

# Tree Response to Injury

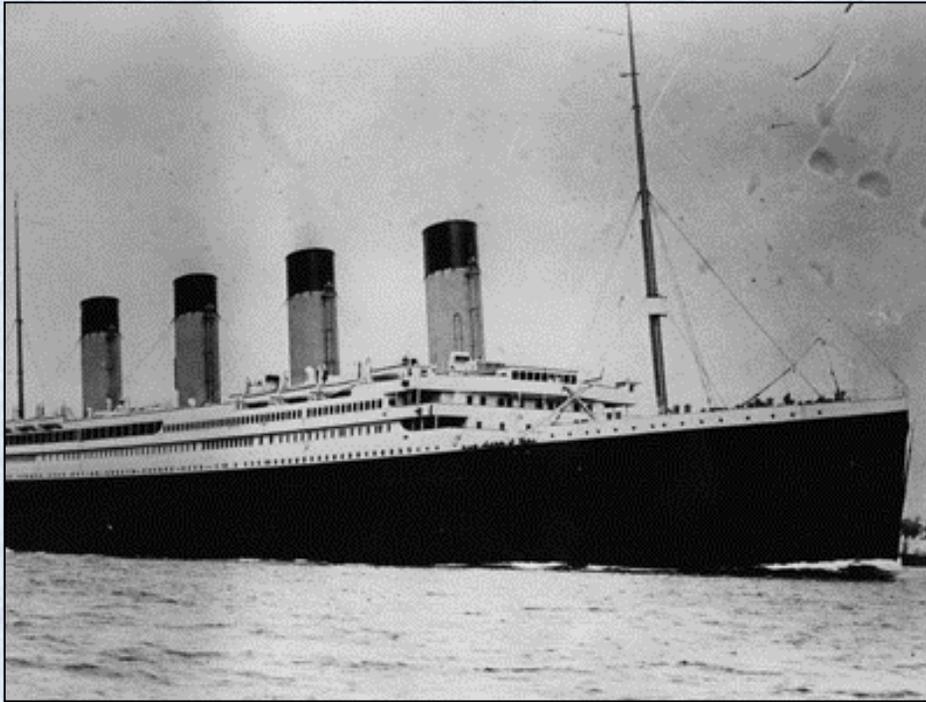
Laurie Stepanek  
Nebraska Forest Service



