

# BeeMapper: a tool for grower assessment of wild bee abundance

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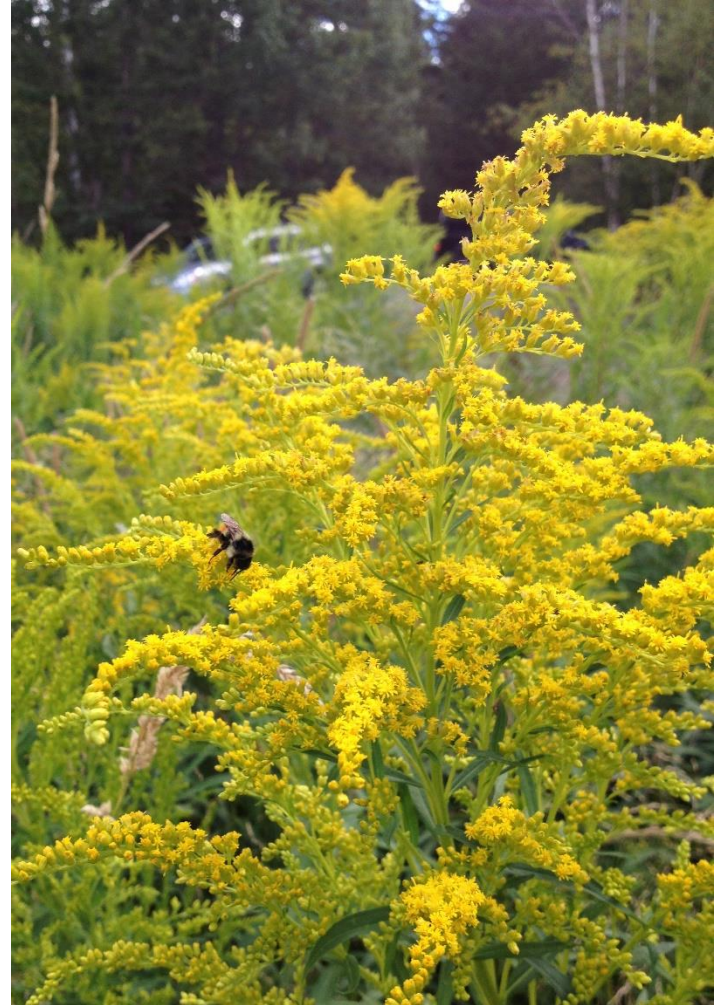
# Outline

- Background
  - Wild bees and wild blueberries
  - What makes good bee habitat?
  - Predicting bee habitat across the landscape
- Tool demonstration
  - Participatory development
- Tool applications



# Wild bees and wild blueberries

- 40 wild bee species associated with wild blueberry
- Better pollinators than honey bees
- Uncertainty in our knowledge of wild bees
- How can growers take advantage of wild bees?
  - Look at the landscape!



