

Native bee diversity in organic and conventional hedgerows in eastern Ontario

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CANPOLIN AGM

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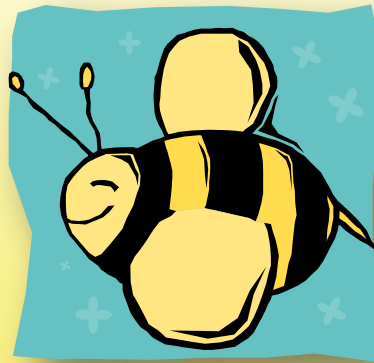
The issue: native pollinators

- \uparrow Agricultural intensity = \downarrow Biodiversity
- \downarrow Biodiversity = potential loss of ecosystem services
- Bees provide pollination to crops and wild plants
- How do agricultural practices affect wild bees?



Research Question:

- Does bee diversity differ between organic and conventional farms in eastern Ontario?
- If not, what other factors are affecting bee diversity?

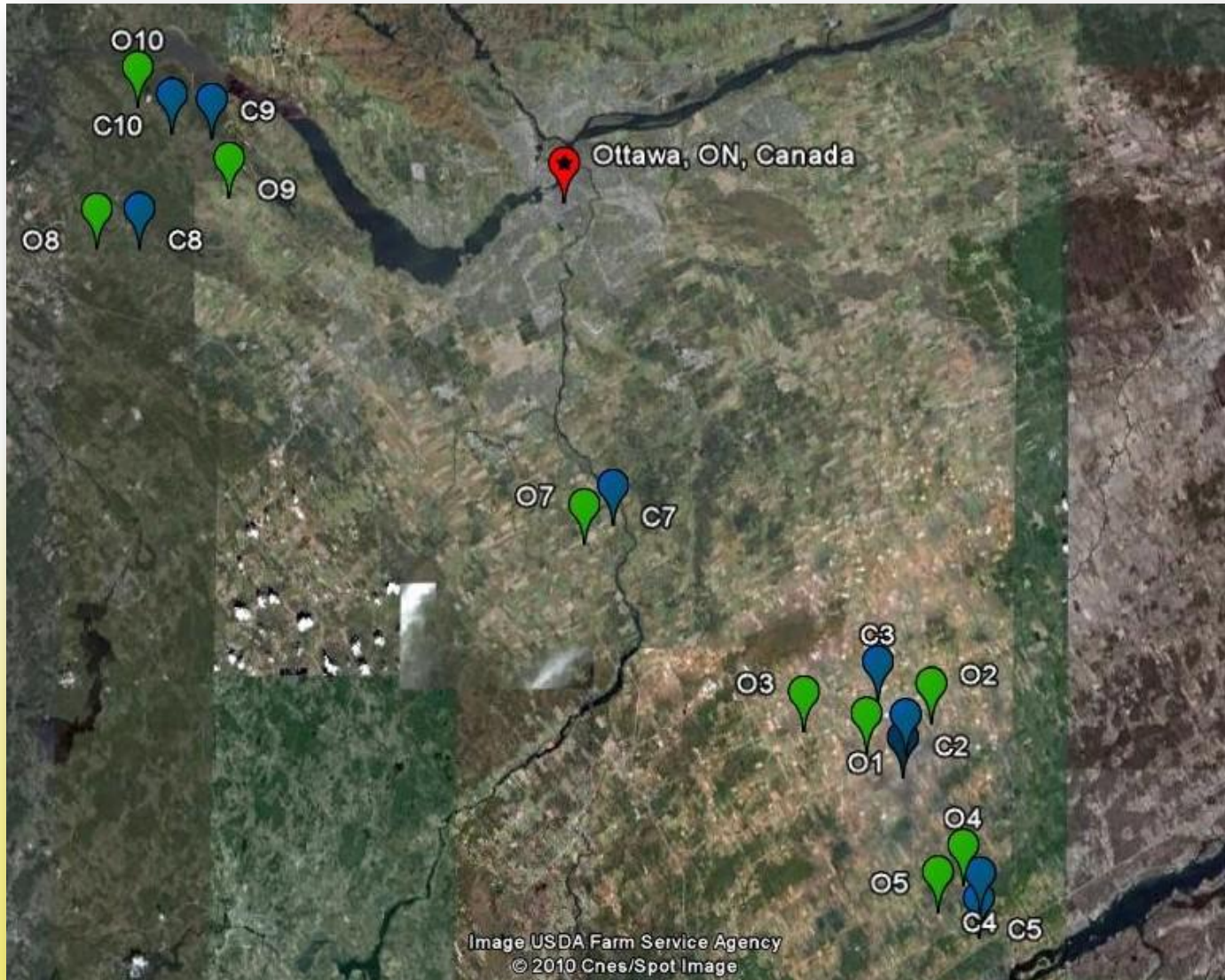


Experimental Design

- 9 pairs of conventional/organic soybean fields bordered by a hedgerow
- Sites paired by:
 - Location (at least 2 km apart)
 - Hedgerow vegetation type (treed vs. grassy)
 - Opposite crop type (crop vs. hay)



Site map



Predictors other than farm type:

- Floral composition
 - Hedgerows were surveyed for flowers at the end of each month (4 times total)
 - Each species was identified and given an abundance rank
 - 1 = rare (one or two individuals)
 - 3 = very abundant



Other predictors cont.

- Floral composition cont:
 - Matrix: highest floral abundance of each species at each site, no matter what month
 - Non-metric multidimensional scaling was used to reduce data
 - Axis 1 explained 62.5% of the variation
 - Values for axis 1 can be used in a model to represent floral composition

Other predictors

- Field management information
 - Pesticides
 - Categorical variable based on bee toxicity data
 - Tillage
 - categorical



Other predictors

- Amount of natural habitat at the landscape scale
 - Digitized 2008 air photos within 1 km buffer around site
 - Natural habitat:
 - Hay/pasture
 - Verge
 - Hedgerow
 - Riparian
 - Forest
 - Semi-natural



Method 1: Pan Traps

- Following CANPOLIN protocol:
 - 1 transect/site
 - 30 pans/transect, 10 of each colour
 - Sites were sampled 9 times, May – September.
 - Traps were left out 9 AM – 5 PM, all sites on the same day



