

An Analysis of the Maine Coast: Potential Wind Farm Locations

By Sophie Newbury '08, ES212, Colby College.



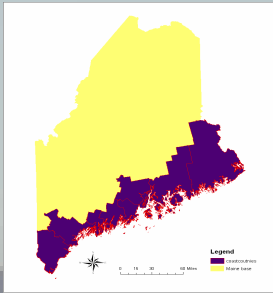
INTRODUCTION

The energy crisis that we now face should send a wake up call to America that it is time to search for alternative energy sources. Wind power is a sustainable, free, resource that the US has become a leader in developing but most areas of the U.S that hold great potential are not yet useful. In this study I ask which areas of the Maine Coast would be most valuable as wind farms.

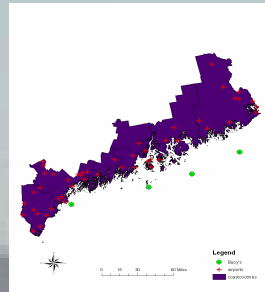
METHODS

The models that I developed used a program called ArcGIS, use for creating Geographic Information Systems (GIS). A GIS takes spatial data (like wind speed at particular buoy's) and by linking it to latitude and longitude coordinates, projects it onto a map. I used three layers (sets of spatial data) to create this model: Maine airports, Maine counties and NOAA buoy data. The data representing the Maine counties and Maine airports were download from the Maine Office of GIS. The wind averages were calculated from NOAA buoy's placed off of the Maine coastline which record the average wind speed of every ten minutes of every day; this data was recorded in the year 2004. The data was projected to Transverse Mercator zone 19 using the North American Datum of 1983

Counties on the coast were selected out from a map of all Maine counties



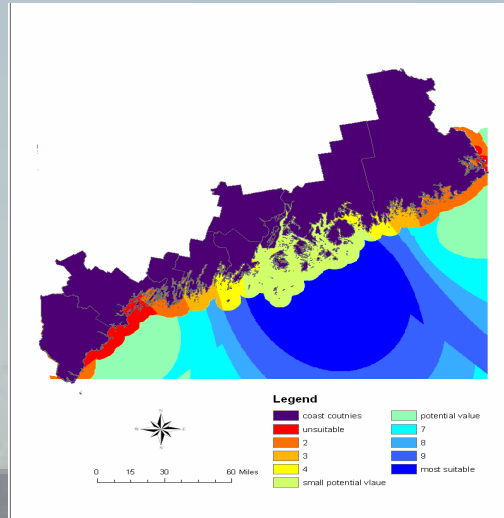
A layer of all Maine airports and four NOAA buoys were overlaid on Maine counties



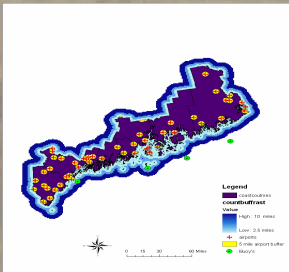
In order to model the most suitable locations took into account three features: location in respect to coastline, location in respect to counties and areas of high wind speed. Each factor was weighted towards importance, wind being foremost, then coastline and airports being second most important, this was represented in this final calculation: $(\text{wind speed} \cdot .5) + (\text{distance from airport} \cdot .25) + (\text{distance from coast} \cdot .25)$. The final output is a suitability analysis for the positioning of a wind farm off of the Maine coast

RESULTS

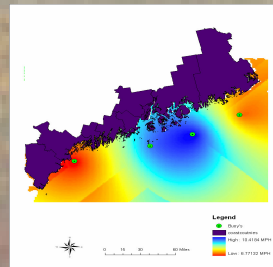
The area that is modeled to be the most well suited is off the coast of Mt. Desert Island. The Darkest blue represents the most suitable area and represents 86,282 kilometers or 53, 613 miles of suitable area. As the shades get lighter, they represent less optimal conditions. The area immediately surrounding Maine is of an entirely different color scheme than the suitable areas; more reds and yellows (low potential suitability) as opposed to the blues and darker greens (more potential value). This is the 10 mile buffer around Maine, the inside of which cannot have a wind farm for political reasons.



I created zones around all counties and airports, of 7.5-10 and 3 miles respectively, any area inside these two zones became unacceptable locations for wind farms



Each buoy location also contains the average wind speed of the location. Using the Kriging function in the geostatistical analyst of ArcGIS I took the average wind speeds of the four known buoy locations and interpolated (calculated) the missing wind speed values



DISCUSSION:

The suitability of an area to be the location of wind farms is based mainly off of the average wind speed of the area. In "Wind Power, Obstacles and Opportunities" by Martin J. Pasqualetti the

Wind Power Class	Resource Potential	Wind Speed (m/s)
2	Marginal	5.6-6.4
3	Fair	6.4-7.0
4	Good	7.0-7.5
5	Excellent	7.5-8.0
6	Outstanding	8.0-8.8
7	Superb	8.8-8.11

According to this table, all along the Maine coast would be a fair location for wind farms and that the area around Matinicus rock and Mt. Desert would be locations with a more than superb output. This model however is limited by the amount of available data. The fact that there were only four available data buoy's limits the amount of detail represented in this map. Other factors that could have been taken into consideration (if data were available) are bird migration patterns and fishing patterns of Maine's robust and vital fishing industry.

The wind farms are a highly controversial topic around the U.S. though no one doubts that they are a sustainable, viable energy source, Americans are not yet ready to sacrifice space or beachfront views. Unfortunately, our energy demands have advanced past our current resources and it is time to consider the alternatives. The Maine Coast is a viable option because of the abundance of wind energy and the space available for development and should be considered as a worthwhile investment.

SOURCES CITED

WWW.capewind.org

"Wind Power Obstacles and Opportunities" by Martin J Pasqualetti, Environment Magazine.

www.ndbc.noaa.gov/rmd.shtml