Nebraska  
Forest  
Service



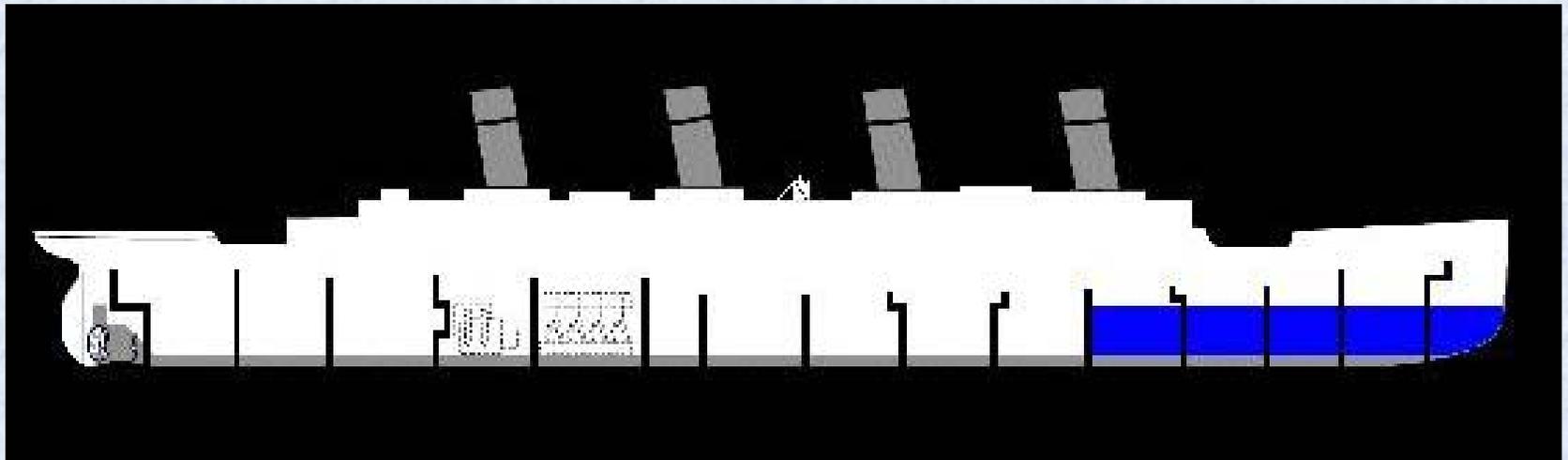
UNIVERSITY OF  
Nebraska



# Titanic

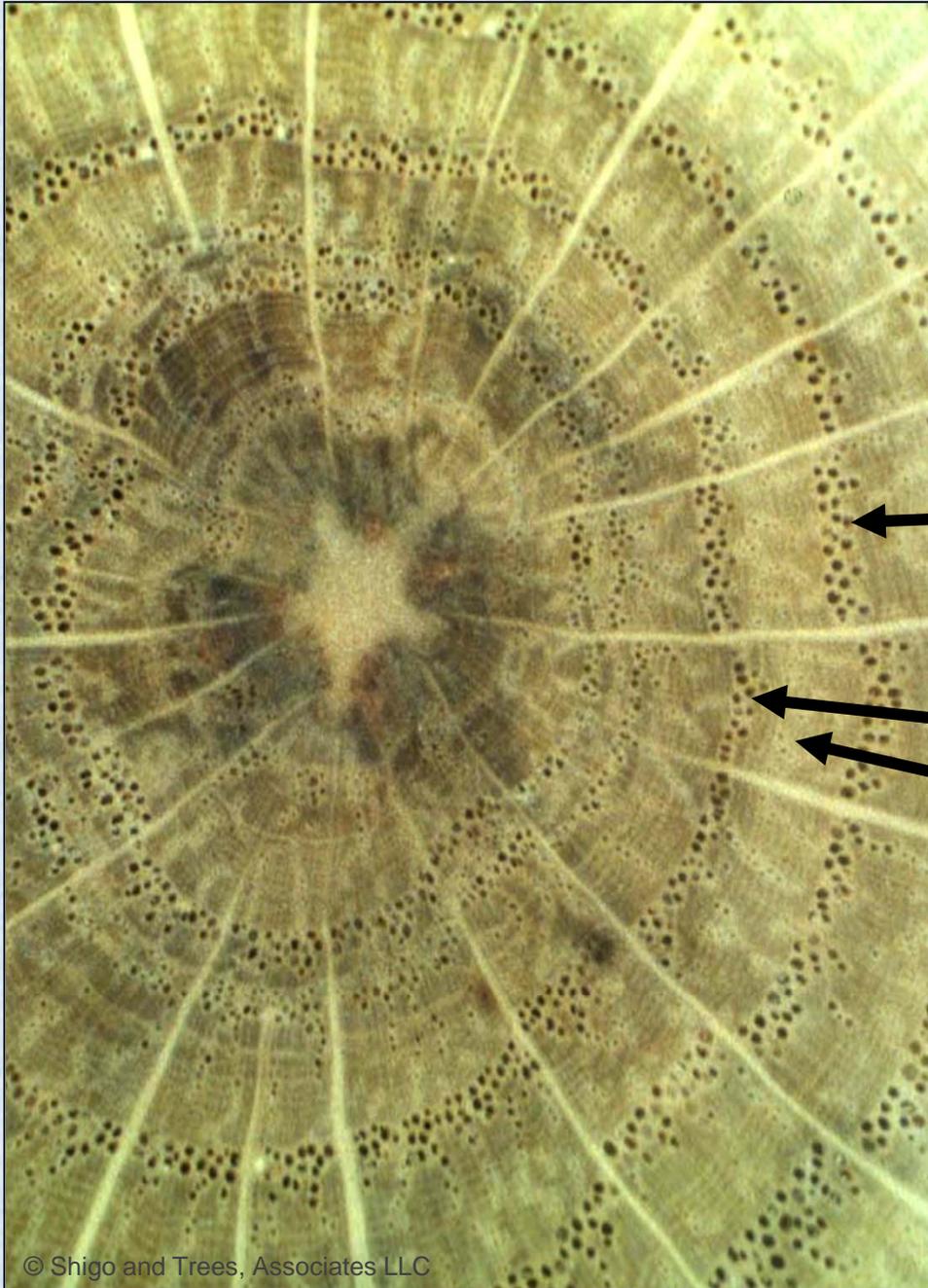
Sealing  
the doors!

