Tufts
Cartographer: Matthew J Reardon
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Projected Coordinate System: NAD 1983 State Plane MA Mainland FIPS 2001
Geographic Coordinate System: GCS North American 1983
Sources: MassGIS, AntennaSearch.com, 2000 US Census, Truewind, MA Executive Office of Transportation

Taking the NIMBY Out of Large Wind:

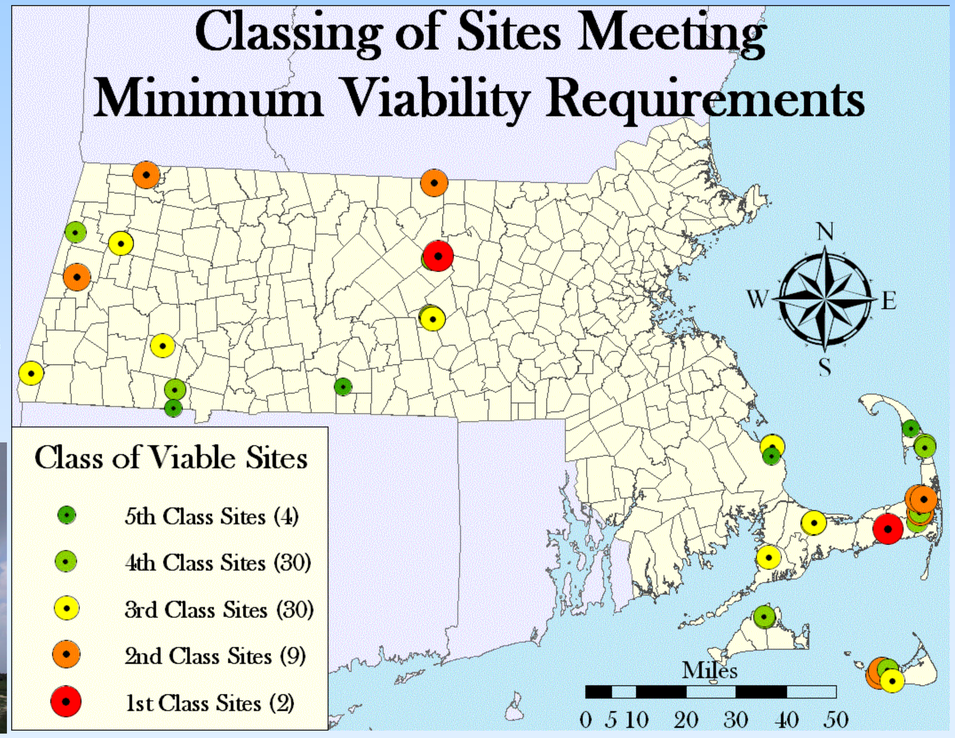
Solving the Commonwealth's Wind Farm Siting Dilemma by Piggbacking on the Communications Infrastructure

Overview

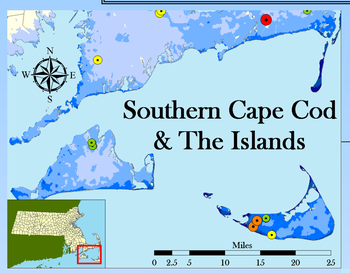
The term NIMBY or 'Not In My Back Yard' has unfortunately been growing in popularity during recent years; especially in reference to wind projects in Massachusetts. Residents of the state are generally strongly in favor of wind power, just as long as the turbines are not located where they live, work or play. A prime example has been the ongoing saga that is 'Cape Wind' but there have also been similar storylines taking place on the windswept hillsides of the Berkshires and across the state as a whole. Massachusetts needs and wants more wind power but less public and private opposition to it. In that spirit, the goal of this project was to find both physically and politically suitable on-shore locations for large-scale wind turbines or wind farms throughout the Commonwealth. How? By piggybacking wind farms on the communication infrastructure. Development of a pristine and natural site is often difficult for local residents and environmentalists to swallow, even for a good cause like renewable energy. Instead the idea would be to develop sites that have already been corrupted by humans in a highly visible way; such as those containing one or several of the many tall and unsightly steel communication towers dotting the state.

