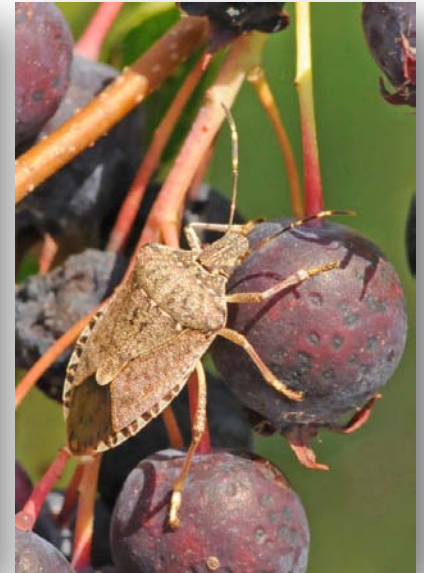


# Spatial patterns of BMSB host use in nurseries: a multi-scale analysis

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# BMSB aggregating on trees



# BMSB feeding through tree bark



Martinson, Raupp, Shrewsbury (in press)  
*Annals of the Entomological Society*

# BMSB feeding through tree bark ... may damage trees



## Possible damage

- Direct feeding
- Indirect as disease vector
- Home invasions



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## Woody Plant Nurseries

Economically important: #2

Ag Sector in MD

2008: ~ \$2 billion green industry gross receipts



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Must immigrate, emigrate

High plant diversity

Large blocks of trees

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- Field- and nursery- scale edge effects
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# Research Site

## Raemelton Farm

Adamstown, MD

300+ Acres, 6 Fields

Plants in the ground 1-7 years

Heavy BMSB pressure 3 years



Photos by Steve Black

# Survey Methods



## **1 minute visual counts for each plant part**

Leaves ▪ Fruit ▪ Bark (up to 2 m)

### **BMSB stages**

Egg clusters ▪ Early nymphs ▪  
Late nymphs ▪ Adults

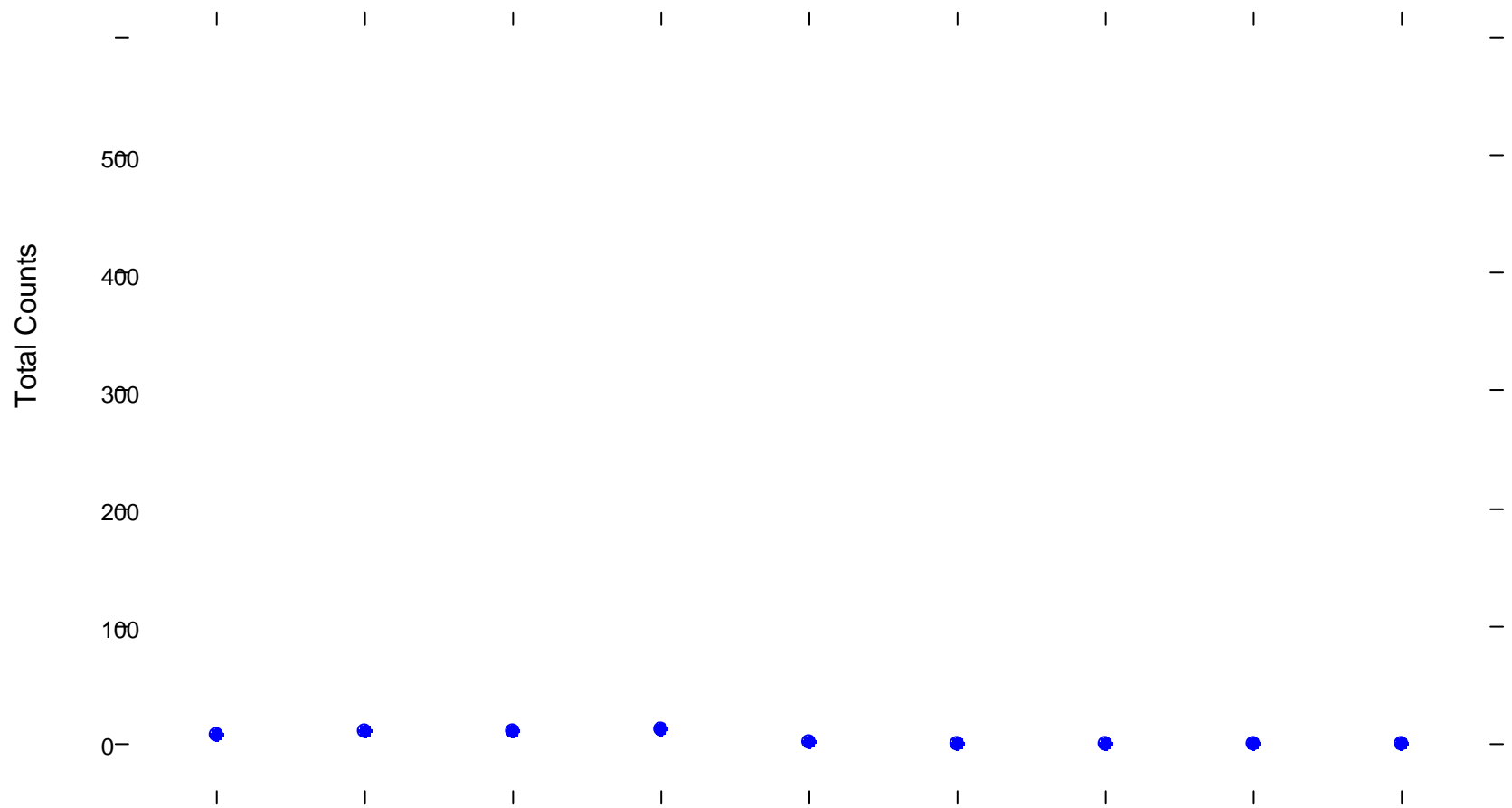
### **2011**

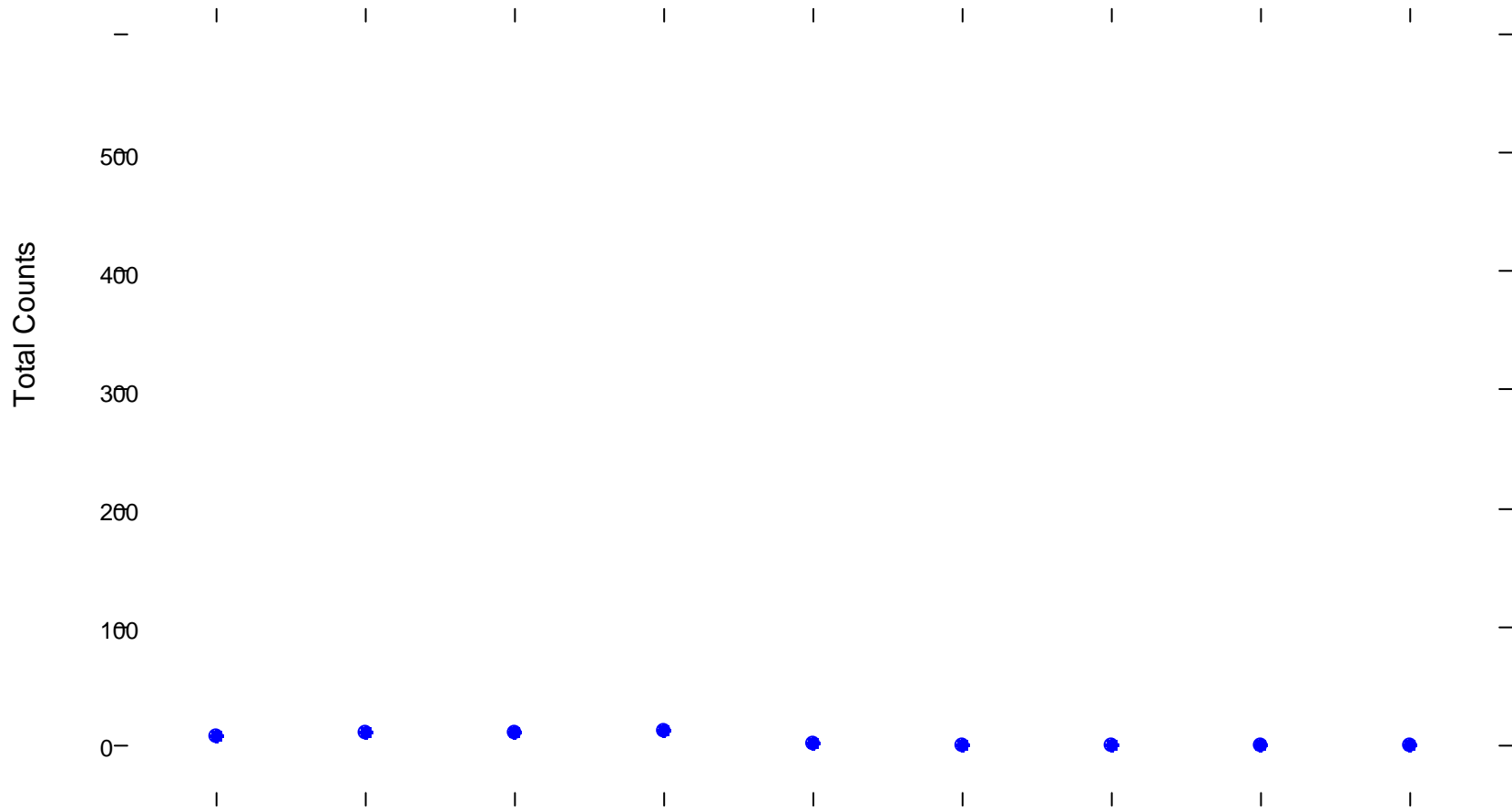
2006 individual trees  
178 cultivars  
7578 tree visits