# What do bees need in their landscape?

Food:  
pollen and nectar

Shelter:  
open soil, dead  
logs and twigs

Within their  
flight limit

# Bee flight limit

*Colletes inaequalis*  
Max flight limit: 1096 yd



*Osmia inspergens*  
Max flight limit: 495 yd



*Lasioglossum leucomomum*  
Max flight limit: 31 yd



# What makes good bee habitat?

- Lots of sun
- Some shade
- Some water



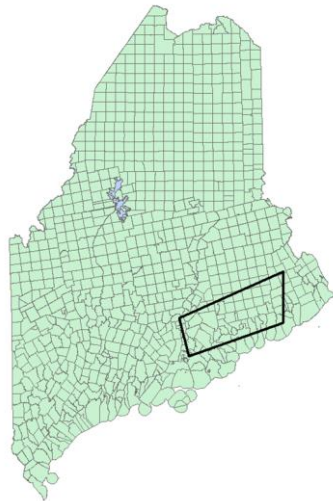
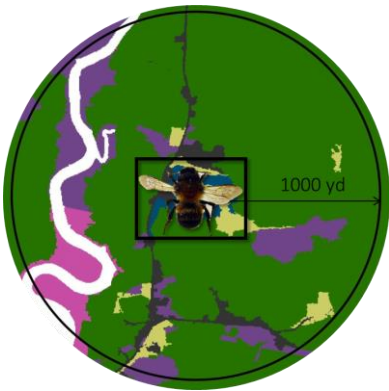
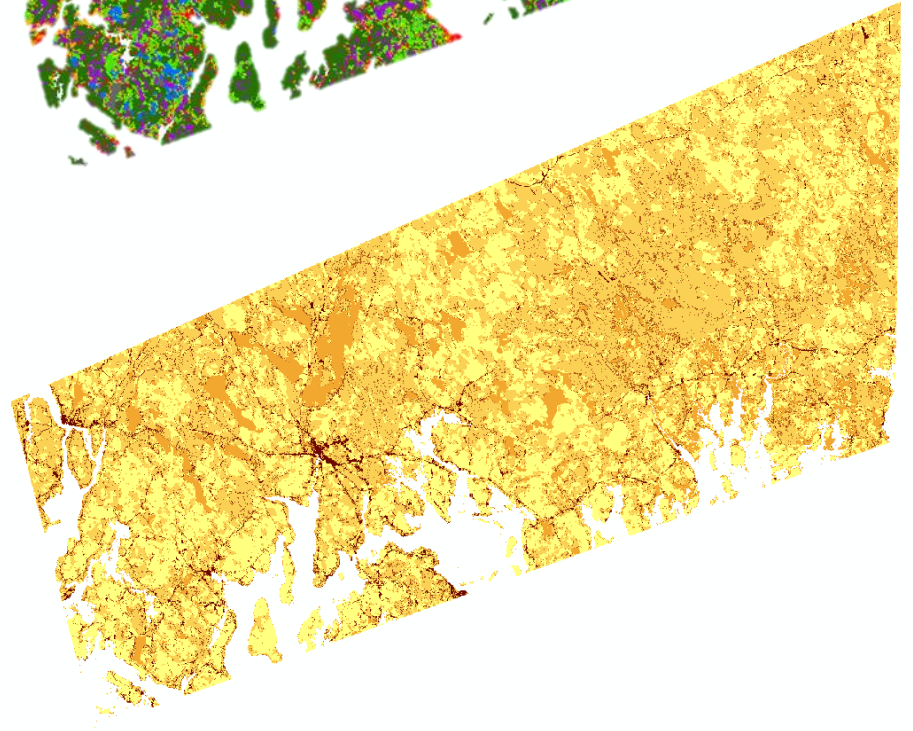
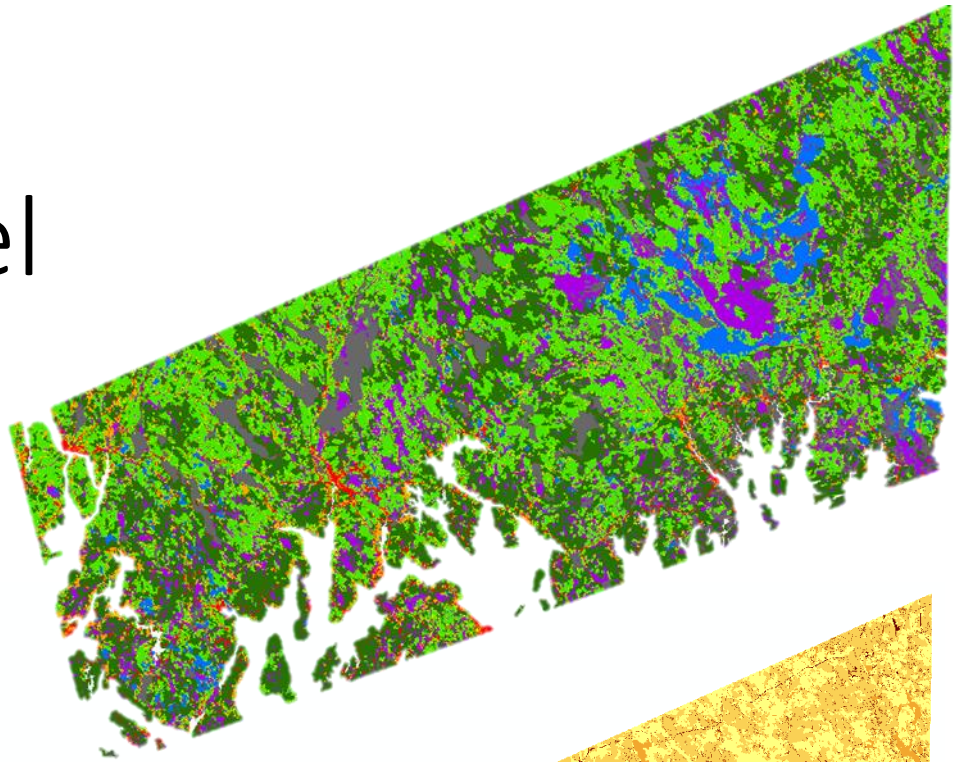
- Woody flowering shrubs
- Well-drained soils

Some types of  
land are better  
than others!



