

# Studies Related to Firewood and the Spread of Invasives

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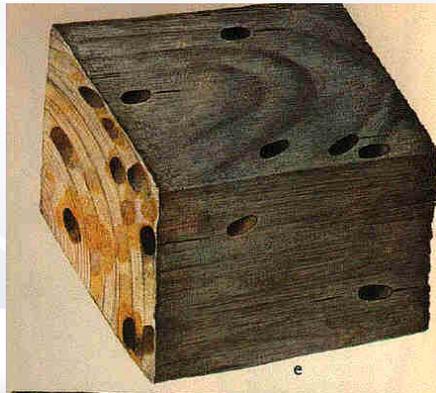
# How many insects are there?

Over 1 million described species

Estimates of 2-30 million

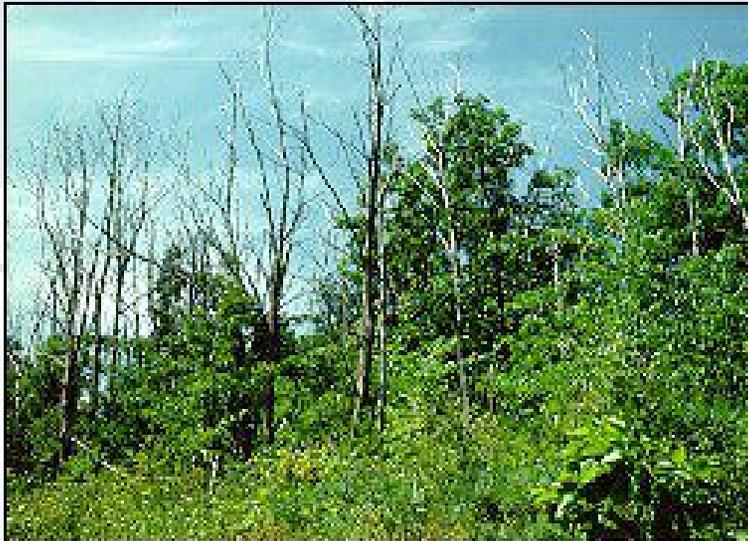
In the US: about 100,000 species

## Important roles of insects



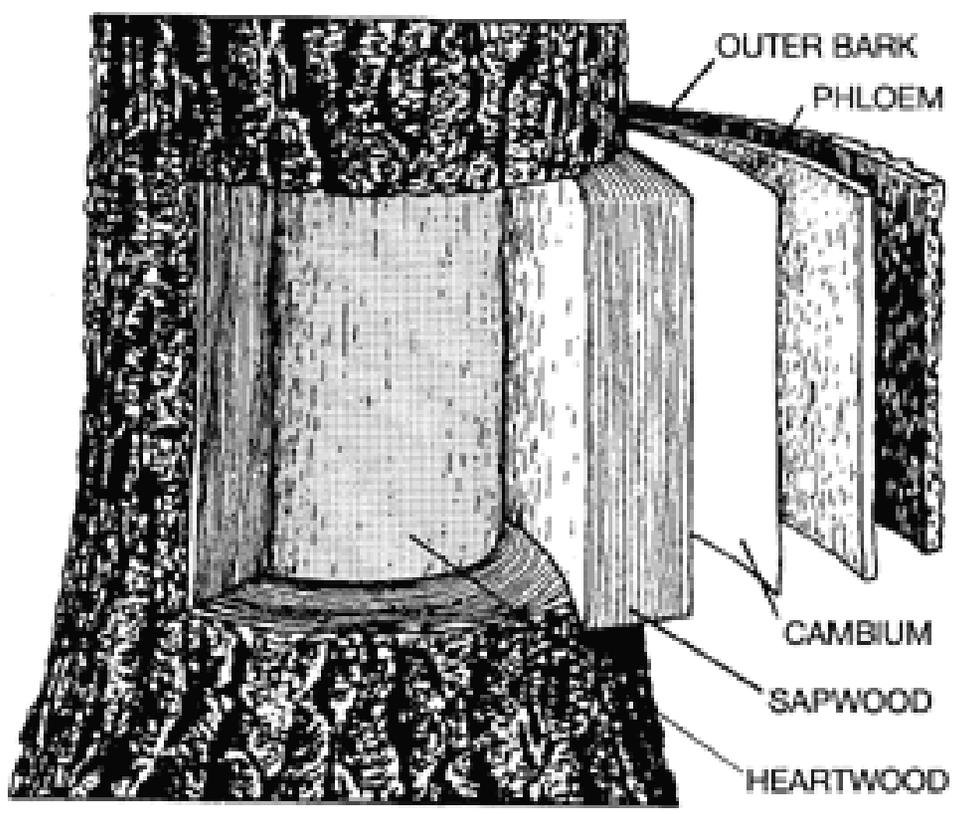
# Pathogens Can be Moved in Firewood

Dutch elm disease  
Oak wilt  
Beech bark disease  
Butternut canker



Some insects  
are hitchhikers

# Nutritional Ecology of Bark & Wood Borers



**Phloem (or Inner Bark):** downward movement of sugars

**Xylem:** upward movement of water & minerals



## Typical length of borer life cycle

Inner Bark	1 year or less