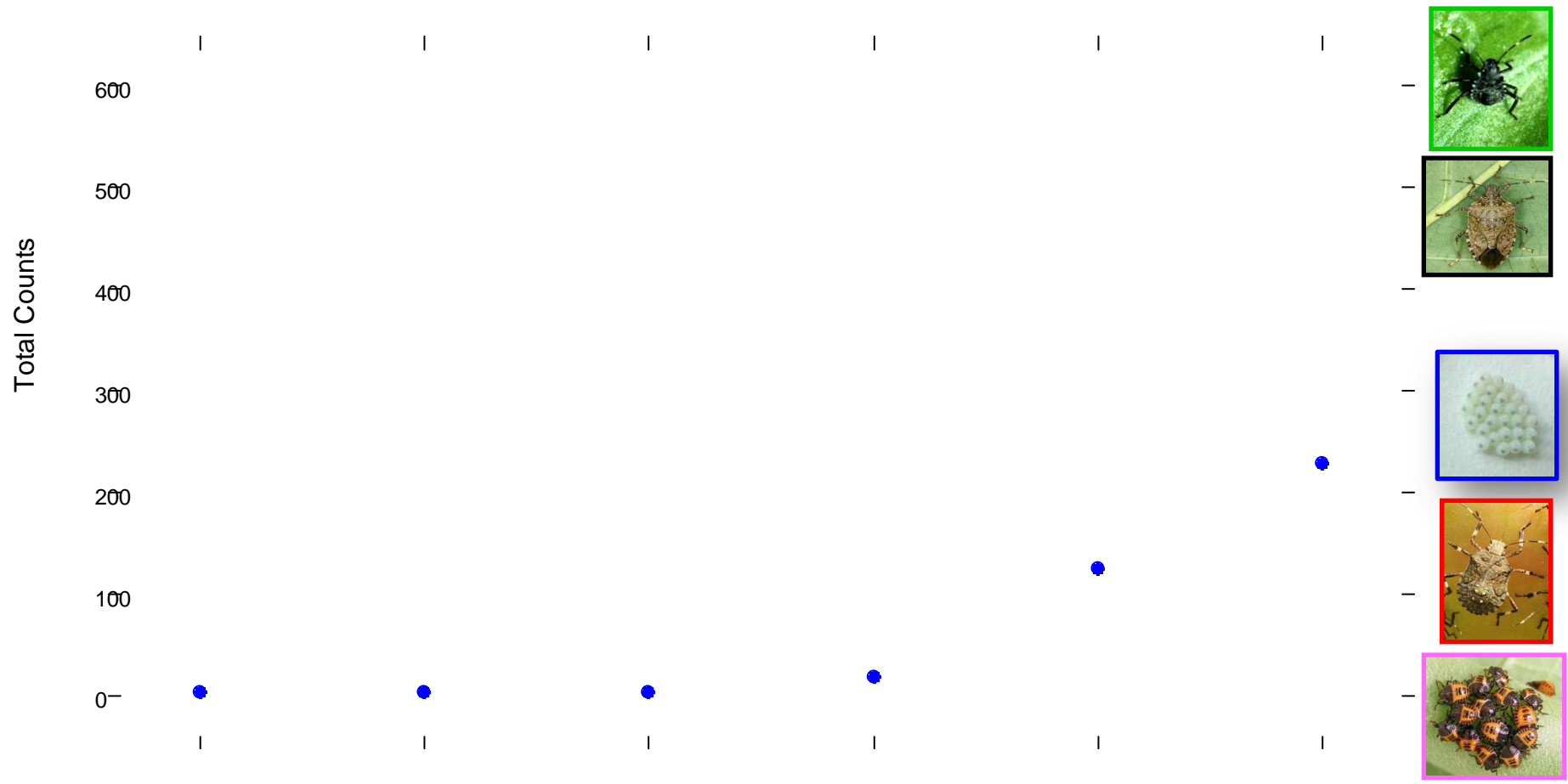
### **2012**

3350 individual trees  
191 cultivars  
17,280 tree visits







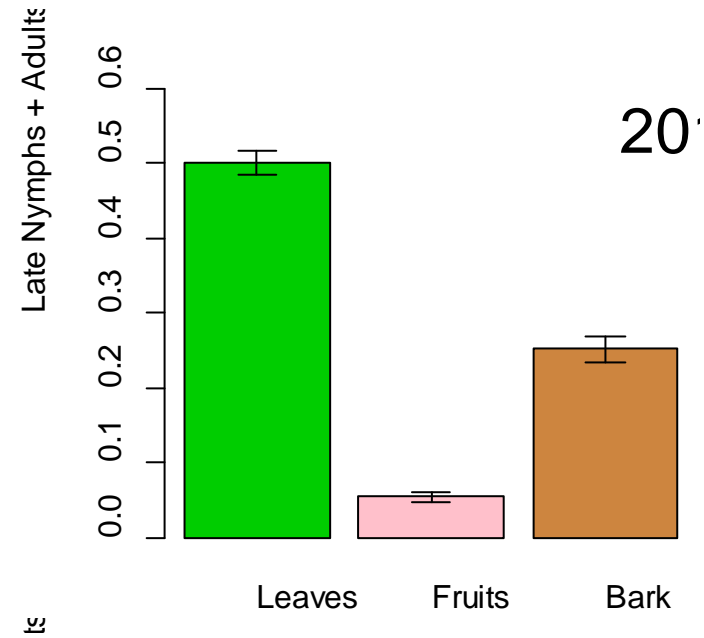


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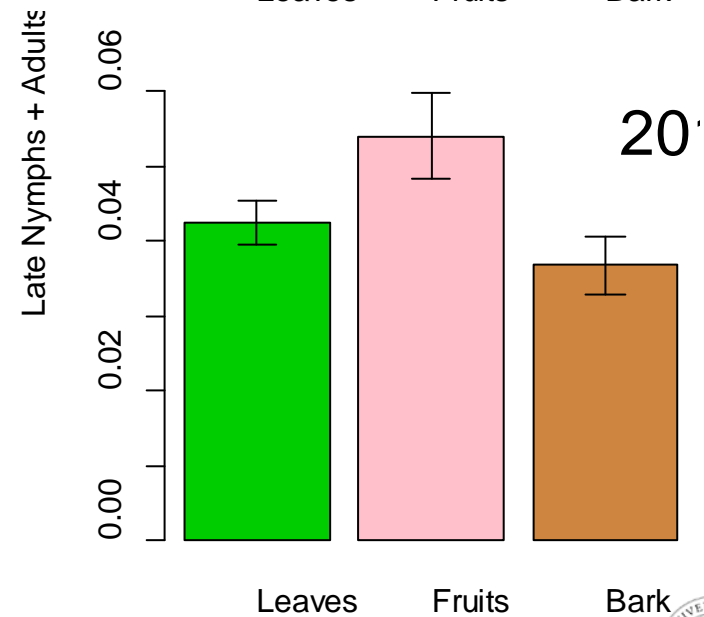
