

Natural Geologic Methane Emissions

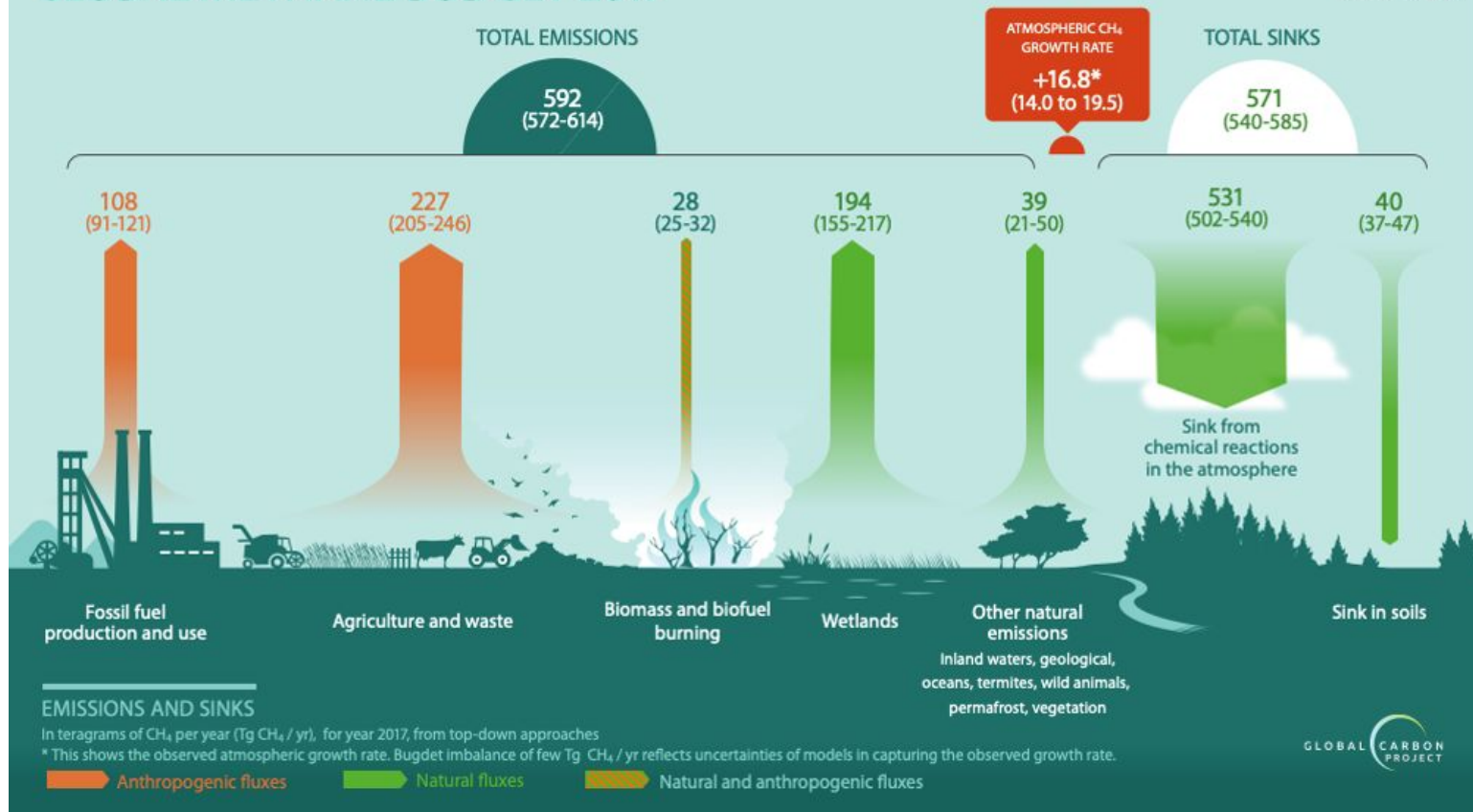
Presented by Katie Hall, Haoran Piao, and Thomas Weber