compartments



# Tree Compartments

## Ring-porous Tree



vessels

annual ring:

earlywood

latewood

ray



© Shigo and Trees, Associates LLC

California black oak

# Tree Compartments

Diffuse-porous

scattered vessels



© Shigo and Trees, Associates LLC

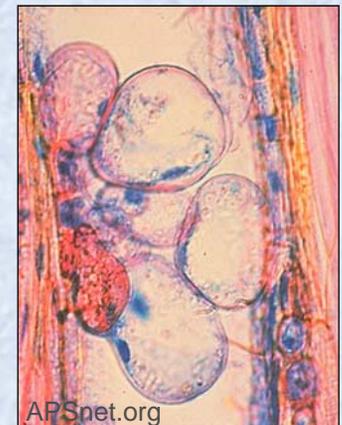
beech

# Reaction Zone



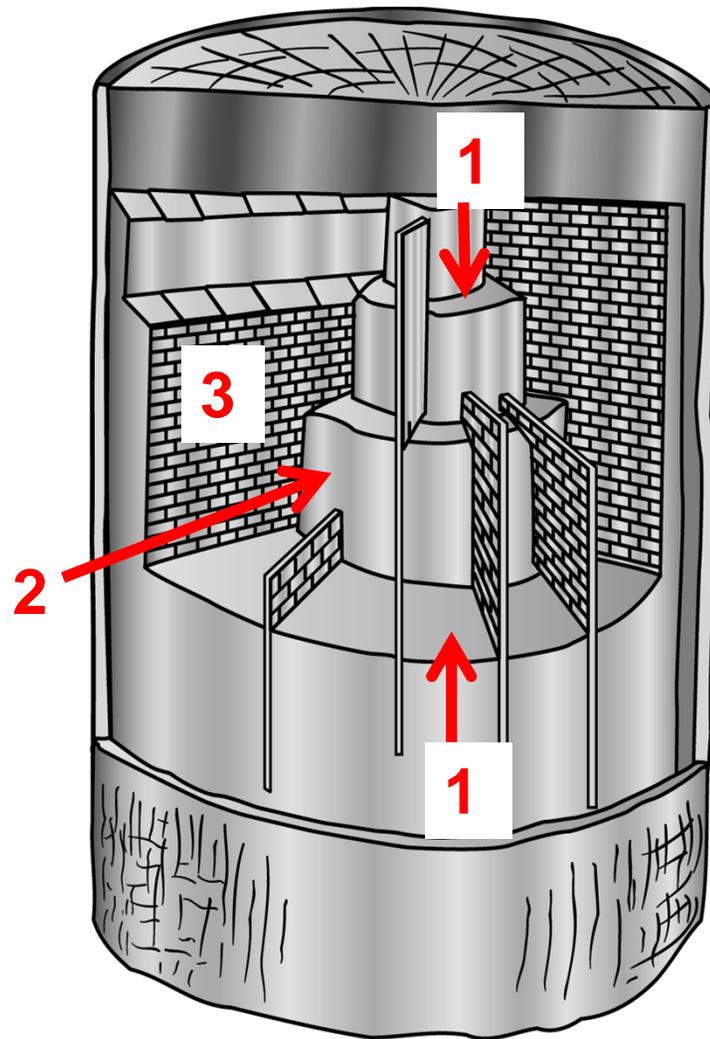
- antimicrobial compounds form
- openings between cells close
- vessels plug up gums tyloses

