# Impact of Climate Change on Bee Habitats

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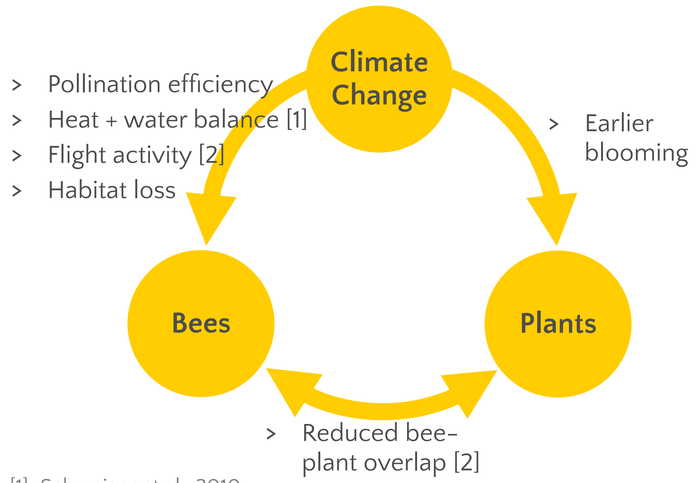
## Background

### Climate Change + Bees + Plants

Complex relationship that can threaten food security and ecosystem functioning.




[1] Schweiger et al., 2010
[2] Memmott et al., 2007

### Southeastern U.S. as an Area of Study

- Region particularly sensitive to climate change
- Wide array of bee-dependent agriculture

## Goal

To inform potential bee conservation efforts in the southeast by identifying possible "bee deserts", or areas likely to become uninhabitable by bees, through 2070.

## Methodology

- Identify species to evaluate, using a list of bees surveyed in Georgia by Gwinnett Georgia College
- Model habitat ranges and project habitat range shifts through Habitat Projections computational algorithm
- Analyze changes, gaps, and potential complementarities across bee species

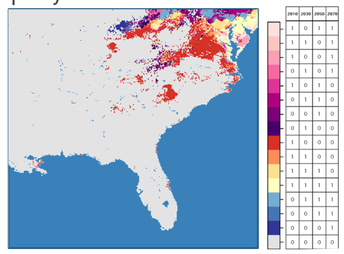
## Model Outputs

### Sample Outputs

#### Sweat Bee[1] Range Shifts from 2010 to 2070, RCP 2.6

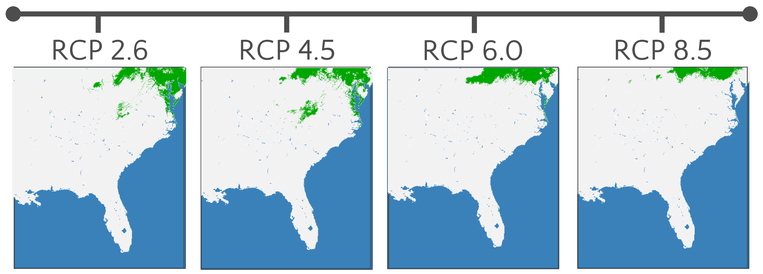
Under the most conservative climate change model (RCP 2.6), the suitable habitat range in the southeast is largely projected to contract with northward shifts. Overlaying habitat ranges over time provides a visual analysis of shifts as indicated:

- Pink/purple: intermittence
- Red/orange: contraction
- Yellow: persistence
- Blue: expansion
- Grey: absence



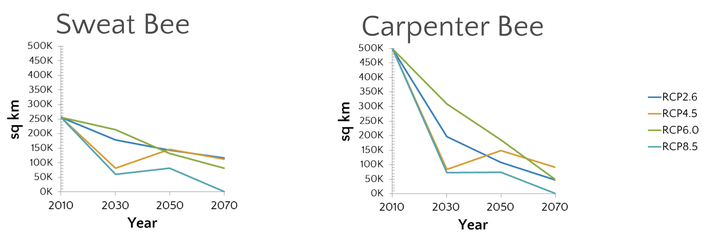
#### Sweat Bee Habitat Suitability Across RCPs, Year 2050

Climate change scenarios, which increase in severity, have varied impacts on projected habitat suitability.



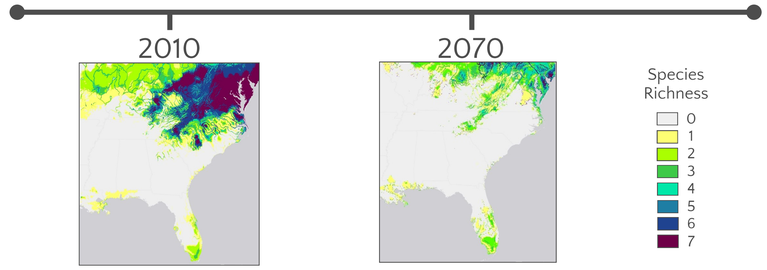

#### Impact of Climate Change Varies by Species and RCP

Climate change can sometimes benefit, and other times hinder a bee species' habitat range. Additionally, different species are impacted to different degrees. The carpenter bee[2] begins with twice the suitable habitat as the sweat bee, yet by 2070, has less suitable habitat than the sweat bee in all climate scenarios except RCP 8.5.




#### Biodiversity, RCP 2.6

Overlaying habitat suitability layers of multiple species can reveal how many of the 7 species we analyzed have suitable habitats in a given area. Note the northward shifts and decreased diversity from 2010 to 2070.




**Notes**

Scientific names: [1]*Lasioglossum bruneri*, [2]*Ceratina strenua*

## Discussion

Preliminary results indicate many bees will experience habitat contractions + northward shifts

- May impact bee-dependent agriculture in southeast
- Suggests need for bee conservation efforts

### Limitations

- Gwinnett Georgia College bee species list does not fully represent bee species in southeastern U.S.

### Future Work

- Analyze habitat projections of additional bee species
- Compare habitat projections of the widely domesticated honey bee to wild, native bees

## Acknowledgements

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