

Assessment of efficacy of Level 1 MPB treatment using neighborhood analysis

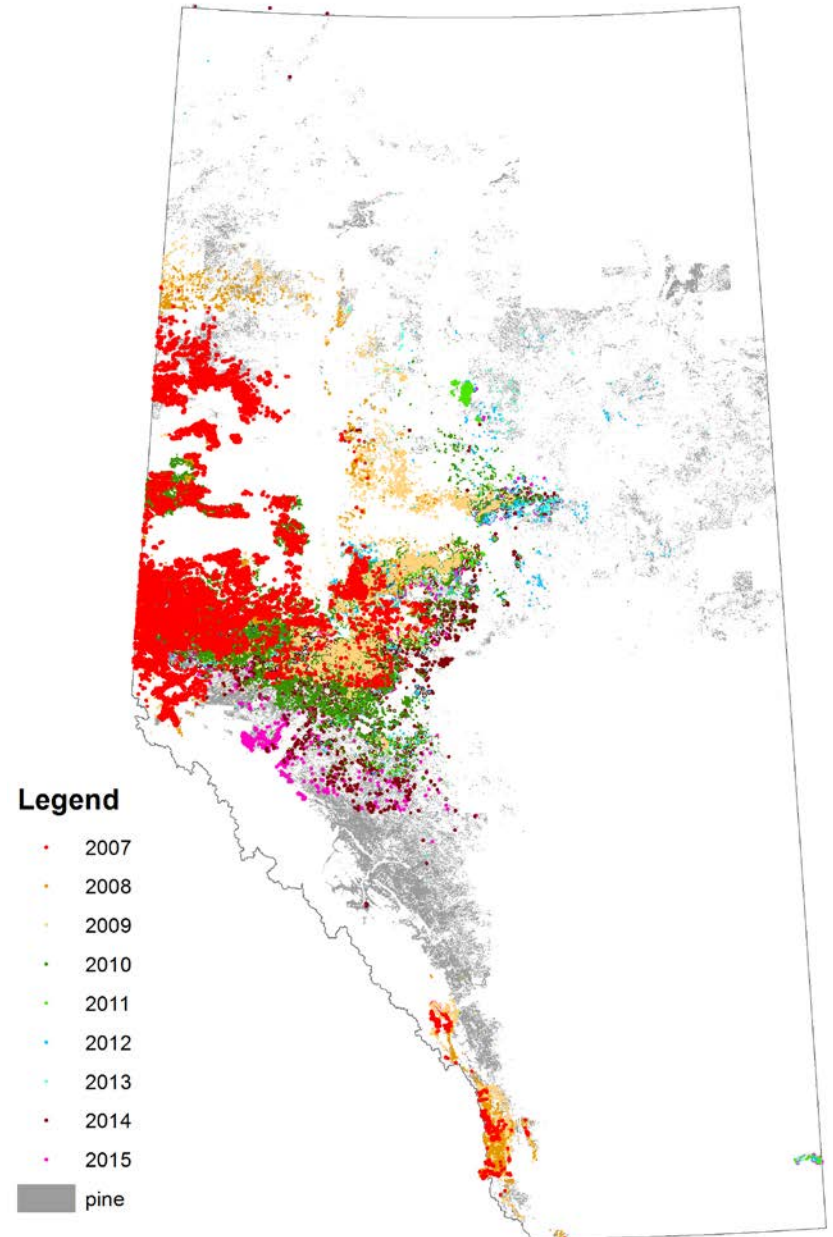
Outline

1. Annual Aerial Surveys with Treatment Points
2. Brief Review of Level 1 Treatment
3. Overview of Neighborhood Analysis Method
4. Results and Discussion

Assessment of efficacy of Level 1 MPB treatment

Aerial Survey Data 2006-2015

- Data show locations of dead trees identified during annual aerial surveys
- Type 1 treatments were applied each year with a focus on leading-edge areas
- **How effective are these expensive treatments at reducing spread?**



Assessment of efficacy of Level 1 MPB treatment

Overview of Level 1 Treatments

1. Identify red trees from aerial survey
2. Use ground crews to locate green-attack trees within a 50m radius



Photo: Lux 2007

Assessment of efficacy of Level 1 MPB treatment

Overview of Level 1 Treatments

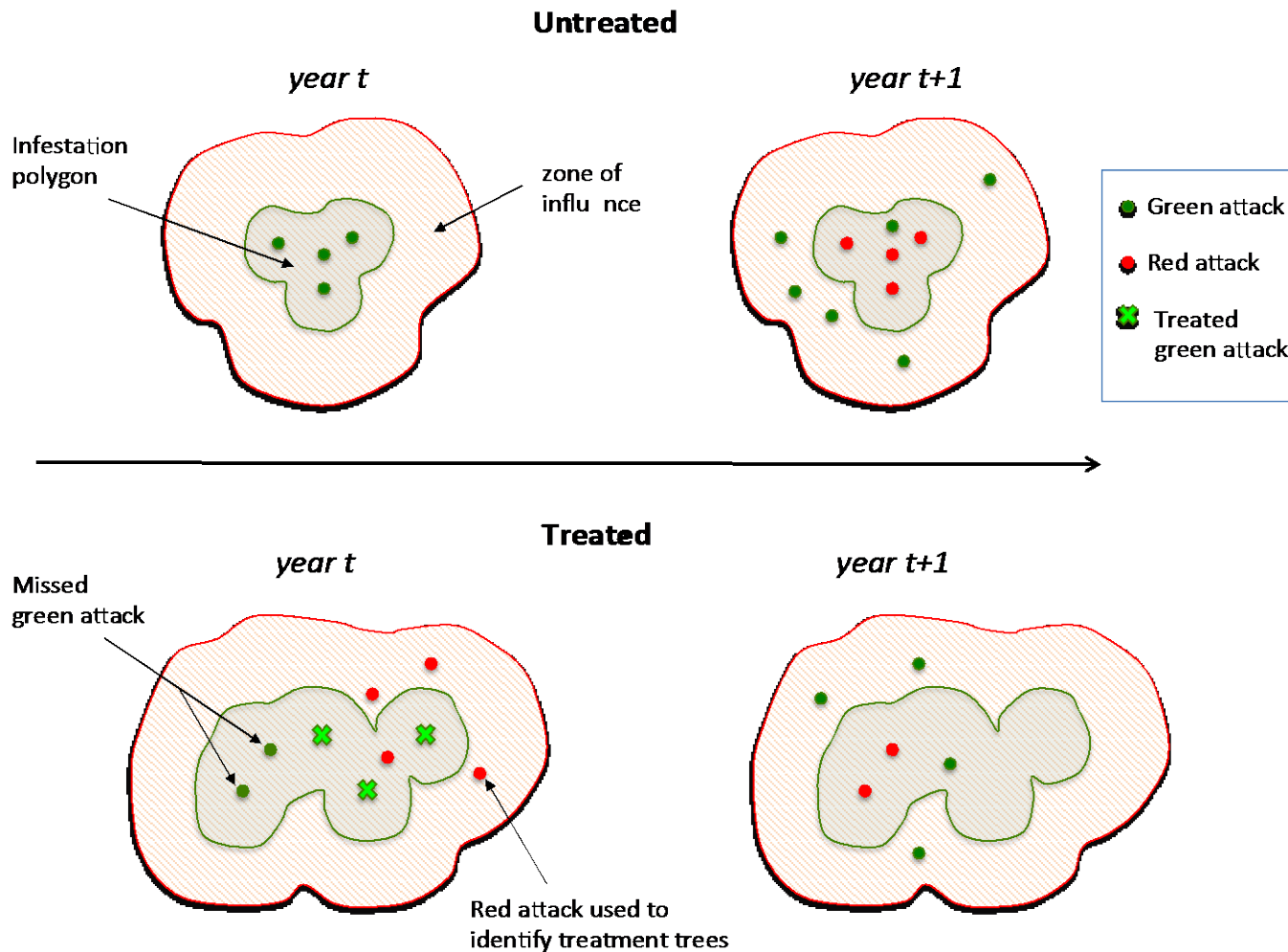
3. Prioritize infestations according to management zone (leading edge, holding, salvage)
4. Cut down and destroy infested trees prior to emergence (between Oct-Mar)