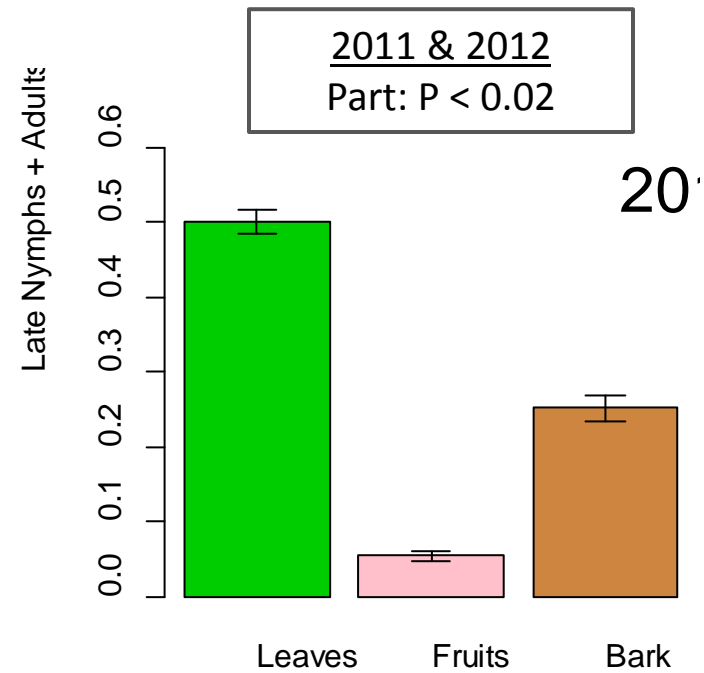
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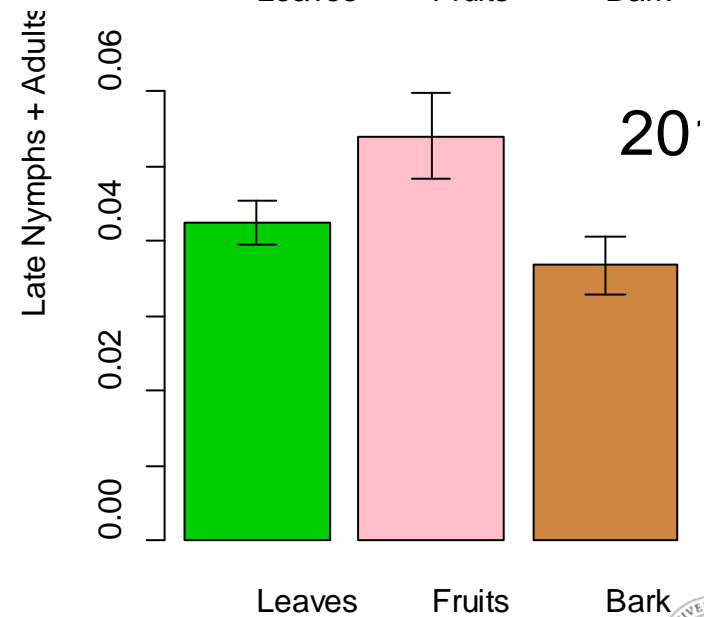
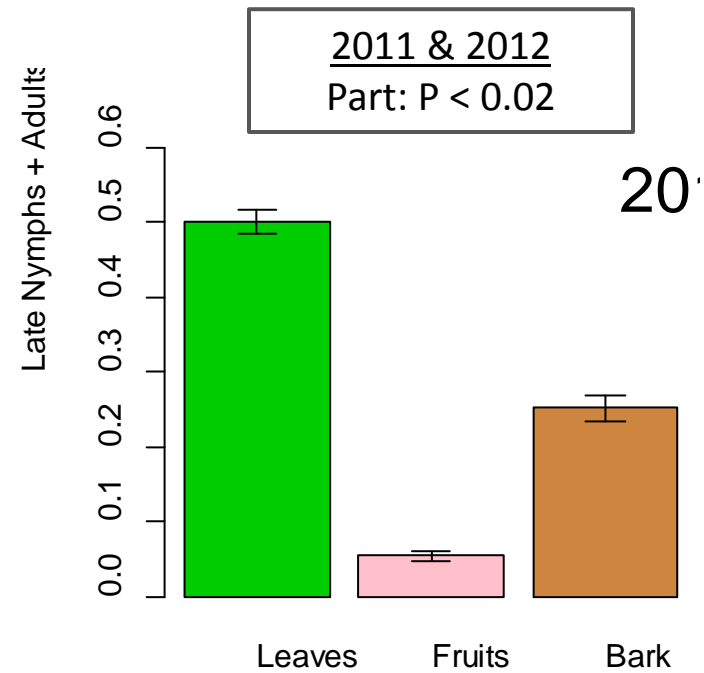
# BMSB distribution within plants