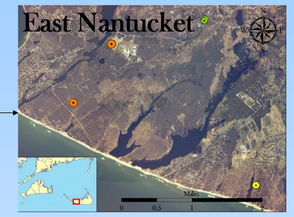
Methodology

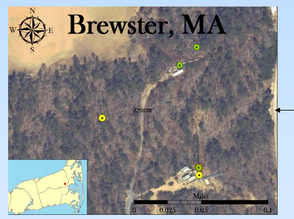
The project began with a database, graciously provided by AntennaSearch.com, containing information on all communication towers in Massachusetts. Next, a series of minimum viability requirements for each tower site were established and, using six individual variables, each was tested in order to screen out and then classify all qualifying tower sites: To start, the **Population Density**(1) had to be less than or equal to 1 person per Sq. Acre; the **Land Use**(2) designation had to be viable for a large wind project; a **Wind Class**(3) of at least 3 was required; and the **Height of the Tower**(4) had to be at least 200 feet. A total of 75 out of an original 4,248 towers met these requirements. At this point an **Urban Proximity Score**(5) and a **Road Proximity Score**(6) were calculated for each qualifying tower site and then combined to create a **Political Viability Score** of 1-3 which was added to a generalized **Wind Score** of 1-3 and **Tower Height Score** of 1-3 in order to determine the final **Class Site Score** which is displayed above. For more details on the Methodology you can read below about each individual variable used in the project or refer to the accompanying paper.

