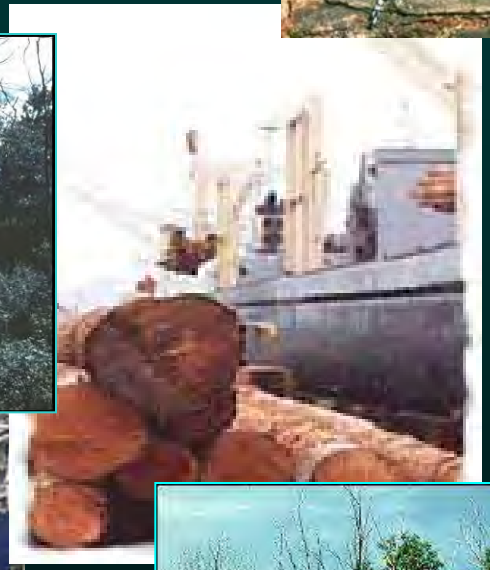
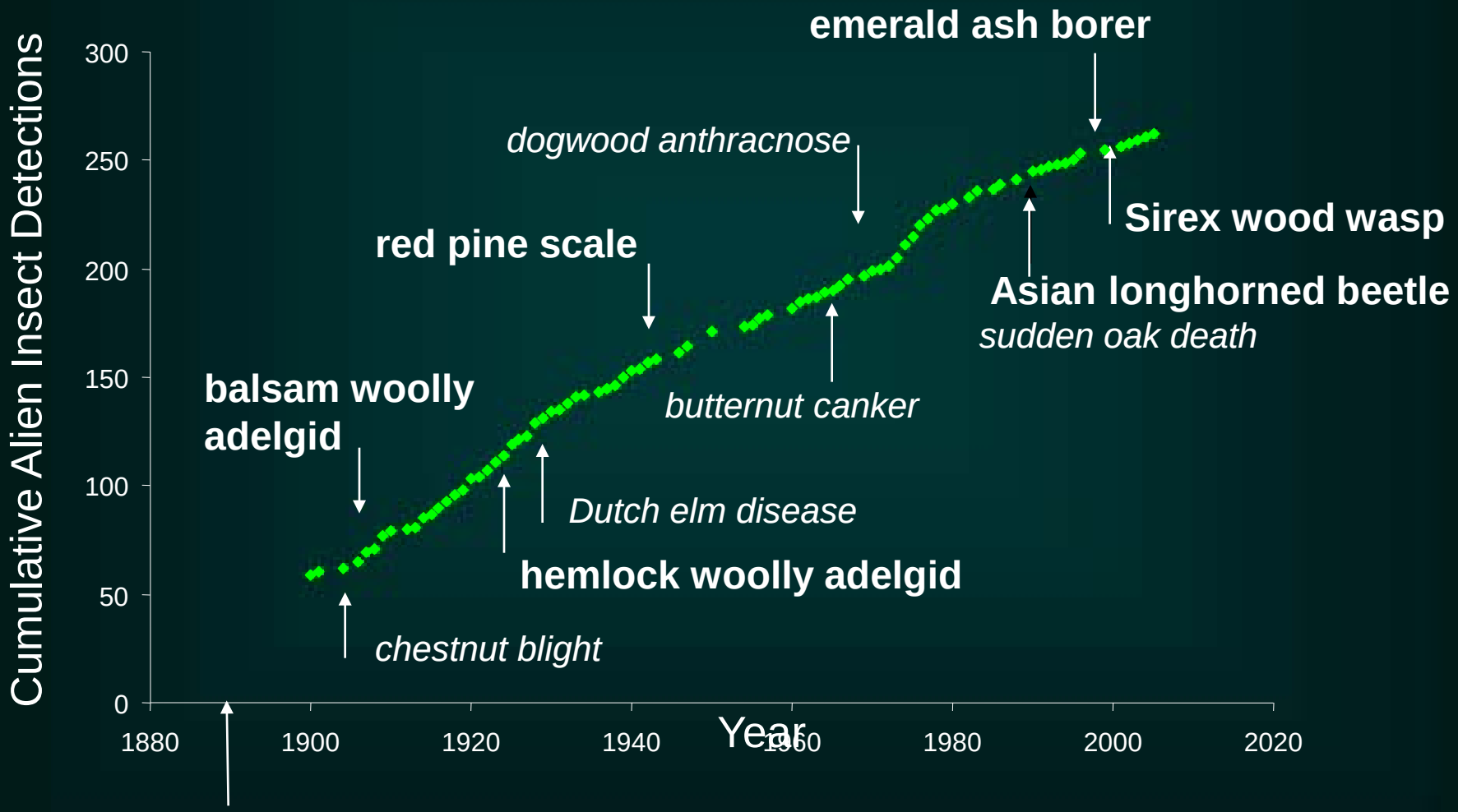
Invasions by non-indigenous forest insects and diseases




Northeastern US and
Eastern Canada

What effects are invading forest pests having on N. American forests?



Pre 1900: **gypsy moth**, **beech scale**, **larch casebearer**, *white pine blister rust*

Alien Forest Pest Explorer, a web-based application for exploring non-native forest pest distributions

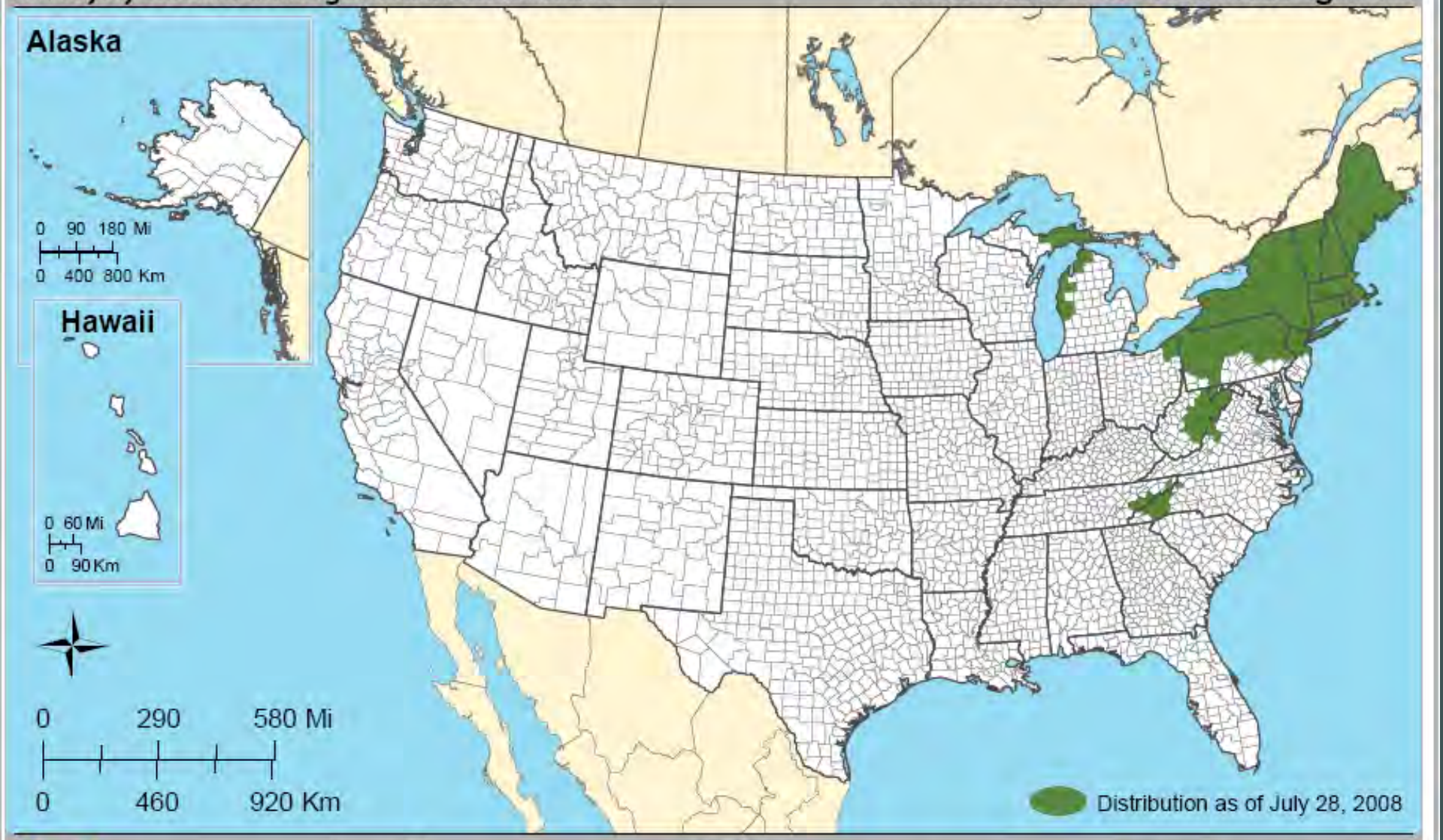
- http://www.fs.fed.us/ne/morgantown/4557/AFPE
- Arc/IMS – based, in transition to Adobe Flex – Arc GIS Server interface
- County-level maps
- Forest pest distributions
- Host tree volume (generated from FIA data)
- Supported by USFS FHTET and EFETAC