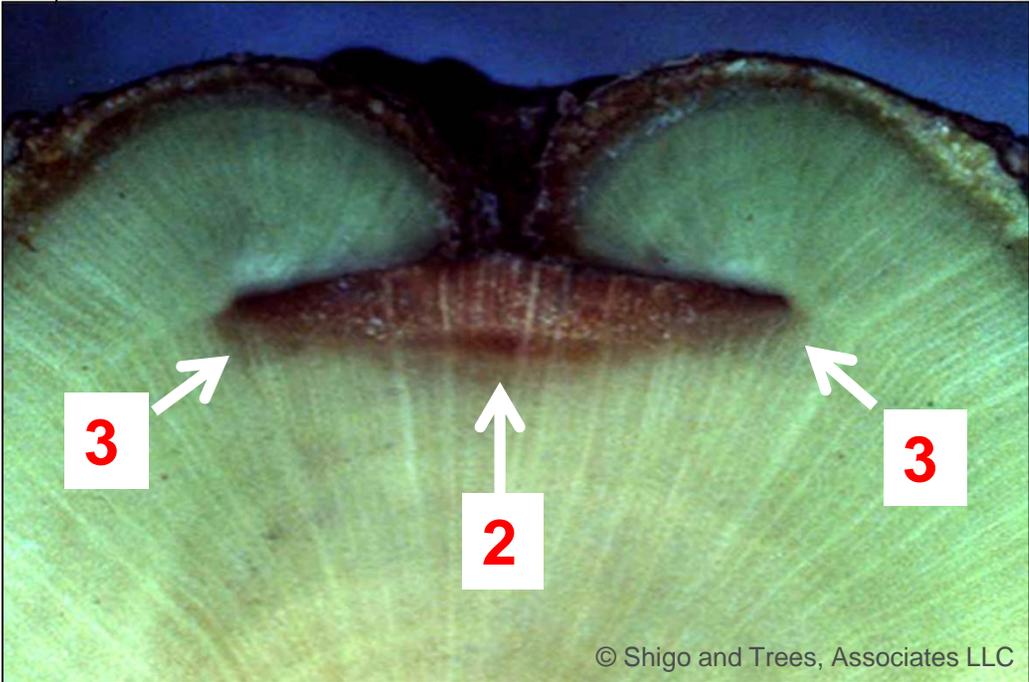
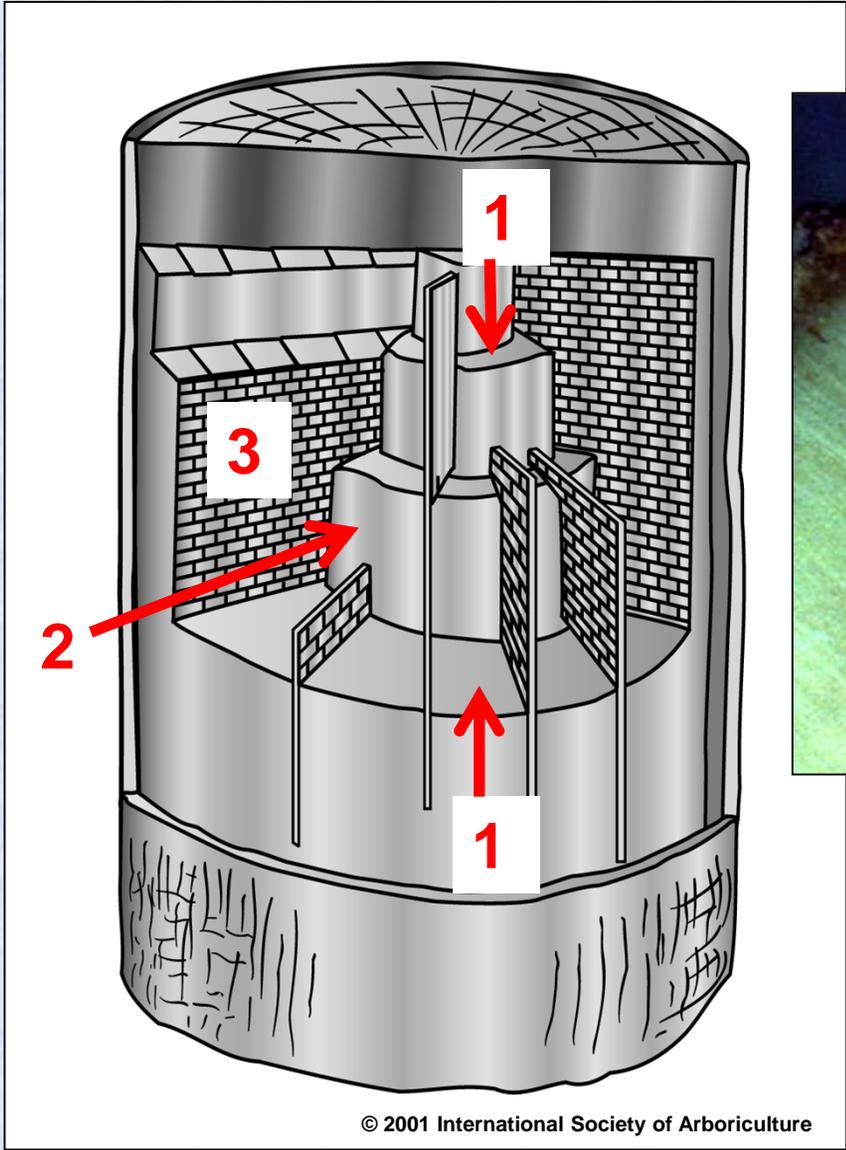
A protective chemical boundary that separates wood infected by pathogens from healthy wood present at the time of injury and infection.

