

BeeMapper

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What is BeeMapper?

BeeMapper is an interactive, internet based tool that allows wild blueberry growers to assess the wild bee habitat around their crop fields

- Nov 2014: presented idea to Wild Blueberry Commission advisory board
- April 2015: first round of grower testing
- Summer 2015: Bee field surveys
- February 2016: second round of grower testing
- December 2016: Anticipated launch date

Why BeeMapper?

- Increasing reliance on honey bees may be unsustainable
- Need to understand contribution from wild bees
- Get information to growers!
 - umaine.edu/blueberries



Photos: Wyman's of Maine,
University of Maine

A collaborative, interdisciplinary effort

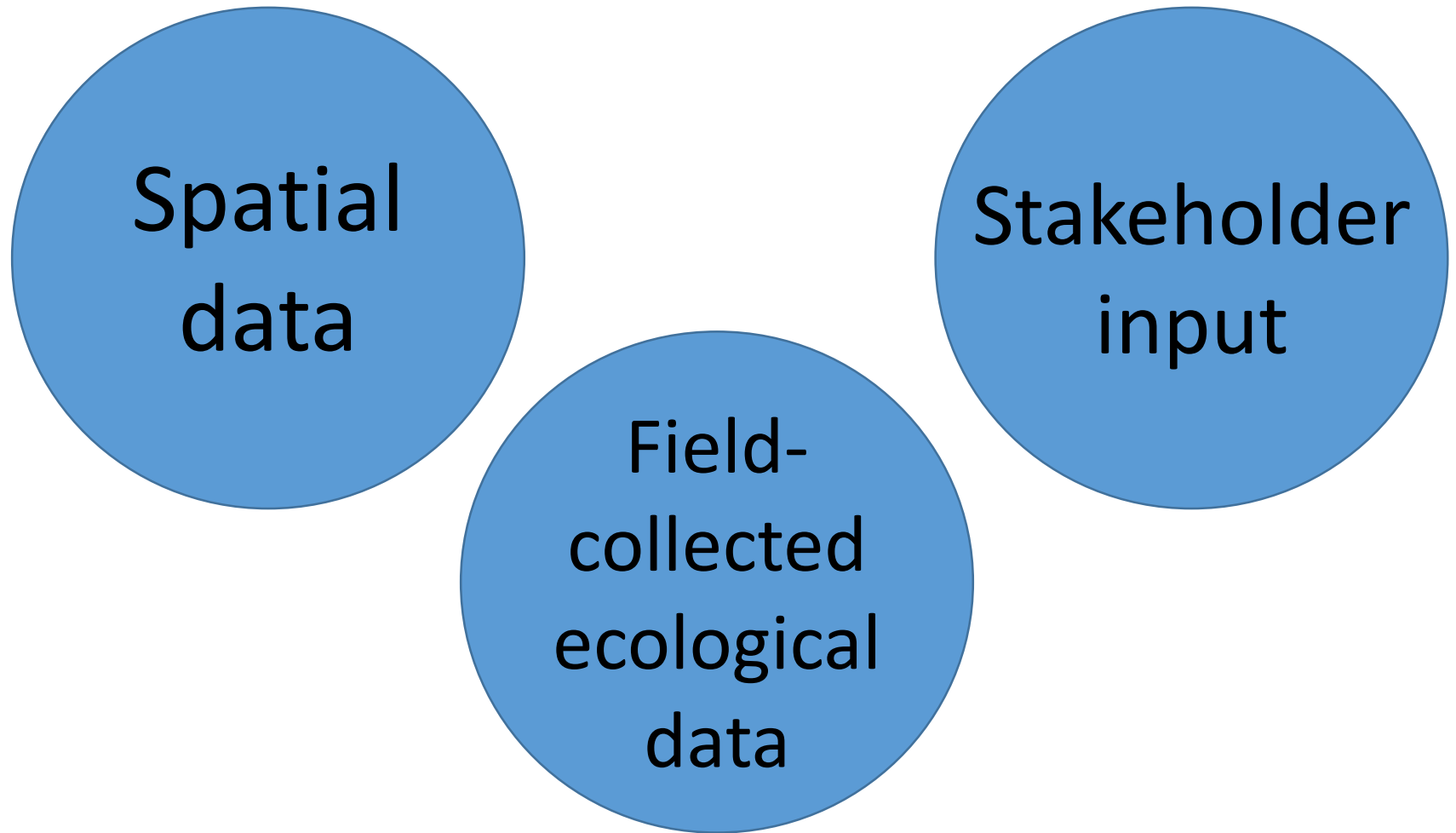
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and Conservation
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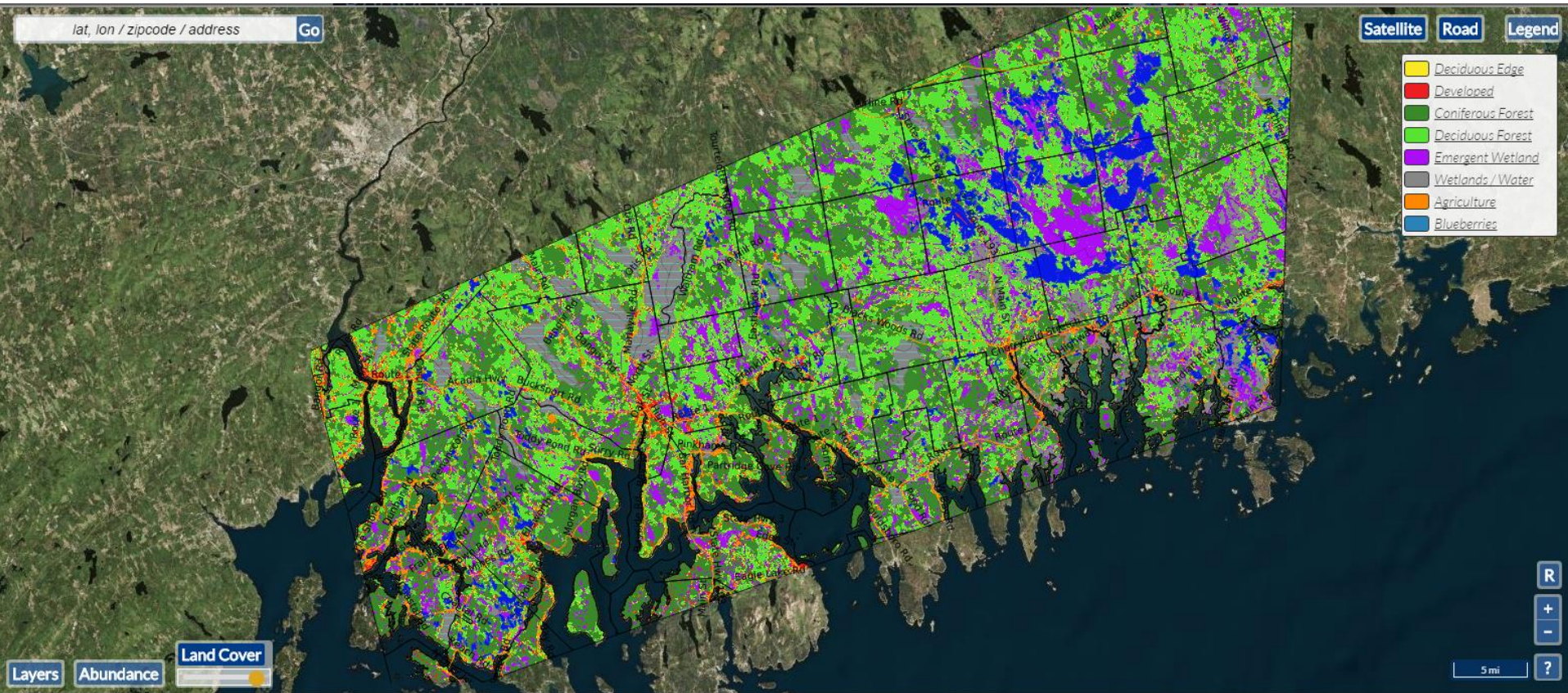
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Wild blueberry
growers and
conservation
professionals