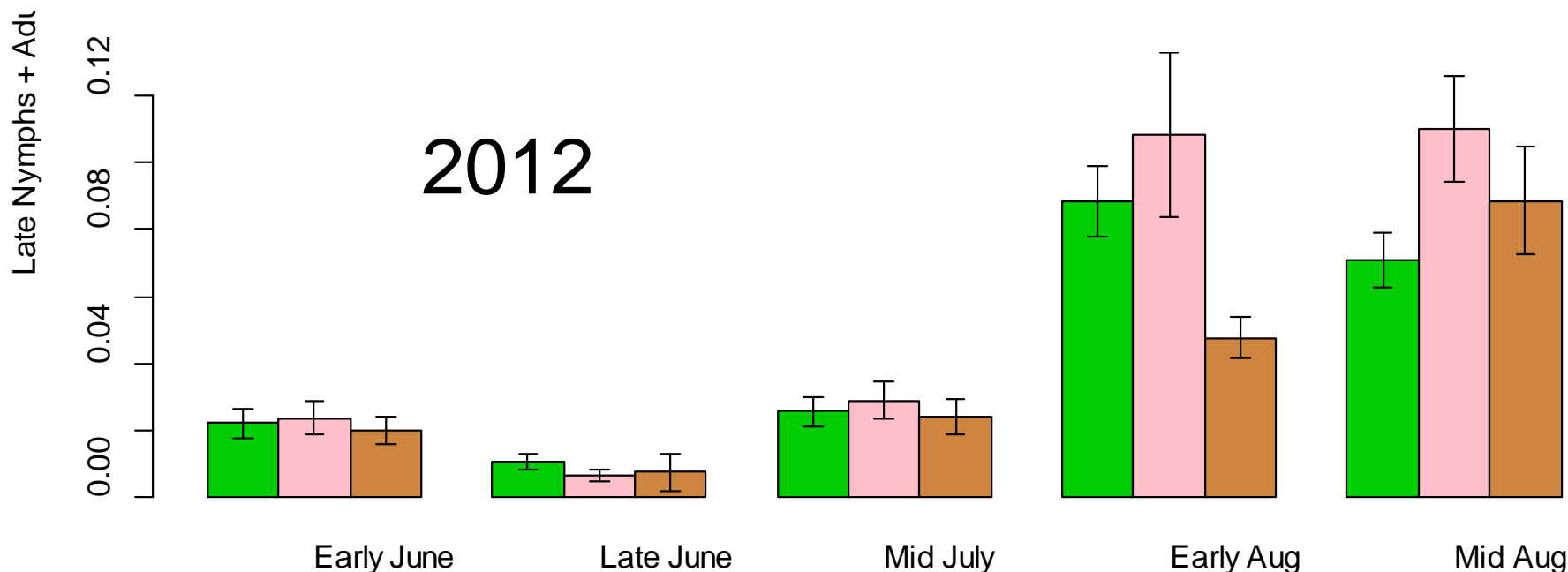
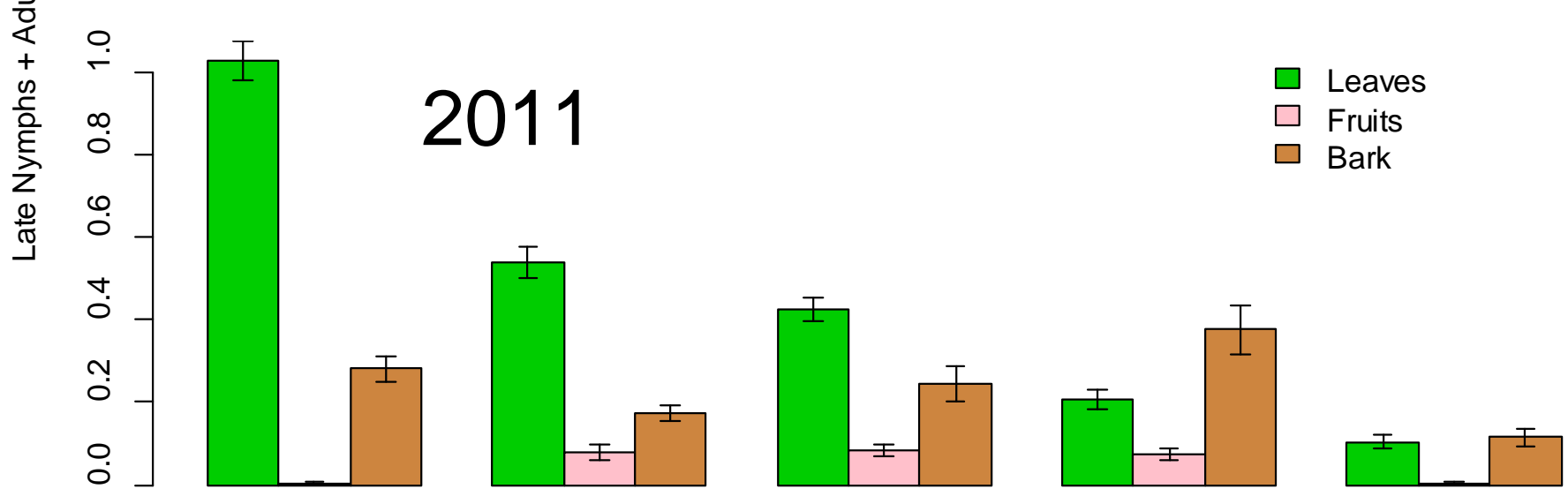


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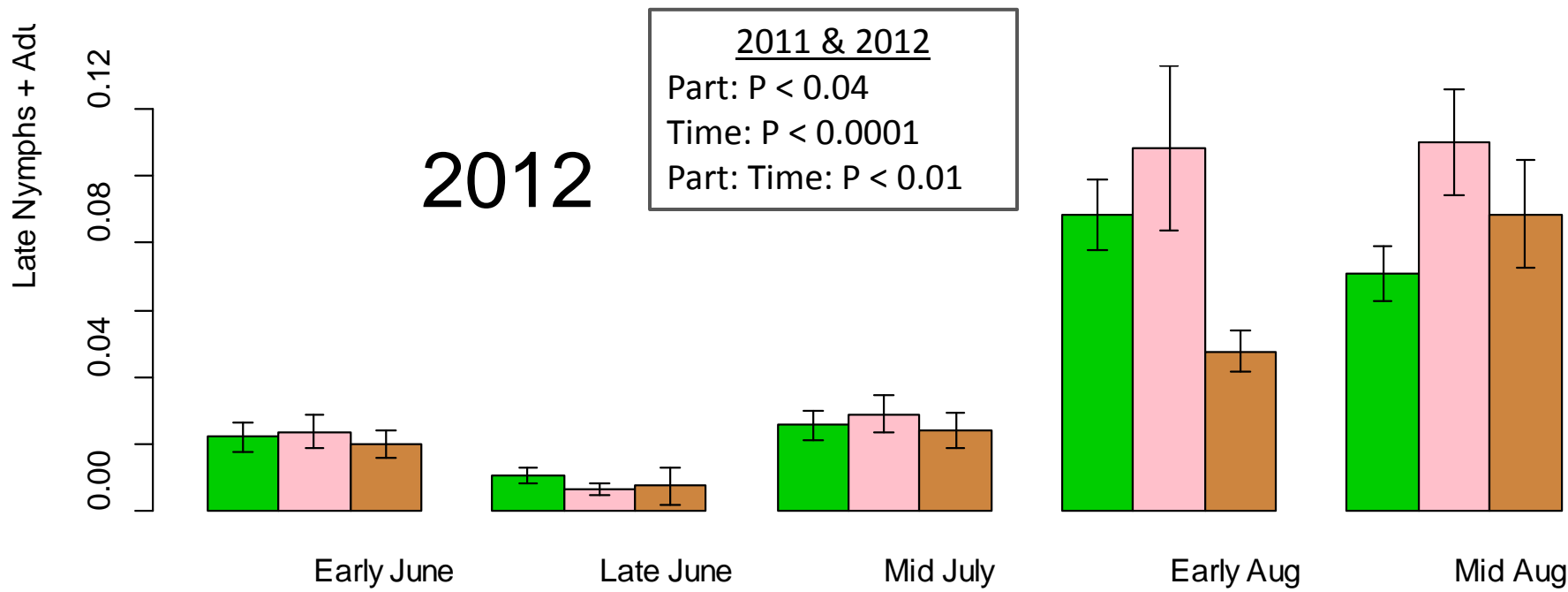
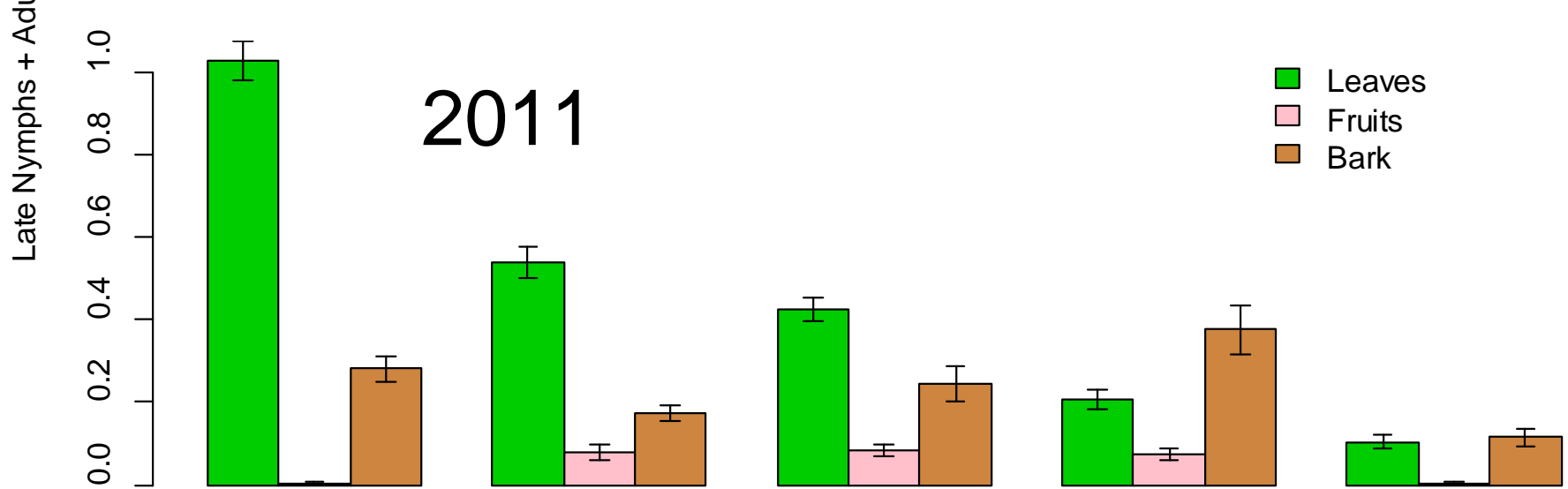