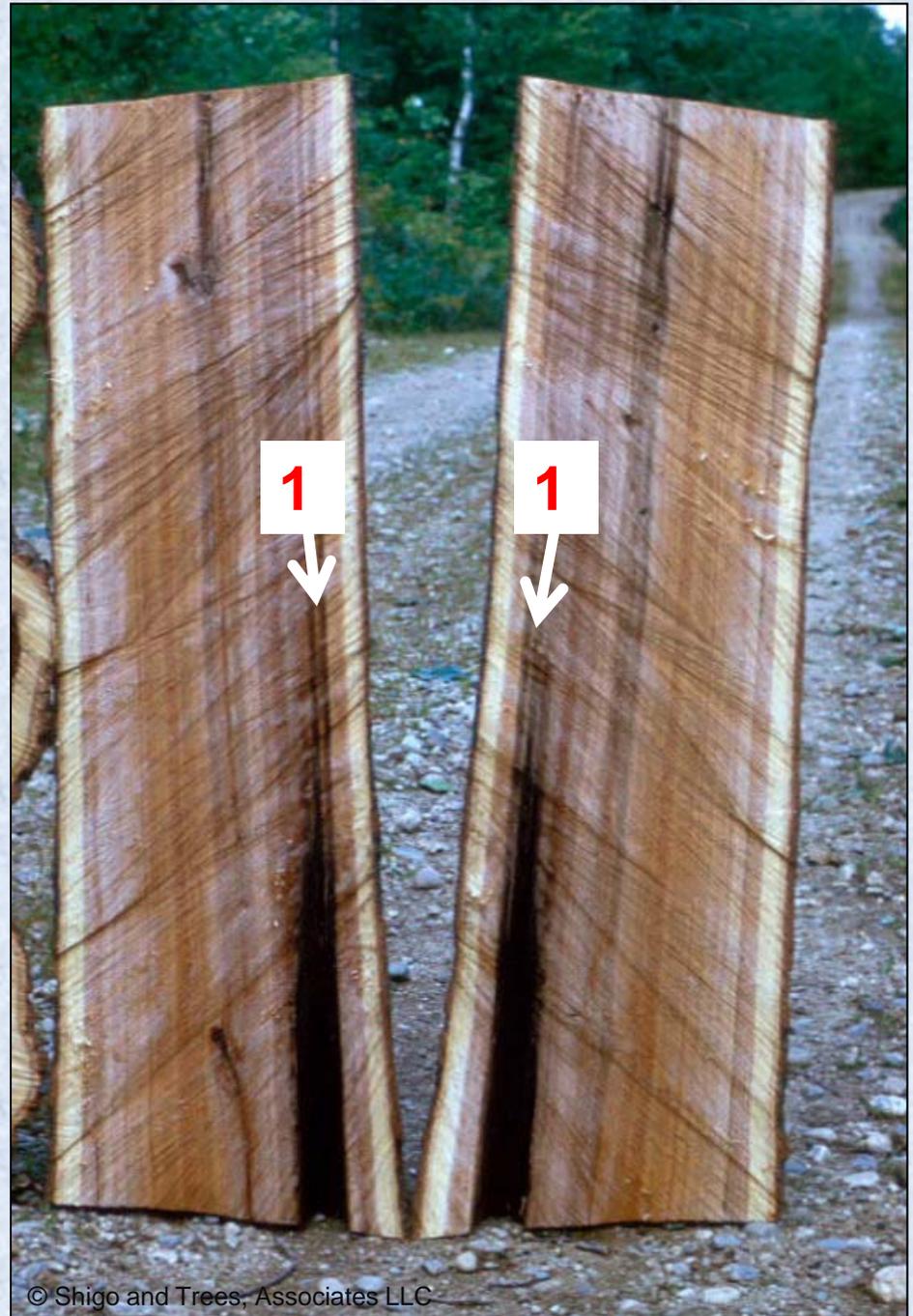
