A tool for grower assessment of wild bee abundance in the Maine wild blueberry landscape

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We developed an online interactive mapping tool called BeeMapper that shows Maine wild blueberry growers the wild bee abundance in the landscape surrounding their crop fields, predicted from an application of the InVEST Crop Pollination model (a product of the Natural Capital Project; http://www.naturalcapitalproject.org/InVEST.html).

Why BeeMapper?

- Wild blueberry growers depend on commercially sourced honey bees to pollinate their crop.
- Wild bees are abundant in wild blueberry fields and the landscape surrounding Maine's wild blueberry fields during crop bloom.

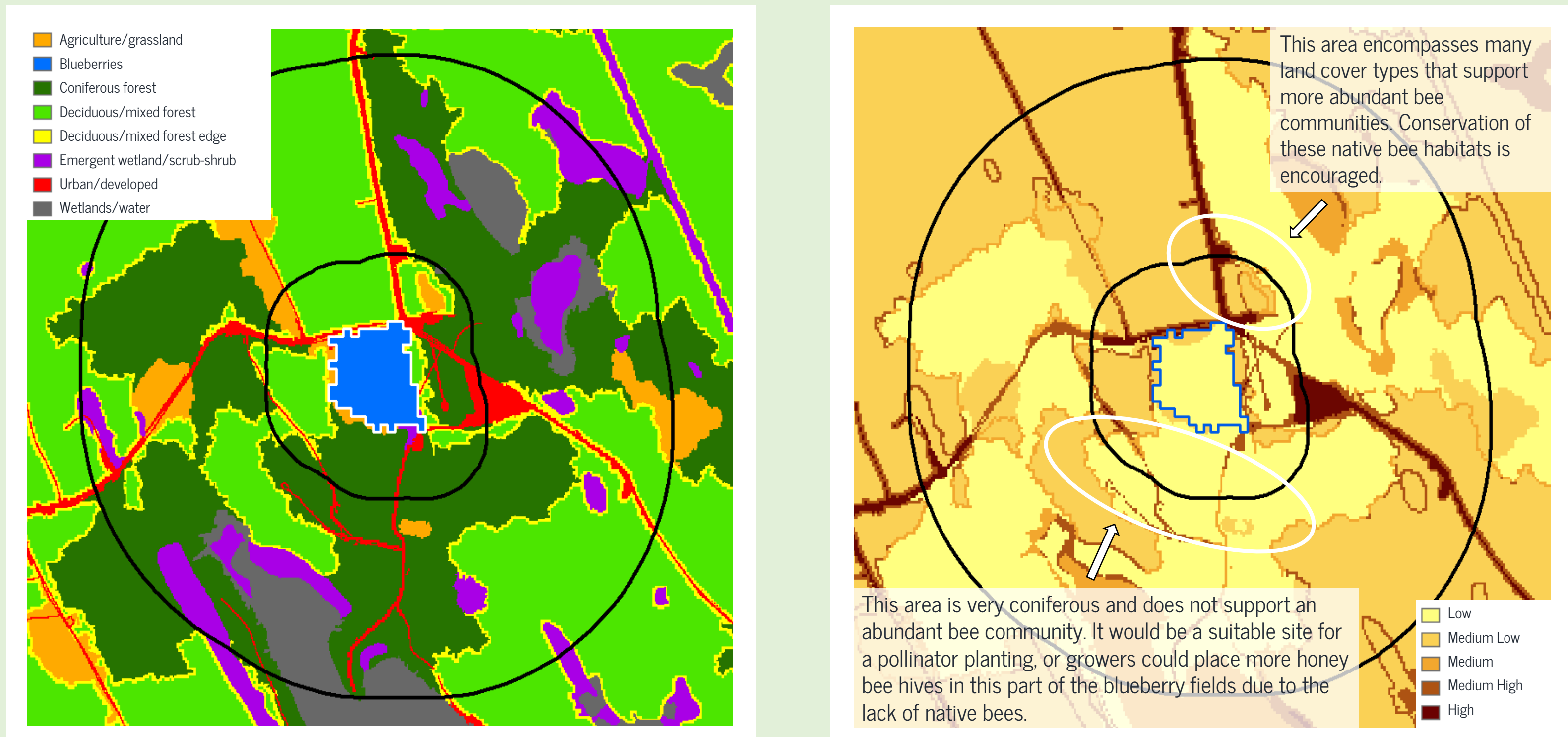Wild blueberry growers can use the information presented in BeeMapper to:

- 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.