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BMSB in Nurseries



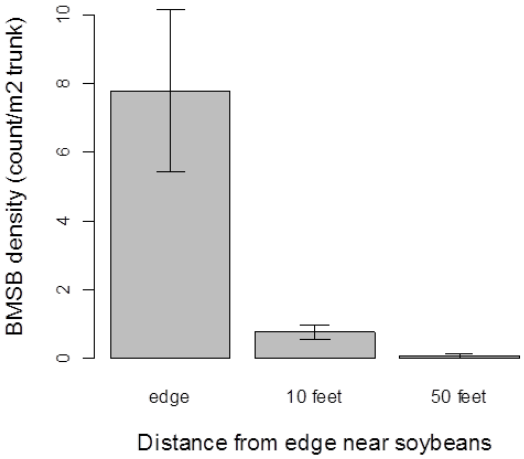
Objectives



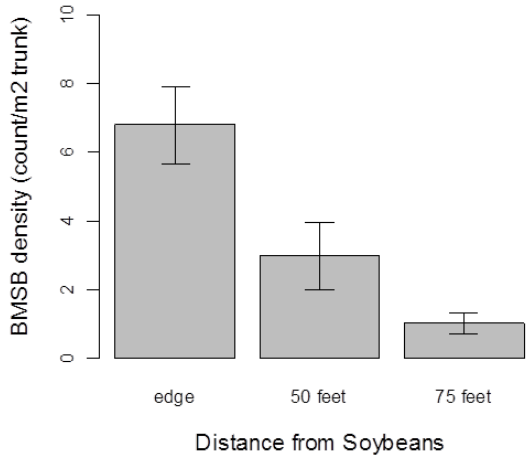
# 2010 Pilot Study



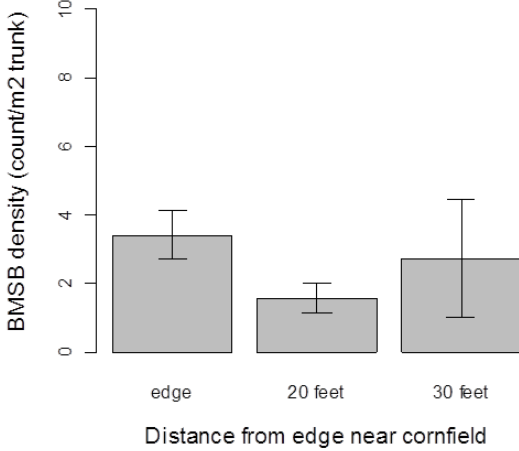
**Ruppert: BMSB on maple (Red Sunset)**



**Ruppert: BMSB on sycamore (London Plane)**

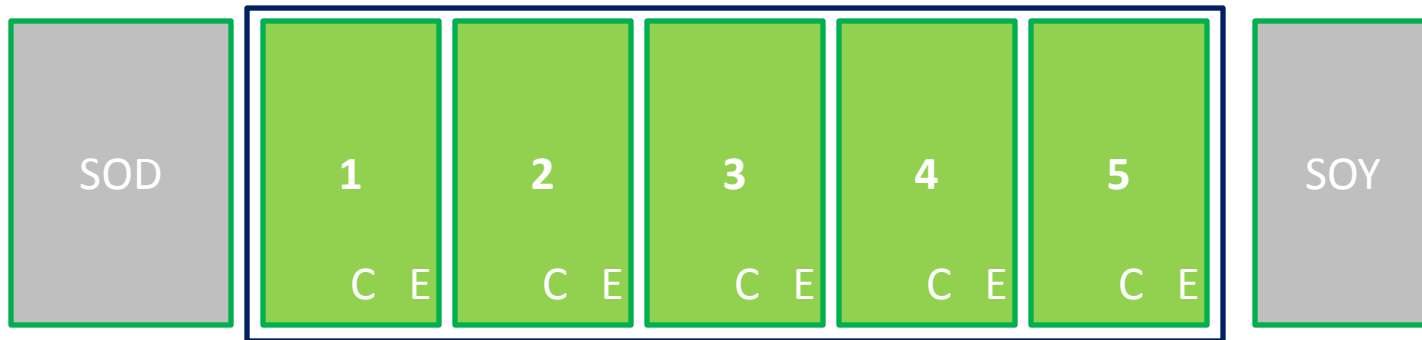


**Ruppert: BMSB on maple (October Glory)**



# 2011 Spatial Patterns

## Edge effects?

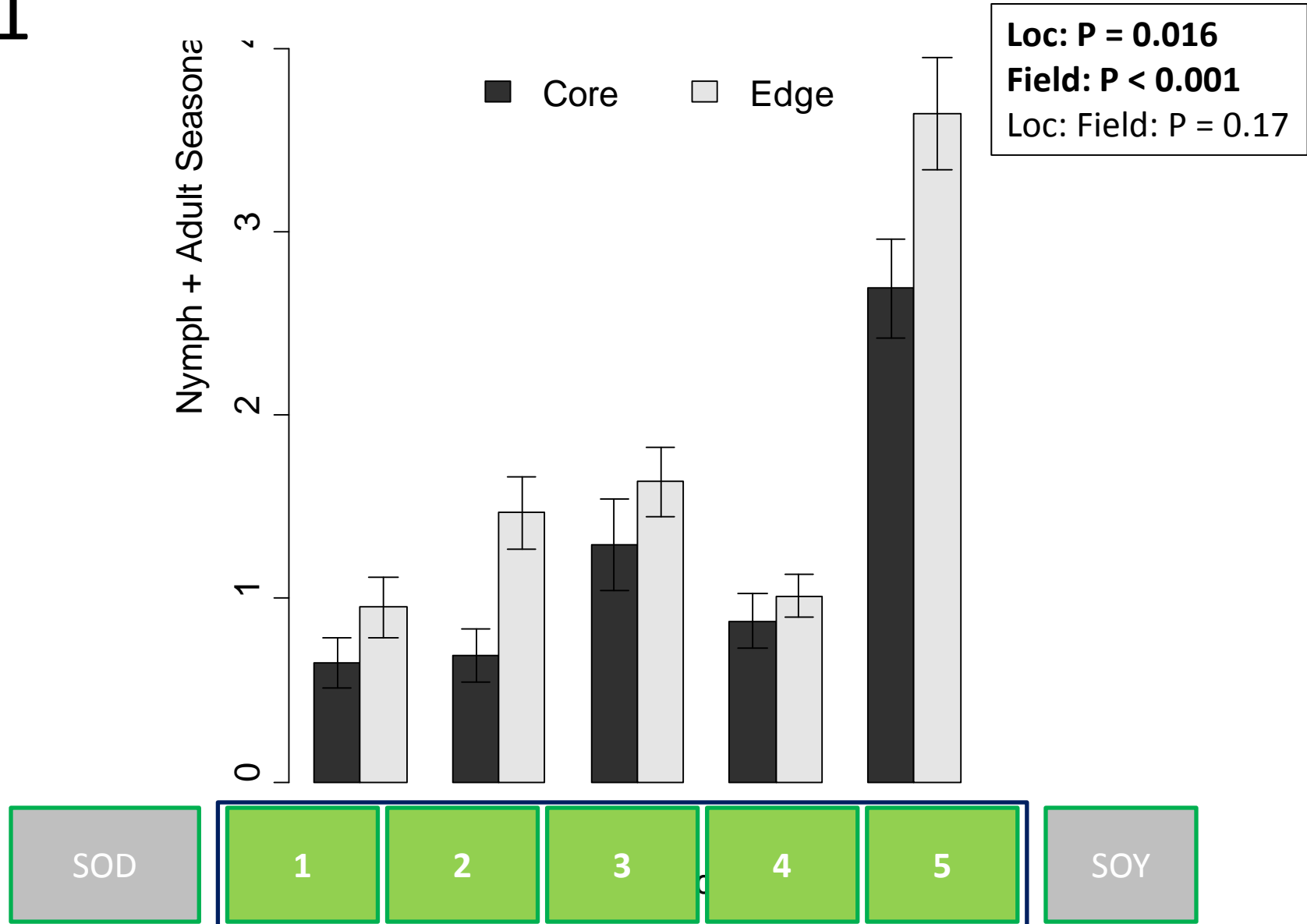


Edge Tree (E): 1-3 positions from field edge  
Core Tree (C): 9-15 positions from field edge

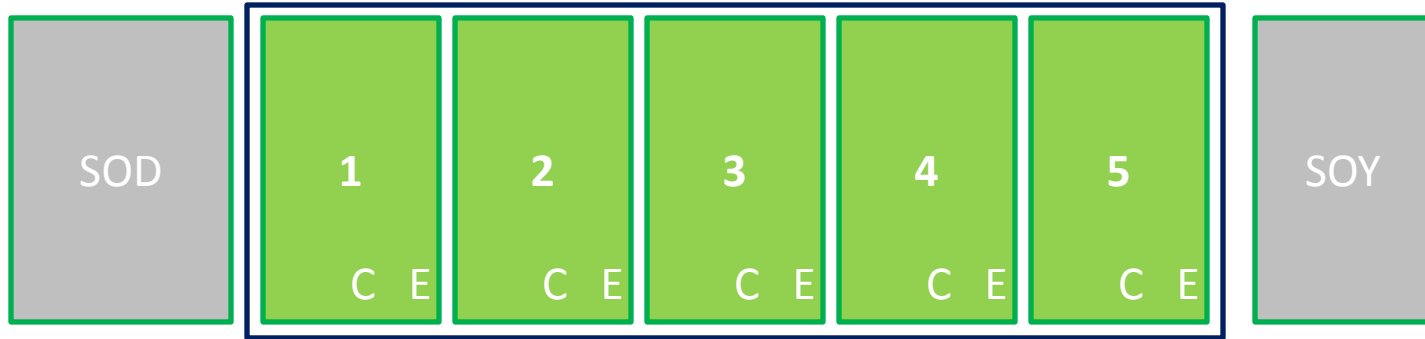
### Hypotheses:

- Fields will differ in densities due to adjacent habitat type (field effect).
- BMSB counts will be higher on edge trees (position effect).
- The strength of the edge effect will vary with field (interaction).