Photo: ASRD 2007

Assessment of efficacy of Level 1 MPB treatment

Identify parent infestations and assess effect of treatment in surrounding zone of influence



Assessment of efficacy of Level 1 MPB treatments

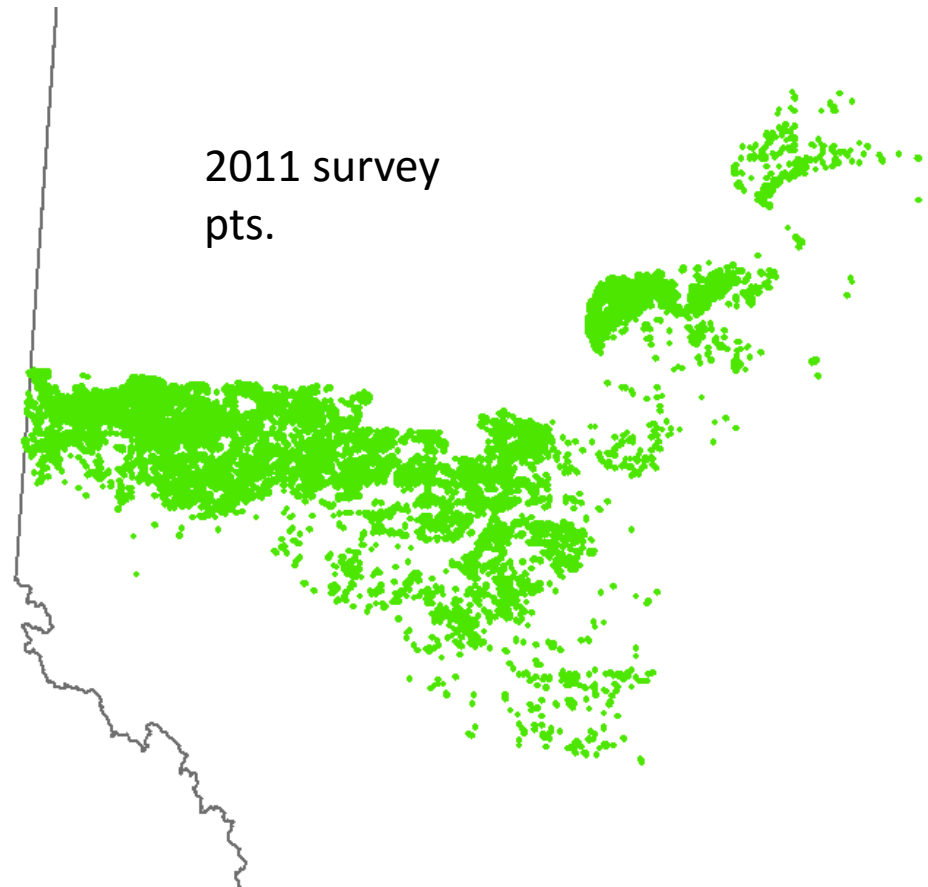
Overview of Approach

1. Identify relatively isolated infestations for use in testing treatment effect
2. Identify individual infestations using spatial statistics
3. Determine zone of influence (ZOI) around parent infestations
4. Evaluate efficacy of Level 1 treatments in ZOI region in year $t+1$

Assessment of efficacy of Level 1 MPB treatment

1. Identify relatively isolated infestations for use in testing treatment effect

- A raster-based (1km*1km) masking technique was employed to removed high density areas