Figure 1. How to use BeeMapper for pollination management.

Step 1: Locate the target blueberry field.

Step 2: Click on the target field to display the wild bee habitat in 2 buffers (250 and 1000 yd) representing maximum foraging distance of small and large wild bees.

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

Step 3: Examine the land cover type map within the wild bee habitat. Growers see what kind of habitat is available to wild bees around their crop fields.

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

This area is very coniferous and does not support an abundant bee community. It would be a suitable site for a pollinator planting, or growers could place more honey bee hives in this part of the blueberry fields due to the lack of native bees.

Legend:
- Low
- Medium Low
- Medium
- Medium High
- High

Step 4: Assess wild bee abundance around the target crop field by looking at the predicted abundance map.

BeeMapper has three components:

1) Land cover map:
- Based on the 2004 Maine Land Cover Dataset (MeLCD; http://www.maine.gov/megis/catalog/).
- We classified the MeLCD into 8 land cover classes that are important for wild bees (Figure 1).
- We further modified this map to provide the most extensive wild blueberry coverage.

2) Predicted wild bee abundance:
- We applied the InVEST Crop Pollination model to Maine's wild blueberry landscape (Chapin 2014).
- InVEST uses the suitability of each land cover type as bee habitat and bee life history traits to predict wild bee abundance across a landscape.
- The final map displays an index of predicted wild bee abundance across the landscape (Figure 1).

3) Grower participation:
We developed BeeMapper with an iterative, participatory method including
- Small group meetings with early adopters and industry influencers
- Large group meetings with tool demonstration
- 1:1 interviews with wild blueberry growers (Box 1)
We refined the tool to incorporate grower suggestions after each participatory event, and growers tested multiple iterations of the tool throughout the development process.

Figure 2: Wild bees in wild blueberry.
a) *Andrena carlini*
b) *Lasioglossum leucomomum*
c) *Halictus ligatus*
d) *Osmia inspergens*
All photos © Laurence Packer via discoverlife.org

Box 1: Interview summary

Interviews assessed grower interest in, comfort with, and understanding of BeeMapper.

We conducted six interviews with growers over a range of crop management practices:
- Organic, low-input, and high-input farms
- 12 acres to 1000+ acres of wild blueberry fields
Growers were receptive of and engaged with BeeMapper:
- "I can use this to figure out how many honey bee hives I need to bring in."
- "This shows me where I can put my honey bees to get the most benefit."
- "Now I know where to be extra careful when we spray pesticides."
Growers made many suggestions to improve the tool:
- Summarize the data in a clear, concise way (Figure 3).
- Add information about InVEST and important wild bees to tool documentation
- Describe abundance by expected number of bees and contribution to pollination
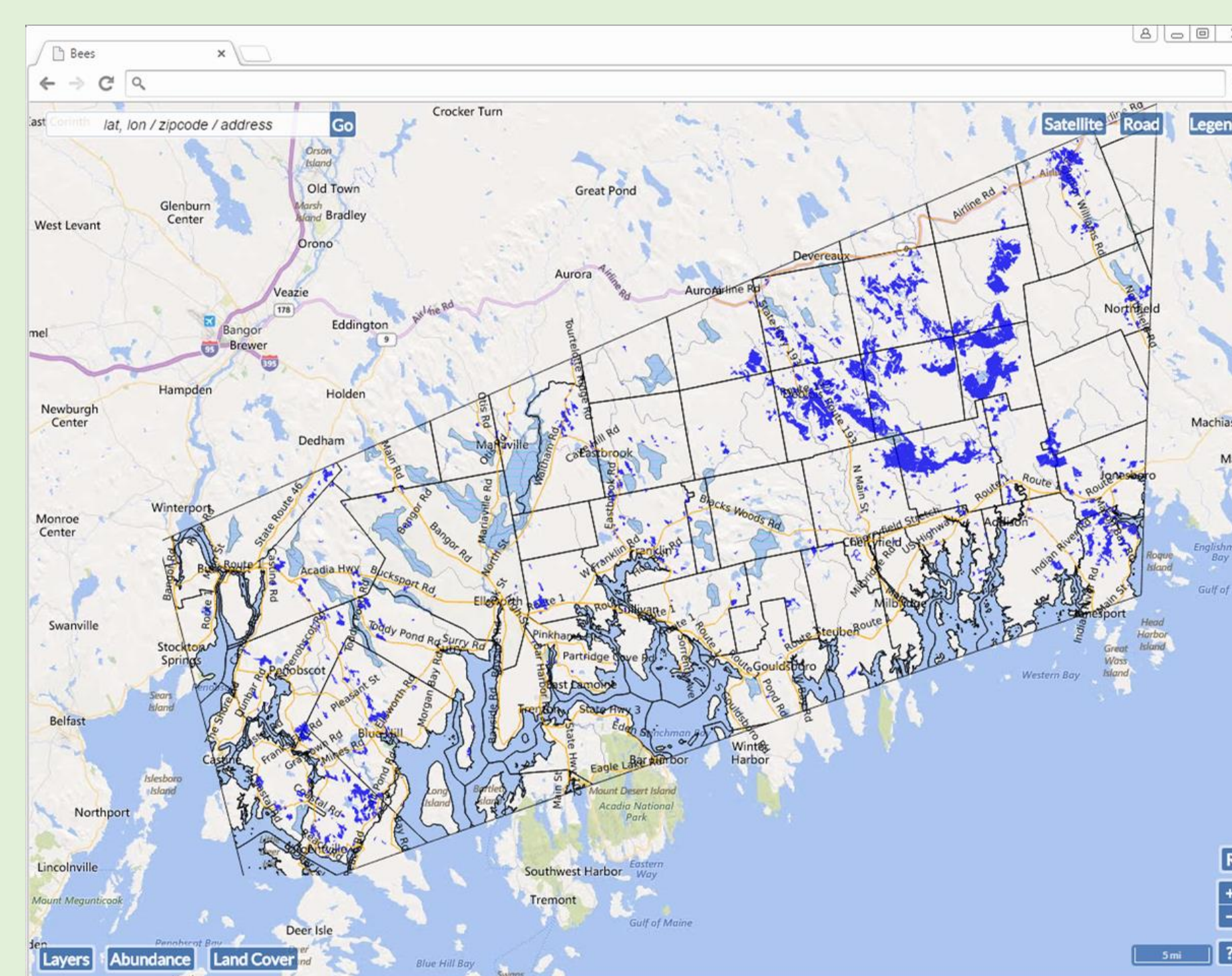