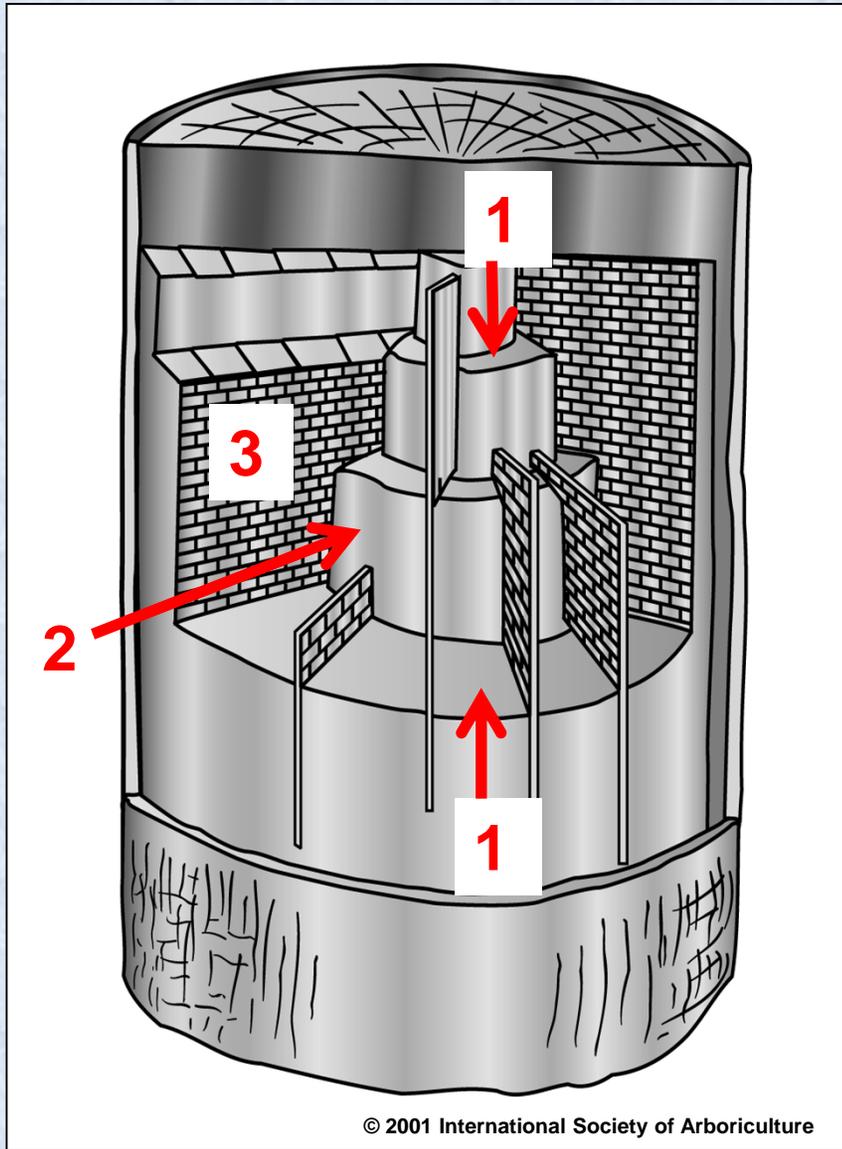