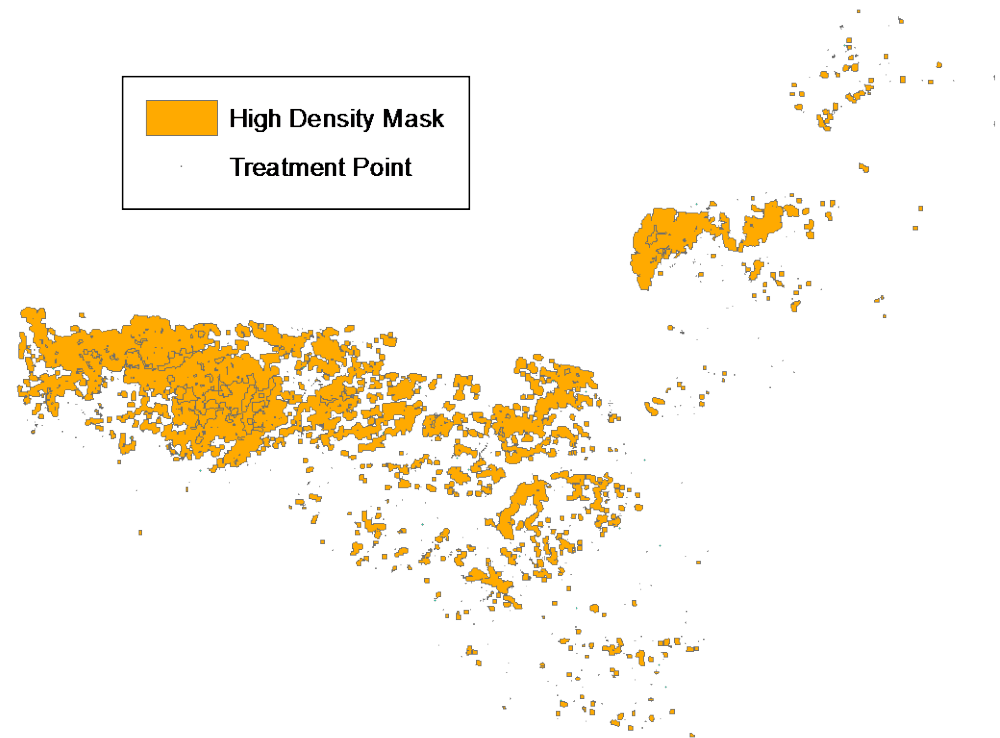


Assessment of efficacy of Level 1 MPB treatment

1. Identify relatively isolated infestations for use in testing treatment effect

- A raster-based (1km*1km) masking technique was employed to removed high density areas
- Areas that have not been surveyed in consecutive years are excluded
- Areas with < 20% PI forest are excluded

Example 2011 survey area with high density masks

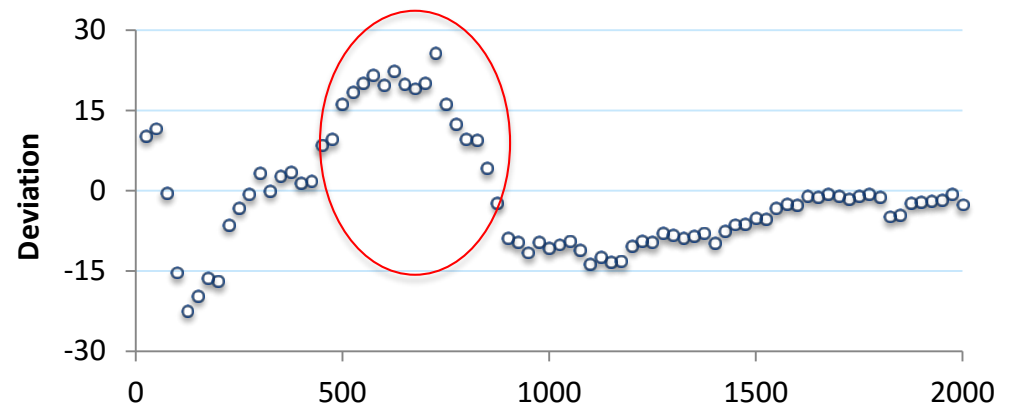
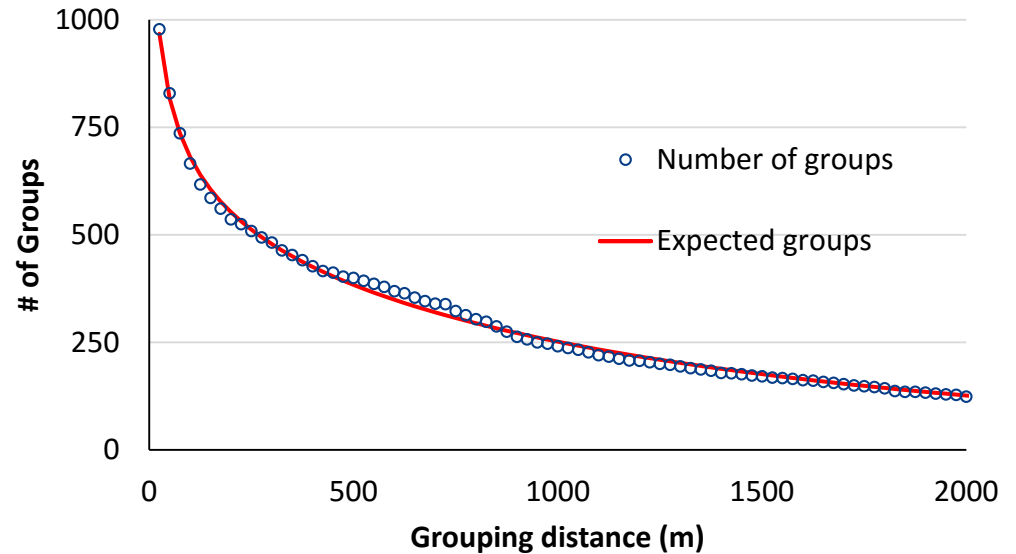


Assessment of efficacy of Level 1 MPB treatment

2. 750m was found to be the best distance for grouping survey points into “parent” infestation polygons

- Frequency analysis of groups of survey points with increasing distance between points for grouping
- Threshold around **750m**
- All survey points within 750m of each other grouped as a single infestation
- **Parent polygons** for each survey year created by buffering around survey points within each group (750m buffer)