# InVEST Crop Pollination Model

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



# What is BeeMapper?

- An interactive map that displays predicted wild bee abundance in the landscape surrounding wild blueberry fields
- Information from BeeMapper can be used to
  - Determine placement of honey bee hives during blueberry pollination.
  - Establish a pollinator conservation plan for particular crop fields.
  - Understand wild pollinator communities in different types of land.

# Development Timeline:

- July 2014:
  - Introduced at Wild Blueberry Field Day
- November 2014:
  - Presented to Wild Blueberry Commission Advisory Board
- March 2015:
  - Spring Growers Meeting
  - 1:1 grower sessions
- July 2015:
  - Update at Wild Blueberry Field Day
- October 2015:
  - WildBREW Demonstration



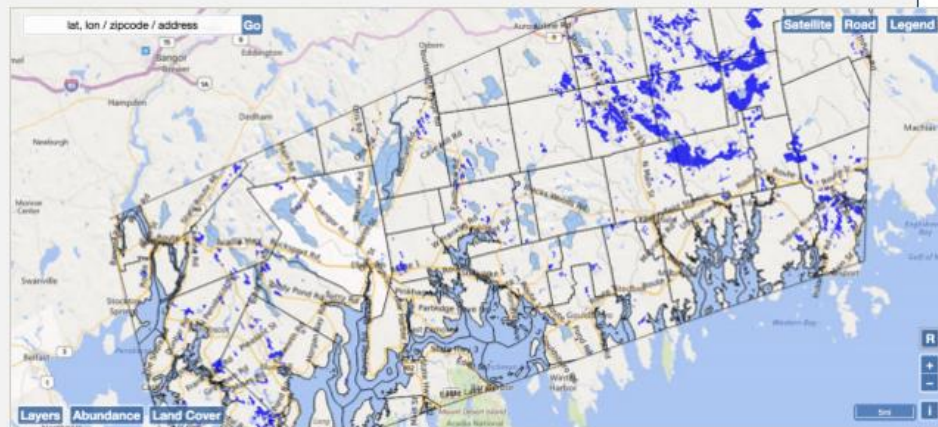
BeeMapper

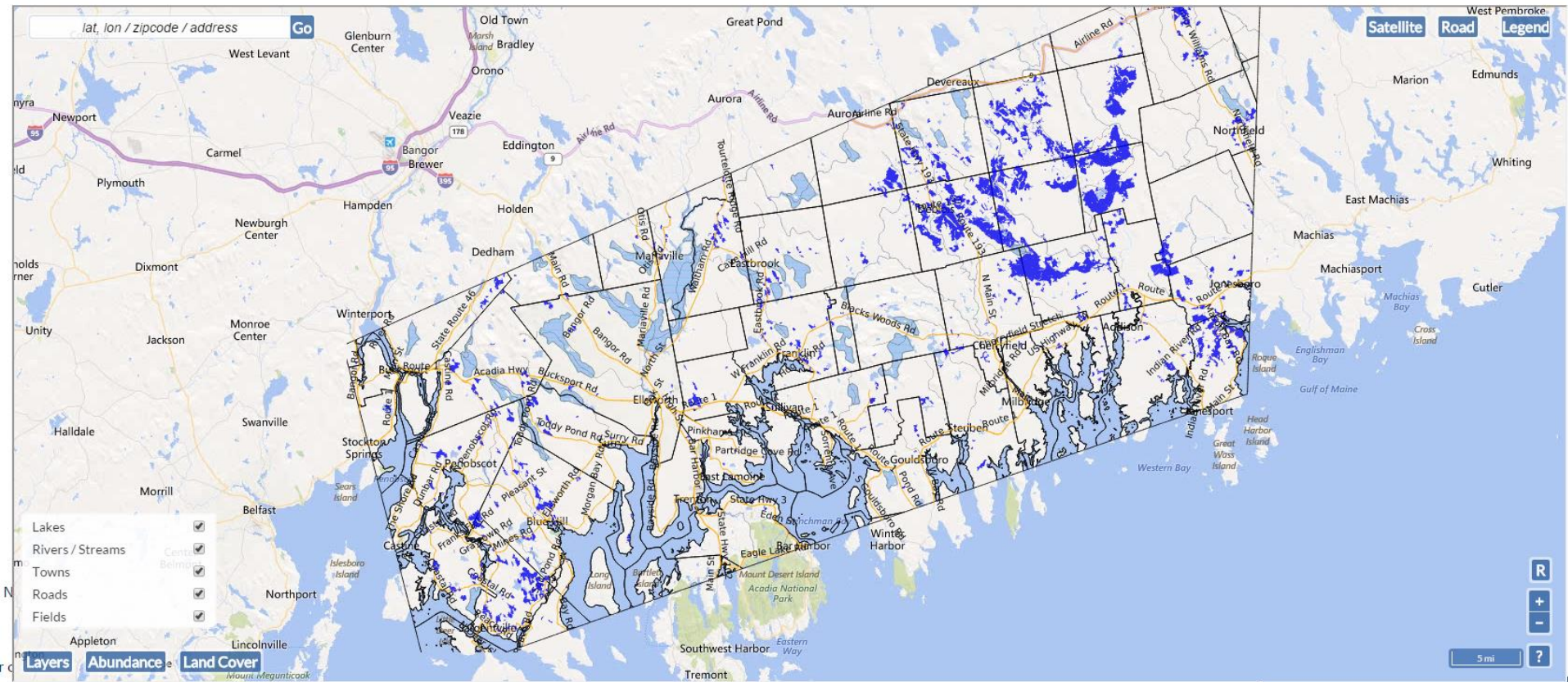
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Welcome to BeeMapper





lat, lon / zipcode / address

Go

Satellite

Road

Legend

Sugar Hill Rd

Narragansett Rd

77-77 Pa

Il Rd

Layers

Abundance

Land Cover

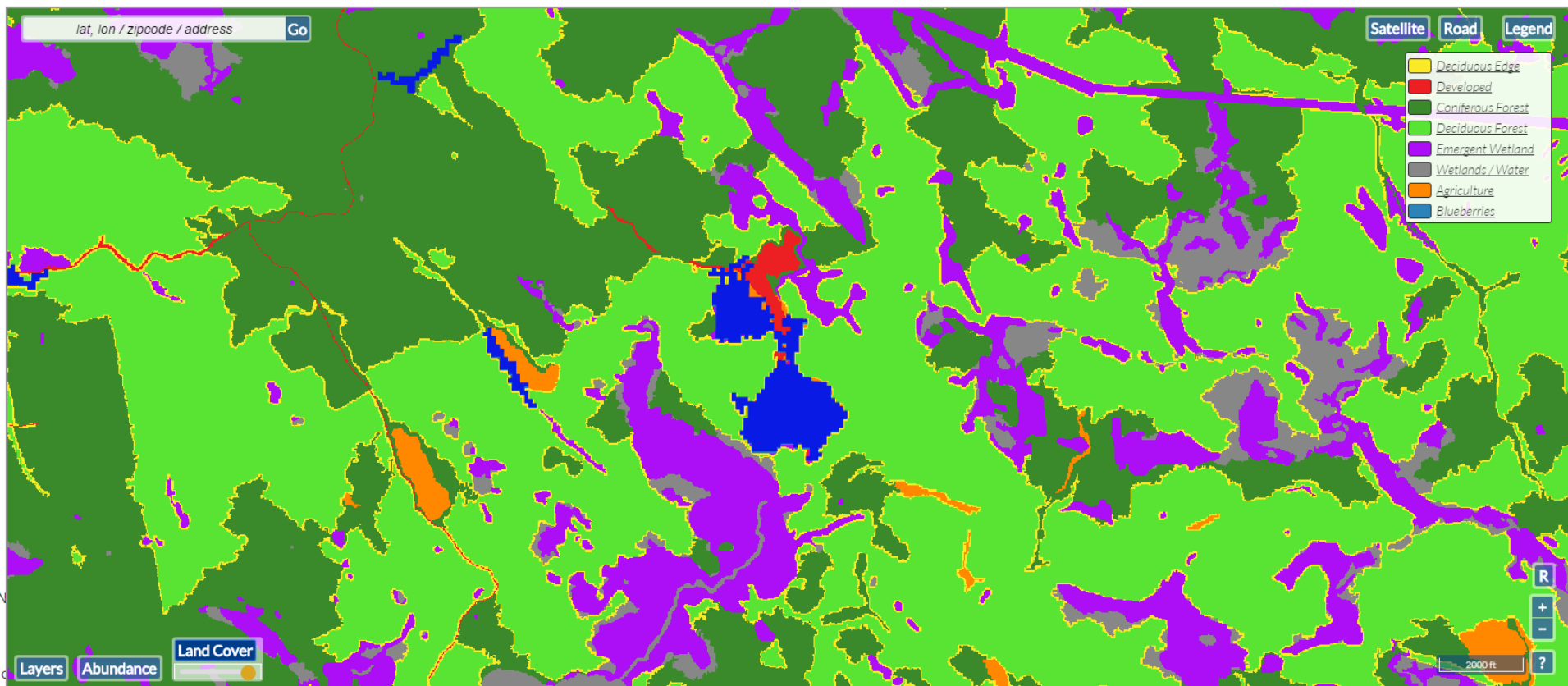
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2000 ft