Figure 3. One-click summary of wild bee habitat and abundance surrounding a crop field.

What's next with BeeMapper?
- Launch website to growers: http://www.umaine.edu/beemapper (Figures 4 and 6).
- We will interview more growers to assess the website and refined tool.
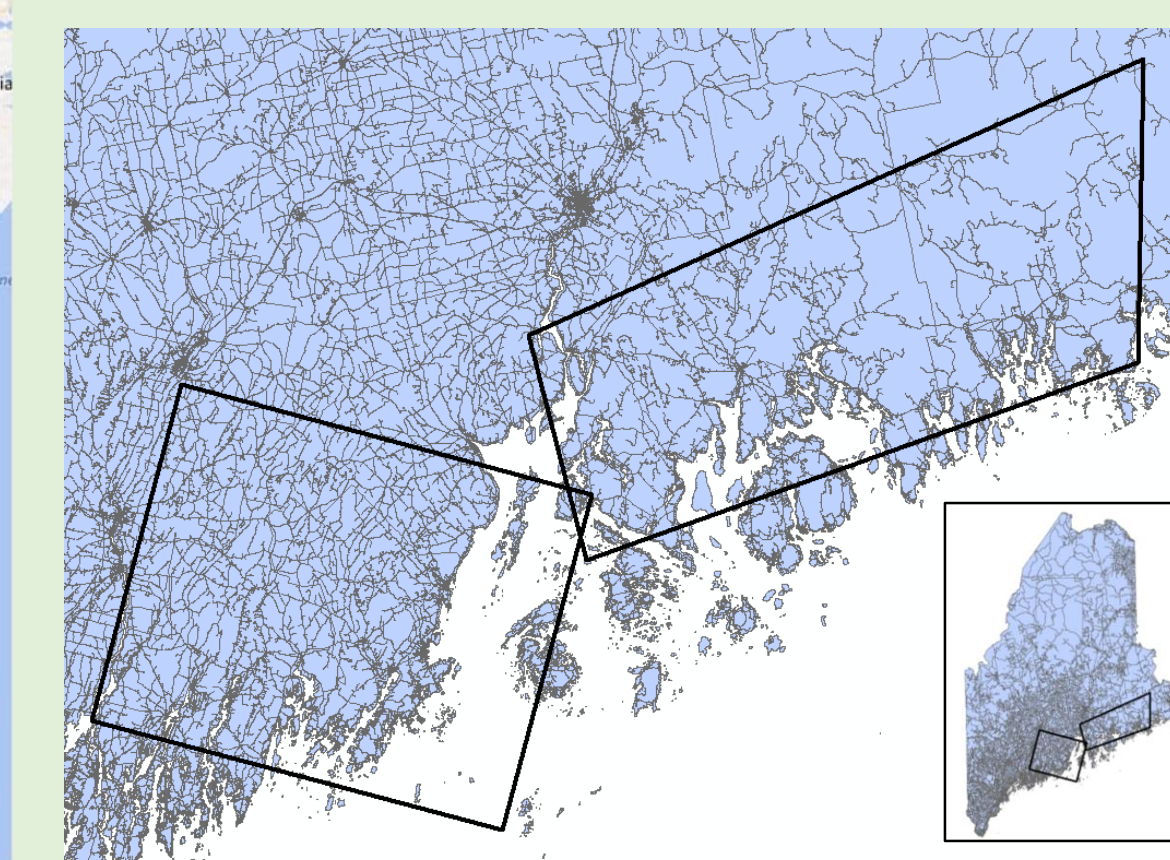- We are expanding coverage of BeeMapper to more of Maine's wild blueberry production landscape (Figure 5).
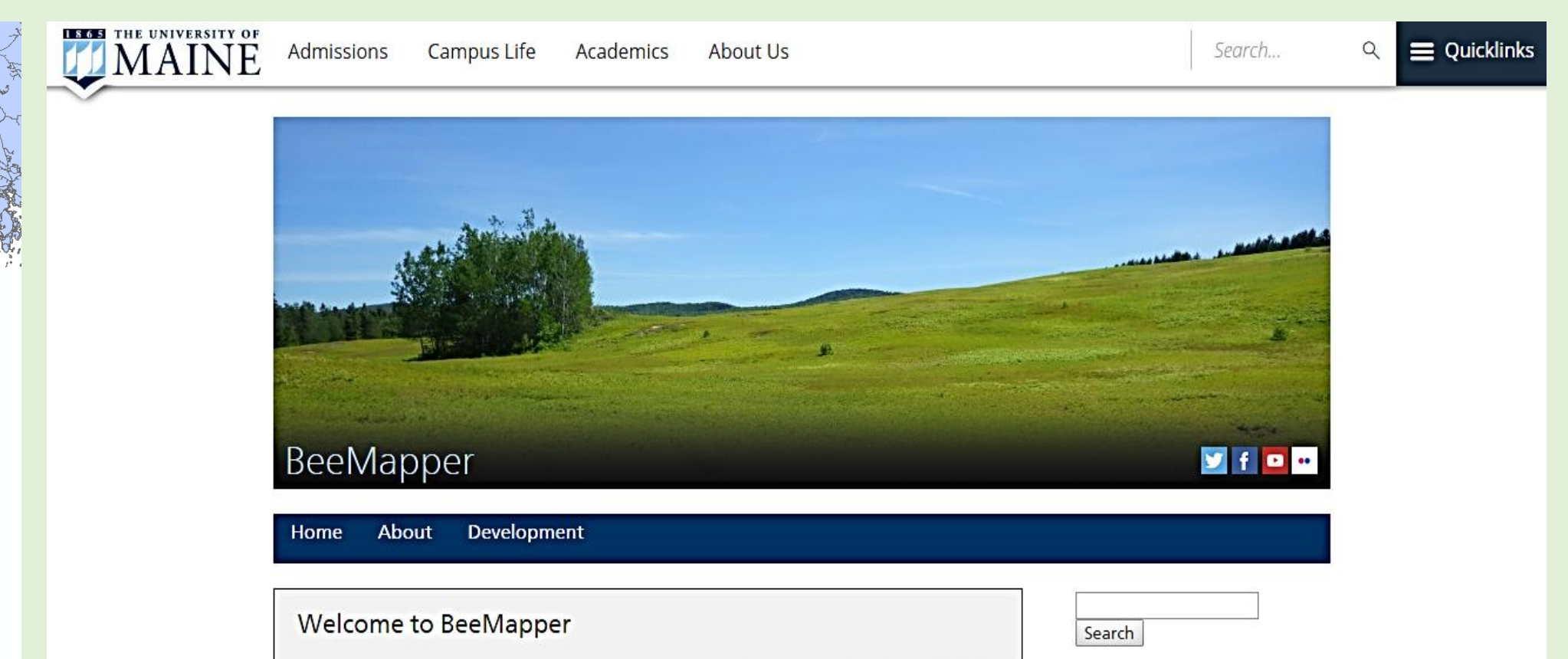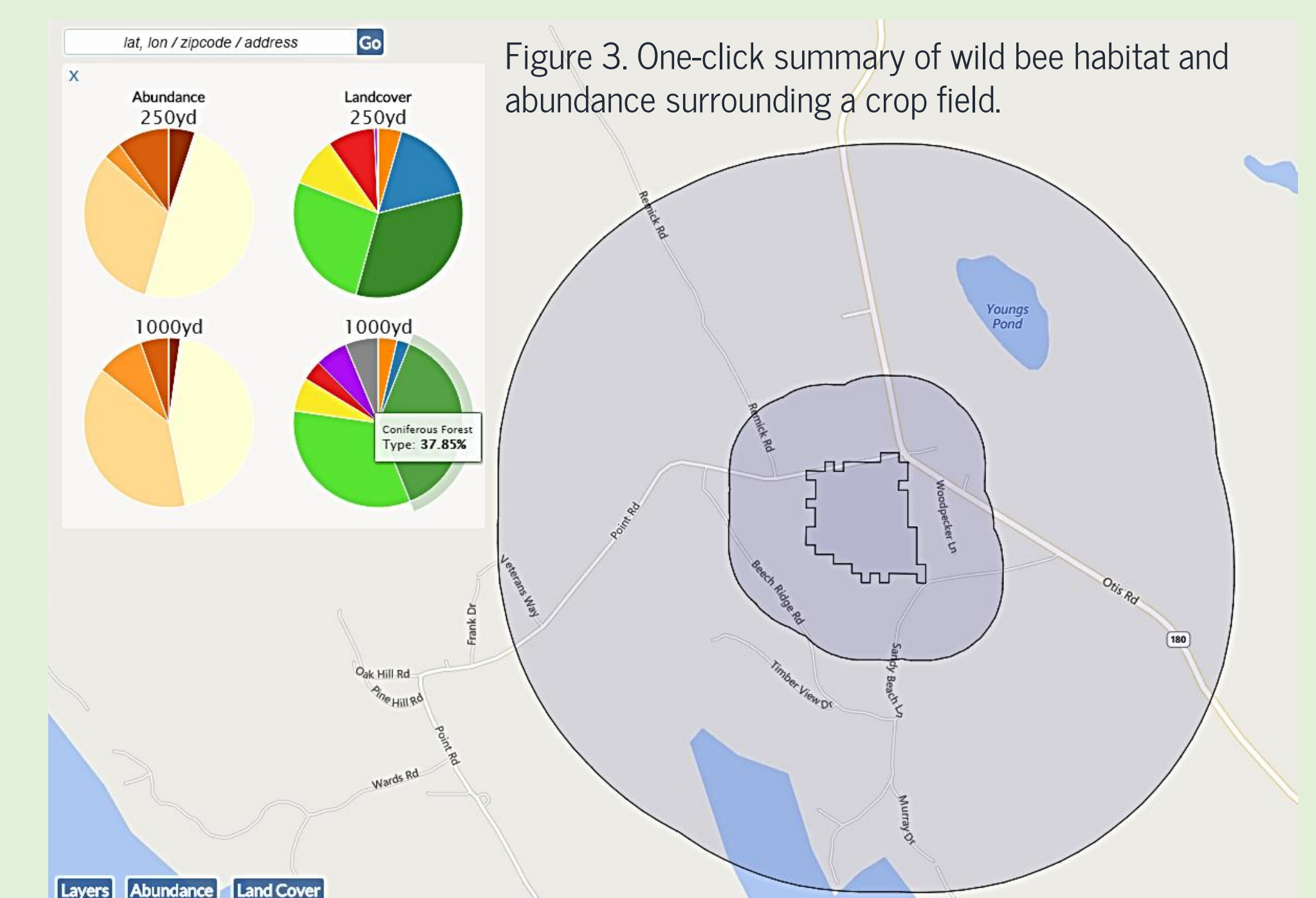

Figure 4. Home screen of BeeMapper.

Figure 5. Total extent of BeeMapper.

Figure 6. Website that hosts BeeMapper and documentation.

Chapin, S.J. 2014. The application of spatial modeling tools to predict native bee abundance in Maine's lowbush blueberries. http://digitalcommons.library.umaine.edu/etd/2112

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