Alien Forest Pest Explorer

Beech Bark Disease

www.fs.fed.us/ne/morgantown/4557/AFPE/

Neonectria coccinea var. faginata



USDA Forest Service

Northern Research Station

Forest Health Technology Enterprise Team

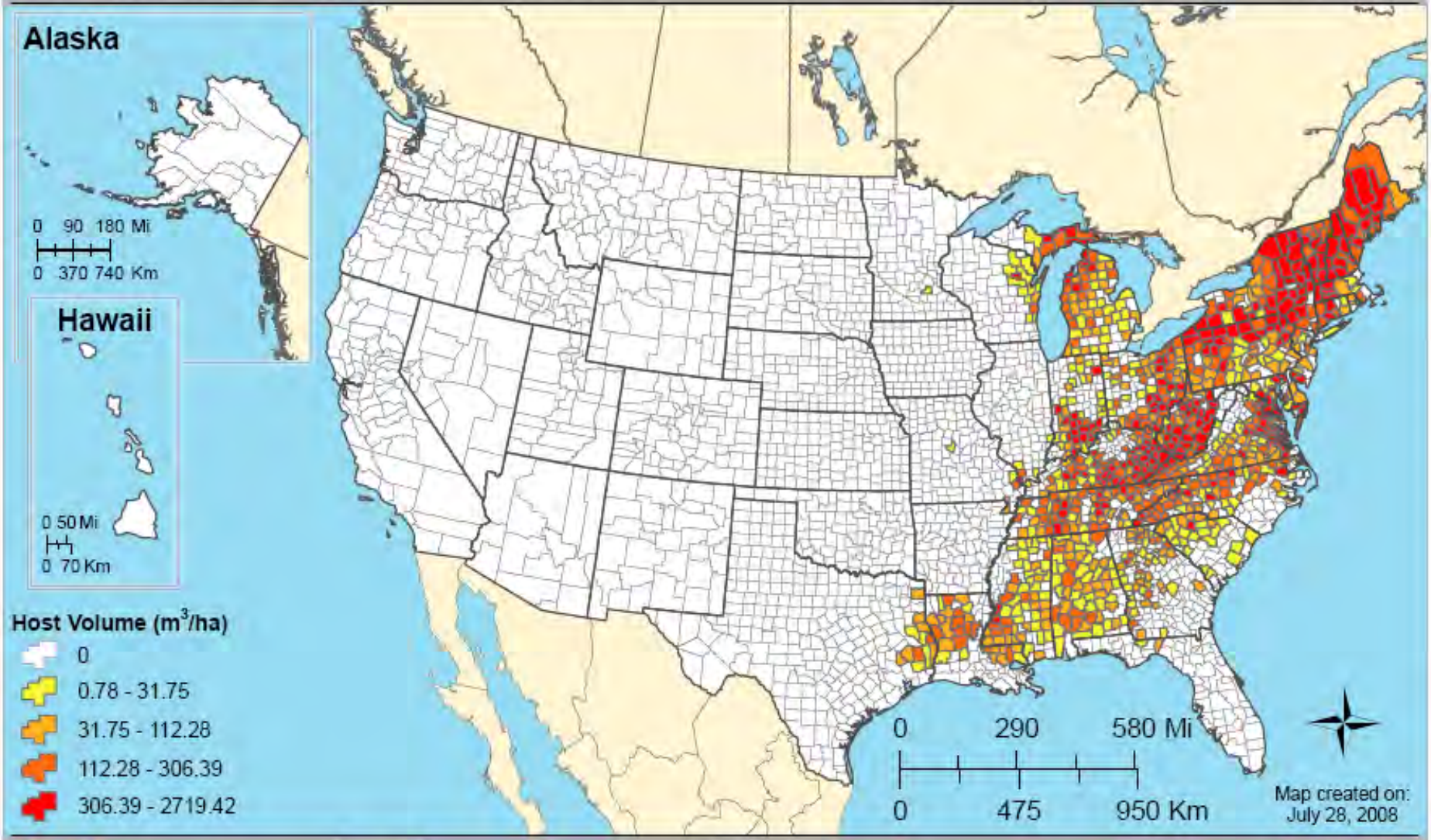
RSAC Remote Sensing Applications Center

Alien Forest Pest Explorer

Beech Bark Disease

www.fs.fed.us/ne/morgantown/4557/AFPE/

Neonectria coccinea var. faginata



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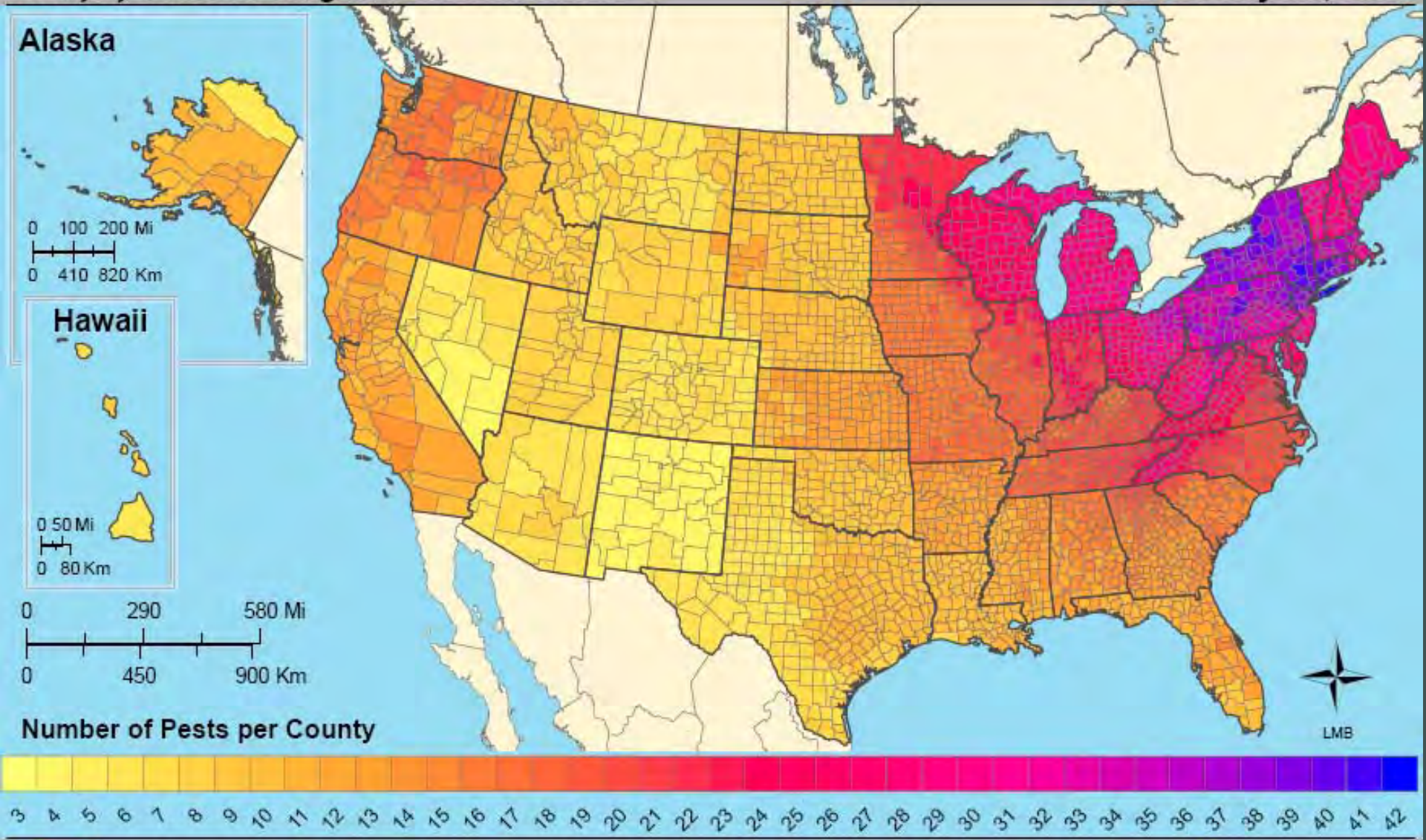