A synthesis of data

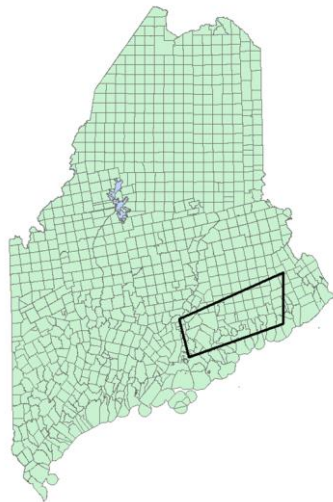
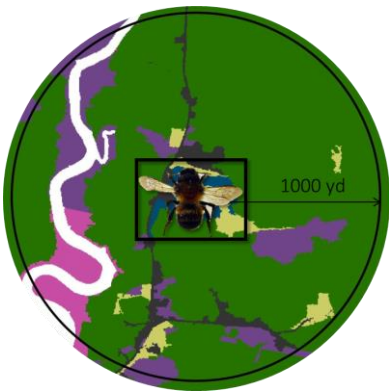
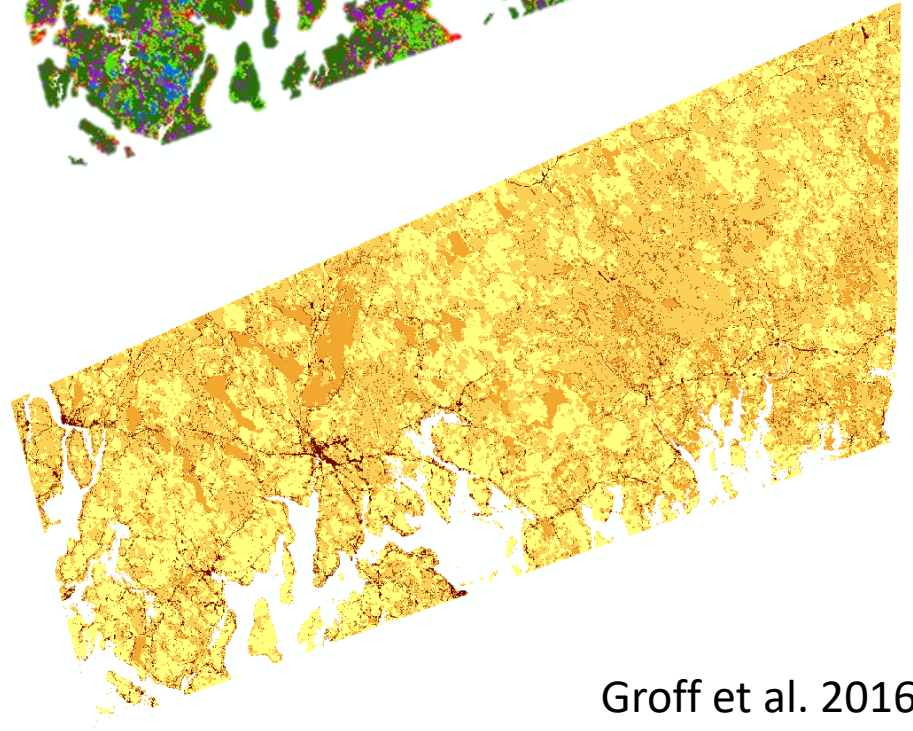
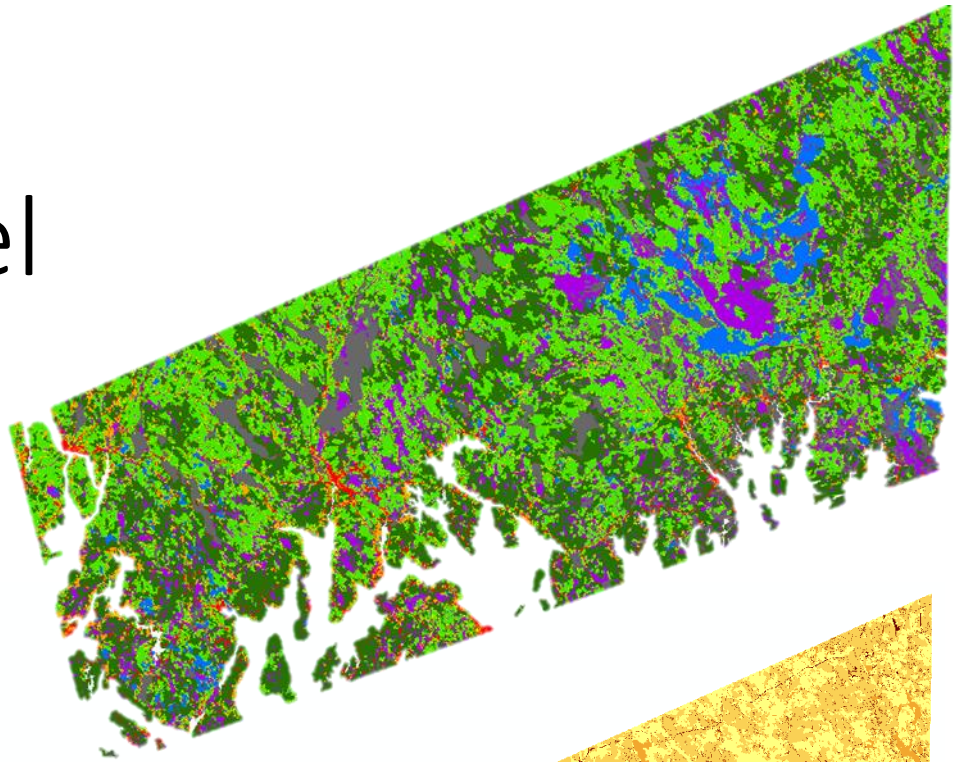


