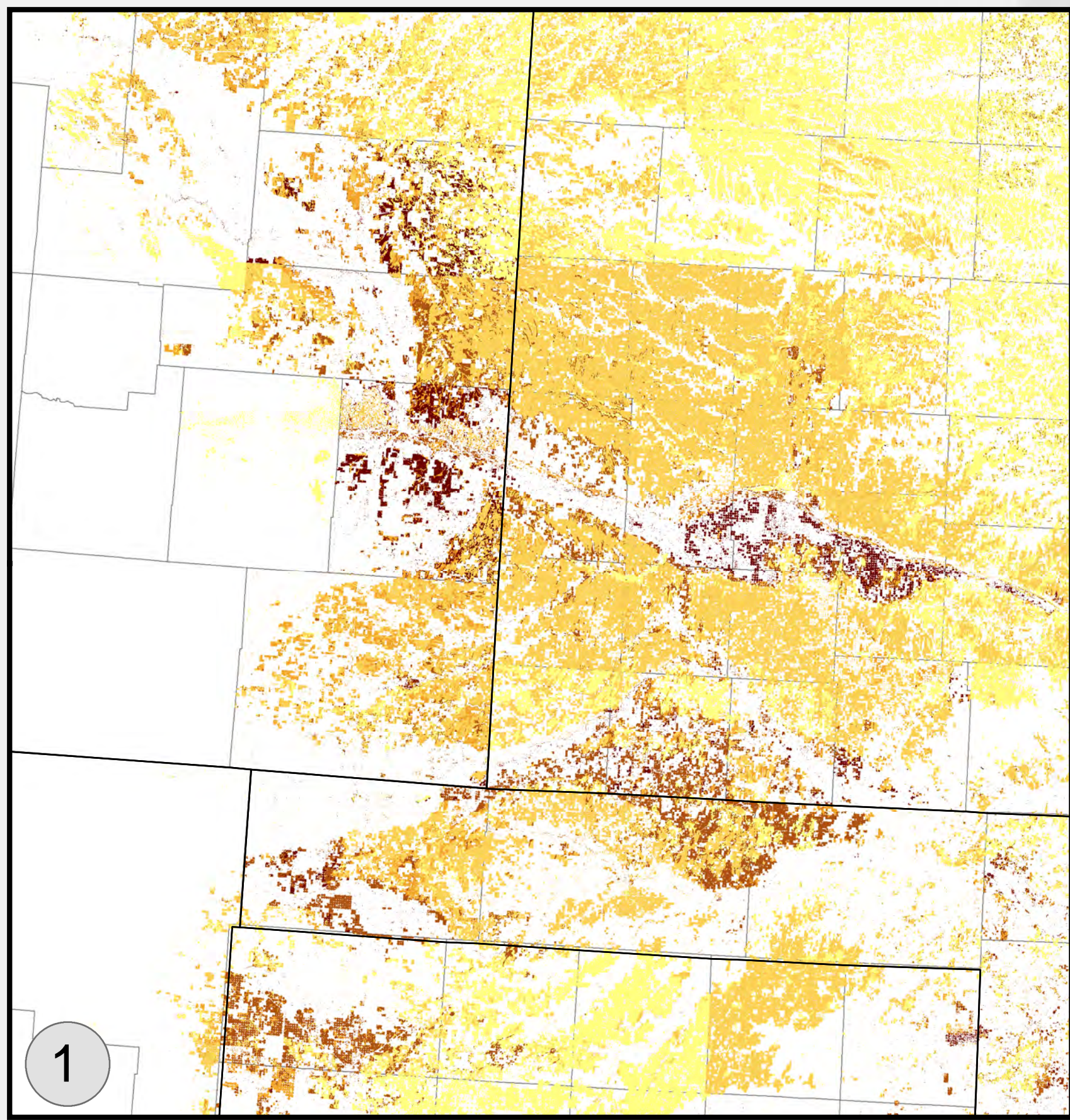
