

# On-farm Habitat To Enhance Biological Control: Does landscape context matter?

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# Habitat simplification occurs at multiple spatial scales...



*field scale*



*landscape scale*

# Landscape Heterogeneity

"the diversity and area of non-crop natural habitat surrounding an agroecosystem"

(Bianchi et al. 2006)



LOW HETEROGENEITY

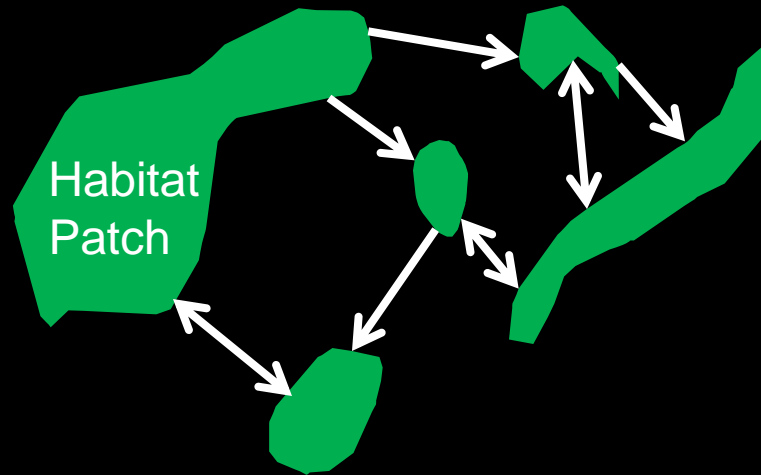


HIGH HETEROGENEITY

# Why might this matter?

## Metapopulations

"Local populations linked together by movement."



1. Landscape support for metapopulation of natural enemies
2. Field-scale populations will likely be influenced by the surrounding landscape matrix

# Thresholds of Landscape Heterogeneity

## LOW landscape heterogeneity

1. Grower enhances on-farm habitat
2. Landscape does not support metapopulation of natural enemies
3. Natural enemies unable to reach on-farm resources
4. On-farm habitat does not enhance biological control



# Thresholds of Landscape Heterogeneity

**HIGH**  
landscape heterogeneity

1. Grower enhances on-farm habitat
2. Landscape does support metapopulation of natural enemies
3. **BUT** so many natural enemies already migrating into vineyard
4. **On-farm habitat does not enhance biological control**



# Thresholds of Landscape Heterogeneity

## INTERMEDIATE landscape heterogeneity

1. Grower enhances on-farm habitat
2. Landscape does support metapopulation of natural enemies
3. Addition of on-farm habitat "tips the balance"
4. On-farm habitat could be most cost-effective in intermediate landscapes



# Current Research: #1

## Landscape influence on floral resource provisioning for biological control

2010: Monitor biological control in vineyards situated along a continuum of landscape heterogeneity



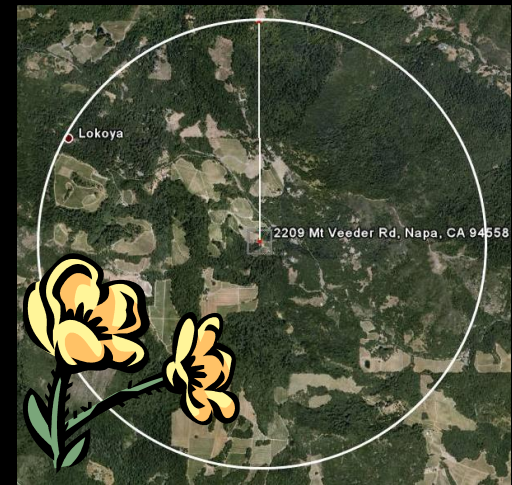
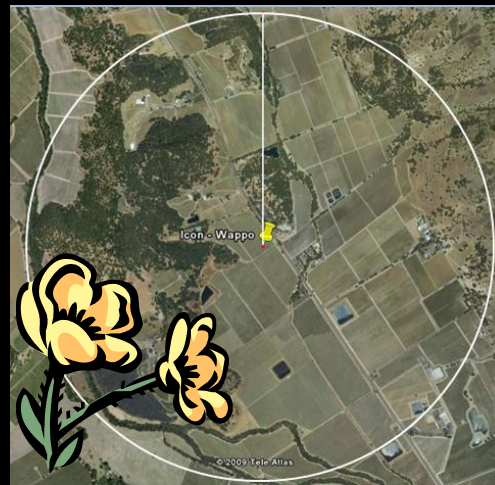
Low  
Heterogeneity

High  
Heterogeneity

# Current Research: #1

Landscape influence on floral resource provisioning for biological control

2011/12: Introduce floral resources into these different landscapes.



Low  
Heterogeneity

High  
Heterogeneity

# Current Research: #2

Evaluate insect dispersal  
from non-crop habitats

2010: Preliminary assessment

2011/12: Mark-recapture studies

Dispersal into Diversified x Monoculture plots



## Current Research: #3

Identify new overwintering habitat for key parasitoids of wine grape pests

2010: Assessment of landscape plant species composition and associated insects.

2011/12: Evaluate parasitoid use of candidate insect/plant associations found in Napa/Sonoma landscapes.

# Implications of research

## New information...

1. Influence of floral resources and landscape heterogeneity on control of leafhoppers and mealybugs.
2. Influence of flowering plants on parasitoid fitness
3. Parasitoid overwintering and dispersal from non-crop habitats

## ...for key decision makers.

1. Growers
2. Public agencies (NRCS: EQIP)
3. Conservation/Restoration organizations

UC Berkeley  
seeking new growers  
to participate in on-farm trials

Interested in participating?

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