# 2011

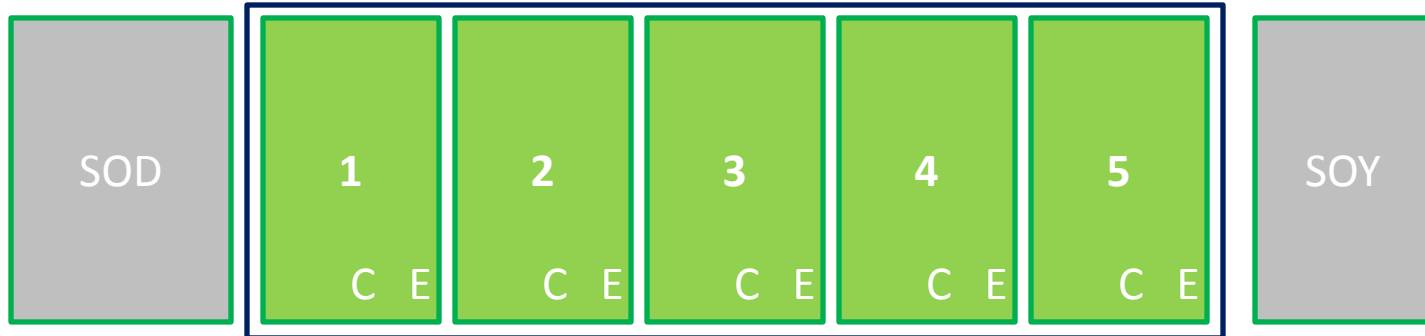


2011

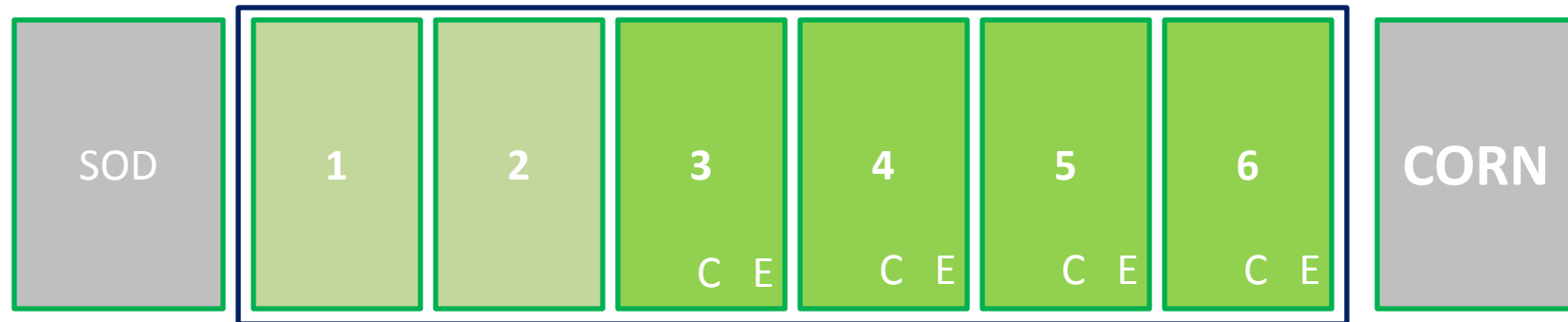


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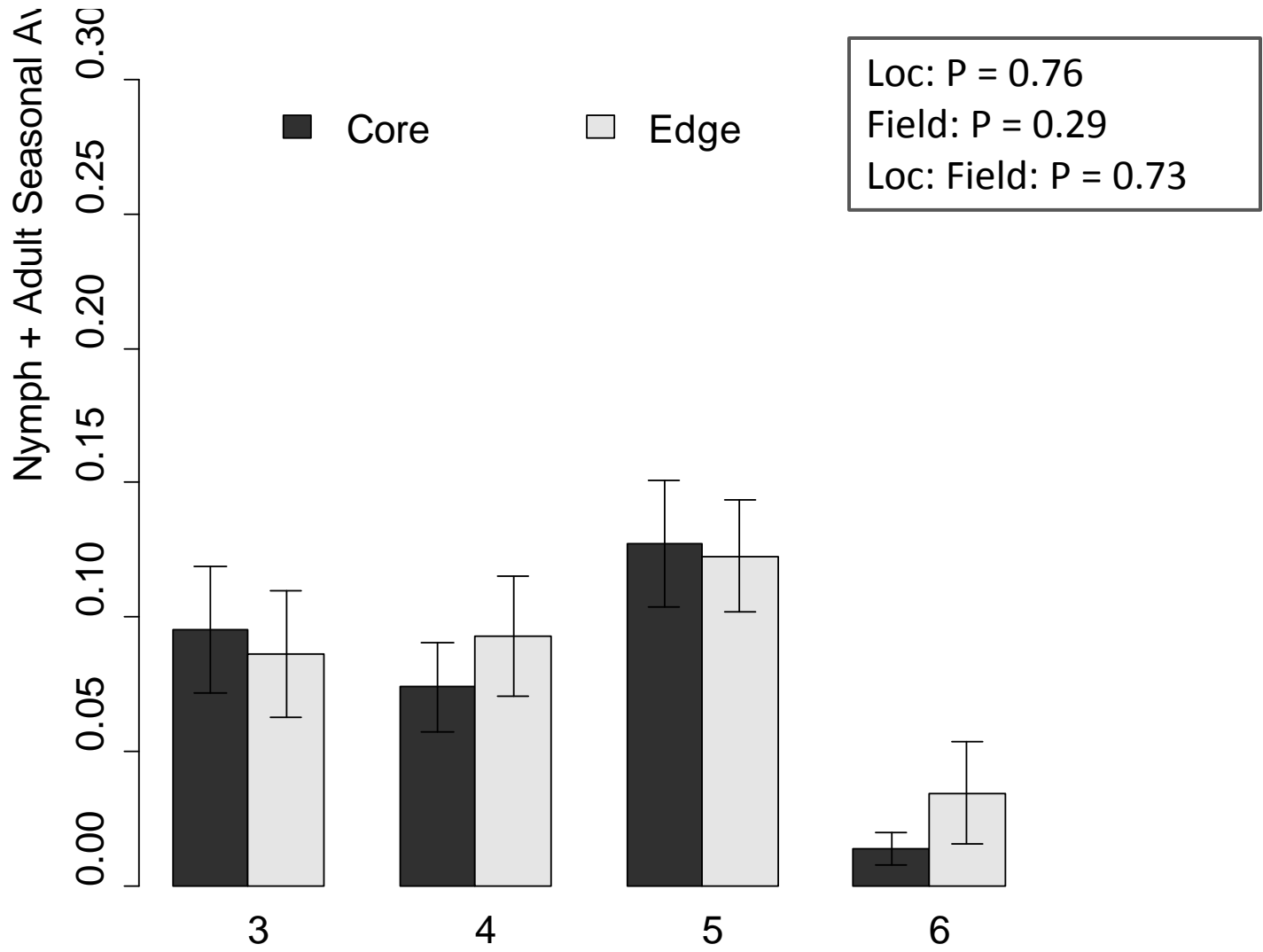


2012