Spatial data

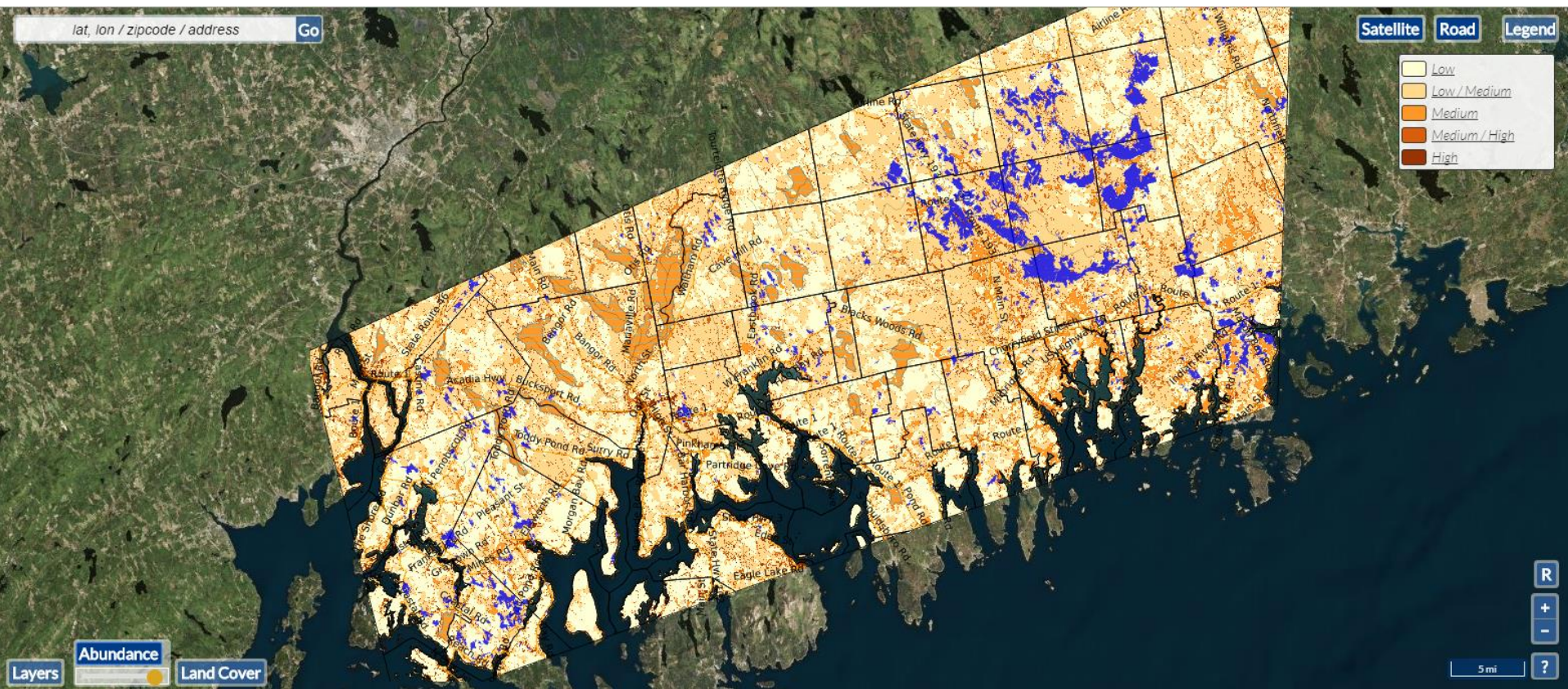


InVEST Crop Pollination Model

- Input:
 - Land cover data
 - Suitability values
 - Bee species life history
- Output: predicted wild bee abundance

