

# A DECISION SUPPORT TOOL FOR MARINE SPATIAL PLANNING IN THE GREAT LAKES



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## Introduction

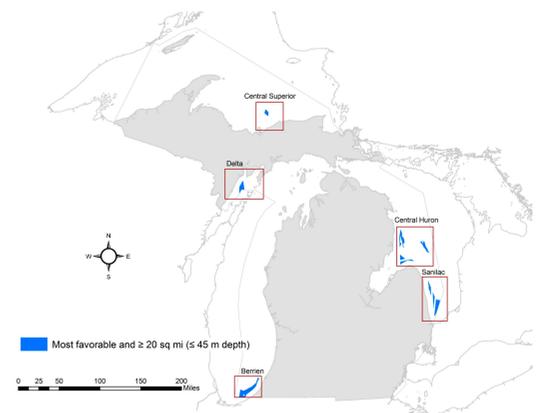
When making siting decisions for offshore wind projects, coastal resource managers must consider possible effects on sensitive environmental features and competing uses of the water. Although there exist spatial data sets describing the locations of those features, it can be difficult for managers to use the data to assist in making siting decisions. To fill this need, we have created a user-friendly package of software and data. This decision support tool will be available to the public at no cost, although users must have the ArcGIS software package to run it. Our software tool allows users to specify their own site-suitability criteria for offshore wind projects based on political, biological, environmental, and physical data sets, and then find the areas of the Great Lakes that meet those criteria.

## Available Data Sets

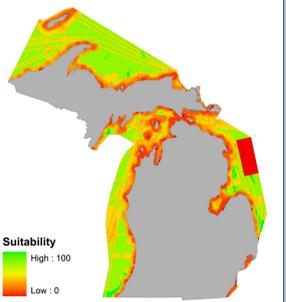
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|--|---|--|---|
| <p><b>Physical features</b><br/>                 Bathymetry (depth)<br/>                 Coastal wetlands<br/>                 Ice thickness<br/>                 River mouths<br/>                 Sand dunes<br/>                 Shoreline<br/>                 Shoreline hardening<br/>                 Slope<br/>                 Substrate<br/>                 Wind power and speed</p> | <p><b>Protected features</b><br/>                 Bottomland preserves<br/>                 Protected shorelines<br/>                 Refuges<br/>                 Shipwrecks</p> <p><b>Environmental features</b><br/>                 Areas of Concern<br/>                 Confined disposal sites</p> <p><b>Fisheries data</b><br/>                 Commercial fishing<br/>                 by ten-arcminute grid</p> | <p><b>Base/political features</b><br/>                 Federal/state/tribal lands<br/>                 Harbors/Marinas<br/>                 Islands<br/>                 Military areas<br/>                 National Parks and National Lakeshores<br/>                 Shipping routes<br/>                 Transmission lines<br/>                 Urban areas<br/>                 Water intakes</p> | <p><b>Biological features</b><br/>                 Fish spawning sites<br/>                 Important Bird Areas<br/>                 Offshore bird concentrations</p> <p><b>User-Provided Data</b><br/>                 Must be in "Shapefile" format.</p> |
|--|---|--|---|

## Applications

The Michigan Great Lakes Wind Council, created by Governor Jennifer Granholm in 2009, has been using this decision support tool continuously since mid-2009 to determine the most favorable sites for wind power development in Michigan's waters of the Great Lakes. Here is a map produced using some of the Council's criteria, showing five high-priority areas, based upon environmental, legal, and practical criteria.



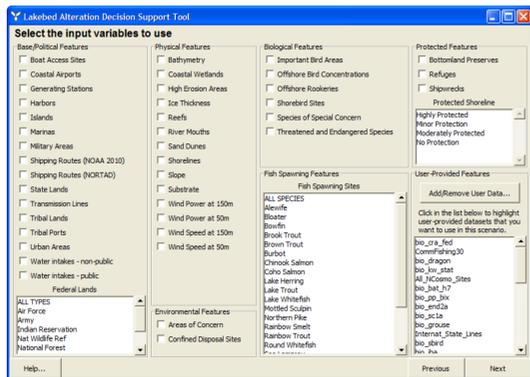
By entering these suitability criteria into the tool, the Wind Council was able to narrow Michigan's 38,000 square miles of Great Lakes bottomland down to a few hundred square miles. These could be given first consideration if the state actively chooses areas to offer for lease.