Alien Forest Pest Explorer

Species Richness

www.fs.fed.us/ne/morgantown/4557/AFPE/

as of July 28, 2008



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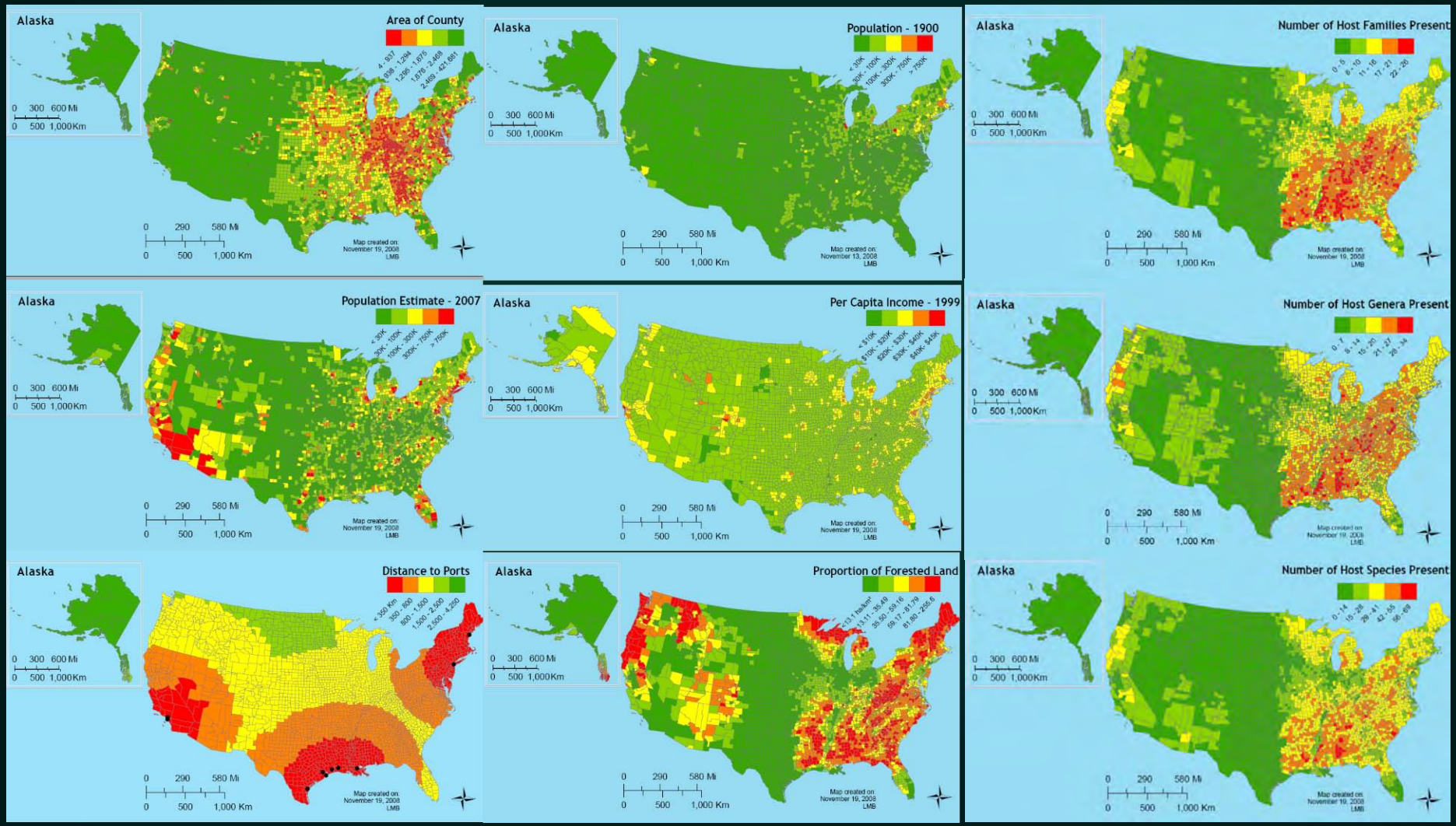
Correlates of pest species richness

- Current human population size
- Human population size in 1900
- Per Capita Income
- Forest Area (km^2)
- No. Host Species
- No. Host Genera
- No. Host Families
- Distance to Port (km)
- Road density (km/ha)