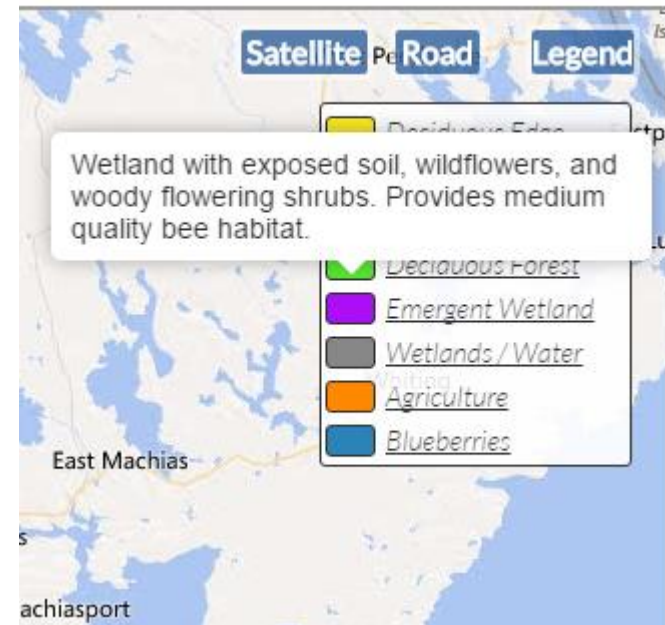




- Emergent wetland: Wetland with exposed soil, wildflowers, and woody flowering shrubs. They are medium quality bee habitat. Emergent wetland provides pretty poor ground and cavity nesting resources, but they are a good source of pollen and nectar throughout the growing season.