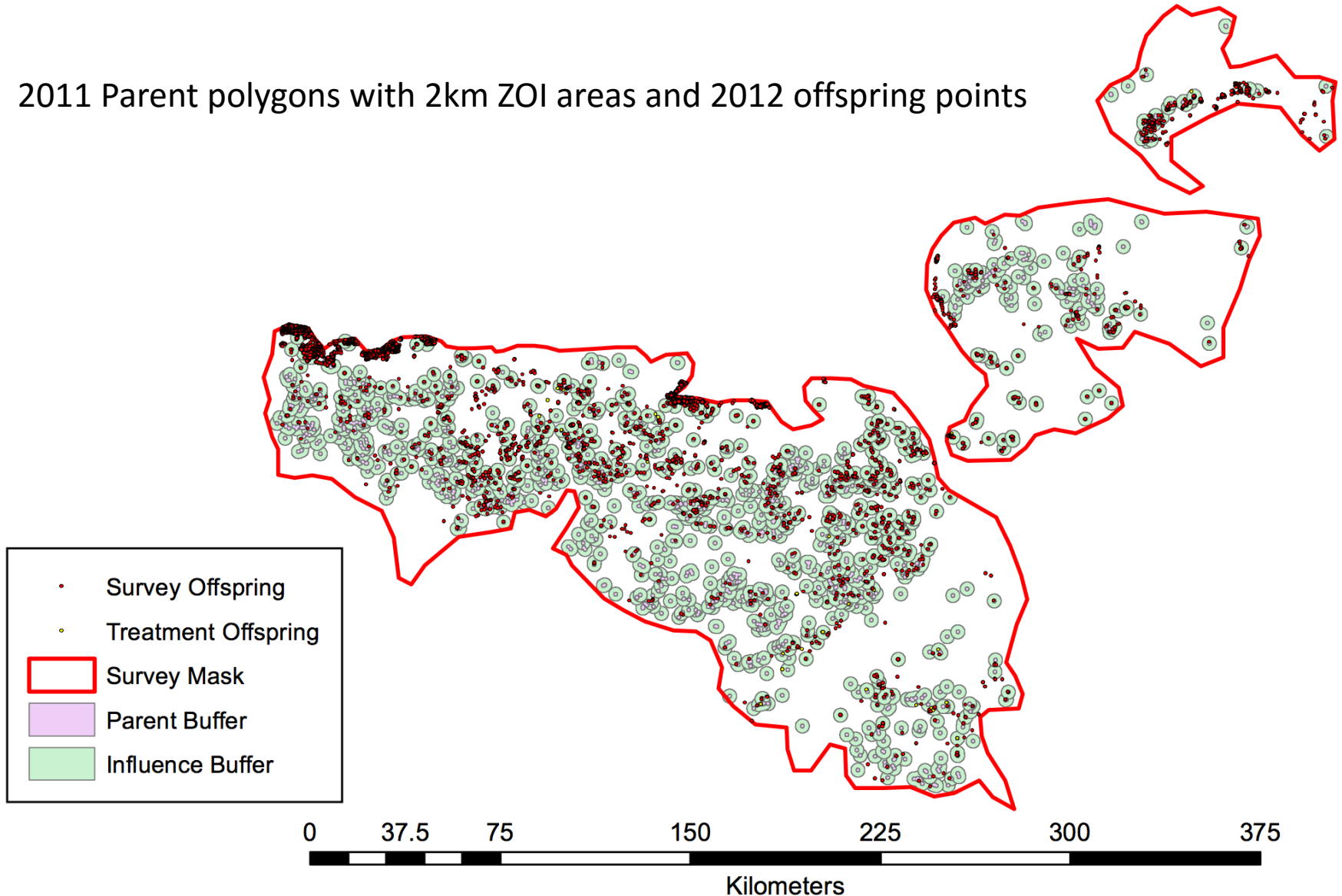
Survey 2008 - Frequency of Groups by Buffer Distance



Assessment of efficacy of Level 1 MPB treatment

4. Evaluate efficacy of type 1 treatments in ZOI region in year t+1

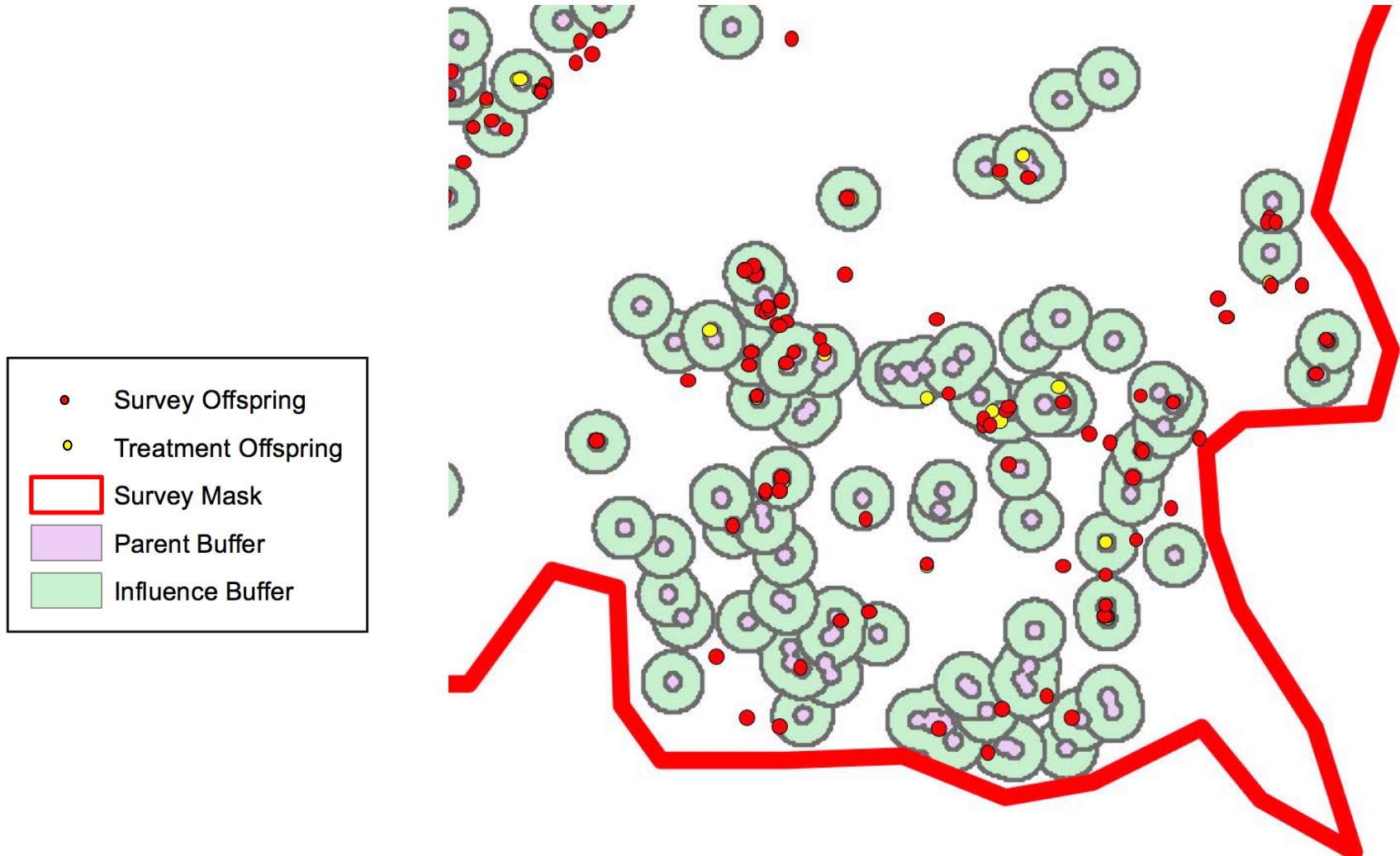
2011 Parent polygons with 2km ZOI areas and 2012 offspring points