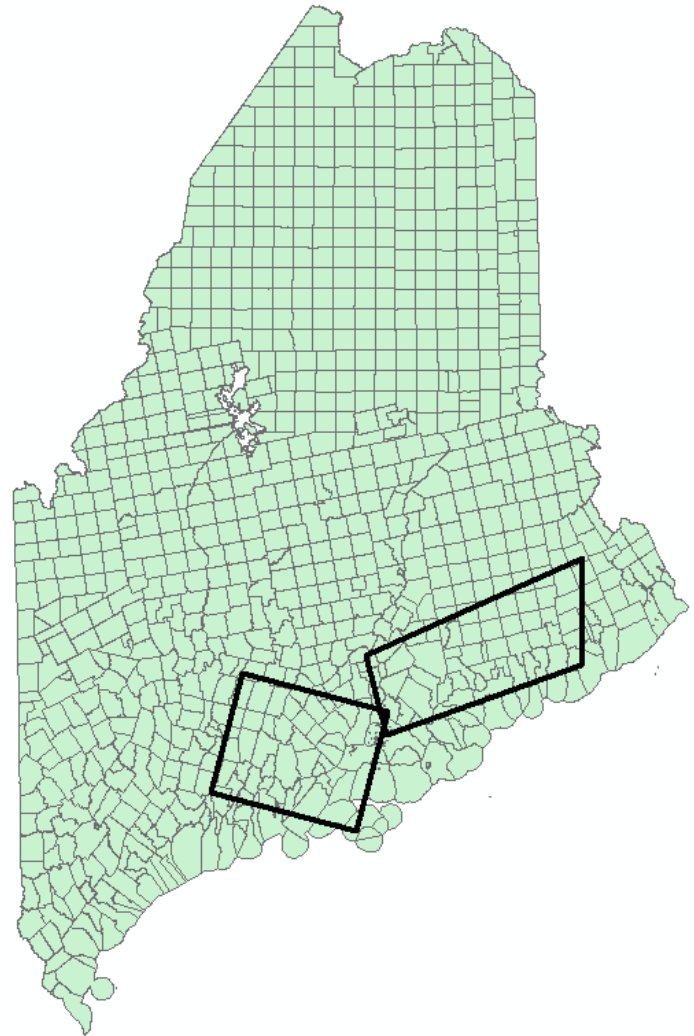
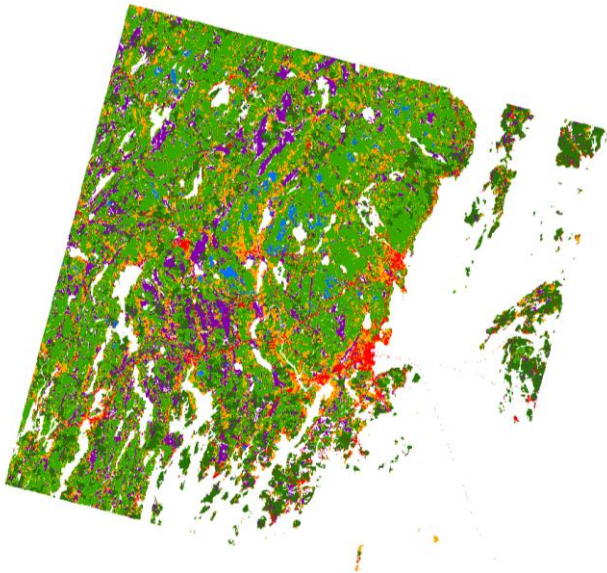


Spatial data



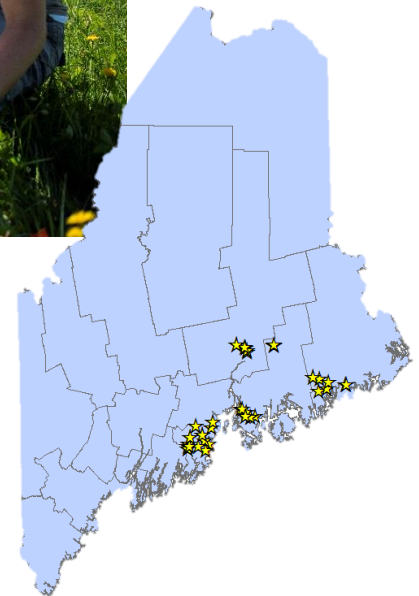
Improving and expanding InVEST

- Incorporate the Midcoast wild blueberry landscape
- Create robust parameters for more accurate predictions



