



# Mapping Susceptibility Associated with Beech Bark Disease



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## INTRODUCTION



Sexual fruiting bodies (perithecia) of *N. coccinea* var. *faginata*



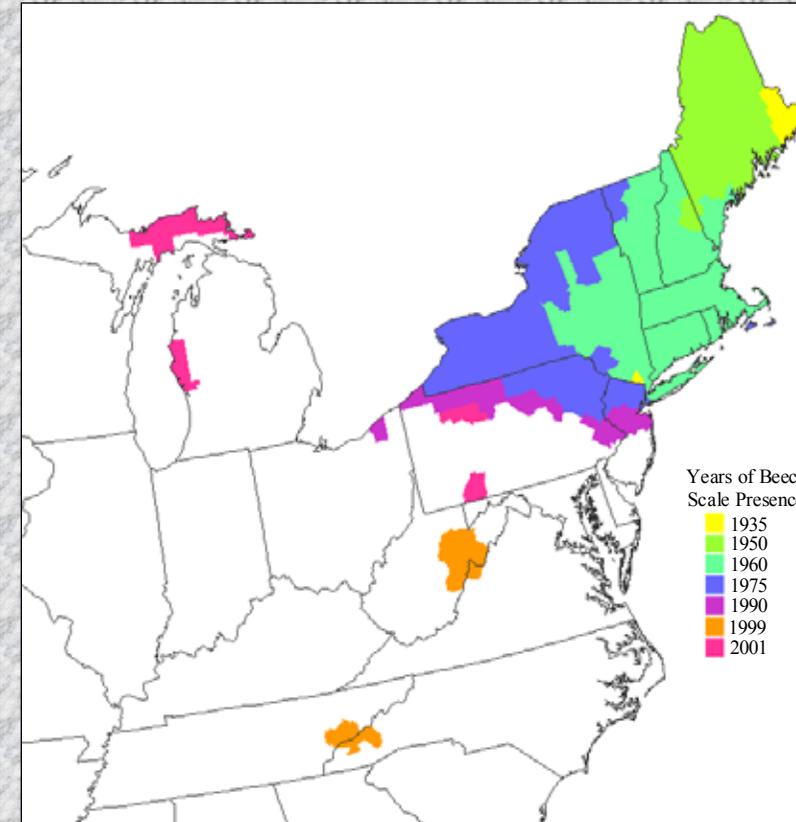
Beech scale nymph (about 0.3 mm long)



Beech snap occurs when wind breaks stems of trees where wood borers and decay fungi weakened the wood beneath *Nectria*-killed bark

Beech bark disease is an alien pest species complex consisting of the scale insect, *Cryptococcus fagisuga* and at least two species of *Nectria* fungi, *N. coccinea* var. *faginata*, and *N. galligena*. The scales typically achieve large numbers feeding on sap in the inner bark and allow the pathogenic *Nectria* fungi to invade the xylem, often resulting in dieback or tree mortality. The disease was apparently introduced to North America near Halifax around 1890 and has been slowly expanding its range. As this disease invades new areas, large proportions of American beech, *Fagus grandifolia*, are often killed. In order to plan for the management of the beech bark disease in the future, there is a need to delimit the distribution of susceptible stands in areas that are currently uninfested. American beech has a very large range and beech bark disease has only invaded a fraction of that area. While the greatest concentrations of this tree species occur in northeastern North America, this species exists through much of the southeast as well. We expect that the impacts of this disease are likely to increase in the future.

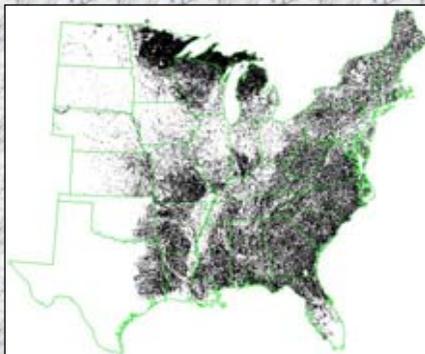
## HISTORICAL RANGE EXPANSION



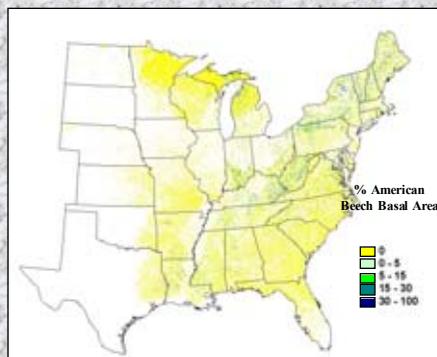
Years of Beech Scale Presence  
1935  
1950  
1960  
1975  
1990  
1999  
2001

The range of beech bark disease (as of 1999) has been spreading since it was first discovered in Maine in 1931. The map shows the number of years since beech bark disease was first detected in the area. In the future we will adjust the percent beech map (shown below) by a predicted beech bark disease spread map. Another possible analysis will be to use historical FIA data to model American beech mortality in the wake of the beech bark disease killing front.

