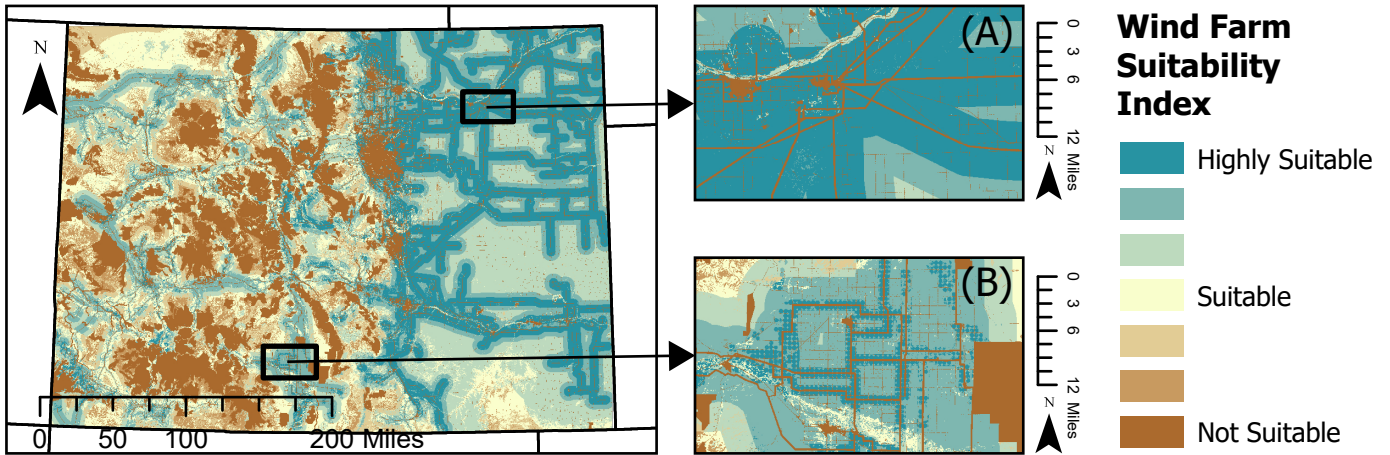
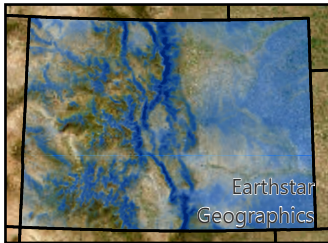


Wind Farm Suitability Map for Colorado

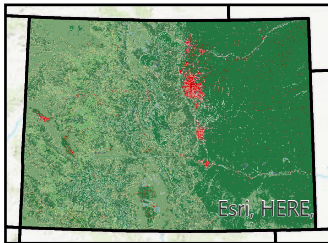


1. Annual 80m Wind Speeds (50%)



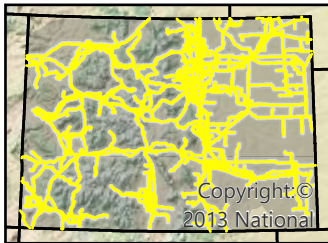
Darker Blues Indicate Higher Avg 80m Wind Speeds

2. Land Cover Suitability (30%)



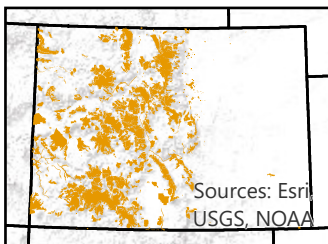
Darker Greens Indicate Better Suited Land Cover Types

3. Distance to Power Lines (20%)



Yellow Power Lines; Closer Sites Have Better Suitability

4. USA Protected Areas (Mask)



Orange Shows Development Restricted US Biodiversity Protected Areas

Colorado is a state in the west-central part of America, and its geography can be roughly divided into a flat eastern half on the Great Plains and a mountainous western half in the Rocky Mountains. This study aimed to find the most suitable locations for wind turbines (and wind farms) to produce wind energy, with a particular curiosity into whether plains or mountain brows are more favorable for wind turbines.

The criteria selected to determine spot suitability were:

- (1) Annual Average 80m Wind Speeds {50%} - Represents the potential of generating electricity from wind. Single most important factor because this determines if the land is worth building on.
- (2) Land Type Cover {30%} - Represents contextual feasibility of building a wind turbine; e.g. open field is optimal, forest is suboptimal, urban area is unsuitable. Second most important factor because it determines the plausibility of building a wind turbine in a location.
- (3) Distance from Power Transmission Lines {20%, Mask} - Represents available infrastructure for transporting energy. Areas within 100m of the transmission lines were masked out as unsuitable. Outside this mask, proximity to power lines was considered the least important given factor, but it helps further distinguish between optimal building areas.
- (4) US Protected Area Status {Mask} - Represents legal availability of land for use in wind farming. Biological Diversity Protected Areas were considered unsuitable.

After scaling each criteria to a value from 1 - 10 and creating a suitability index with the weights and masks as described above, large areas stand out as suitable locations for building a wind farm. While most of the flat eastern half of the state is well suitable (see inset Map A for an example), the western half would have highly favorable mountaintops and brow lines if they those features were not within US Protected Areas (Compare Map 1 and Map 4). However, a few locations on the west side do show signs of suitability for a wind farm (see inset Map B). Note that while this model accounts for many factors, it does not account for the elevation, slope, or aspect of the land area and does not account for non-biological US Protected Areas. These and other considerations may further impact the suitability of these locations.

Data Sources:

- (1) Draxl, C., B.M. Hodge, A. Clifton, and J. McCaa. 2015. "The Wind Integration National Dataset (WIND) Toolkit." Applied Energy 151: 355366. <https://doi.org/10.1016/j.apenergy.2015.03.121>
 - (2) U.S. Geological Survey, 2025, Annual NLCD (National Land Cover Database)—The next generation of land cover mapping: U.S. Geological Survey Fact Sheet 2025–3001, 4 p., <https://doi.org/10.3133/fs20253001>.
 - (3) U.S. Government, 2024. "U.S. Electric Power Transmission Lines (Archive)" <https://arcg.is/HLH410>
 - (4) U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2024, Protected Areas Database of the United States (PAD-US) 4.1: U.S. Geological Survey data release, <https://doi.org/10.5066/P96WBCHS>.
- State Boundary Tigerlines - US Census Bureau
All maps projected to NAD 1983 UTM 13N

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