Field-collected ecological data

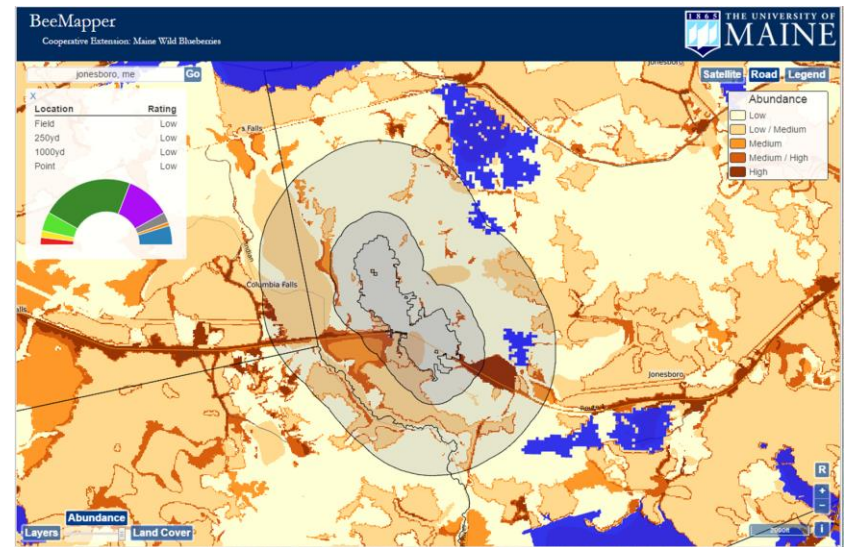
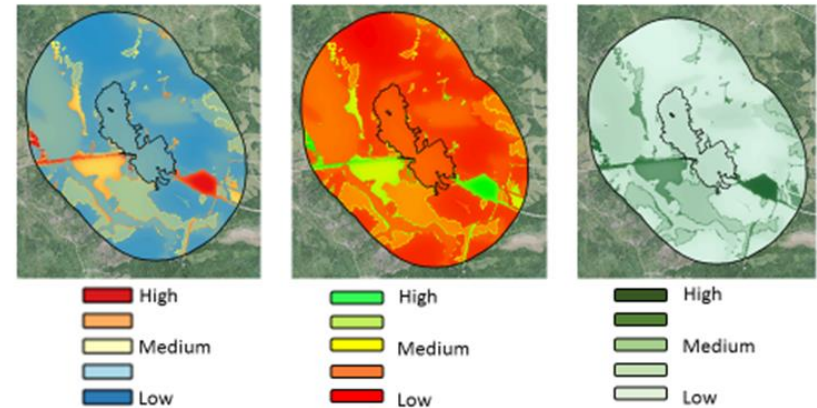
- Four sampling areas:
 - Midcoast (Waldo and Knox Counties)
 - Washington County
 - Hancock County
 - Orono/Old Town (Penobscot County)
- Eight types of land
 - 5 blocks → 40 sites
- Early, mid, and late summer 2015



Stakeholder input

- Two rounds of grower interviews:
 1. April 2015
 - General tool use
 - Data display and interpretation
 2. February 2016
 - Users' Guide
 - Website design
 - Data interpretation

Q: What should the color scheme be for the bee abundance map?



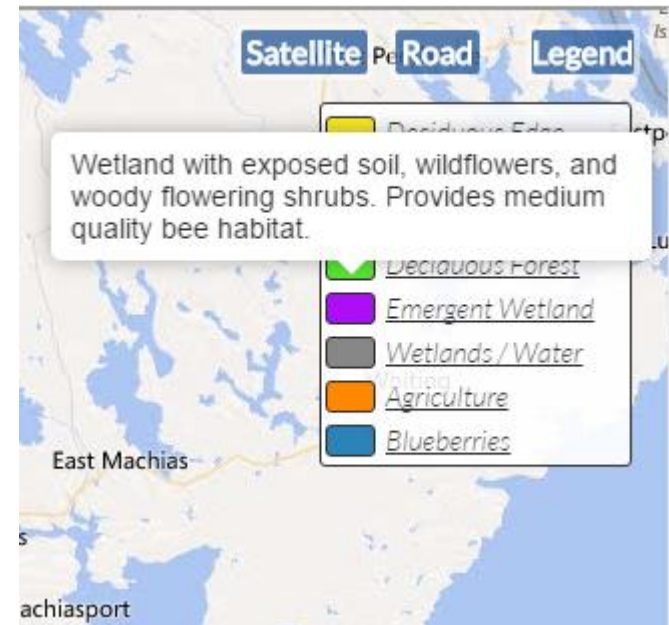
Tool documentation



- Emergent wetland: Wetland with exposed soil, wildflowers, and woody flowering shrubs. They are medium quality bee habitat. Emergent wetland provides pretty poor ground and cavity nesting resources, but they are a good source of pollen and nectar throughout the growing season.



