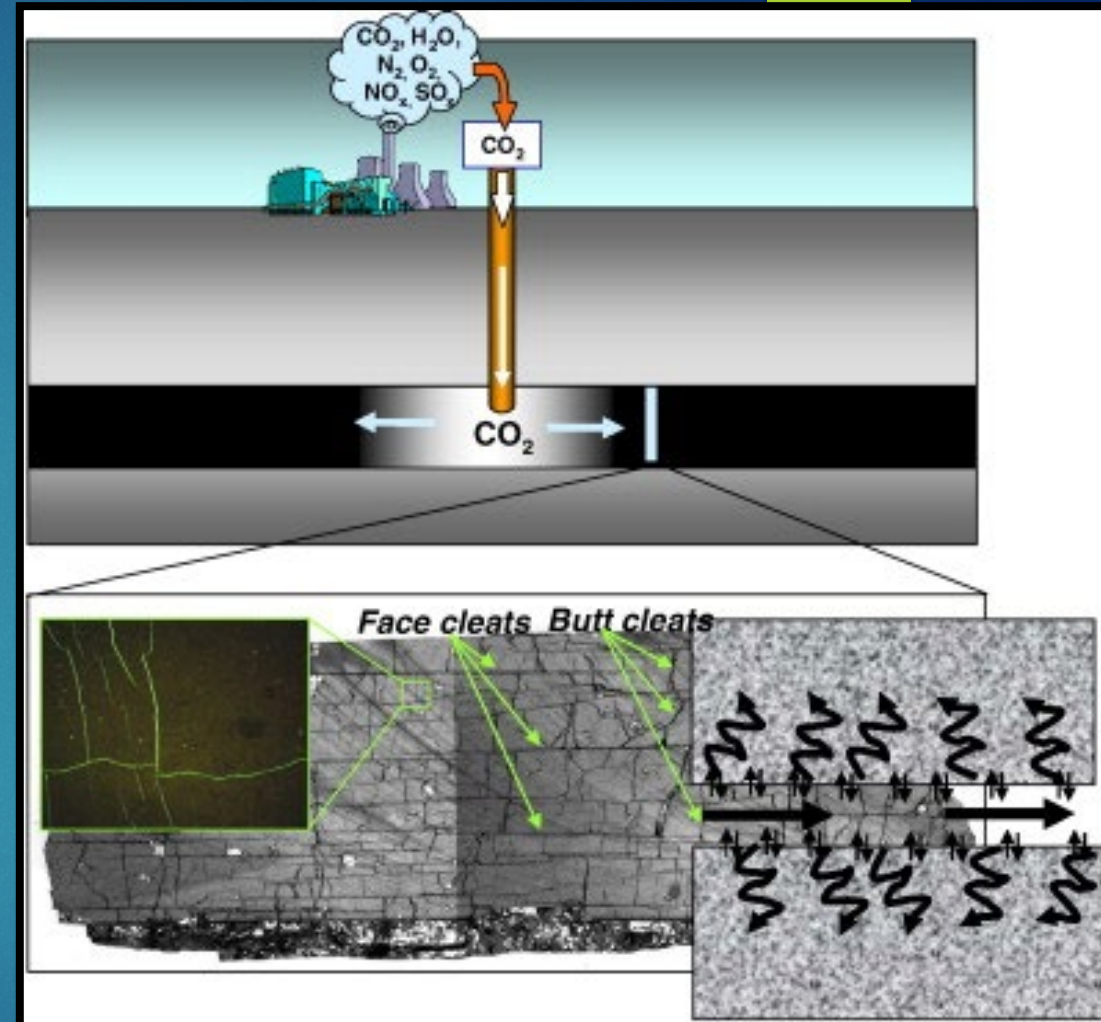
CO_2 injection in coal seams from Ozdemir, 2009

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General Methods

- **Laboratory flow-through experiments at in-situ conditions on Fruitland coal samples measure the permeability changes over time**

- **Samples will be tested using standard methods (Pulse decay and/or steady flow) during a series of N_2-CO_2-N_2 core floods**

- **Pre- and post-CO_2 flood permeability will be compared to quantify permeability changes due to adsorption and swelling**