Correlates of pest species richness



Results of Stepwise Ordinary Least Squares Regression

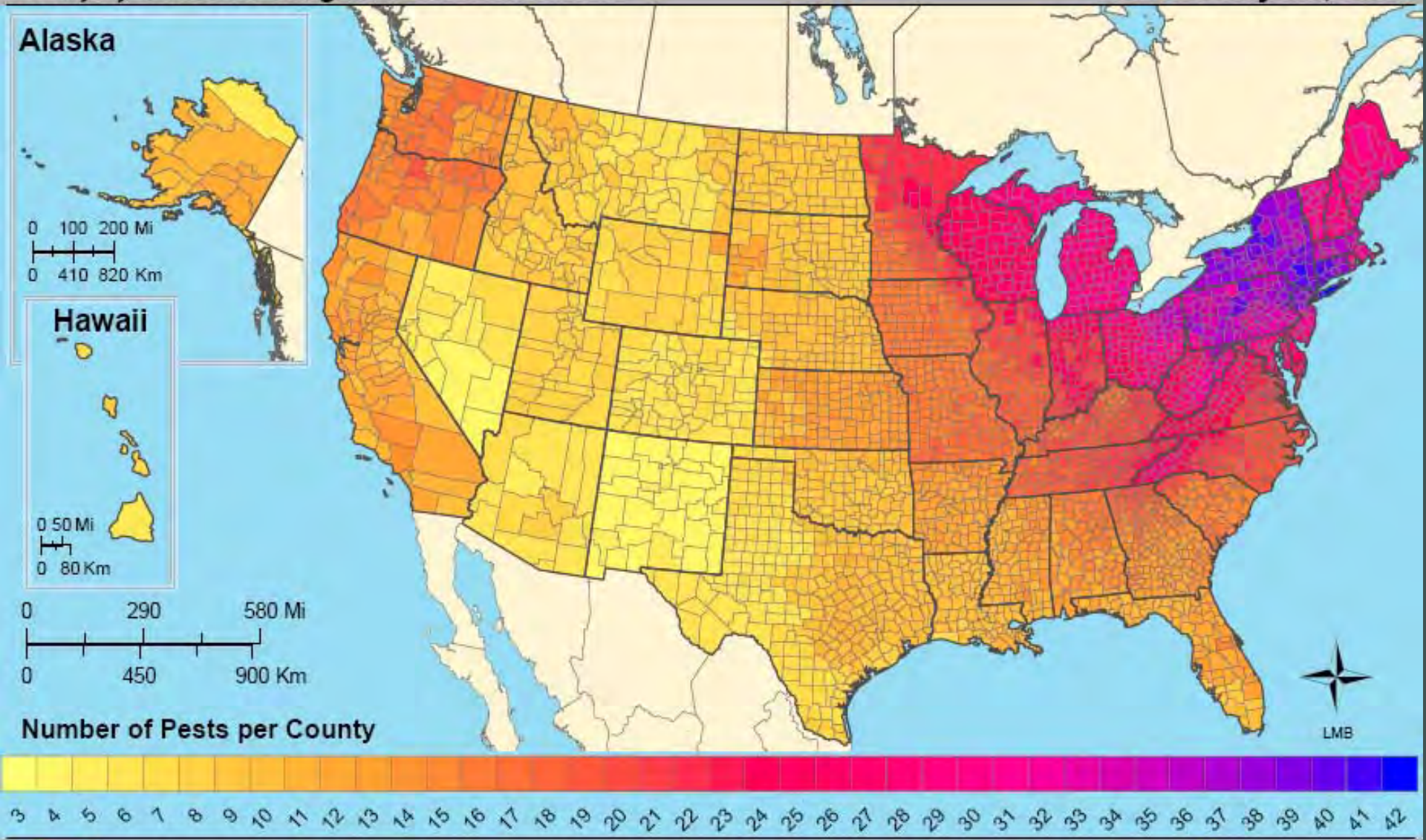
	Entry into Model	estimate	partial R^2
No. Host Genera	1	2.39024	0.213
Per Capita Income	2	0.00052	0.100
No. Host Families	3	-1.85572	0.082
Forest Area (km^2)	4	-0.00001	0.049
Population in 1900	5	0.00002	0.024
No. Host Species	6	-0.27440	0.010
Distance to Port (km)	7	0.00000	0.005
Road density (km/ha)	8	-0.00302	0.004

Alien Forest Pest Explorer

Species Richness

www.fs.fed.us/ne/morgantown/4557/AFPE/

as of July 28, 2008



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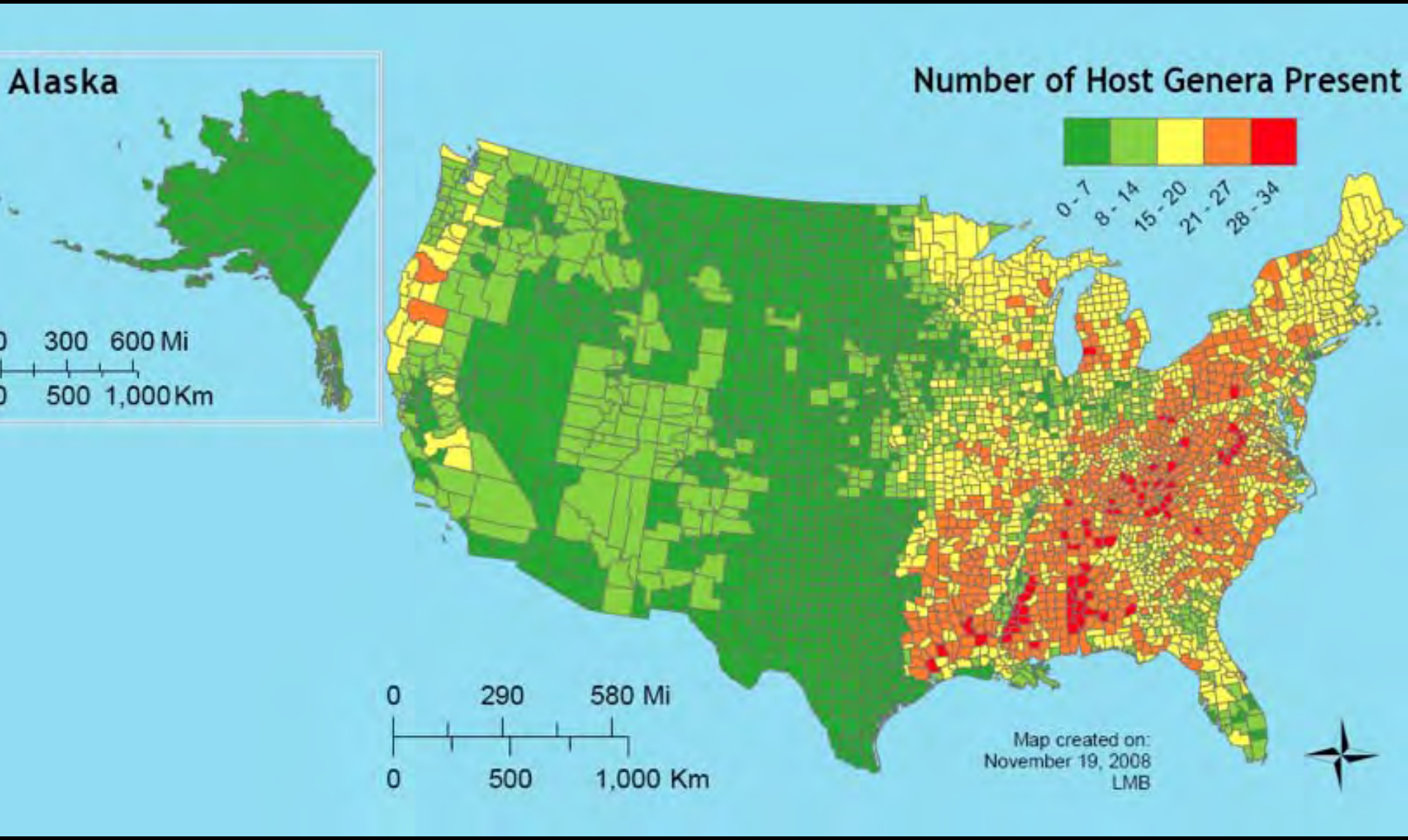
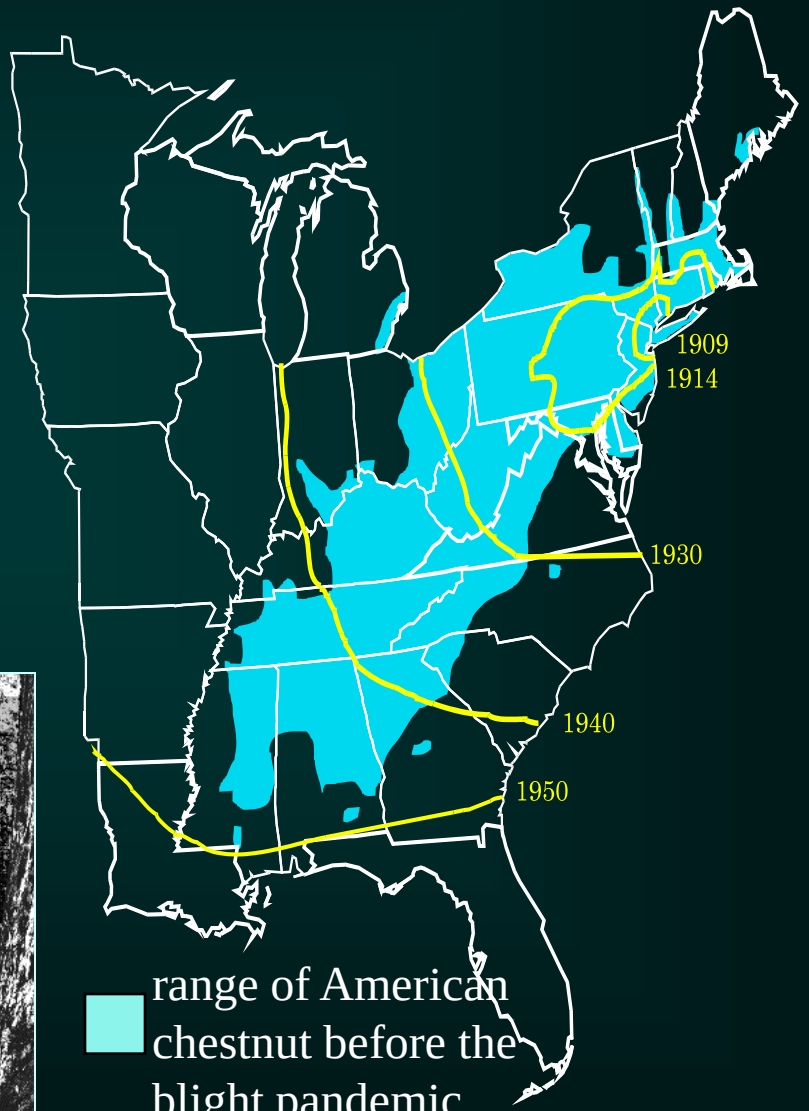