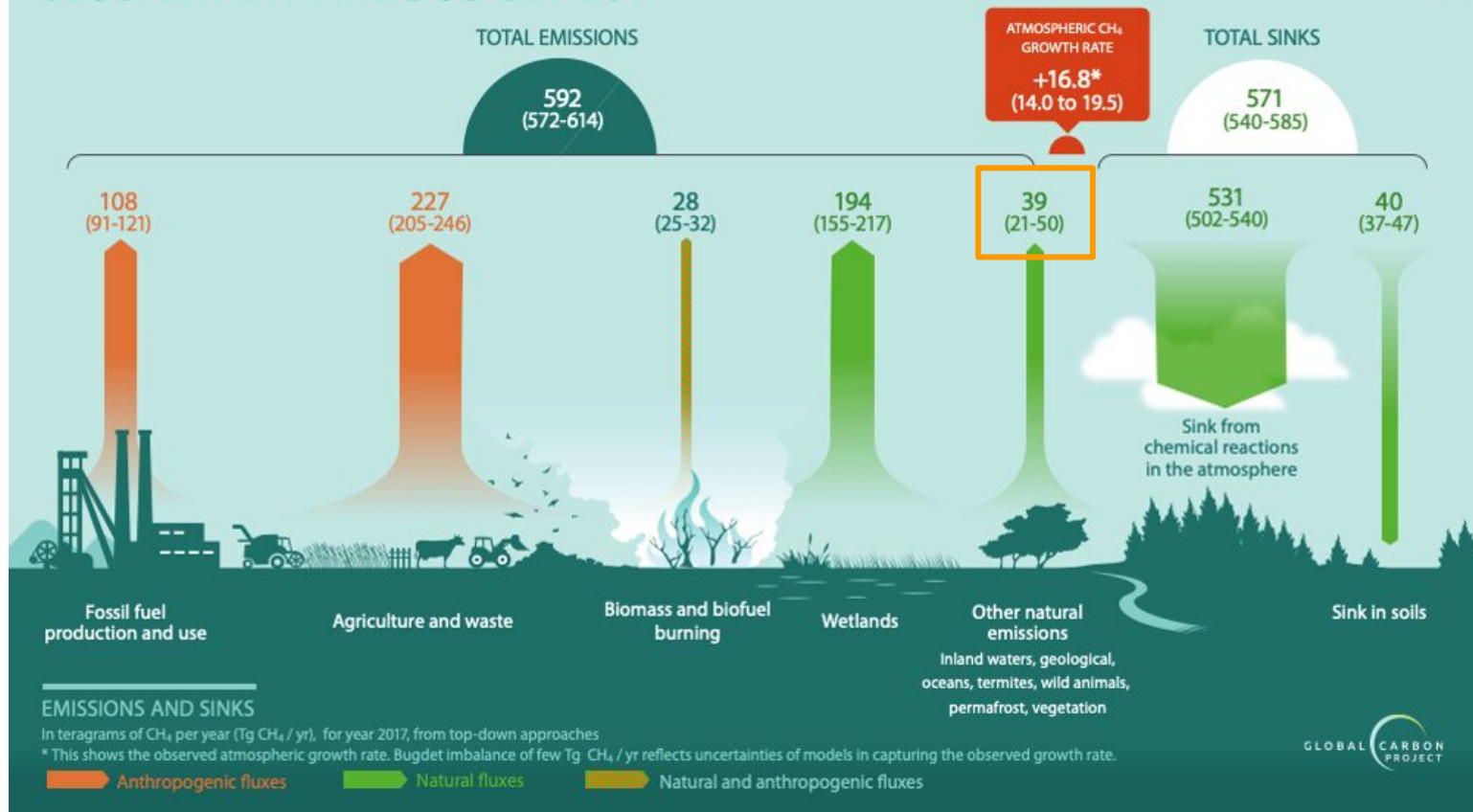
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GLOBAL METHANE BUDGET 2017