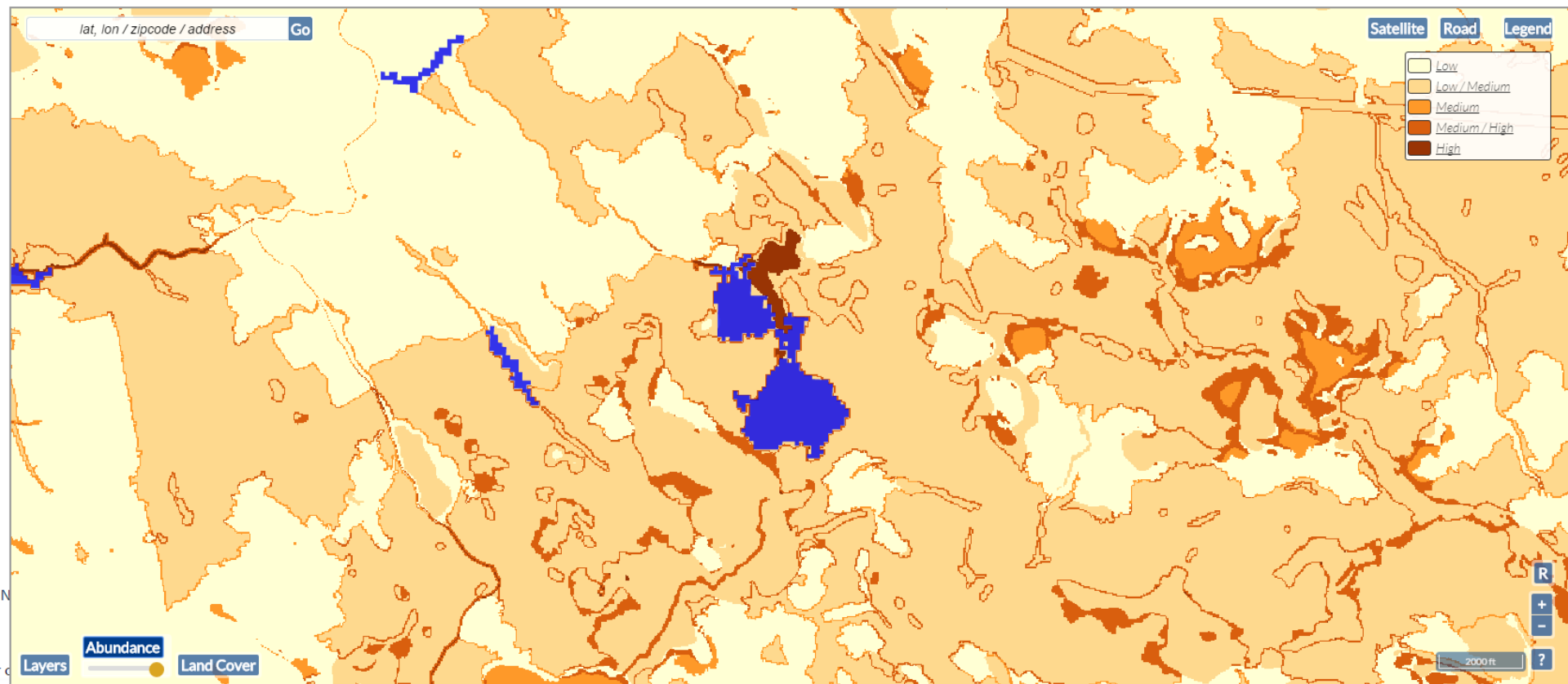


- Wetlands/water: Either submerged wetlands with few flowering plants or open water. These areas are pretty poor bee habitat—they provide little ground nesting or cavity nesting resources and offer little pollen and nectar throughout the growing seasons.



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/>



- 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*:



lat, lon / zipcode / address

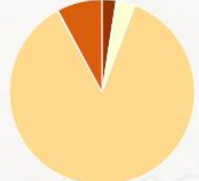
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Satellite