Alaska
0 300 600 Mi
0 500 1,000 Km
Number of Host Genera Present
0 - 7
8 - 14
15 - 20
21 - 27
28 - 34
0 290 580 Mi
0 500 1,000 Km
Map created on:
November 19, 2008
LMB

Chestnut Blight in North America

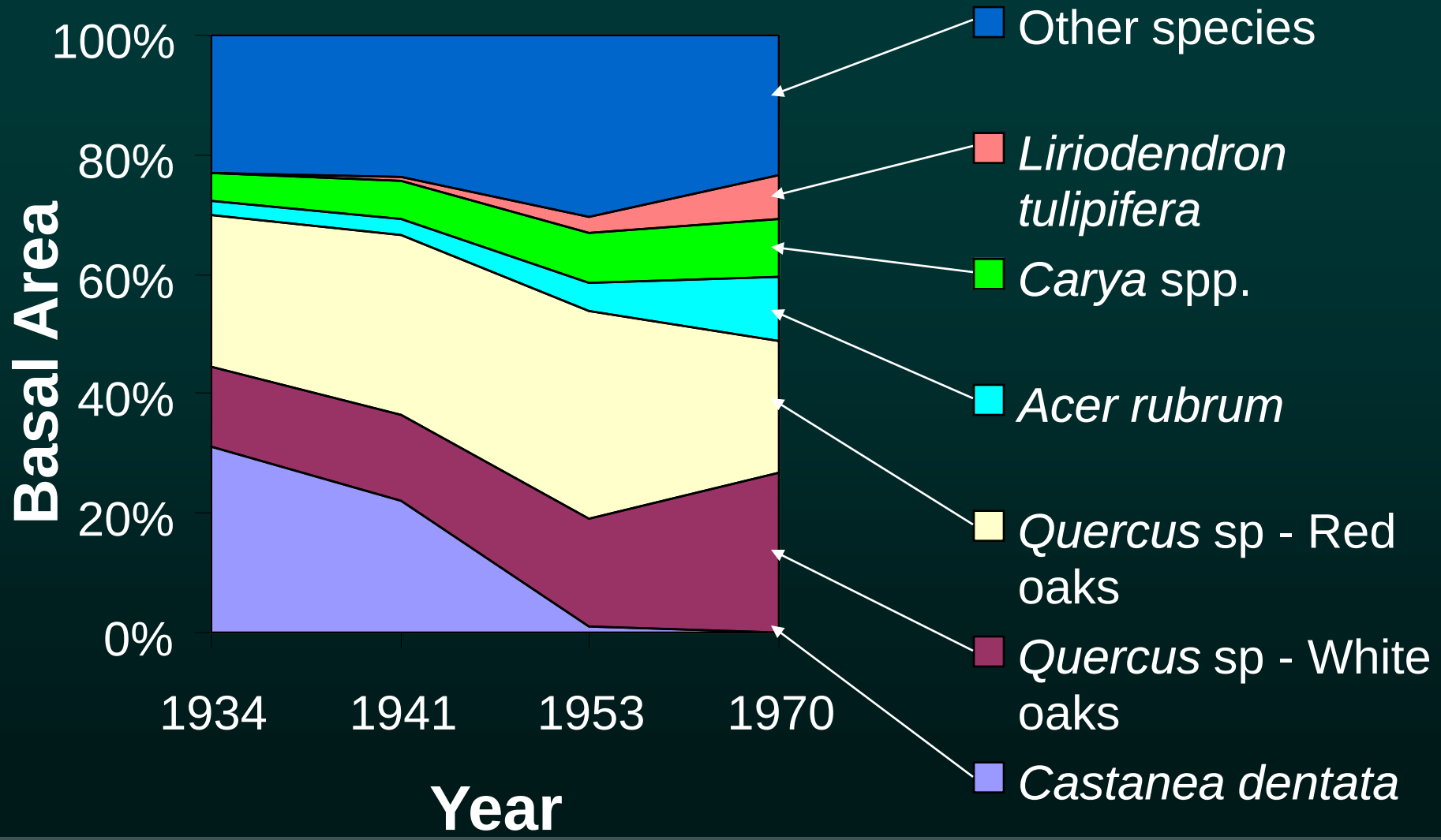
- American Chestnut originally dominant through eastern N. America
- Causal Agent: *Endothia parasitica*
- Accidentally introduced in New York in 1904
- By 1960, chestnut was mostly eliminated