GLOBAL METHANE BUDGET 2017

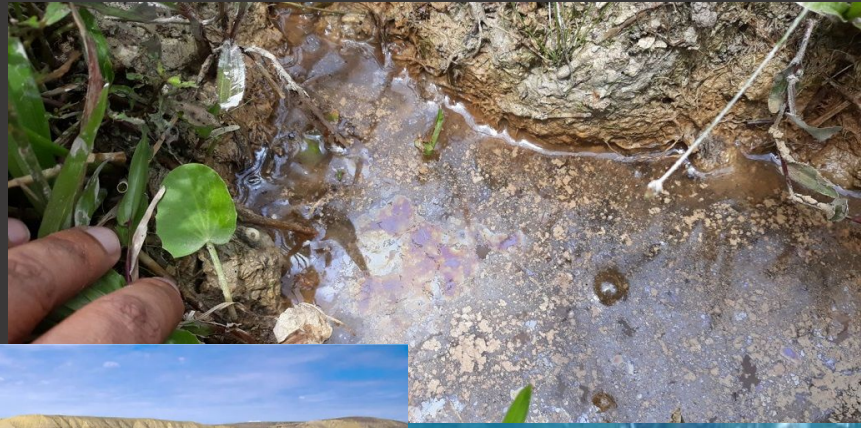


What are natural geologic methane emissions?

Defined as emissions of fossil methane (natural gas) from mud volcanoes, onshore and offshore gas and oil seeps, microseepage, volcanoes, and geothermal areas.

According to recent studies, **microseepage** is thought to be the largest natural source.

Microseepage is diffuse seepage of methane over large areas.



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Why do we care?

Understanding how much fossil methane is being emitted naturally can help quantify how much is being emitted by the fossil fuel industry.

This can guide emissions regulations and improve the understanding of the atmospheric methane budget.



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Motivation For This Study

To resolve discrepancies between
bottom-up and **top-down**
estimates of natural geologic methane emissions

The current estimate for natural geologic emissions is uncertain:

Bottom-Up estimates
extrapolated from ground
measurements range from
 $\approx 40-60 \text{ Tg CH}_4/\text{yr}$

(e.g., Etiope 2019)

VS

Top-Down estimate
from ^{14}C -methane measurements from
ice cores indicates

$0 - 6 \text{ Tg CH}_4/\text{yr}$

(Hmiel 2020)

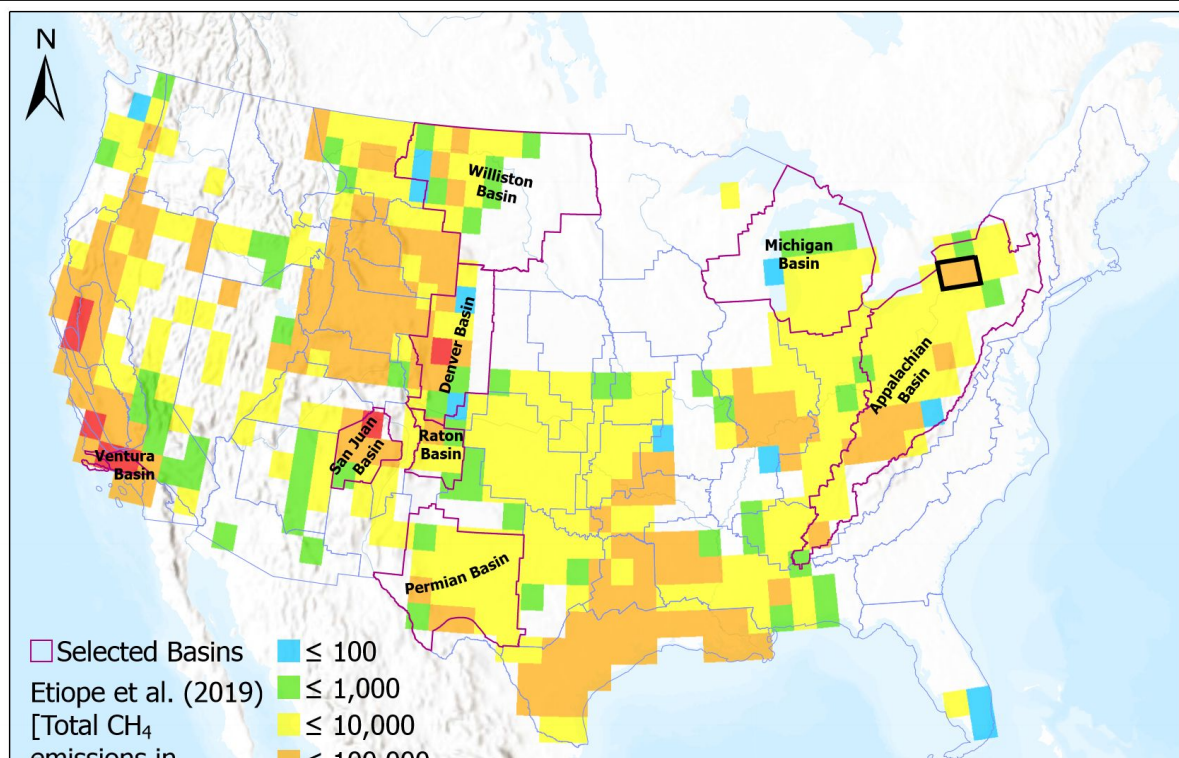
An order of magnitude difference!