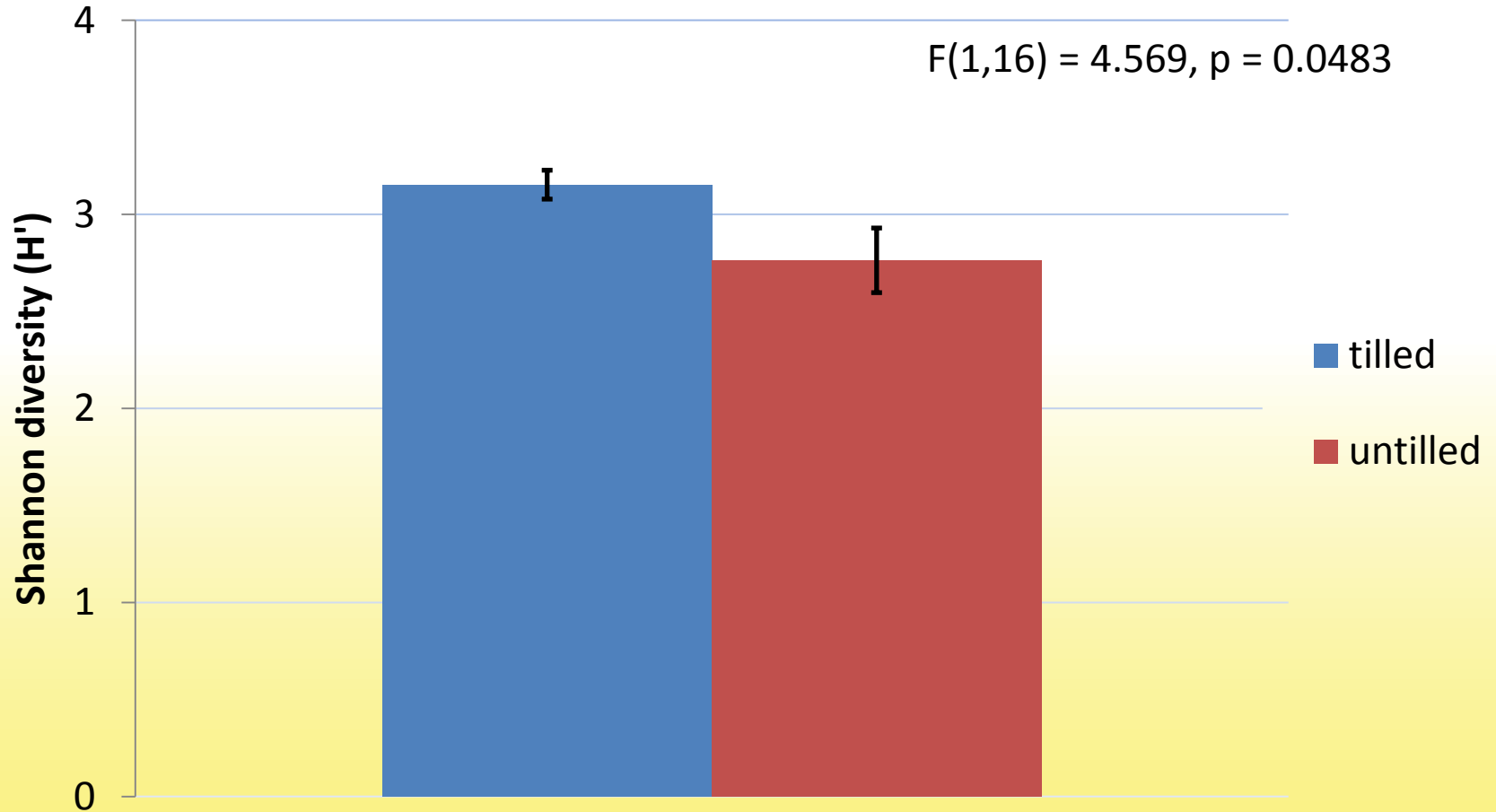
Method 1: Pan Traps

- Data analysis
 - Response variables:
 - Abundance (N)
 - Species richness (S)
 - Shannon diversity index (H')
 - Evenness (J')
- Approach to data analysis:
 - Test each response for farm type first
 - If not significant, add other predictors
 - Floral composition
 - Tillage
 - Pesticide category
 - Natural habitat

Pan Trap Results

- 18 sites x 30 traps x 9 sampling runs = 4860 traps
- Total abundance = 3472 bees (not including *Apis mellifera*)
 - Conventional: 1613
 - Organic: 1959
- 149 species from 24 genera
- Farm type was not significant