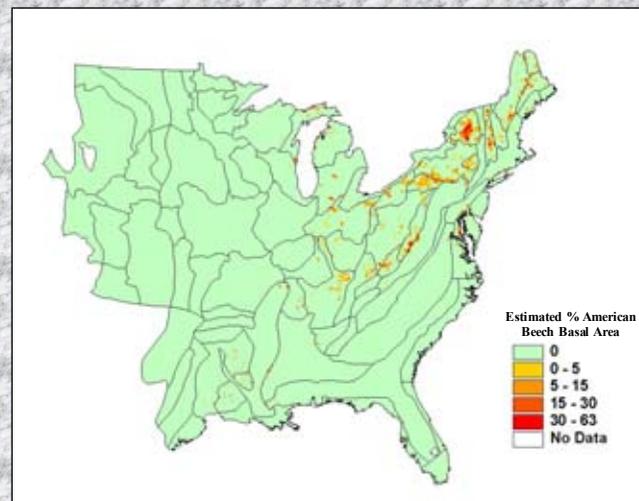
## METHODS AND RESULTS



The most recent survey from each state was downloaded from the Eastwide FIA Database. Plots with less than 10 sq. ft. of basal area were removed. Therefore, 88,687 plots were included.

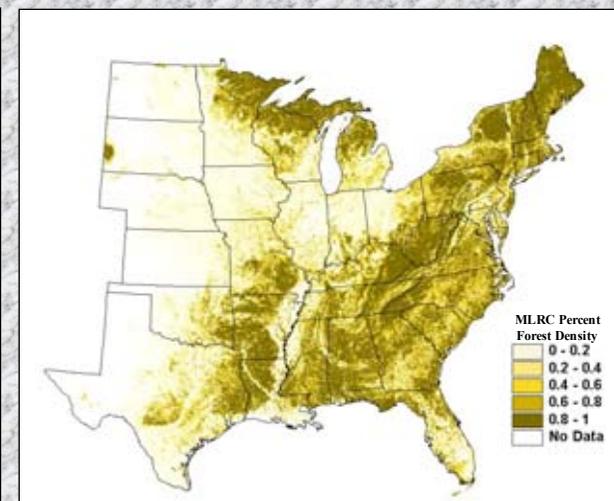


The percent American beech basal area was calculated for each plot.



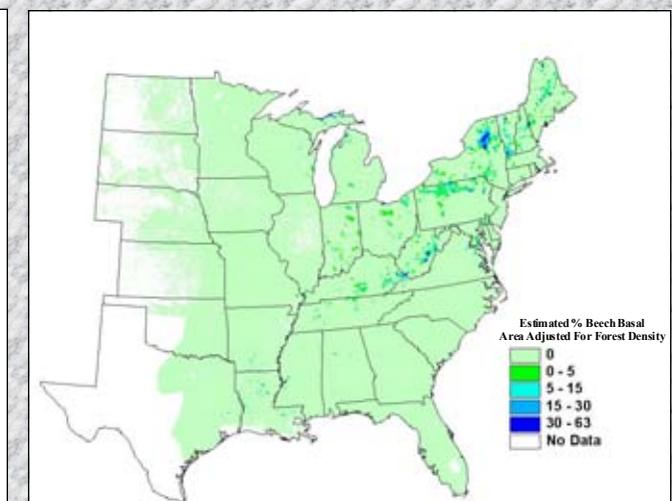
Estimated % American Beech Basal Area  
0  
0 - 5  
5 - 15  
15 - 30  
30 - 63  
No Data

Median indicator kriging was repeated separately for each ecoregion section in the East to estimate the percent basal area of American beech. The results were combined as a mosaic.



MLRC Percent Forest Density  
0 - 0.2  
0.2 - 0.4  
0.4 - 0.6  
0.6 - 0.8  
0.8 - 1  
No Data

The estimates were adjusted for forest density using a land-cover map (proportion forest) generated from the Multi-Resolution Land Characteristics Consortium (MRLC) data. Each 30-m pixel was classified as forest or non-forest and then pixels were aggregated into 1-km percent forest pixels.



Estimated % Beech Basal Area Adjusted For Forest Density  
0  
0 - 5  
5 - 15  
15 - 30  
30 - 63  
No Data

The forest density map values were multiplied by the percent beech map to create an adjusted beech bark disease susceptibility map.