Sapwood	1-2 years
Heartwood	2-3 years

# Coleoptera (Beetles)

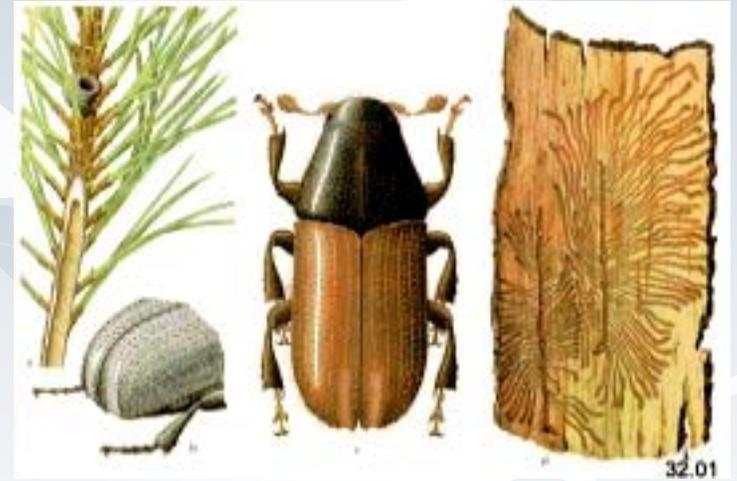
**Scolytidae:** bark & ambrosia beetles

(>6,000 W, >560 NA)

1 or more generations per year most common

**Bark beetle** adults and larvae feed on the inner bark of trees.

**Ambrosia beetle** adults and larvae bore into the wood and feed on fungus.



# Coleoptera (Beetles)

**Buprestidae:** metallic wood borers  
(>15,000 W, >700 NA)  
1-2 year life cycle most common.



# Coleoptera (Beetles)

**Cerambycidae:** longhorned beetles

(>20,000 W, >1200 NA)