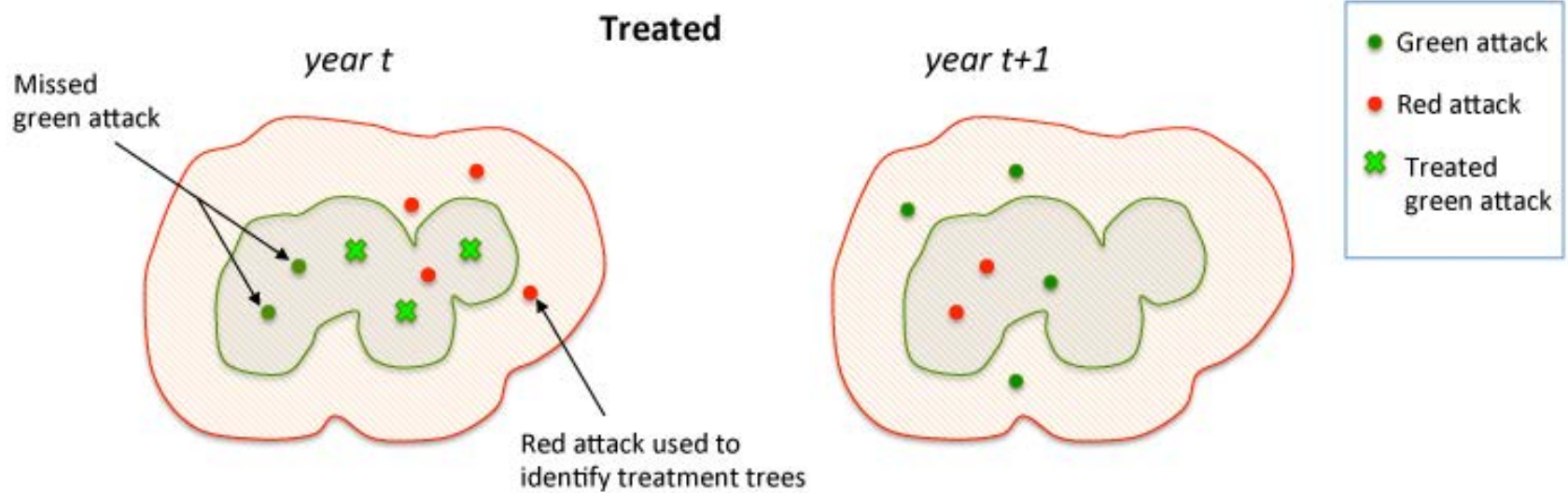
Assessment of efficacy of Level 1 MPB treatment

4. Evaluate efficacy of type 1 treatments in ZOI region in year t+1

2011 Parent polygons with 2km ZOI areas and 2012 offspring points: **Zoomed**



Assessment of detection efficacy

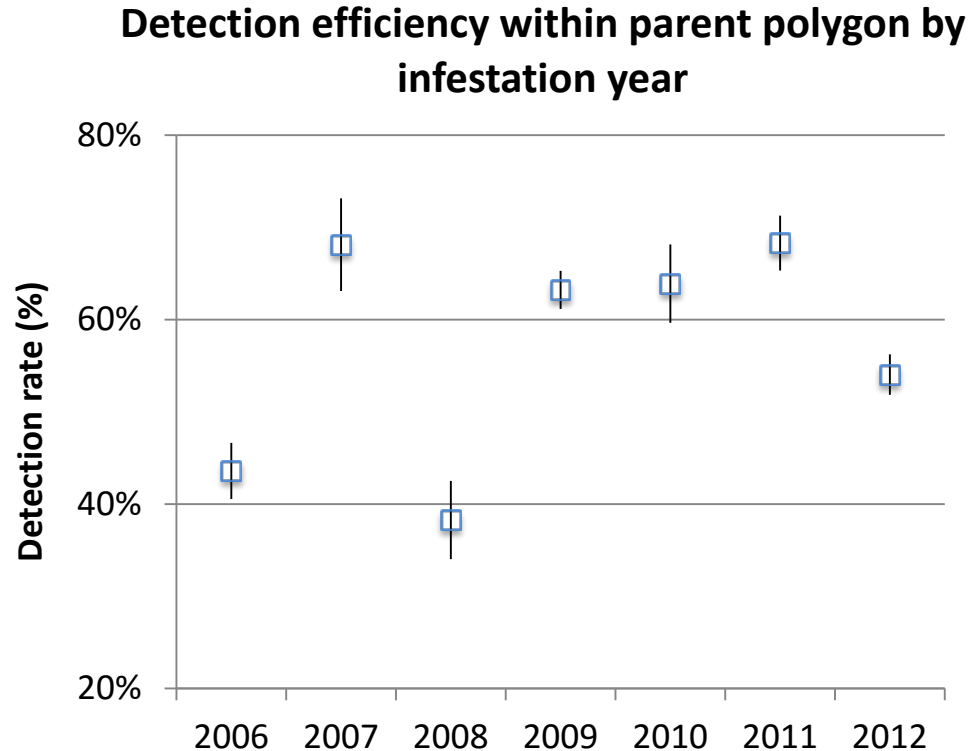


- Assessed by comparing detected and treated trees in a given parent polygon in year t with undetected trees (new red/dead trees in year $t+1$) in the same polygon in the next year
- Detection efficacy = $\text{initial treated} / (\text{initial} + \text{new dead})$

Assessment of efficacy of Level 1 MPB treatment

Detection Efficiency

- Green attack detection was surprisingly low (54-68%) in non-immigration years
- 38-44% in immigration years