# Compartmentalization of Decay In Trees (CODIT)

Walls





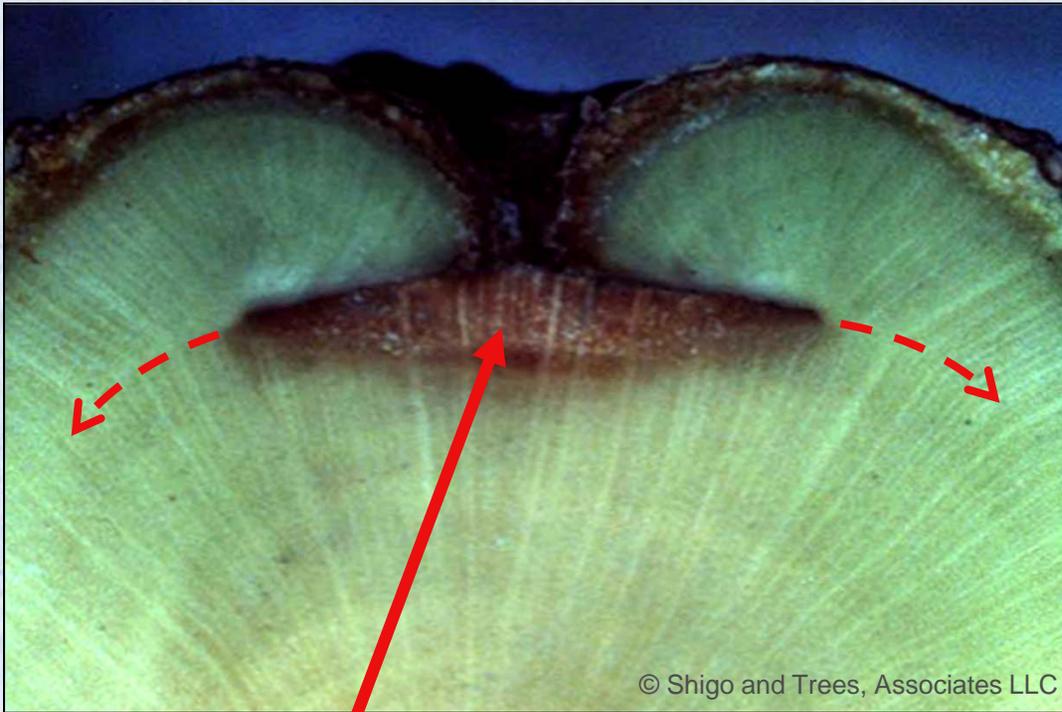




wall 2 failed

© Shigo and Trees, Associates LLC

poplar

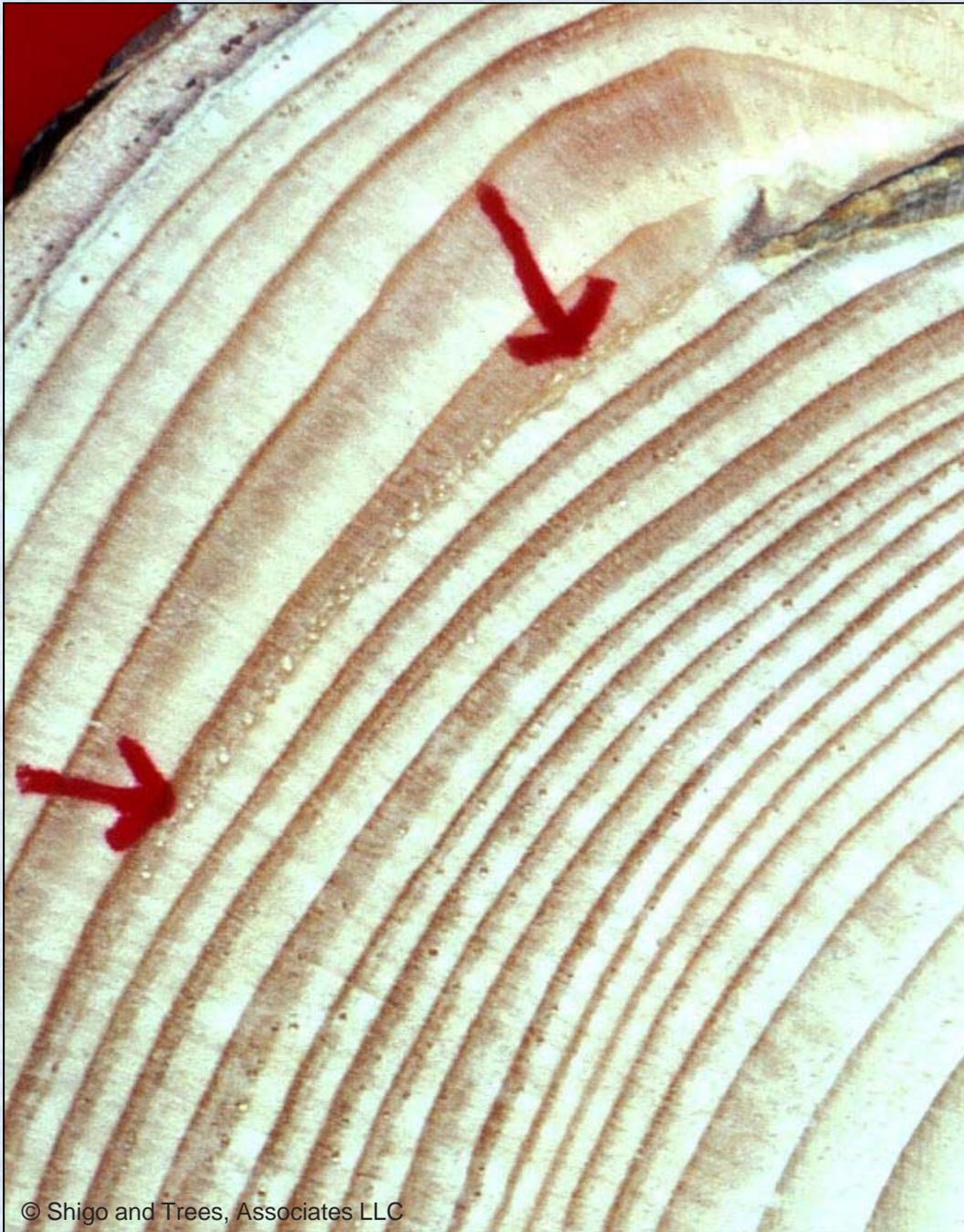


**Reaction Zone**

## **Barrier Zone (Wall 4)**

A protection boundary formed in the wood by the still-living cambium after a tree is injured.