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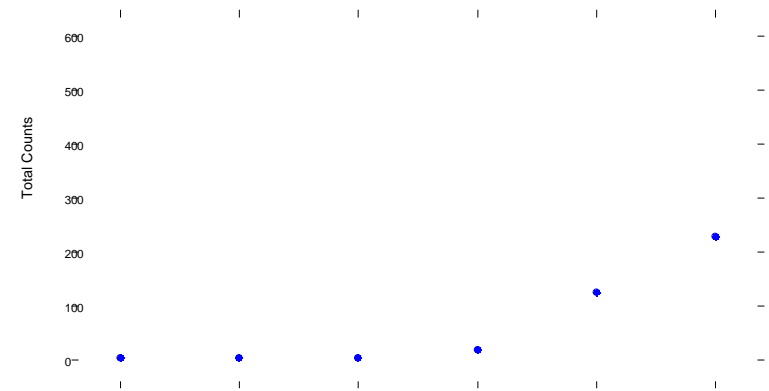
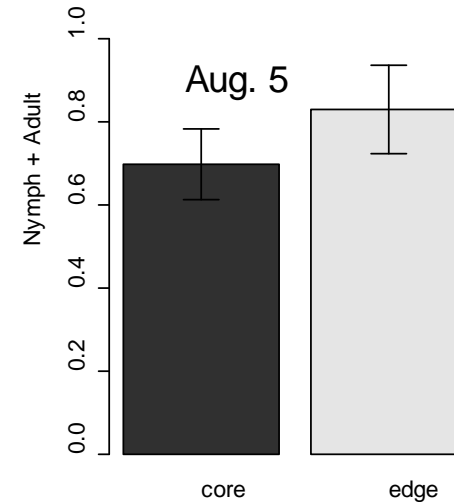


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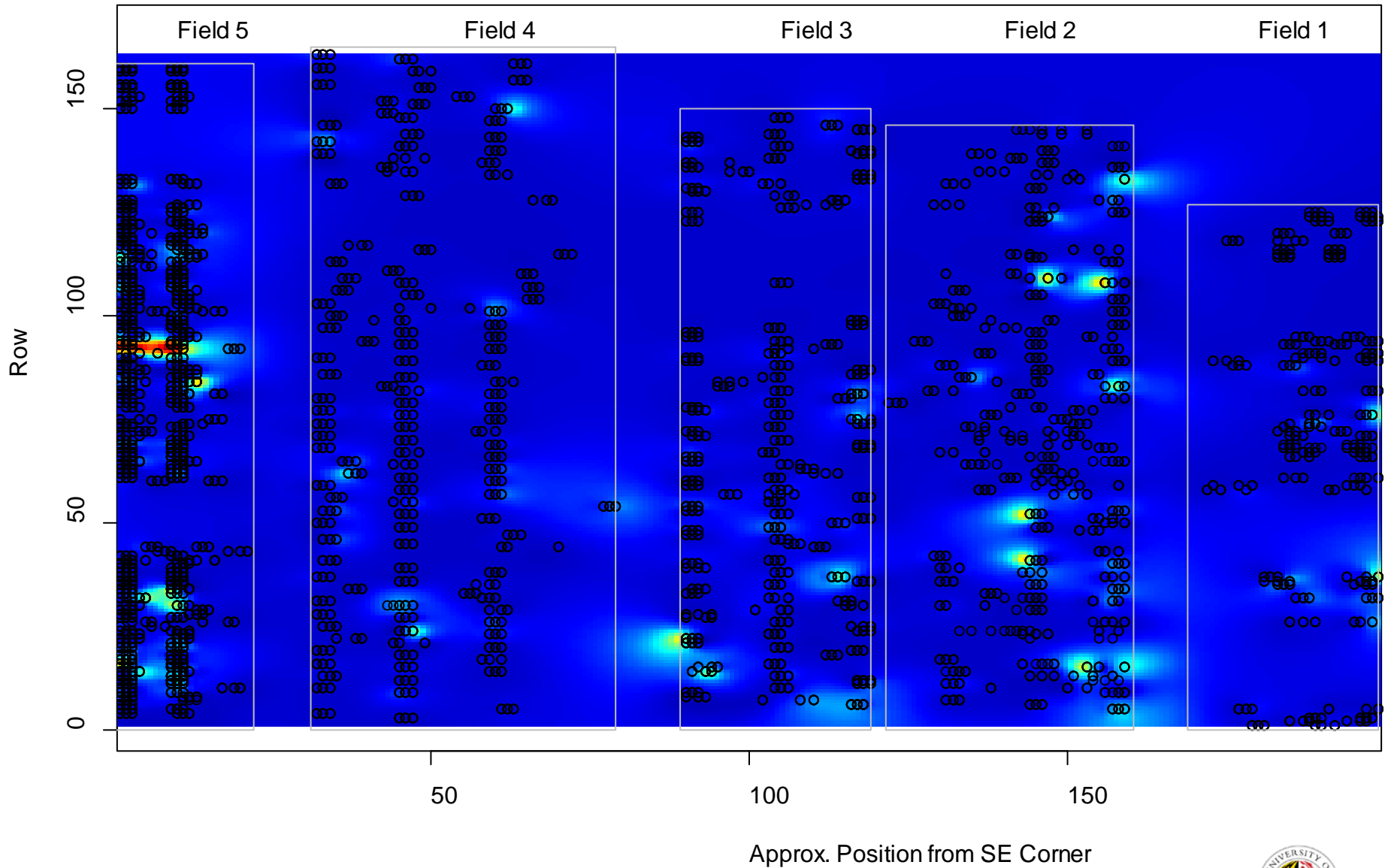