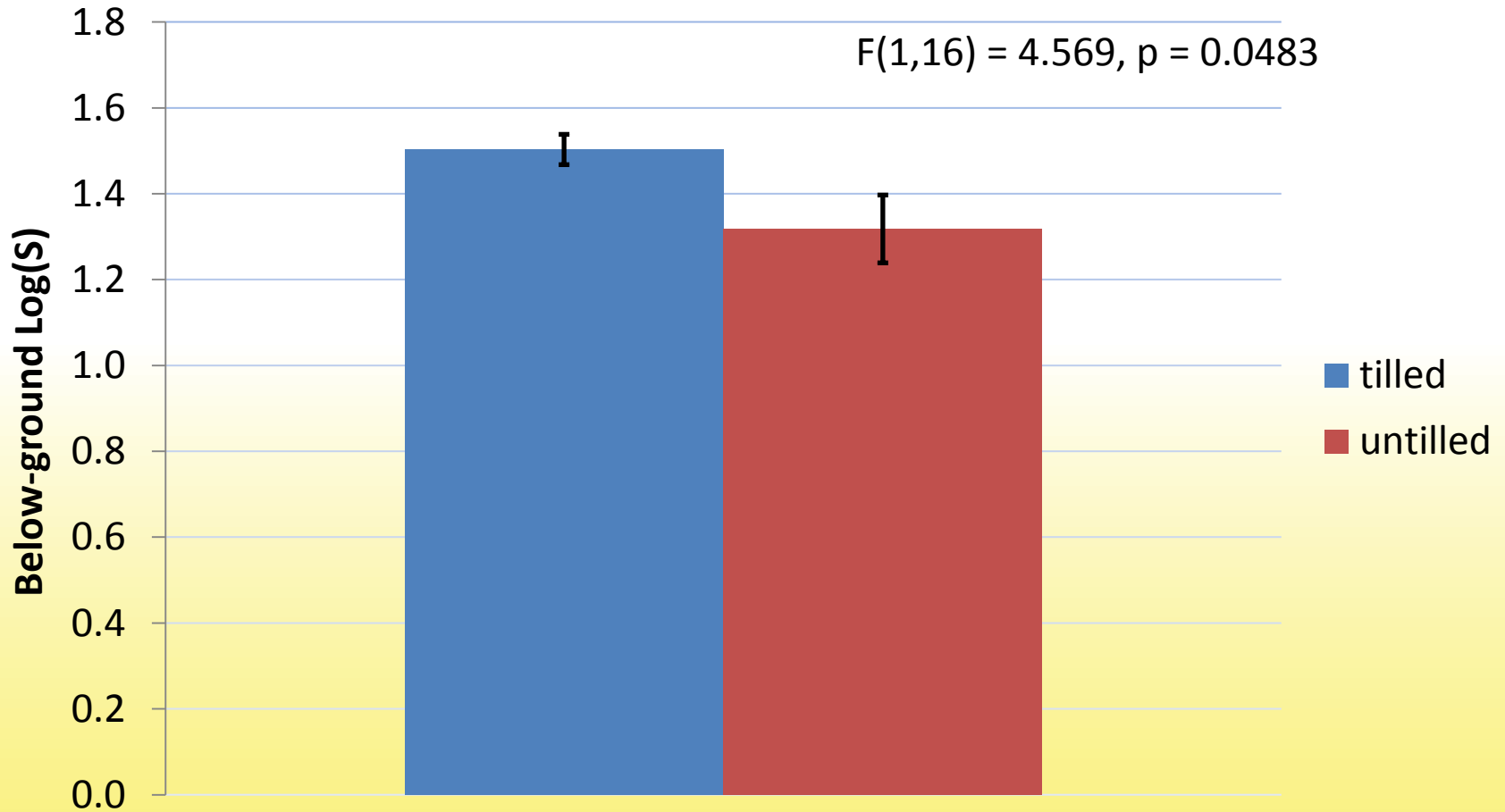
Pan Trap Results



Pan trap Results

- Overall bee community is made up of guilds
- Guilds may differ in response to disturbances
- Repeat analysis using guilds based on nesting preferences:
 - Bees that nest **above** ground
 - Bees that nest **below** ground