- **Tests performed with liquid and supercritical CO_2 verify the effect of CO_2 physical properties on its adsorptive behavior**
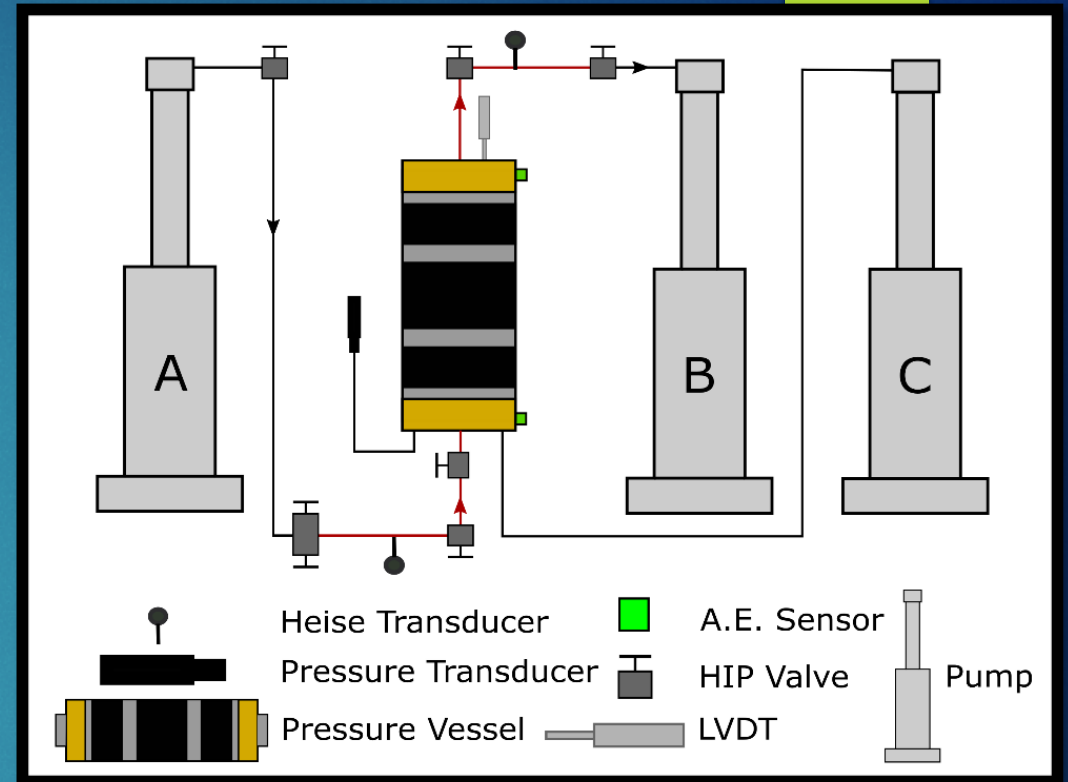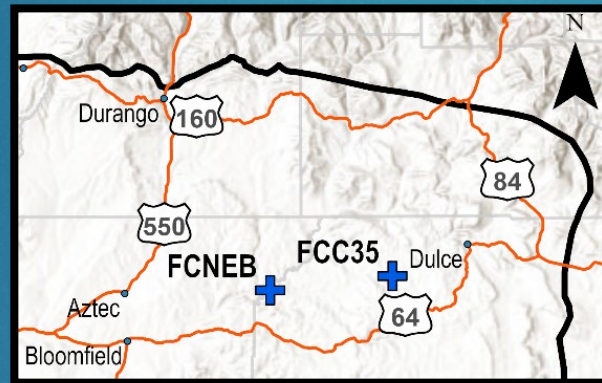

Experimental apparatus: Black lines represent flow lines with directional arrows. Red flow lines are the up- and downstream compartments which can be isolated from the pumps during pulse decay measurements
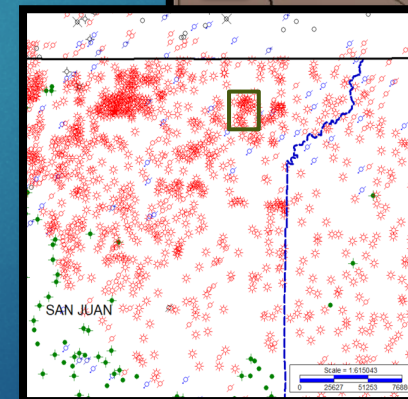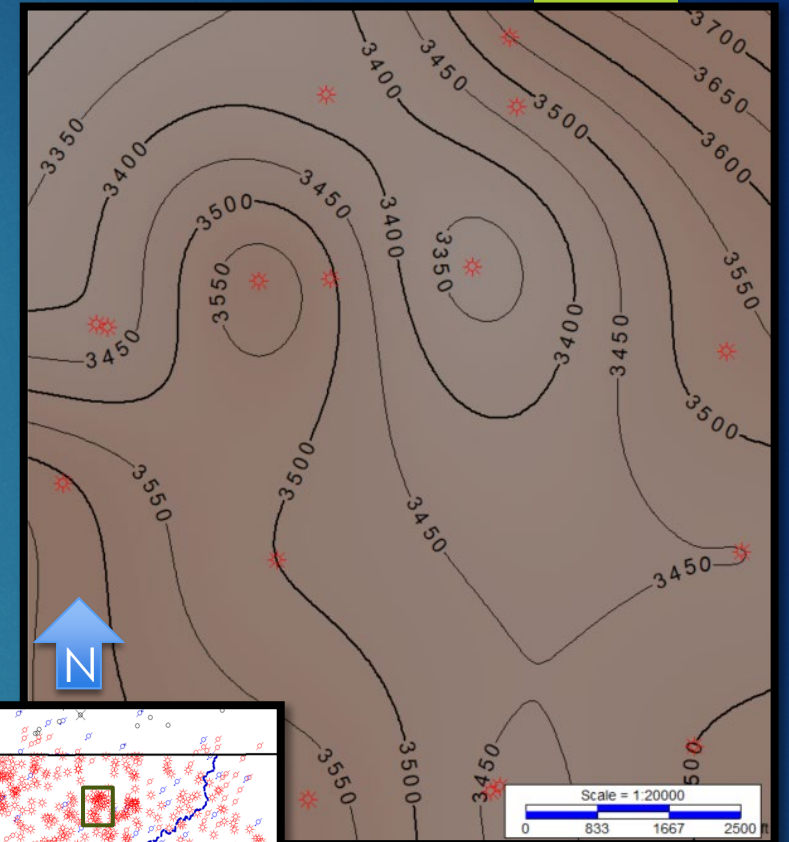
Sample Preparation

▶ **Two cores were selected:**

  ▶ Chicosa 35 (FCC35; 3739-3759 ft)

  ▶ NE Blanco (FCNEB; 3120-3122 ft)

▶ **Samples:**

  ▶ All sample preparation was completed dry to retain sample integrity

  ▶ 5 to 6 samples from each interval

  ▶ 1.5" x 2.5" coal cylinders with a heat shrink

  ▶ Trimmed with a Kemet Automatic Cutter 402 saw

Subsea Top of the Fruitland Coal

Thank You

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