# Nursery-scale spatial dynamics

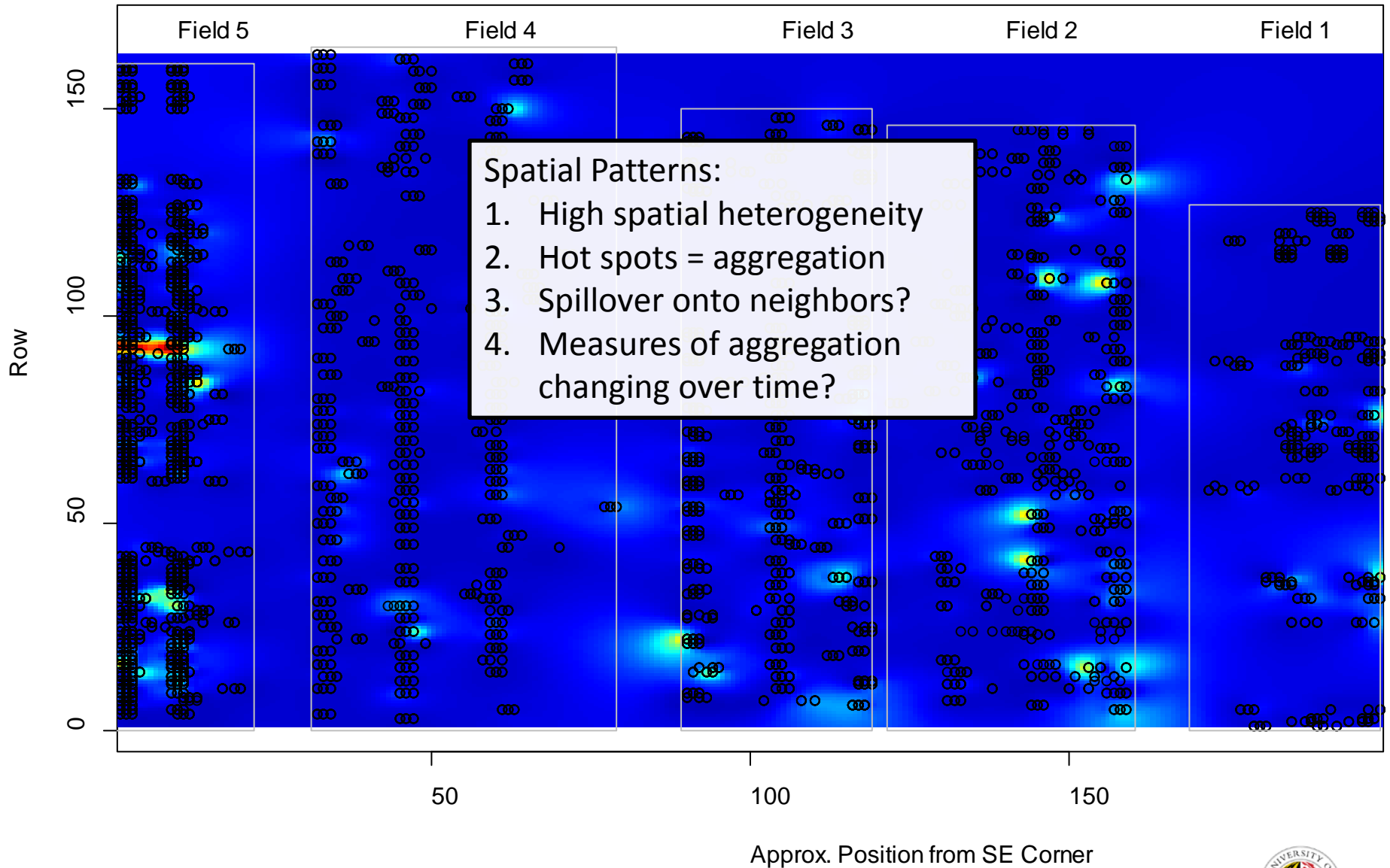
- Edge effects
- Phenology
- But really, there are changes in numbers of BMSB in space and time



# 2011 July 19



# 2011 July 19



# BMSB host use in nurseries

BMSB feeds on a wide range of woody plants

Asymmetric host use

Most cultivars used (2011: 84%; 2012: 66%)

Leaves, fruits, and bark utilized over time

Contrasting patterns of phenology in 2011 & 2012.

Hypotheses:

Abiotic factors: heat, precipitation

Natural enemy cycles

Resource availability within fields and in adjacent habitats

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BMSB frequently exhibit edge effects, especially adjacent to high quality alternative hosts and at high BMSB densities:

soy adjacent – strong  
corn adjacent – weak

High degree of spatial aggregation. Hypotheses:

Host availability and host phenology

BMSB movement within and between habitats

Aggregation behavior and pheromones

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# Acknowledgements

## Field Crew

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Ashley Jones

Chris Riley

Ryan Wallace

Dylan Reisinger

Sean Harris

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Ruppert Nurseries

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Raupp Labs

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Tracey Leskey, USDA ARS

Mike Raupp, UMD

Ryan Wallace, UMD

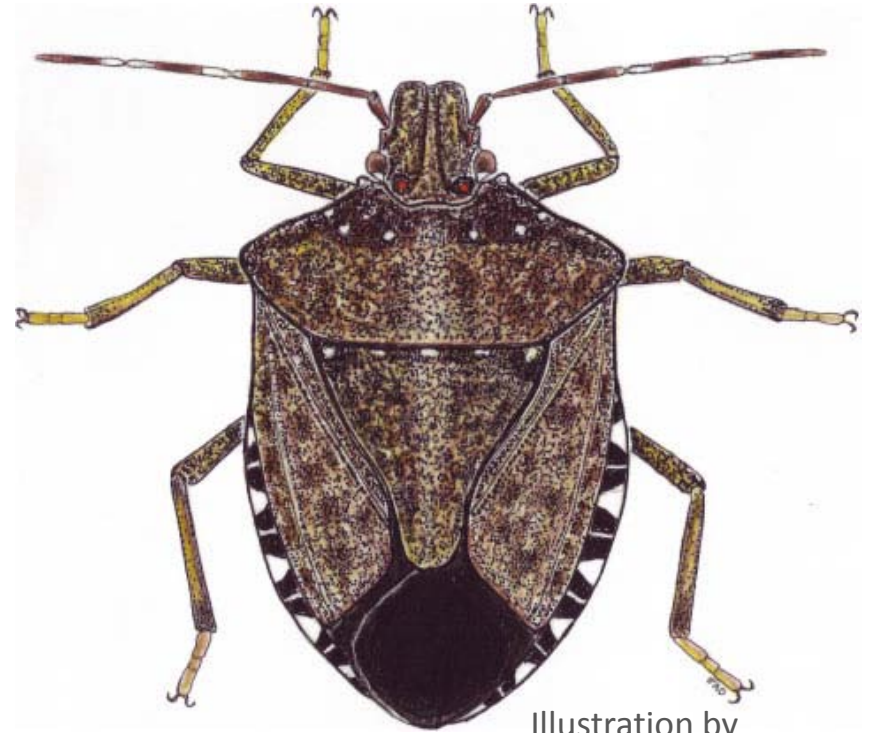


Illustration by  
John Davidson  
UMD Entomology



United States  
Department of  
Agriculture

National Institute  
of Food  
and Agriculture



Questions?

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