



# Spatial dynamics of gypsy moth outbreaks in North America

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## **Landscape Patterns and Ecosystem Processes**

### **2008 US-IALE Symposium**

**Madison, Wisconsin | April 6-10, 2008**

(US-IALE : United States Regional Association for the International Association for Landscape Ecology )

#### **Meeting Theme**

Contemporary landscape ecology continues to explore the causes and consequences of landscape heterogeneity across a range of scales, and demand for the scientific underpinnings of landscape planning and management remains high. The 23rd annual symposium will focus on one of the current frontiers in landscape ecology: understanding the patterns, causes, and consequences of spatial heterogeneity for ecosystem function. Spatial fluxes of matter, energy and information influence the functioning of individual ecosystems and heterogeneous landscapes, but progress at the interface of ecosystem and landscape ecology has been relatively slow compared to other areas. Integrating the understanding gained from ecosystem and landscape ecology will enhance progress in both disciplines while generating new insights into how landscapes function.

## Session Information

Session	<a href="#"><u>Insect Outbreaks in Forested Landscapes: Spatial Patterns and Ecosystem Responses</u></a>
Date	Wednesday (2008-04-09)
Time	10:00 - 10:20
Room	Hall of Ideas E

## Presentation Information

Presenter	Andrew Liebhold
Title	Spatial dynamics of gypsy moth outbreaks in North America
Affiliation	US Forest Service, Northern Research Station
Authors	Andrew Liebhold, O Björnstad, D Johnson, Kyle Haynes, Christelle Robinet-Makdoud
Keywords	Moran effect, Periodicity, Predators, Synchrony
Presentation Type	Symposium

### **Abstract:**

The gypsy moth is an alien forest insect that periodically reaches outbreak levels, causing widespread defoliation across much of eastern North America. We use historical map data delineating outbreaks to characterize the scale of spatial synchrony in populations. Spatial synchrony refers to the phenomenon in which geographically disjunct populations oscillate in a correlated manner and is a ubiquitous feature in the dynamics of most forest insect populations. Gypsy moth populations also exhibit periodicity though the character of this periodicity varies geographically. In oak-dominated forests growing in dry locations, populations exhibit a period of ca. 4-5 years but in more mesic sites, populations are dominated by a periodicity of 8-10 years. We use a population model that incorporates disease dynamics and predator effects to illustrate that this difference in periodicity may be caused by geographical variation in carrying capacities of small mammal predators which are key mortality agents at low densities. Mast seeding in oaks affects the dynamics of predator populations and thereby also influences gypsy moth populations. We hypothesize that synchrony in mast seeding leads to synchronous dynamics in predator populations and in turn contributes to synchrony in gypsy moth populations.