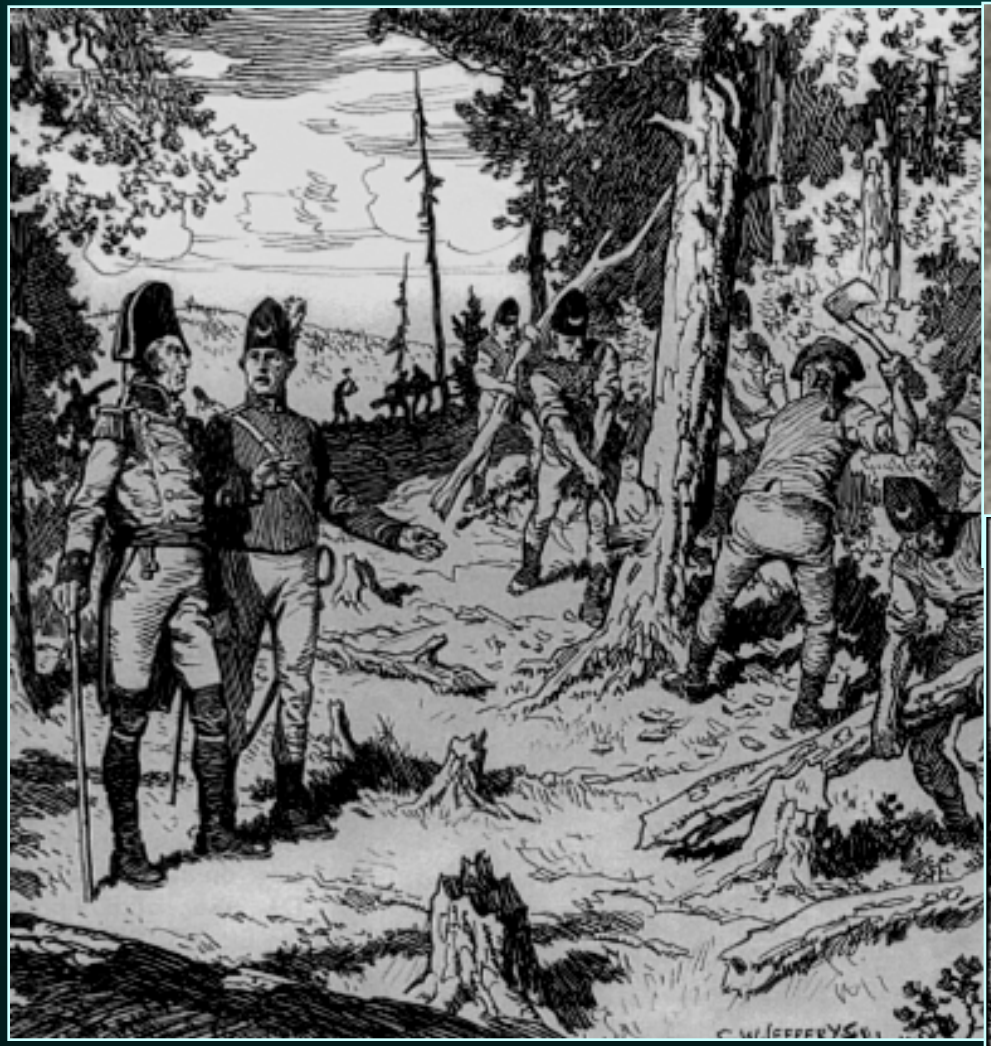
Changes in forest composition following invasion by chestnut blight

Coweeta, North Carolina, S. Appalachian Mtns.

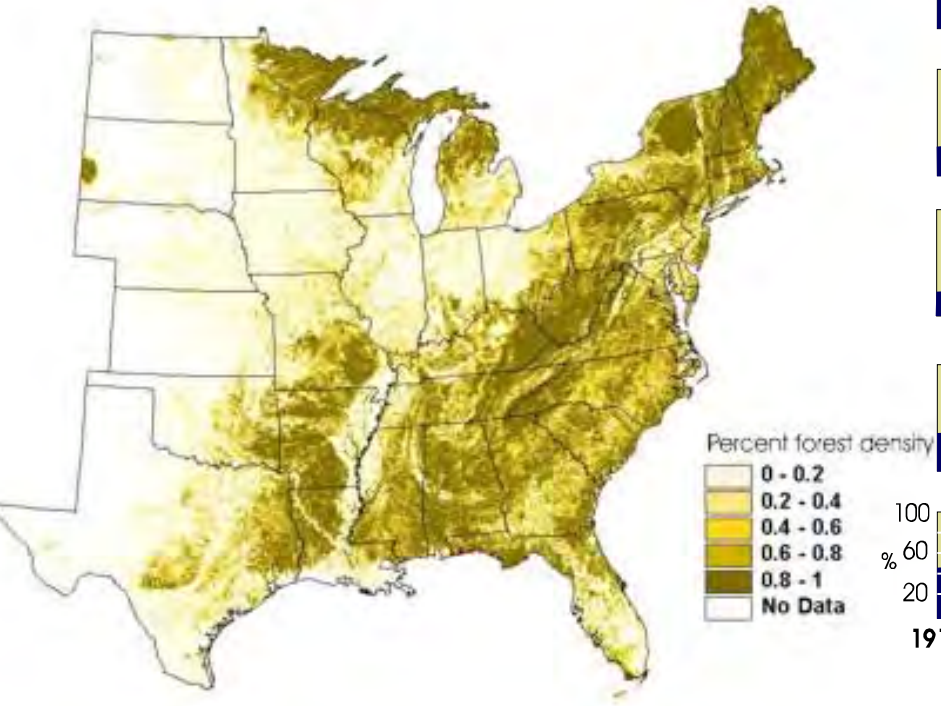
Day, F.P. and C.D. Monk. 1974. Vegetation patterns on a southern Appalachian watershed. Ecology 55: 1064-1074.