- Wetlands/water: Either submerged wetlands with few flowering plants or open water. These areas are pretty poor bee habitat—they provide little ground nesting or cavity nesting resources and offer little pollen and nectar throughout the growing seasons.



The land cover map is based on the 2004 Maine Land Cover Dataset (MeLCD), which is freely available from the Maine Office of GIS (Landcover – MELCD 2004, <http://www.maine.gov/megis/catalog/>). This data has 5m spatial resolution, which captures landscape variation that is important to wild bees. Former UMaine Master of Science student Shannon Chapin Groff classified the original map into 8 land cover classes that are important for wild bees (Chapin 2014). She also modified this map to include roads and railroads, enhance wetland diversity, and provide the most extensive wild blueberry coverage. Additional data sources used for the land cover map are:

- Roads: MEDOTPUBRDS, <http://www.maine.gov/megis/catalog/>
- Railroads: RAILROUTESYS, <http://www.maine.gov/megis/catalog/>
- Wetlands: Landcover, <http://www.maine.gov/megis/catalog/>
- USDA Croplands Dataset: CDL; <http://nassgeodata.gmu.edu/CropScape/>

Tool documentation

- Low: Approximately 0.1 bees per square yard per minute. Estimated contribution to fruit set is 12%.
- Low-Medium: Approximately 0.2 bees per square yard per minute. Estimated contribution to fruit set is 18%.
- Medium: Approximately 0.3 bees per square yard per minute. Estimated contribution to fruit set is 20%.
- Medium-High: Approximately 0.4 bees per square yard per minute. Estimated contribution to fruit set is 25%.
- High: Approximately 0.5-1.0 bees per square yard per minute. Estimated contribution to fruit set is 30%.

Table 1. Average landcover suitability values assigned through expert opinion.

Landcover	Ground nesting	Cavity nesting	Spring forage	Early Summer forage	Late Summer forage
<i>Deciduous/mixed forest, edge</i>	0.9	1.0	0.9	0.9	1.0
<i>Developed/other</i>	0.9(0.25)	0.6(0.30)	1.0(0.27)	0.9(0.26)	1.0(0.22)
<i>Coniferous forest</i>	0.5(0.23)	0.6(0.28)	0.1(0.24)	0.1(0.21)	0.1(0.29)
<i>Deciduous forest/mixed forest</i>	0.6(0.21)	0.9(0.22)	0.7(0.21)	0.5(0.29)	0.4(0.18)
<i>Emergent wetlands/scrub-shrub</i>	0.2(0.14)	0.4(0.24)	0.7(0.22)	0.6(0.25)	0.6(0.20)
<i>Wetlands/water</i>	0.1(0)	0.1(0.05)	0.3(0.20)	0.2(0.16)	0.5(0.18)
<i>Agriculture/field</i>	0.7(0.29)	0.2(0.18)	0.9(0.31)	0.7(0.27)	0.9(0.33)
<i>Blueberries</i>	1.0(0.25)	0.4(0.26)	0.4(0.29)	1.0(0.28)	0.5(0.26)

Andrena carlini:



Andrena carolina:

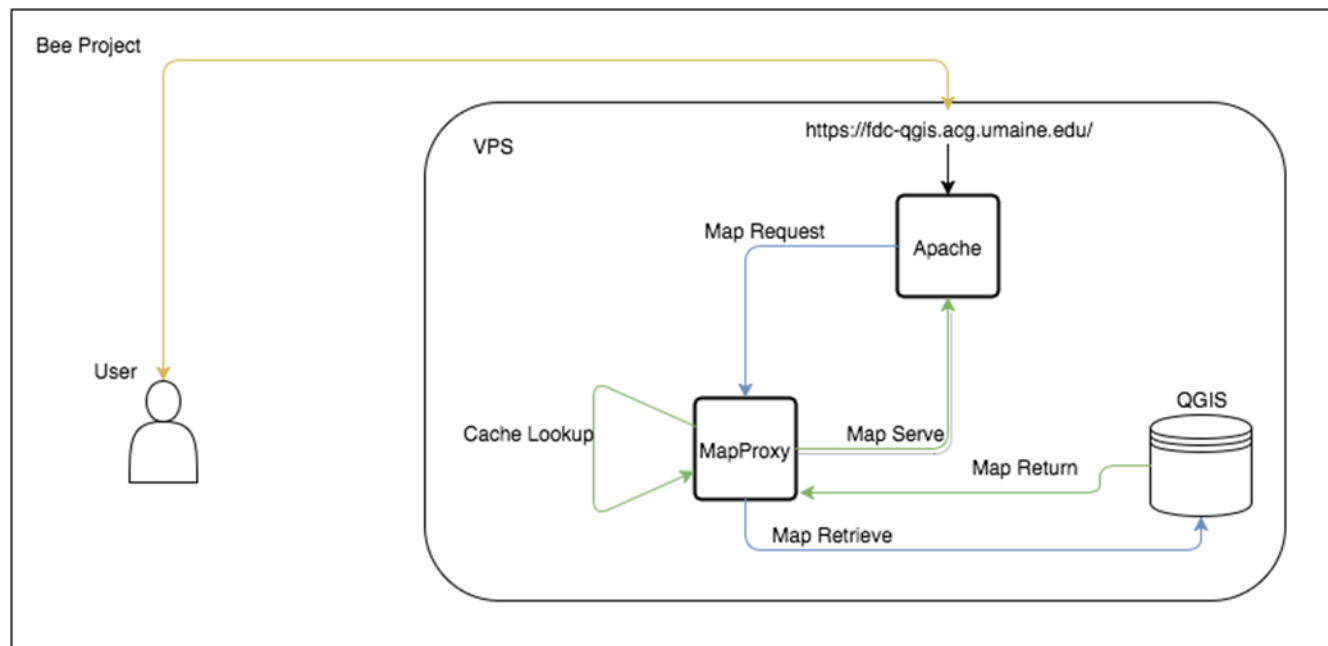


Andrena vicina:




Open source web mapping tools

- Hosted on campus by Advanced Computing Group
- QGIS Map Server, MapProxy, and OpenLayers





Tool demonstration




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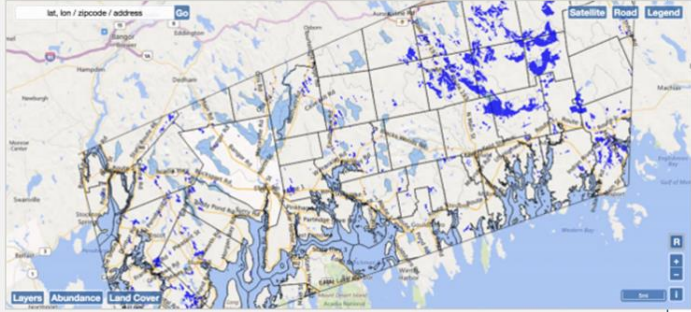


BeeMapper



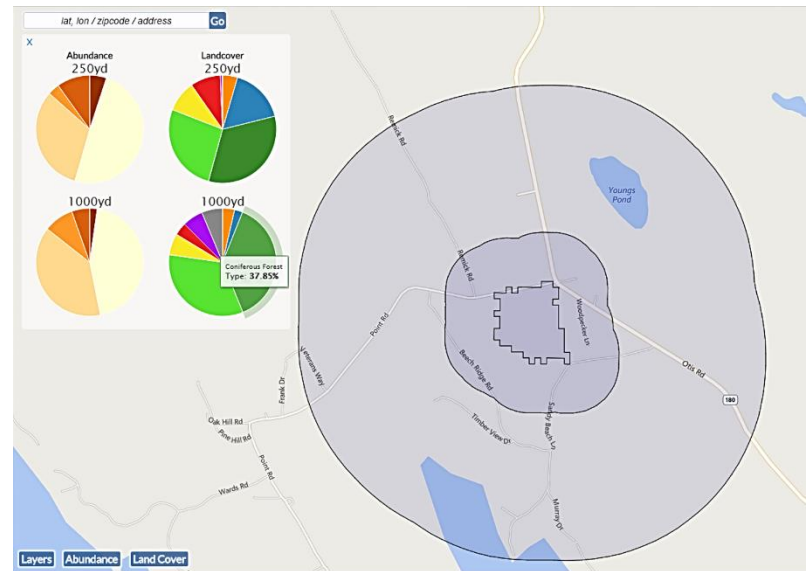
Home About Development

Welcome to BeeMapper



Future directions

- Incorporate recent grower feedback
- Complete InVEST modeling in Midcoast Maine
- Refine model parameters with field-collected data
- Publish User's Guide through MAFES
- Anticipated launch: December 2016



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