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Goals



- Expand the number of methane flux measurements in the US to explore this discrepancy
- Sample basins with varying levels of seepage
- Get a representative picture of microseepage
- Appalachian, Michigan, San Juan, Raton, Denver-Juulesburg, Williston, Ventura basins



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Procedure



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Predictive Features

Known Seeps

Prior Soil Gas Measurements

Seismic Activity: Faults and Earthquakes


Shale Outcrops and Bedrock

Elevated Methane in Groundwater



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Sampled Basins

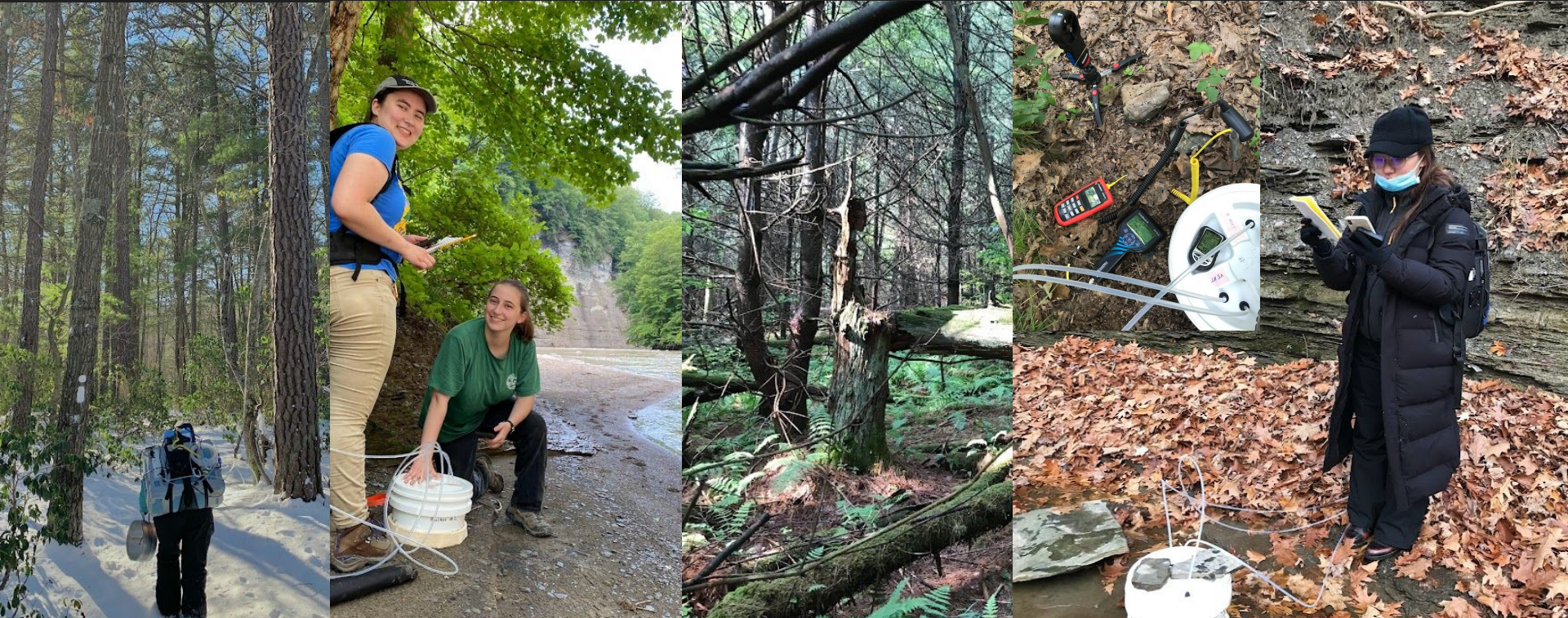
Summer 2021-Winter 2022



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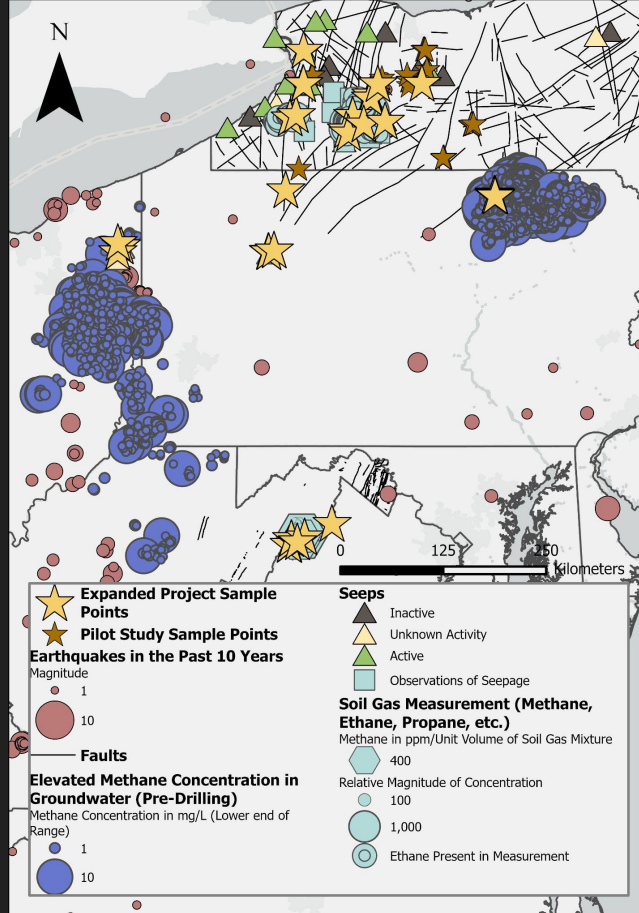
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Appalachian Basin