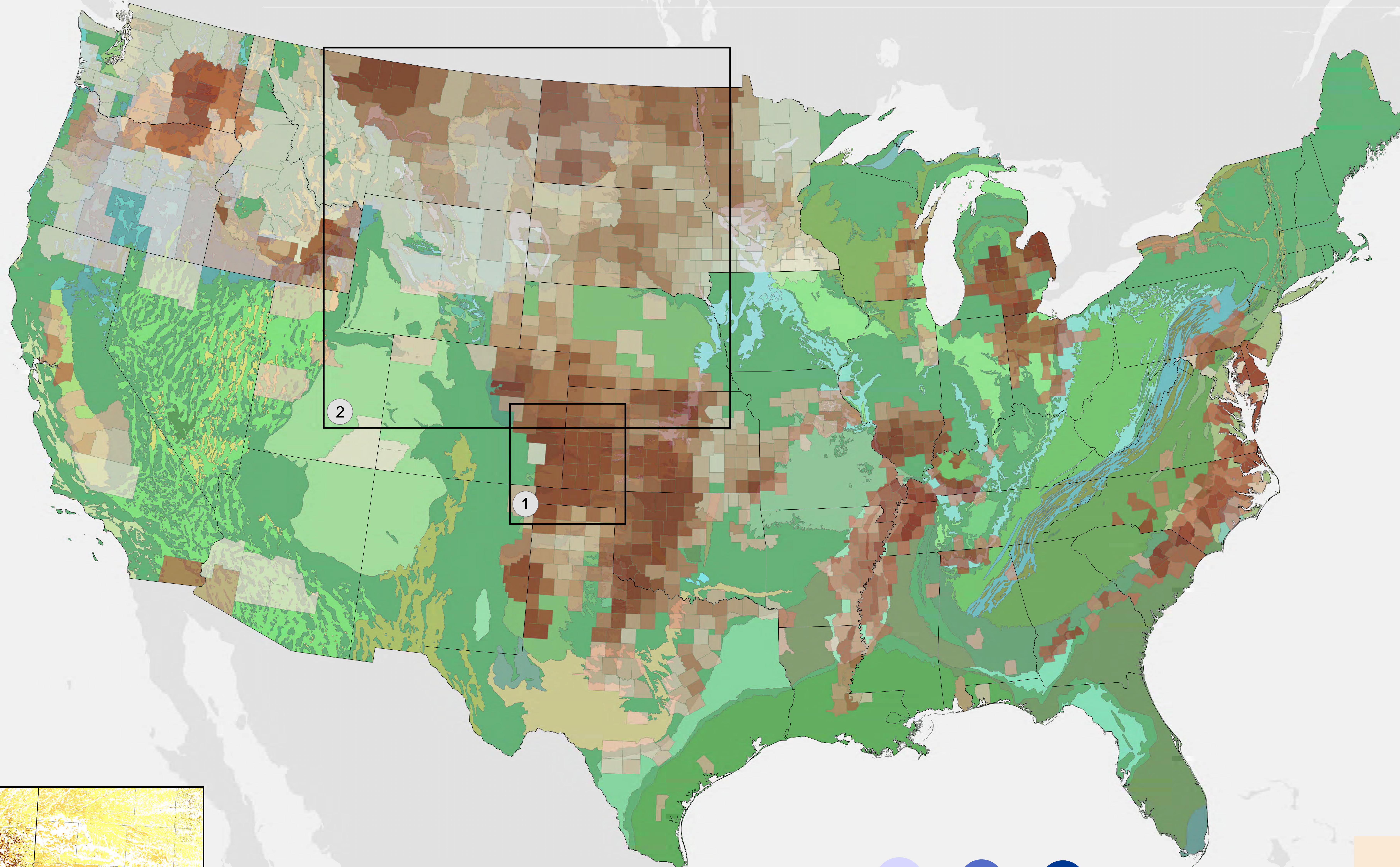