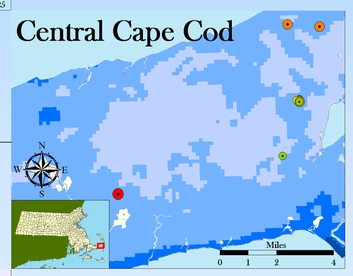


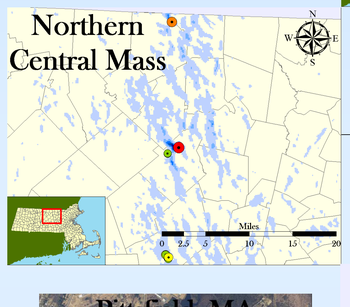
Selected Premier Sites

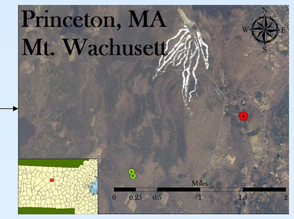


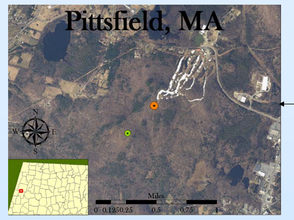


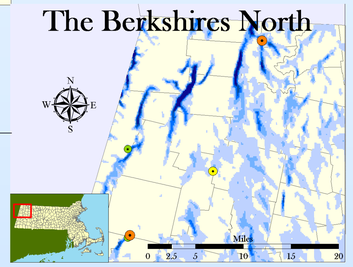


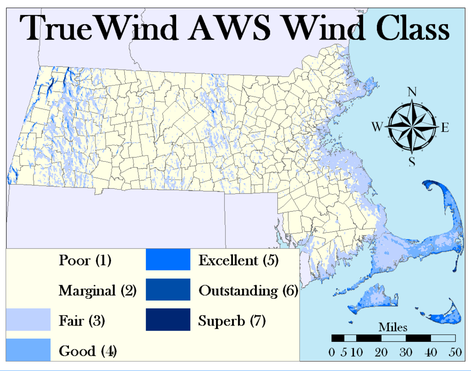




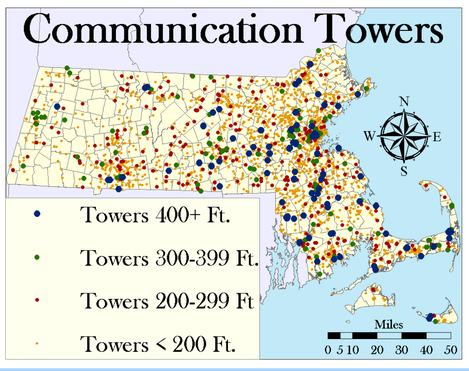




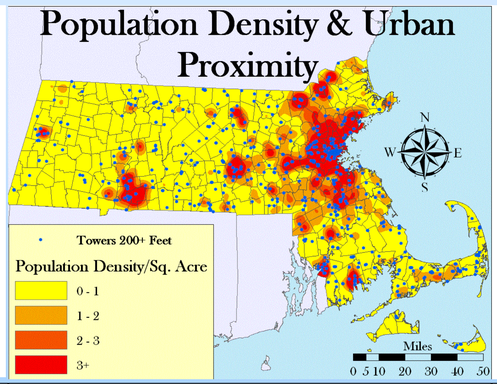




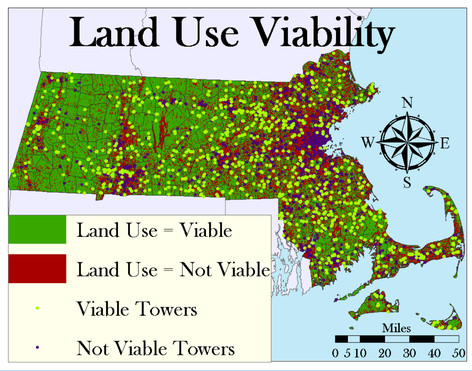
This map displays estimated wind strength for Massachusetts based on the AWS TrueWind class rating model that measures wind in potential Watts per square meter at an elevation of 50 meters. A wind class of at least 3, and preferably 4 or greater, is required for a feasible utility-scale wind project; therefore wind classes of 1 and 2 have intentionally not been displayed. Of the 4,248 towers in the state, 1,690 are located on a site with a wind class of at least 3 while 505 towers experience class 4 winds or greater.
Source: http://www.mass.gov/mgis/windpower.htm



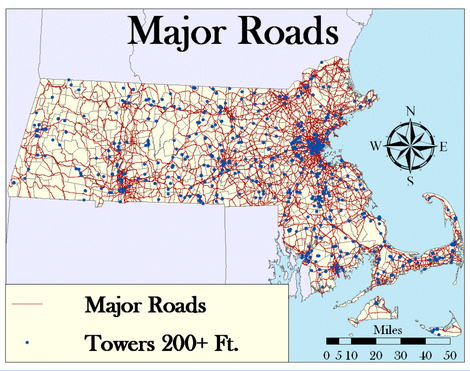
A database provided by AntennaSearch.com allowed for the mapping of all 4,248 communication towers in the state. With a standard 1.5 MW turbine pushing 400 feet tall, highly visible towers of at least 200 feet are a necessity to help mask out the large wind turbines so the height of the tower was weighted accordingly. A total of 1,157 of the total 4,248 towers met the minimum requirement with 675 towers between 200 & 299 feet, 254 towers between 300 & 399 feet, and 228 towers that were 400 feet or taller
Source: http://antennasearch.com/



Creating a raster map of population density was necessary for two purposes. The first was to exclude the 2,356 towers in locations with a density greater than 1 per square acre due to wind projects in urban centers likely attracting more opposition. The second purpose was to establish an 'urban proximity score' by measuring the distance of each rural tower to the closest population center. Those towers closer to, but not in, cities scored higher than more distant ones due to reduced future energy transmission costs into those cities.
Source: http://www.mass.gov/mgis/cen2000_blocks.htm



It cannot be assumed that every site with strong wind and a tall tower would be an ideal site for a wind farm. Land use restrictions make many areas off limits. Accordingly, each parcel has been designated as 'Viable' (pasture, forest/woody perennial, mining, open land and waste sites) or 'Not Viable' (wetlands/water, residential, commercial, industrial, cropland, recreational and transportation). The 2,504 tower sites that were deemed 'Not Viable' have been excluded from further consideration.
Source: http://www.mass.gov/mgis/lus.htm



This map from the MA Executive Office of Transportation depicts every major road in the state. The proximity of each tower to a major road was measured and given a weighted score. Sites adjacent to roads scored high and those more distant scored lower. This 'Road Proximity Score' was computed with the 'Urban Proximity Score' to establish a 'Political Viability Score' that was later used in calculating the final 'Site Class Score' shown above for each qualifying site.
Source: http://www.mass.gov/mgis/eotroads.htm