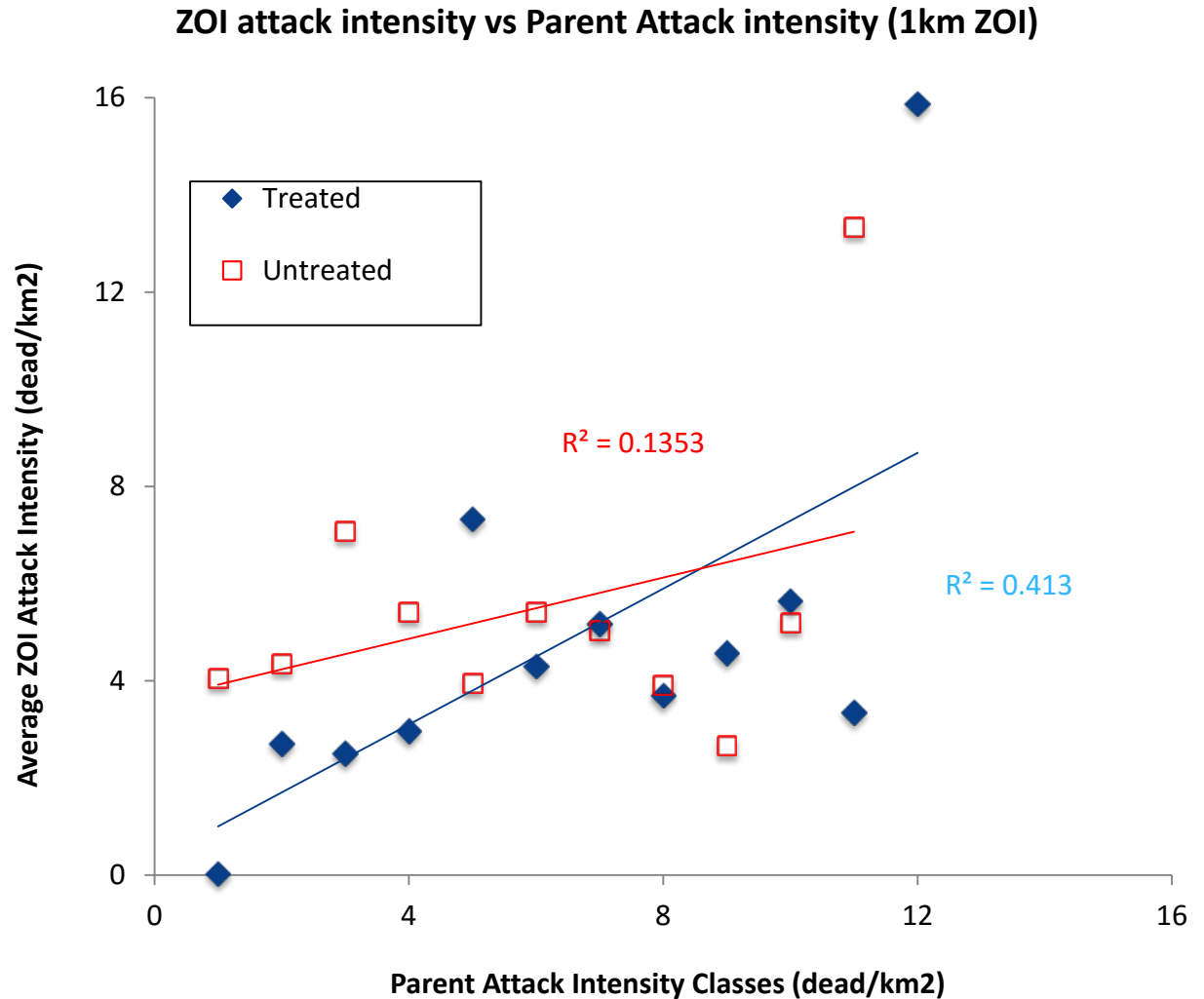


Avg. detection rate (non-immigration yrs): 65%

Assessment of efficacy of Level 1 MPB treatment

Results: Relationship between Parent and ZOI Attack intensity: 1 km zone of influence

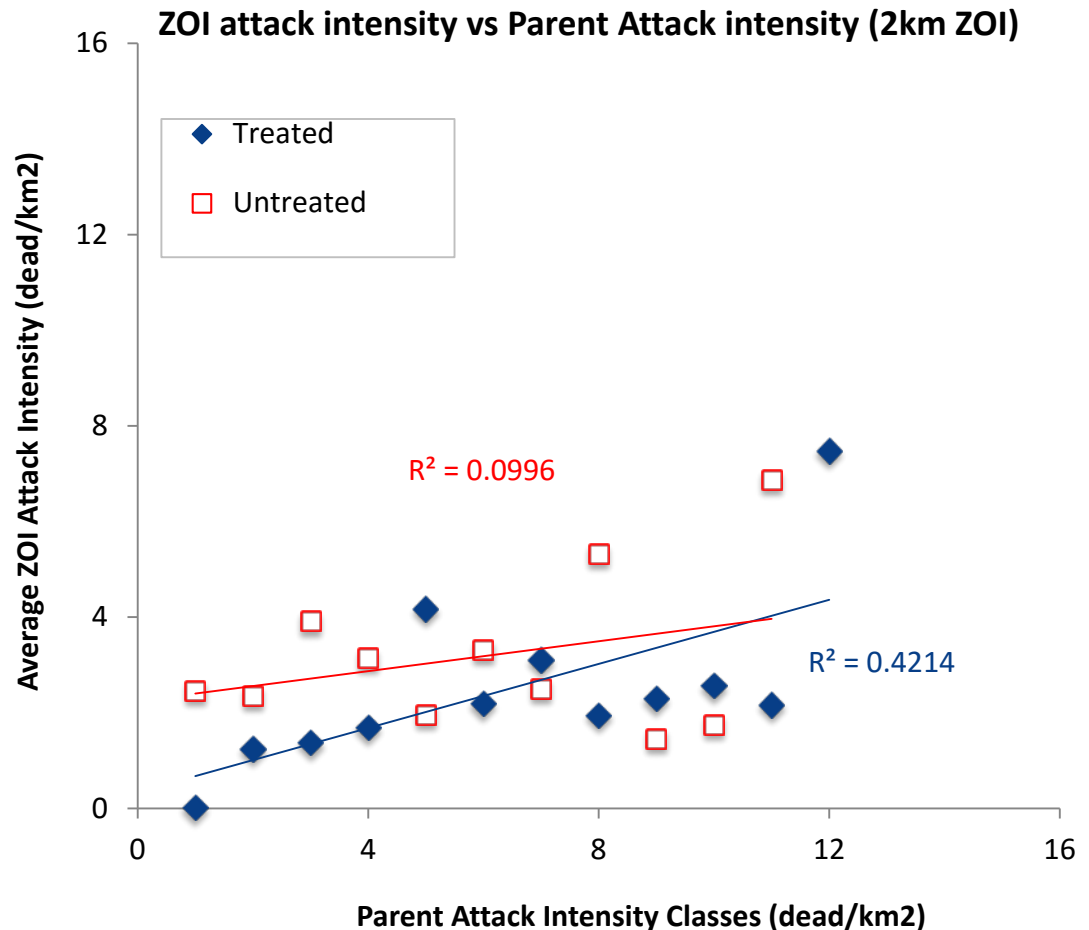
- Assessed by grouping parents into classes based upon Attack Intensity
- Treatment appears to be effective in reducing attack intensity in ZOI area
- Less effective at higher parent attack intensity



Assessment of efficacy of Level 1 MPB treatment

Results: Relationship between Parent and ZOI Attack intensity: 2 km zone of influence