Pan Trap Results



Method 2: Bumble Bee Netting

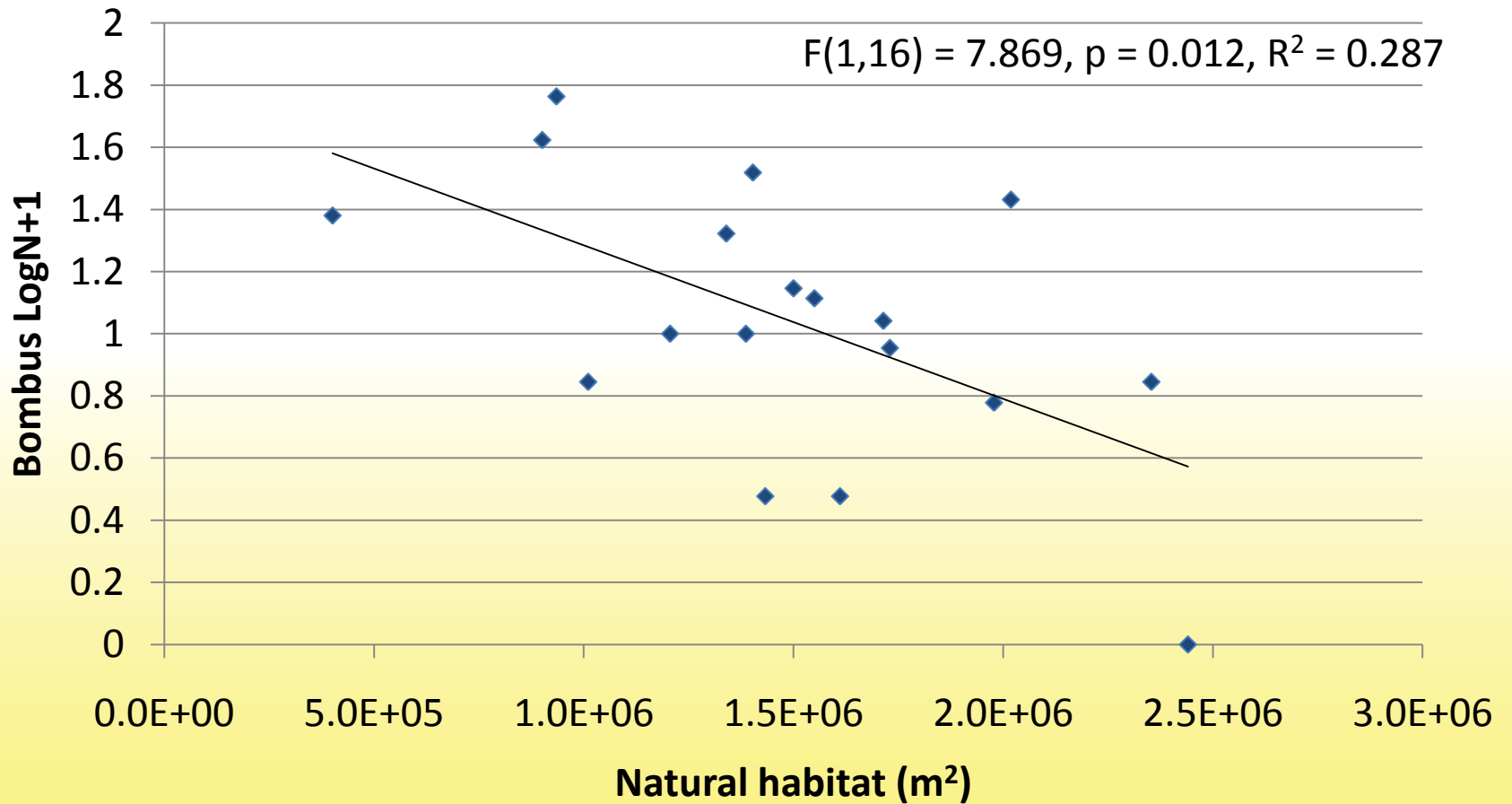
- Same sites were used
- Each site sampled 4 times in July & August
- Sites were sampled for 30 minutes each between 9 AM and 5 PM.