Deforestation of eastern N. America

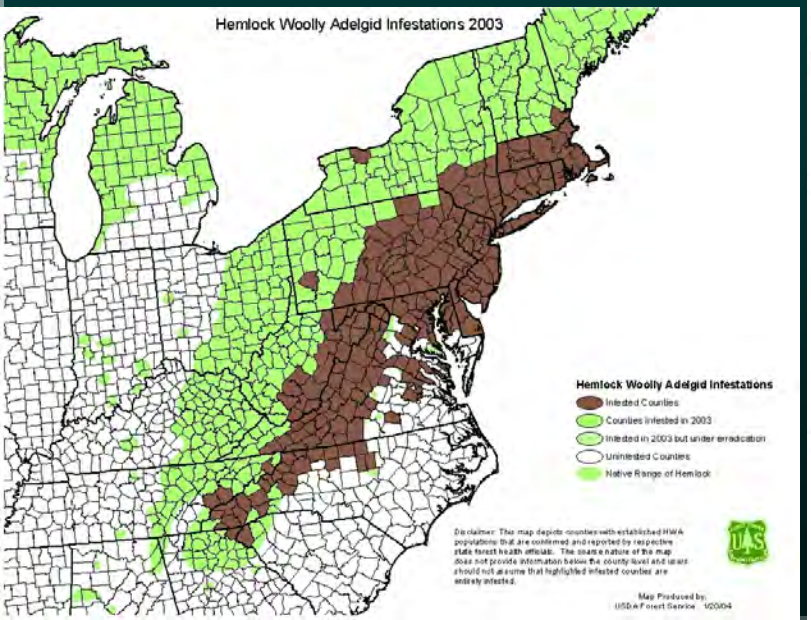


Reforestation of Northeastern USA as a result of agricultural abandonment

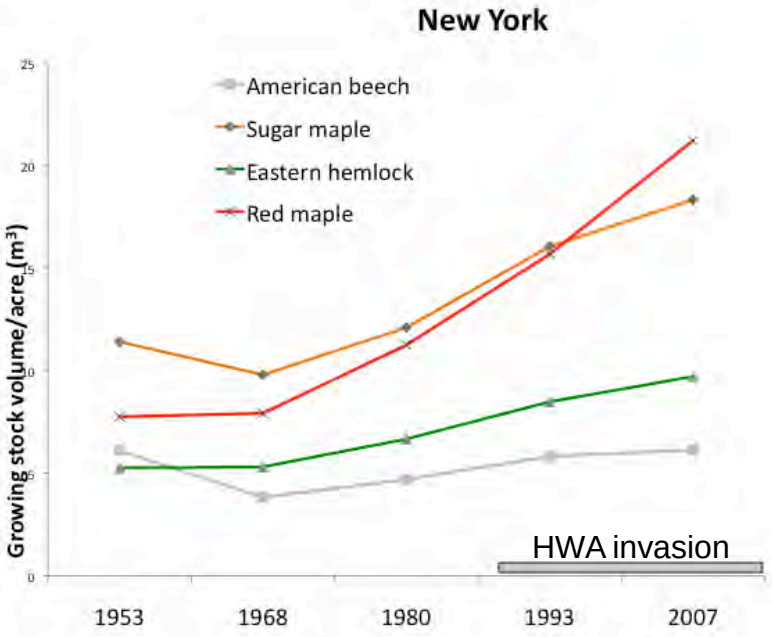


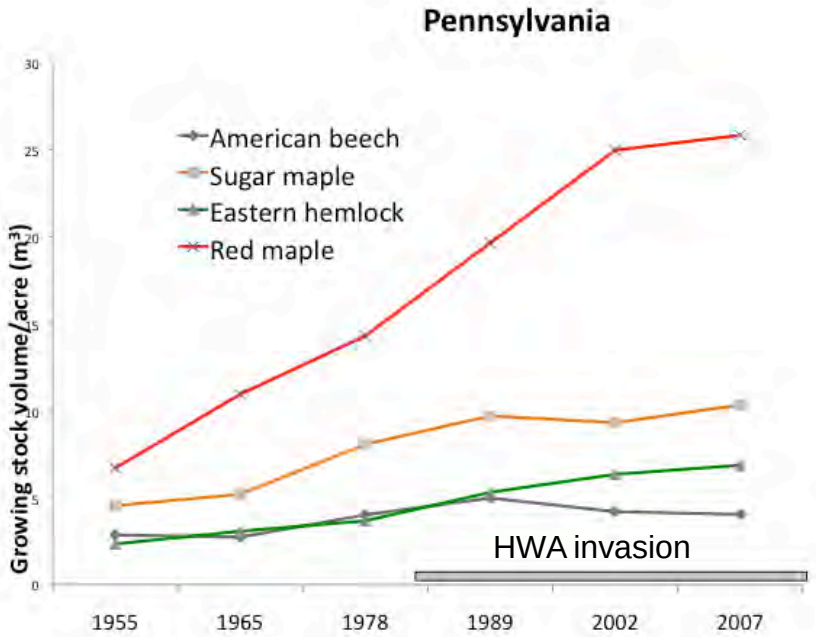
Hemlock Woolly Adelgid

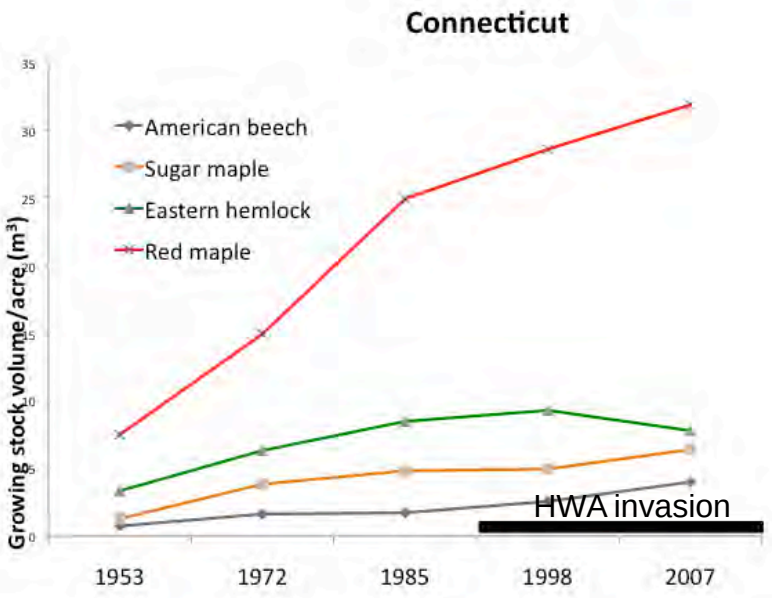
Hemlock Woolly Adelgid

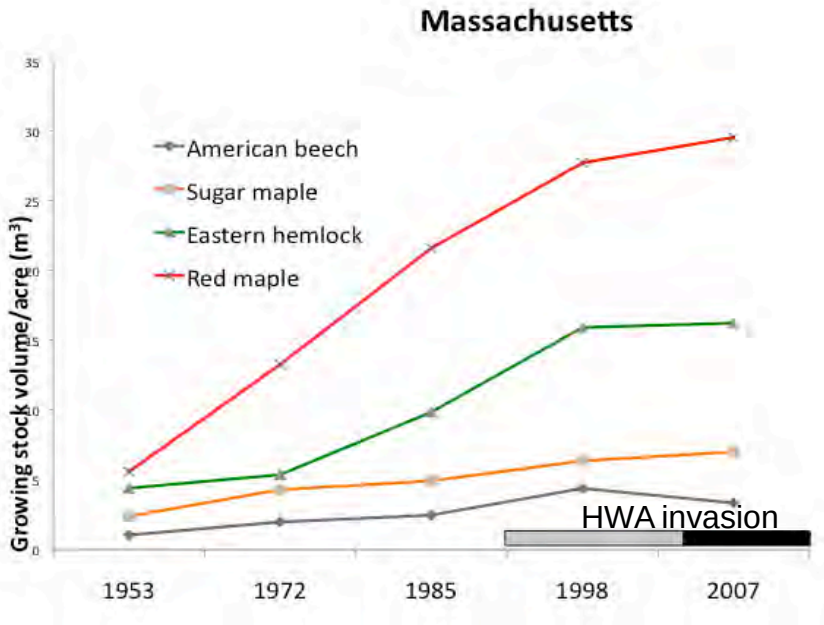


Initial infestation (1951)
1971
1981
1991
1996
2001
2006
Range of *Tsuga* spp.