- Assessed by grouping parents into classes based upon Attack Intensity
- Treatment appears to be effective in reducing attack intensity in ZOI area
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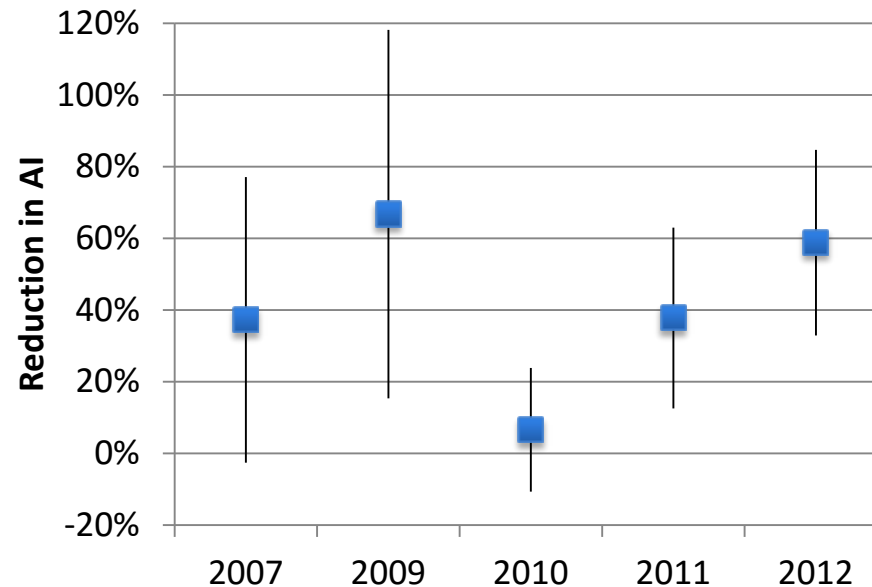


Assessment of efficacy of Level 1 MPB treatment

Results: Relative reduction in ZOI Attack intensity: 1 km zone of influence

- Assessed by comparing relative change from parent to ZOI in treated vs untreated parents
- Each year analyzed independently (2008 excluded)
- Parents with < 3 dead excluded
- Substantial error terms
- **Mean reduction in AI of 41%**

Effect of treatment on ZOI attack intensity



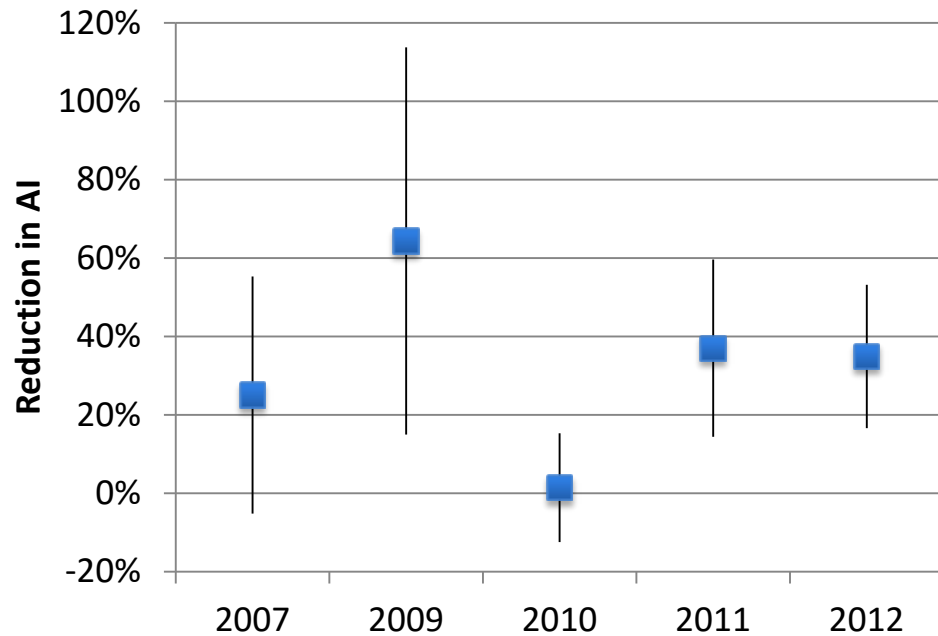
Proportion of infestations treated in each year				
2007	2009	2010	2011	2012
17%	31%	6%	14%	29%

Assessment of efficacy of Level 1 MPB treatment

Results: Relative reduction in ZOI Attack intensity: 2 km zone of influence

- Mean reduction in AI of 33%

Effect of treatment on ZOI attack intensity



Proportion of infestations treated in each year				
2007	2009	2010	2011	2012
17%	31%	6%	14%	29%

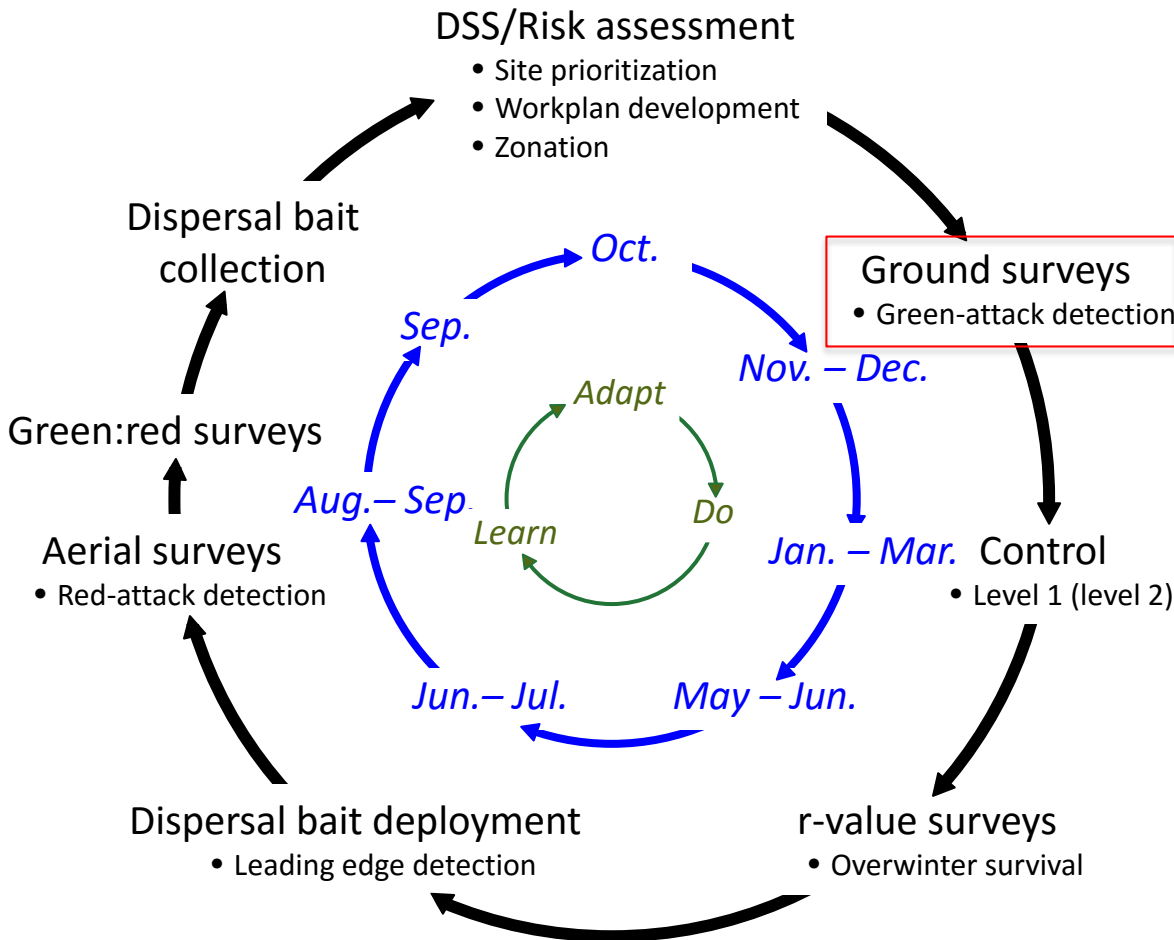
Assessment of efficacy of Level 1 MPB treatment