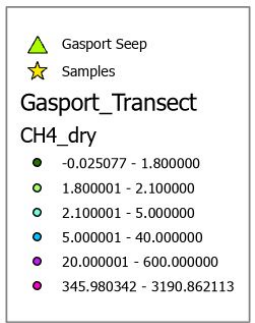
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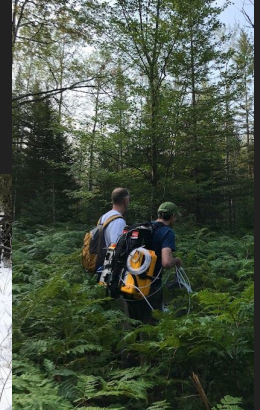
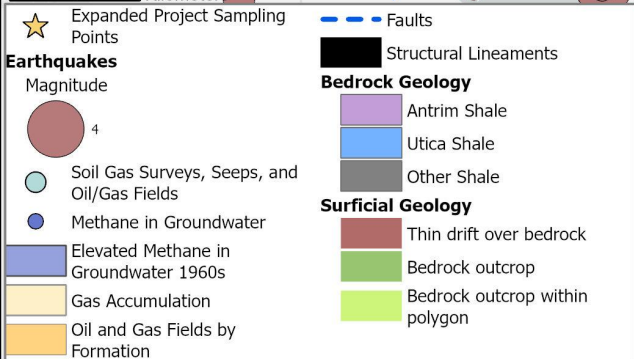
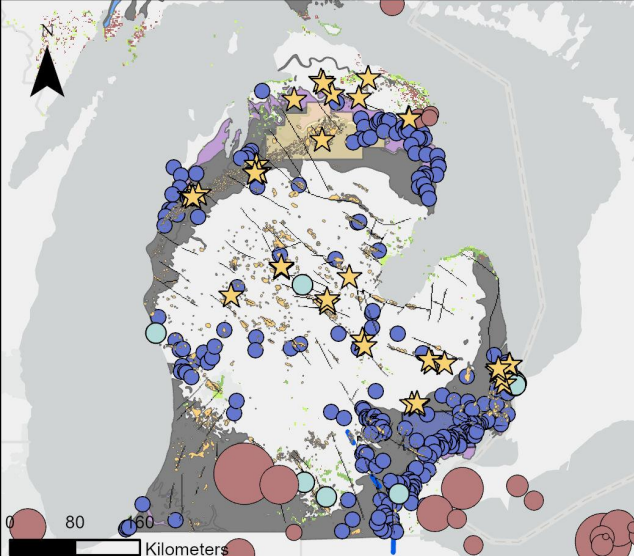
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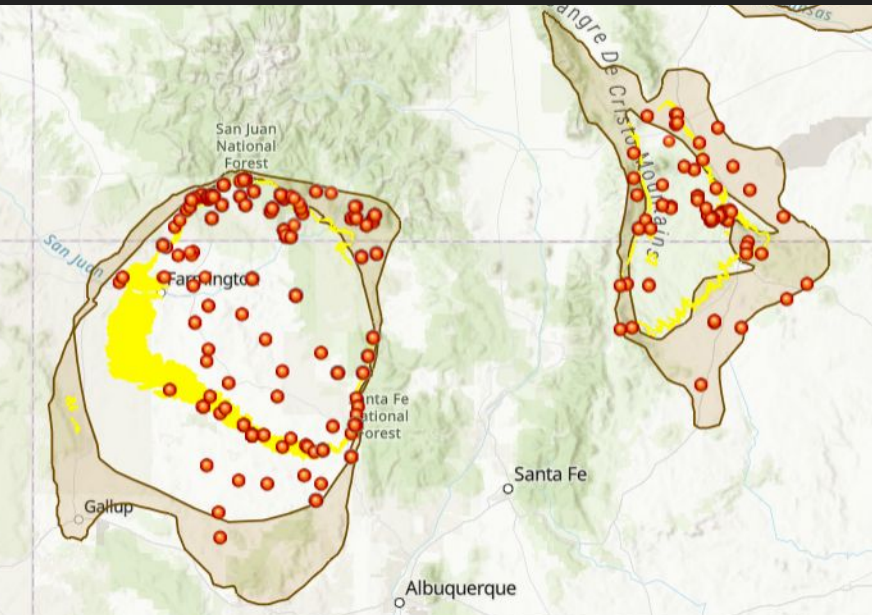
Michigan Basin