Bumble Bee Results

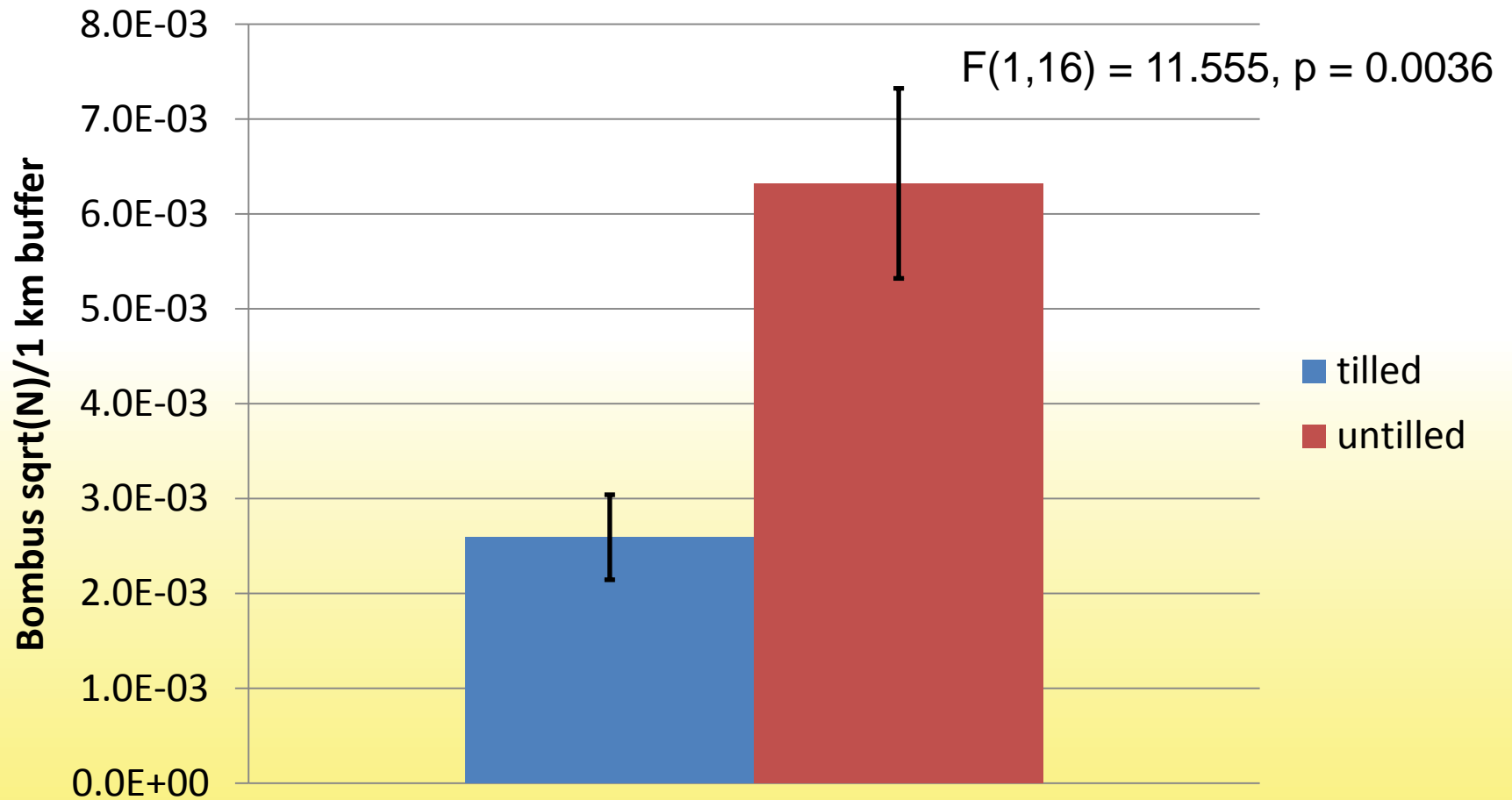
- Total abundance: 282 specimens
- Conventional: 105
- Organic: 177
- 13 species



Bumble Bee Results



Bumble Bee Results



Next Steps and Future Research

- Next steps for this project:
 - Account for spatial autocorrelation
 - DCA analysis to visualize how individual species react to disturbances
- Future research in Pierre Mineau's lab:
 - Development of an index of 'pollination services' based on seed set
 - How spatial configuration of farmland affects pollination.

Thank you!