Conclusions:

- Only able to detect ~65% of new green attack trees in L1 treatment areas
- Level 1 treatments have been effective at slowing the spread of MPB
 - Reduced AI in the 1km ZOI (7-67%) mean of 41%
 - Reduced AI in the 2km ZOI (1-61%) mean of 33%
- If the overall rate of treatment is too low, Level 1 treatments are less effective
- Level 1 treatments were less effective in high attack intensity areas (>8 dead/km²)

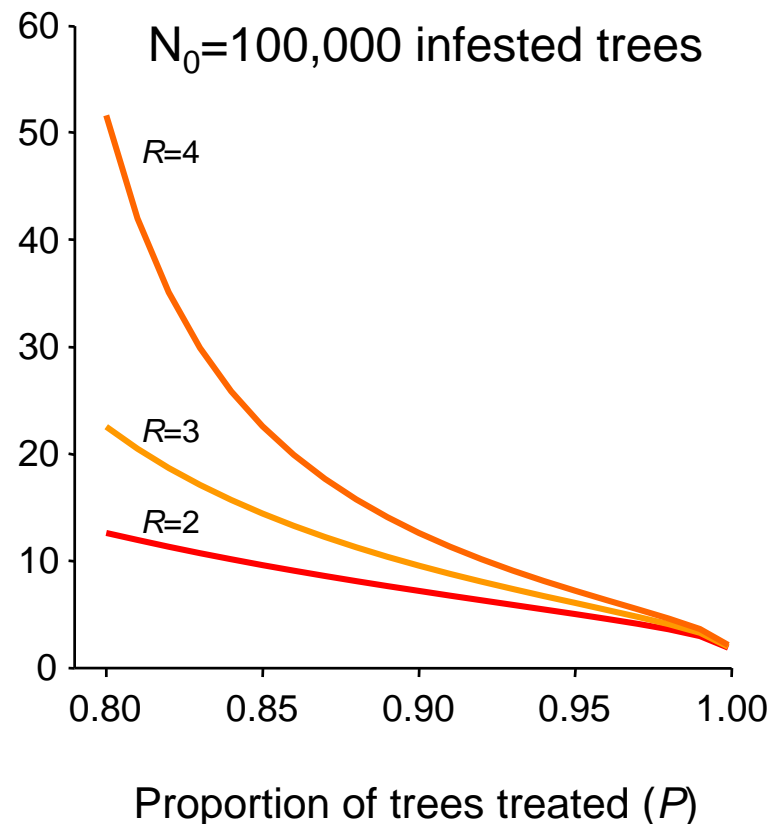
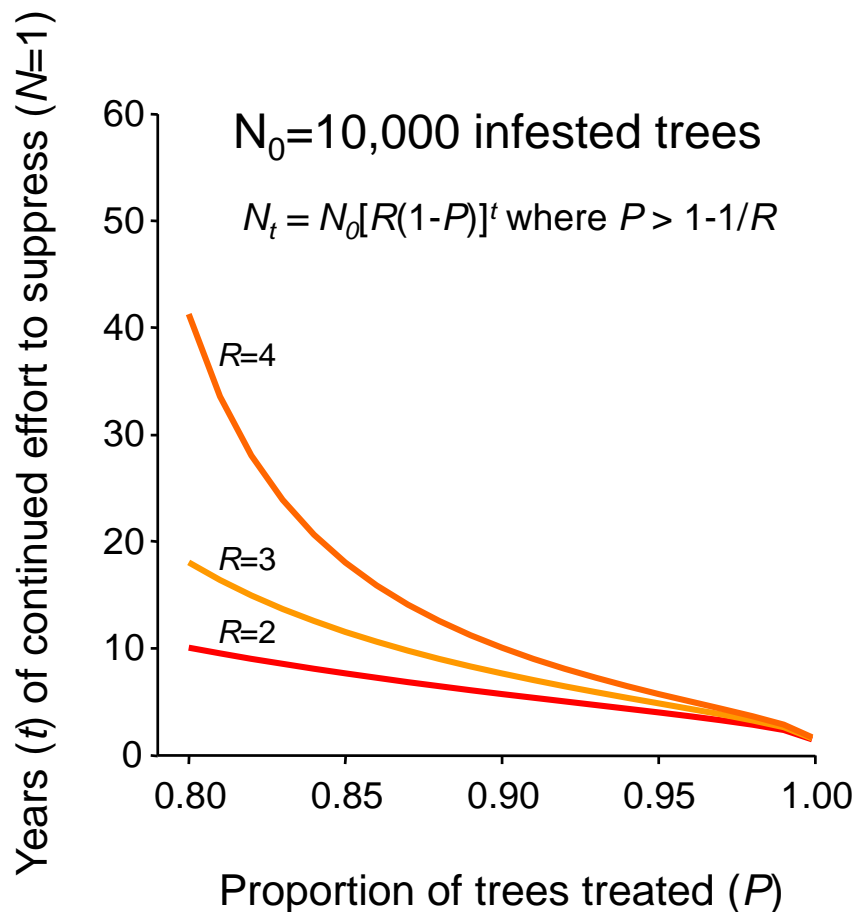
Level 1 control efficacy evaluation: relevance and integration

1. Treatment efficacy can be increased with increasing efforts at green attack detection/treatment





The importance of early, aggressive control



Discussion