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San Juan and Raton Basins



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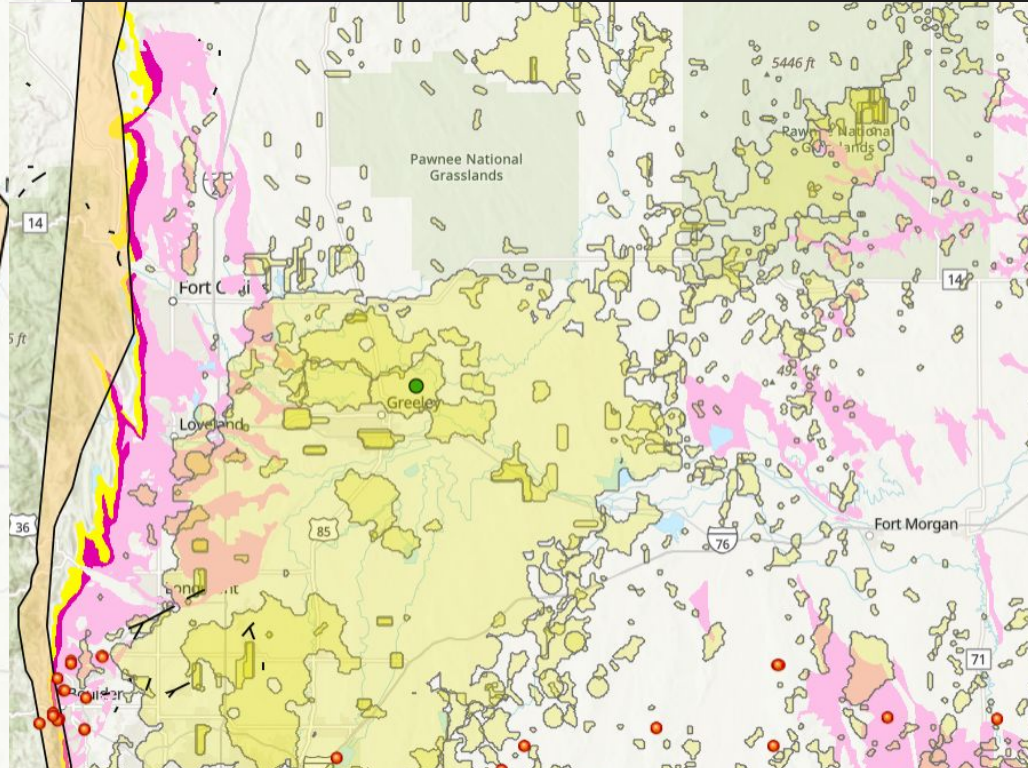
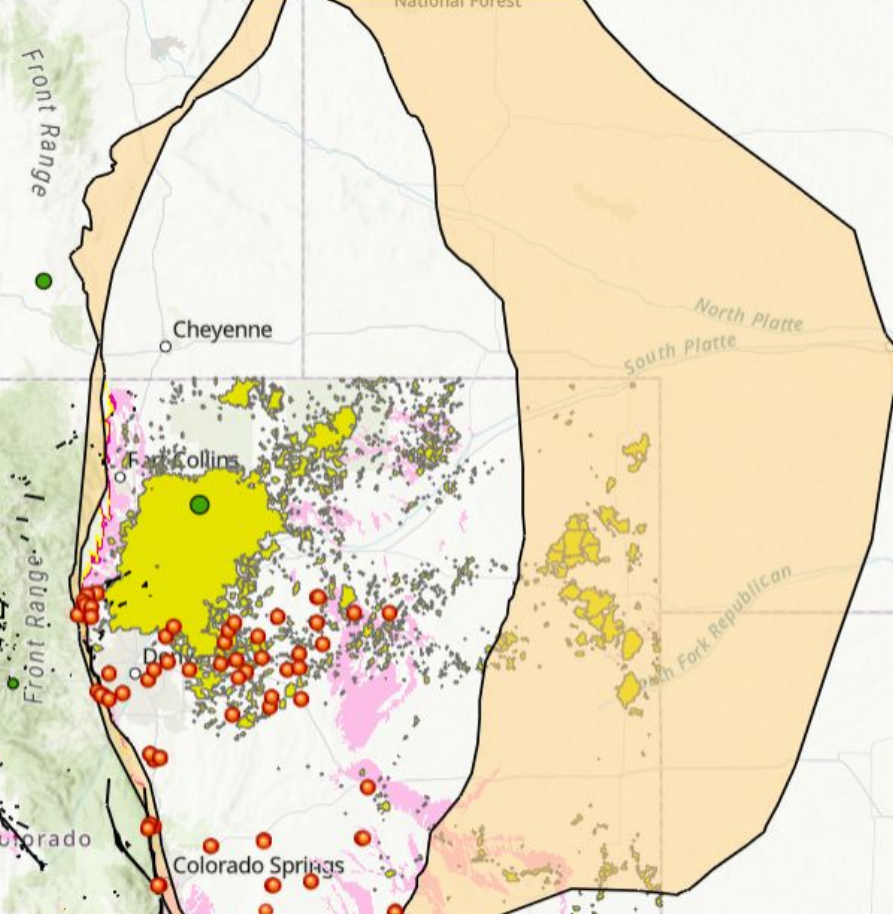
Denver-Julesburg Basin



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