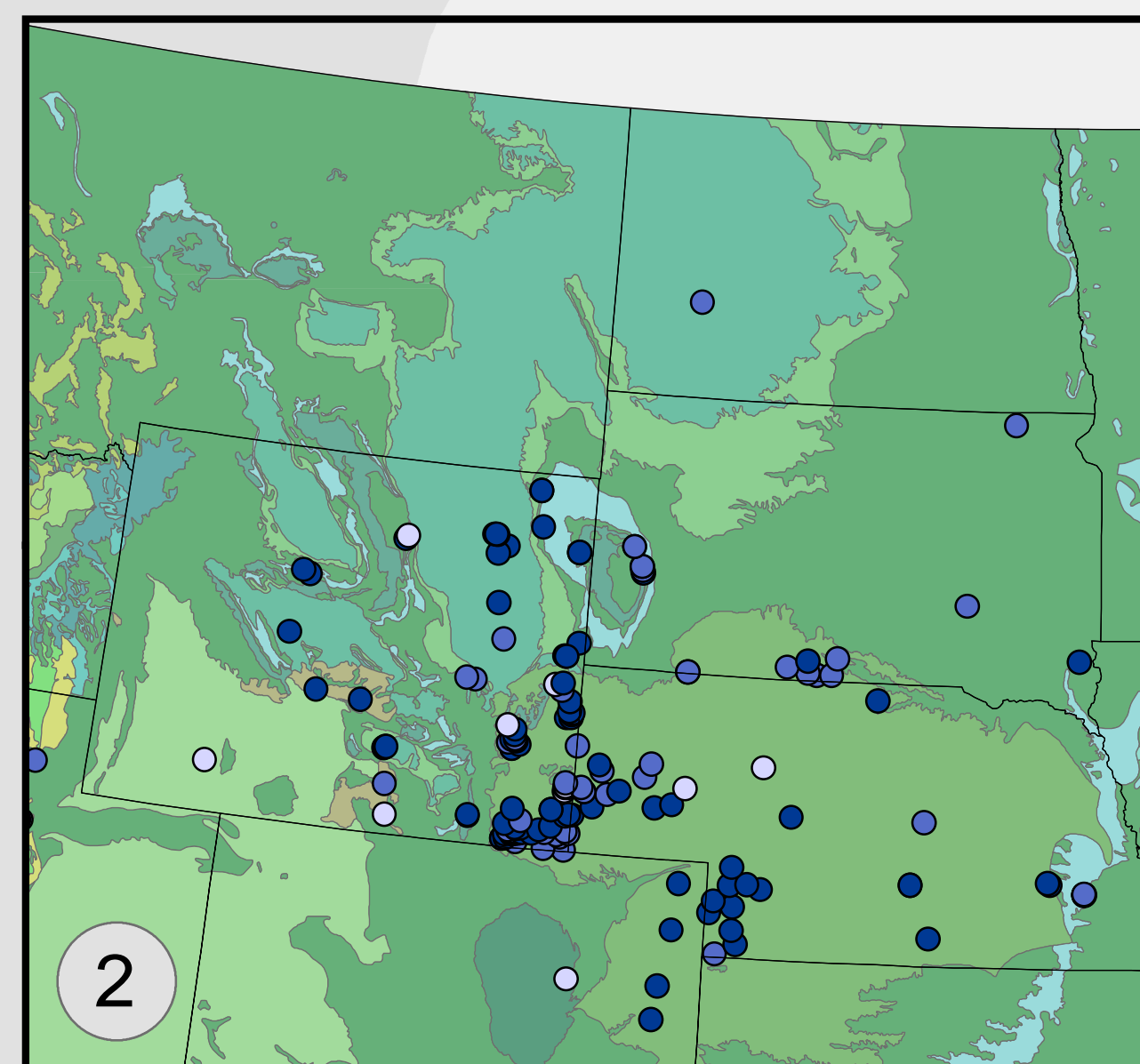
# GROUNDWATER VULNERABILITY IN WHEAT-GROWING REGIONS OF THE UNITED STATES

Groundwater vulnerability to herbicides varies throughout the wheat-growing regions across the nation. Variability is a function of soil types, weather patterns, depth to ground water, and wheat cultivation practices. National datasets including the Soil Survey Geographic (SSURGO) database and Cropland Data Layer (CDL) can be used in conjunction with groundwater models to capture the range in vulnerability.



## Groundwater Modeling

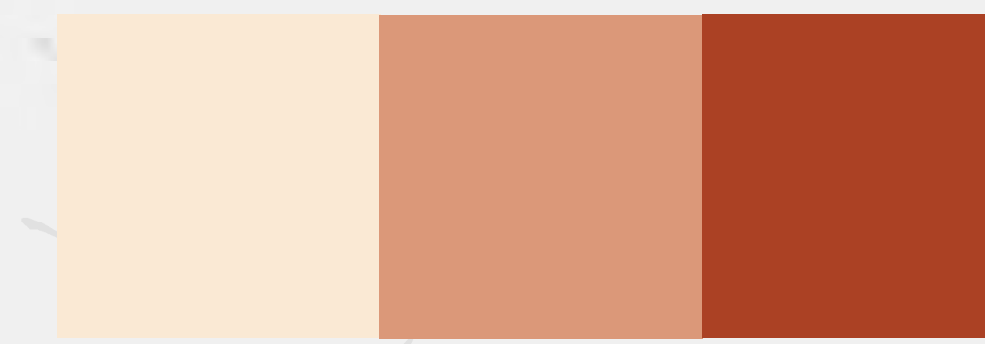
Groundwater modeling was conducted throughout the nation with the Pesticide Root Zone Model (PRZM) for unique combinations of soil types, weather patterns, and wheat cultivation practices assuming a shallow aquifer depth of 4 meters. Model-predicted concentrations of an herbicide in the shallow aquifer varied throughout each county. To illustrate the variability, locations of wheat fields and their corresponding concentrations are shown at left for parts of Colorado, Kansas, New Mexico, Texas, and Oklahoma. Lower to higher concentrations are symbolized from yellow to maroon.



Less than 4 meters    4 to 20 meters    Greater than 20 meters

## Aquifer Depth

Although groundwater modeling was conducted with a constant aquifer depth of 4 meters from the surface, the shallow aquifer depth in wheat-growing regions varies widely throughout the United States. Predicted groundwater herbicide concentrations are sensitive to the aquifer depth. Deeper aquifers generally have lower exposure to herbicides via movement through the soil profile over a given time period. Groundwater depth data from wells (blue dots at left) in the Principal Aquifers of the United States (USGS) were used to identify more vulnerable locations for subsequent analysis. The Principal Aquifers are mapped at left and above.



## Exposure Calculation

The map at left shows, at the county level, the relative exposure to groundwater from an herbicide applied to wheat. Exposure scores are the product of county-average model-predicted herbicide concentrations in the shallow aquifer and the fraction of the county growing wheat. Low exposure counties are shown as lighter red and higher exposure counties are shown as darker red. To standardize the basis of comparison, all counties are assumed to have the same depth to shallow aquifer (4 meters).

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