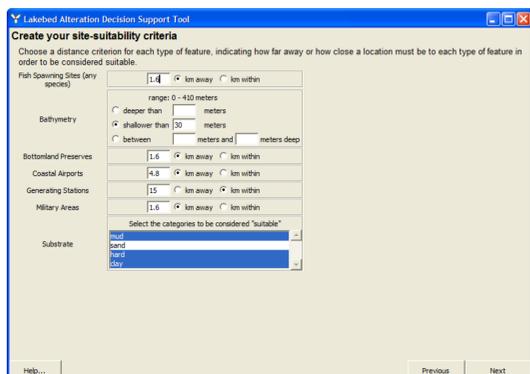
However, the same decision support tool can also help resource managers respond to a wind project proposal initiated by a developer. When viewing a gradient map (like the one shown at right) in the tool software, users can quickly specify a proposal location and discover which criteria were passed or failed there.

## User-Friendly Interface

The software is meant for producing maps that show which areas of the Great Lakes are suitable for wind development, but the definition of "suitable" is left up to the user. To use the software, the user first chooses which factors should be considered when making suitability maps.



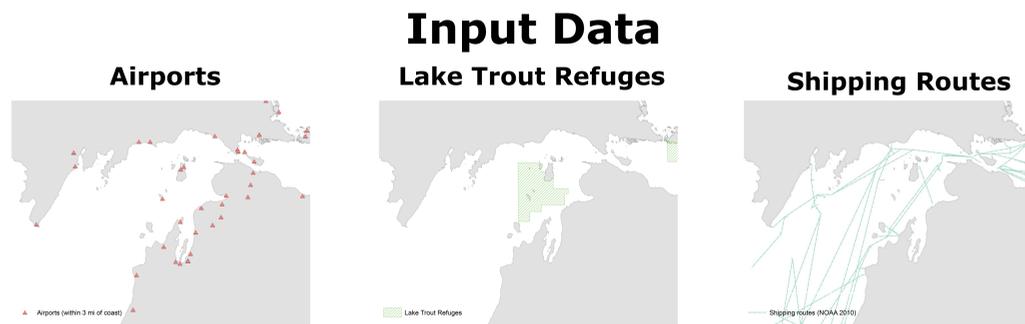
After choosing the input variables, the user creates site-suitability criteria based upon those variables. In the example shown below, the user has specified that areas must be at least 1.6 kilometers from a fish spawning site in order to be considered suitable, along with six other criteria.



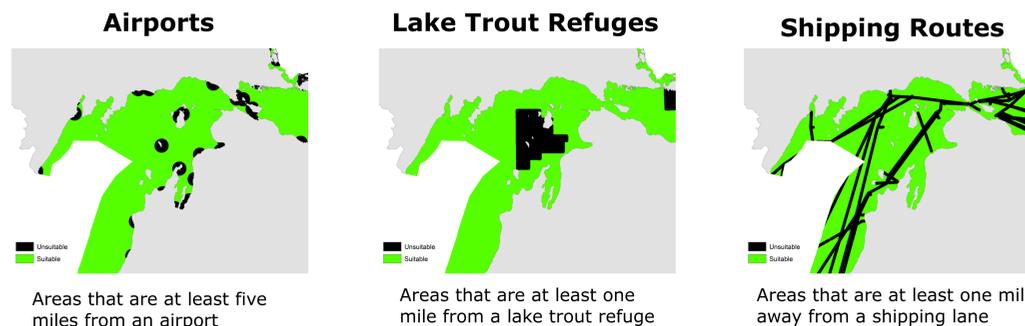
Our tool makes this spatial analysis accessible to resource managers, concerned citizens, scientists, or wind power developers without any geographic information systems training.

## How We Calculate Suitability

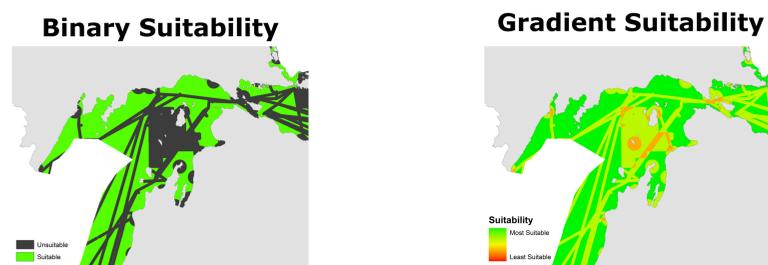
After the user enters their criteria, the Decision Support Tool determines which areas pass or fail each criterion. Then, it combines the suitability determination made by each criterion alone into a single, overall suitability value. Here is a very simple example using three simple suitability criteria, showing a close-up of Michigan's northern waters of Lake Michigan.



## Individual Criterion Results



## Combined Results



## Future Directions

By the middle of 2011, we will expand our tool from only working on Michigan's waters, to working on all of the U.S. waters of the Great Lakes.

We will also offer a version of the tool that can be accessed through a web browser, so that users do not need to have a copy of the ArcGIS software package.

## Contact Us

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Our software and data will be available as a free download here:  
<http://ifrgis.snre.umich.edu/projects/LADST/ladst.shtml>