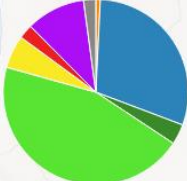
Road

Legend

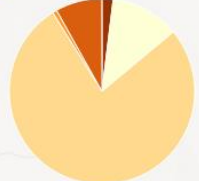
Abundance  
250yd



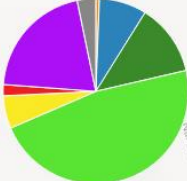
Landcover  
250yd



1000yd



1000yd



Layers

Abundance

Land Cover

2000 ft

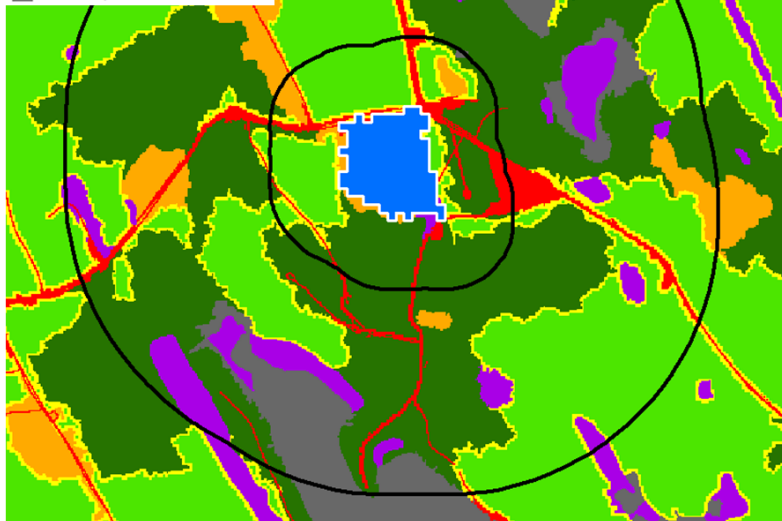
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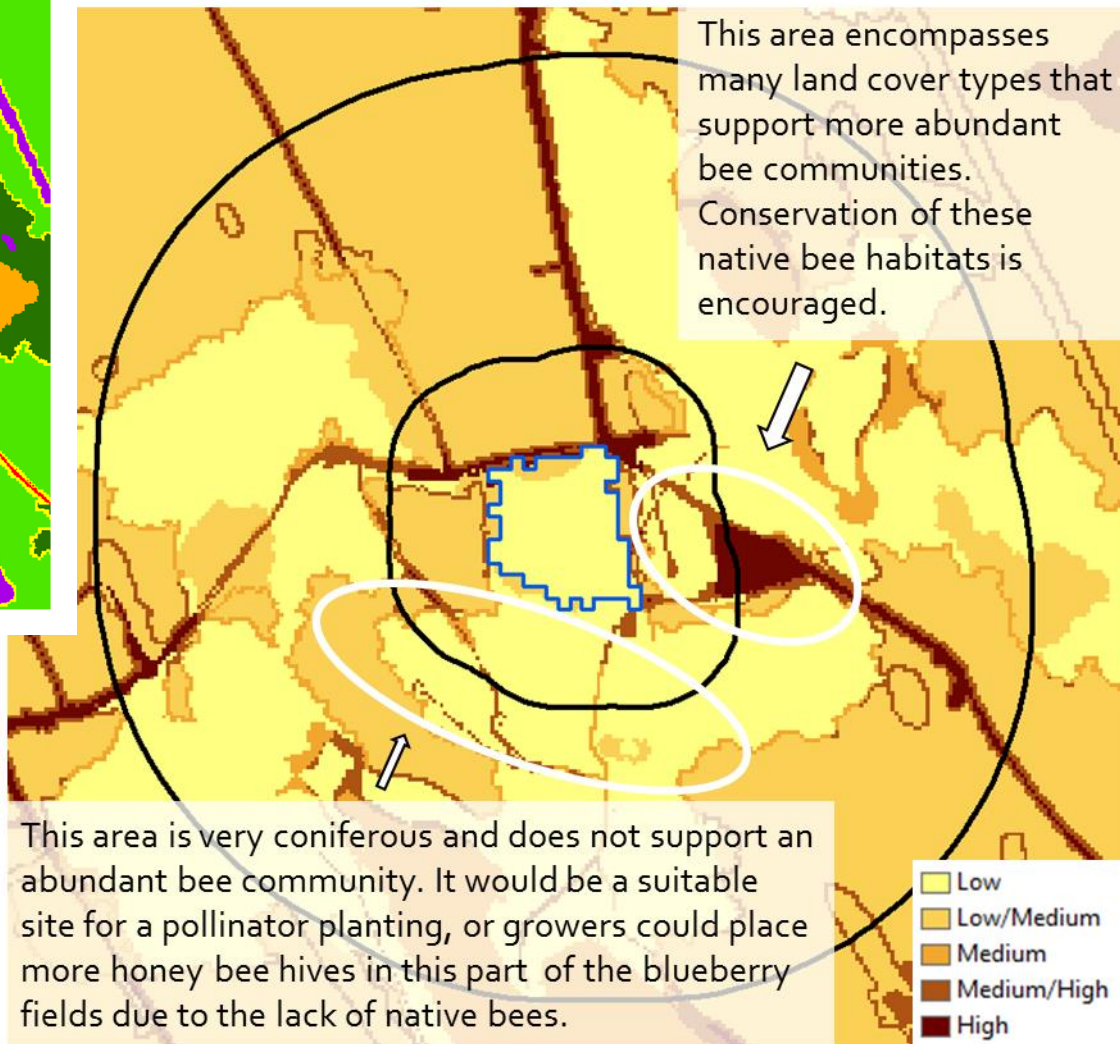
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- Agriculture/grassland
- Blueberries
- Coniferous forest
- Deciduous/mixed forest
- Deciduous/mixed forest edge
- Emergent wetland/scrub-shrub
- Urban/developed
- Wetlands/water



This area encompasses many land cover types that support more abundant bee communities. Conservation of these native bee habitats is encouraged.



# Acknowledgments

- Cooperating crop growers
- Technical support:
  - Andrei Strukov
  - Rob Powell
  - Nate Swan