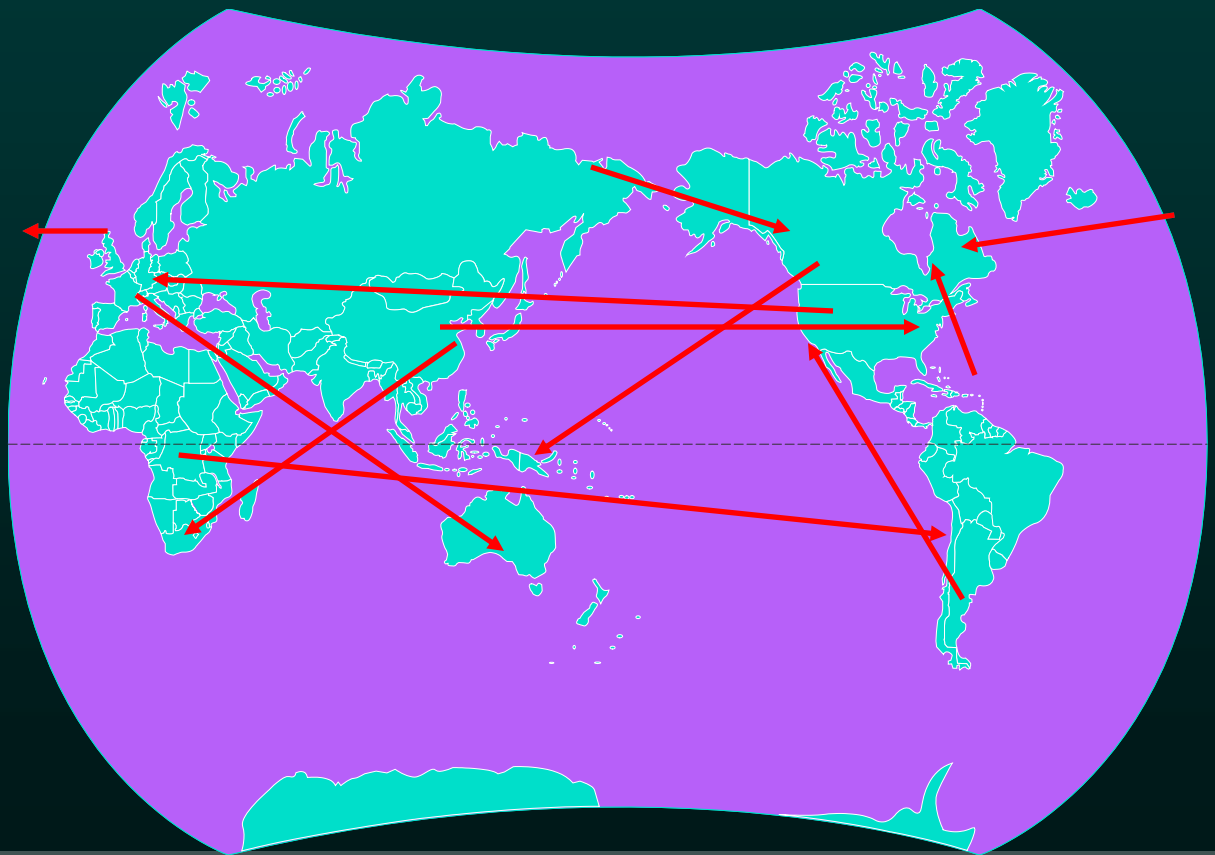




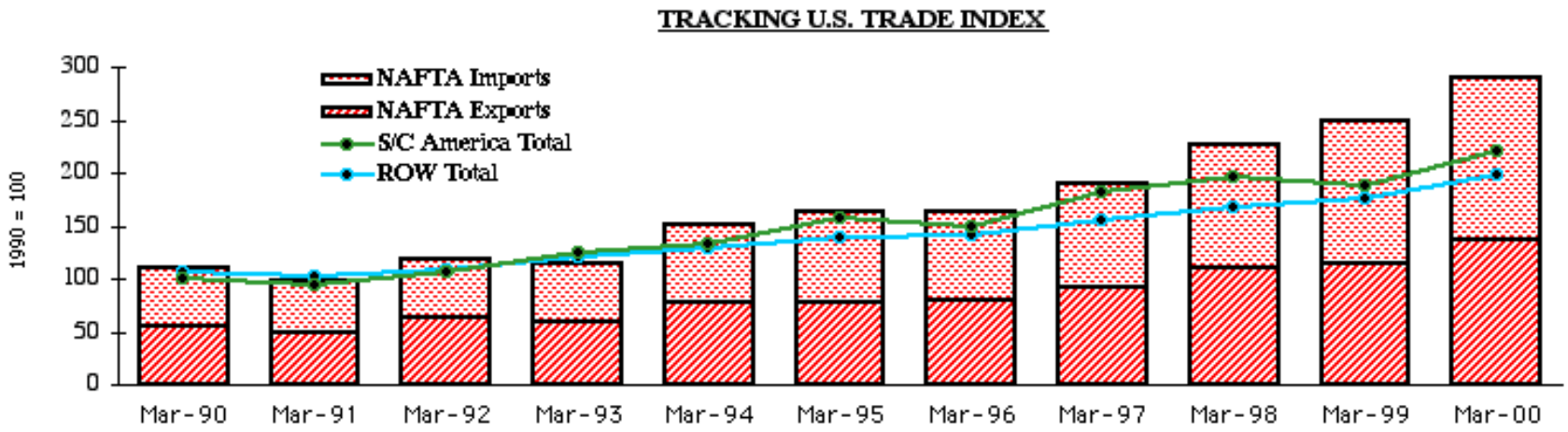


Trotter, Morin, Oswalt and Liebhold. Regional impacts of the hemlock woolly adelgid (unpublished)

Invasion Pathways



Increased Global Trade



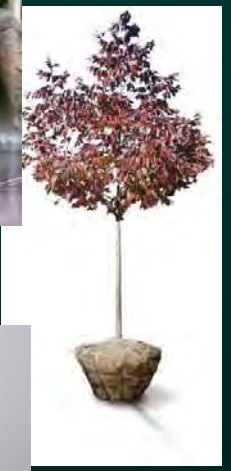
Global Movement of Containerized Cargo

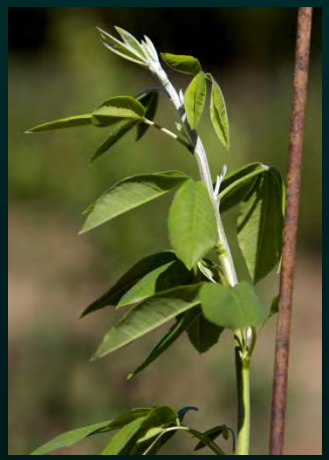
Increases in Air Travel

International movement of raw wood

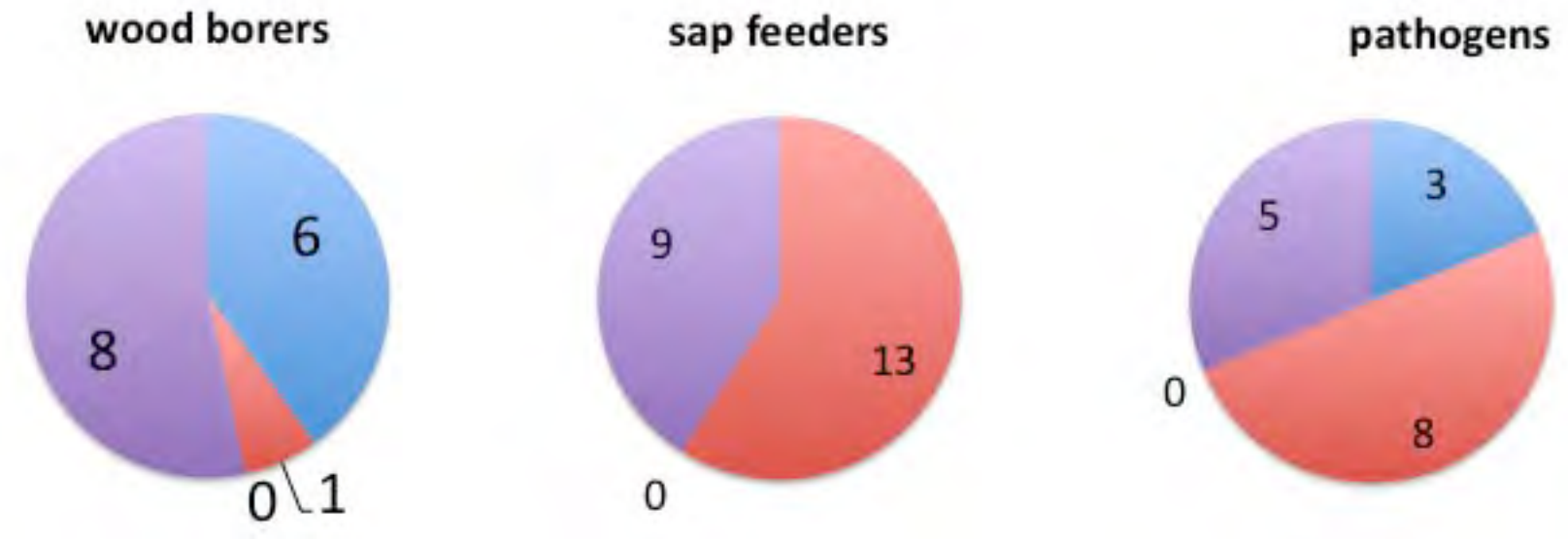
Wood Boring Insects in Furniture

Importation of Live Trees





Historical Forest Pest Invasion Pathways



- Wood
- Plants
- Other
- unknown

Brockerhoff, E., A. Liebhold, J. Parke, F. Lowenstein, K. Britton. Analysis of historical forest pest invasion pathways. (Unpublished draft)

ISPM-15

International Plant Protection Convention (IPPC)
Food and Agriculture Organization of the United Nations (FAO)
World Trade Organization (WTO)

Balancing the impacts of forest pest invasions with the expense of phytosanitary controls

Value of impacts

Cost of controls