1-3 yr life cycle most common



# Hymenoptera (Bees, Ants, Wasps)

**Siricidae:** woodwasps (100 W, 20 NA)

1-year life cycle most common



# Lepidoptera (Butterflies & Moths)

**Sesiidae:** clearwing moths (1,063 W, 115 NA)

1-2 year life cycle



# Lepidoptera (Butterflies & Moths)

**Cossidae:** carpenter moths (650 W, 45 NA)

1-2 year life cycle



# As Wood Moisture Content Decreases Larval Development Time Lengthens: A few records!

**Buprestidae**

***Buprestis aurulenta***

Normally a 2-4 year life cycle

9 years from handrails

26 yrs from structural timbers

30 years from furniture

50 years from window sill



**Cerambycidae**

***Eburia quadrigeminata***

Normally a 2 year life cycle

25 years from flooring

40 years from a bookcase



# 29 Exotic Borers discovered in 1985-2007

First found in 17 states

- 1 Exotic
- 2 Exotics
- 3 Exotics
- 4 Exotics
- 6 Exotics



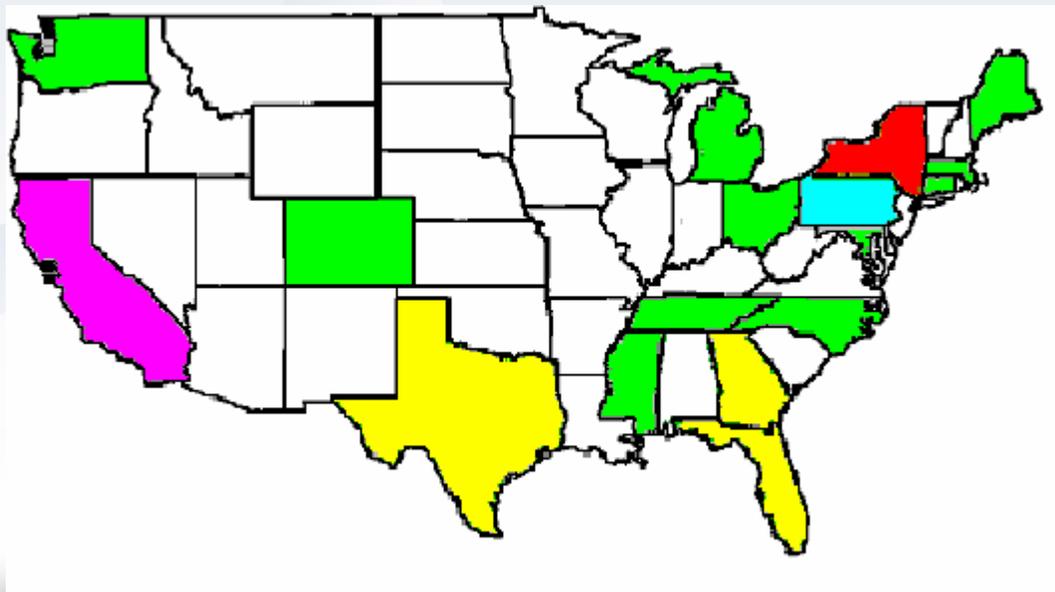
5 Cerambycids



3 Buprestids



1 Siricid



20 Scolytids

12 ambrosia, 8 bark beetles

# Tree Genera Infested by the 29 New Borers

Acer - Maple  
Aesculus - Buckeye  
Ailanthus - Tree of heaven  
Albizzia - Silk tree  
Alnus - Alder  
Asimina - Pawpaw  
Betula - Birch  
Carpinus - Hornbeam  
Castanea - Chestnut  
Corylus - Hazel  
Crataegus - Hawthorn  
Eucalyptus - Eucalyptus  
Fagus - Beech  
Ficus - Fig  
Fraxinus - Ash  
Lindera- Spicebush  
Litsea - Pondspice  
Malus - Apple  
Morus - Mulberry  
Persea - Redbay

Platanus - Plane  
Populus - Aspen  
Prunus - Cherry  
Quercus - Oak  
Robinia - Black locust  
Salix - Willow  
Sapindus - Soapberry  
Sassafras - Sassafras  
Tilia - Linden or Basswood  
Ulmus - Elm  
Abies - Fir  
Cedrus - Cedar  
Chamaecyparis - Cypress  
Cupressus - Cypress  
Juniperus - Juniper  
Larix - Larch  
Picea - Spruce  
Pinus - Pine  
Pseudotsuga - Douglas-fir  
Thuja - Cedar  
Tsuga - Hemlock

**30 HW**  
**11 SW**

# EAB Survival in Firewood

## EAB Exit Holes/m<sup>2</sup>

<u>Month</u>	<u>Whole</u>	<u>Split</u>
July	9	4
Aug	29	6
Sept	61	25
Oct	68	32
Dec	78	75



**EAB emergence in 2004 and 2005  
from the same 10 ash bolts**

**36 EAB in 2004**

**8 in 2005**

# April 2008 Survey of Confiscated Firewood at Mackinaw City, MI

186 pieces split  
> 11 tree species

Current or Prior  
Insect Infestation

No 44%

Yes 56%

Current 16%

Prior 40%



# 19 of the 186 Pieces were Ash Current or Prior Insect Infestation in

No	1
Yes	18

Current: 1 (cerambycid)  
Prior : 17 (10 had EAB)



2	Apple
1	Ash
3	Aspen
19	Beech
35	Birch
3	Boxelder
23	Cherry
5	Cottonwood
12	Elm
13	Hickory
92	Hornbeam
88	Oak
5	Silver maple
45	Sugar Maple
48	Red pine
24	Spruce
<b>418</b>	<b>TOTAL</b>



# Will EAB Emerge Through Plastic Bags?

Plastic bags were “contractor grade” clear, 4 mil thick (= 4/1000 inch or 0.1 mm).

**Single bagged**

1 adult emerged

**Double bagged**

0 adults emerged

Study led by Therese Poland



# Did you know that the US imports firewood?

Argentina	Liberia
Brazil	Lithuania
Canada	Malaysia
China	Mexico
Estonia	Nigeria
France	Paraguay
Germany	Philippines
Guatemala	Singapore
Honduras	Sri Lanka
Hong Kong	Taiwan
Indonesia	UK
Japan	Vietnam



1996	\$12,875,836
1997	6,219,924
1998	4,101,892
1999	4,248,273
2000	4,292,368
2001	4,975,108
2002	6,094,694
2003	6,174,929
2004	8,229,009
2005	8,867,605
Total	\$ 66,079,638

## **In Summary**

**Insects are commonly associated with firewood**

**There is a higher risk of infestation if the firewood is from recently cut live trees, is whole, and has bark.**

**Bark-free firewood that has seasoned for at least 2 years is at a lower risk of being infested.**