Contains suberin (cork) and protects new wood produced after the wounding.



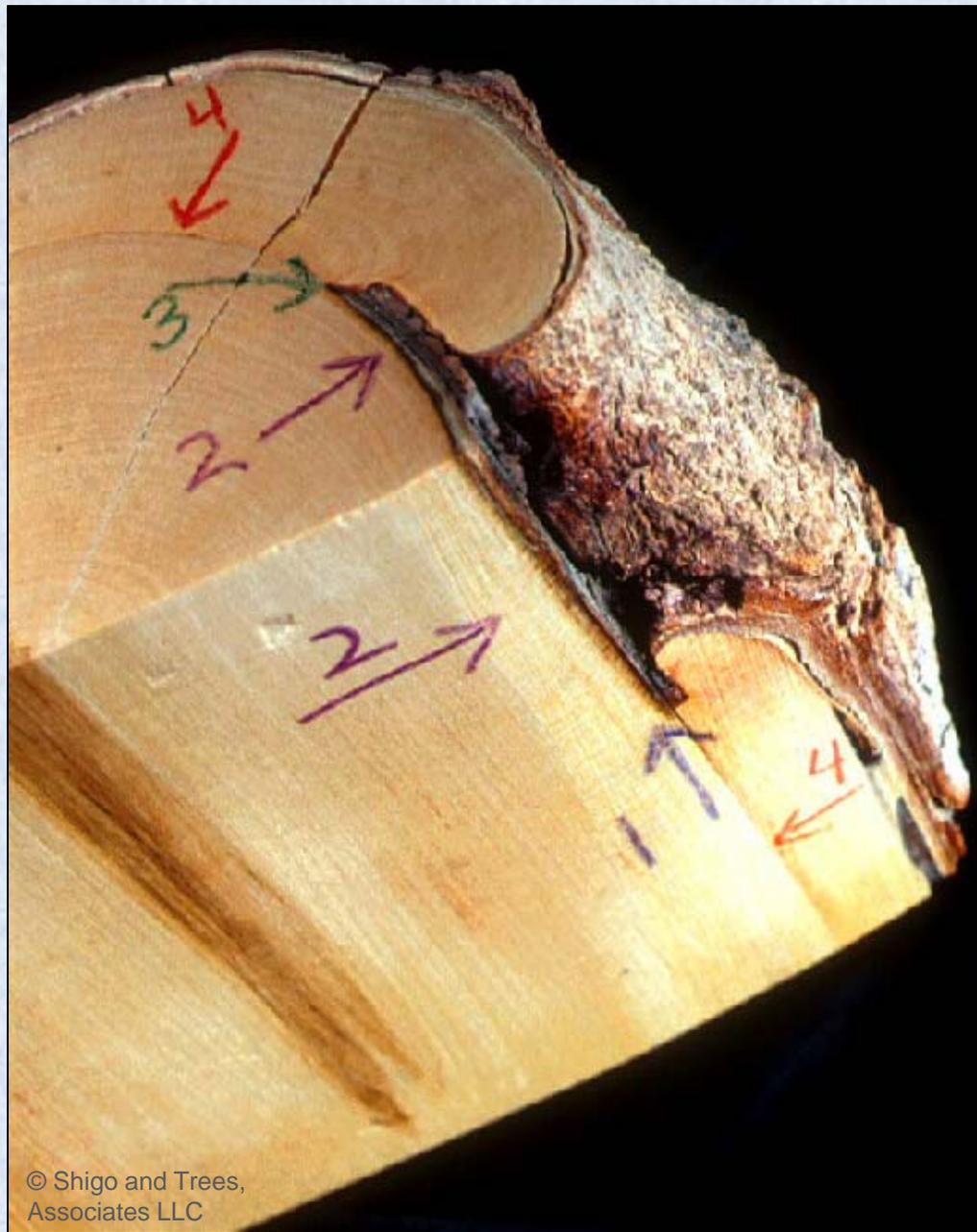
## Barrier Zone (Wall 4)

© Shigo and Trees, Associates LLC

spruce



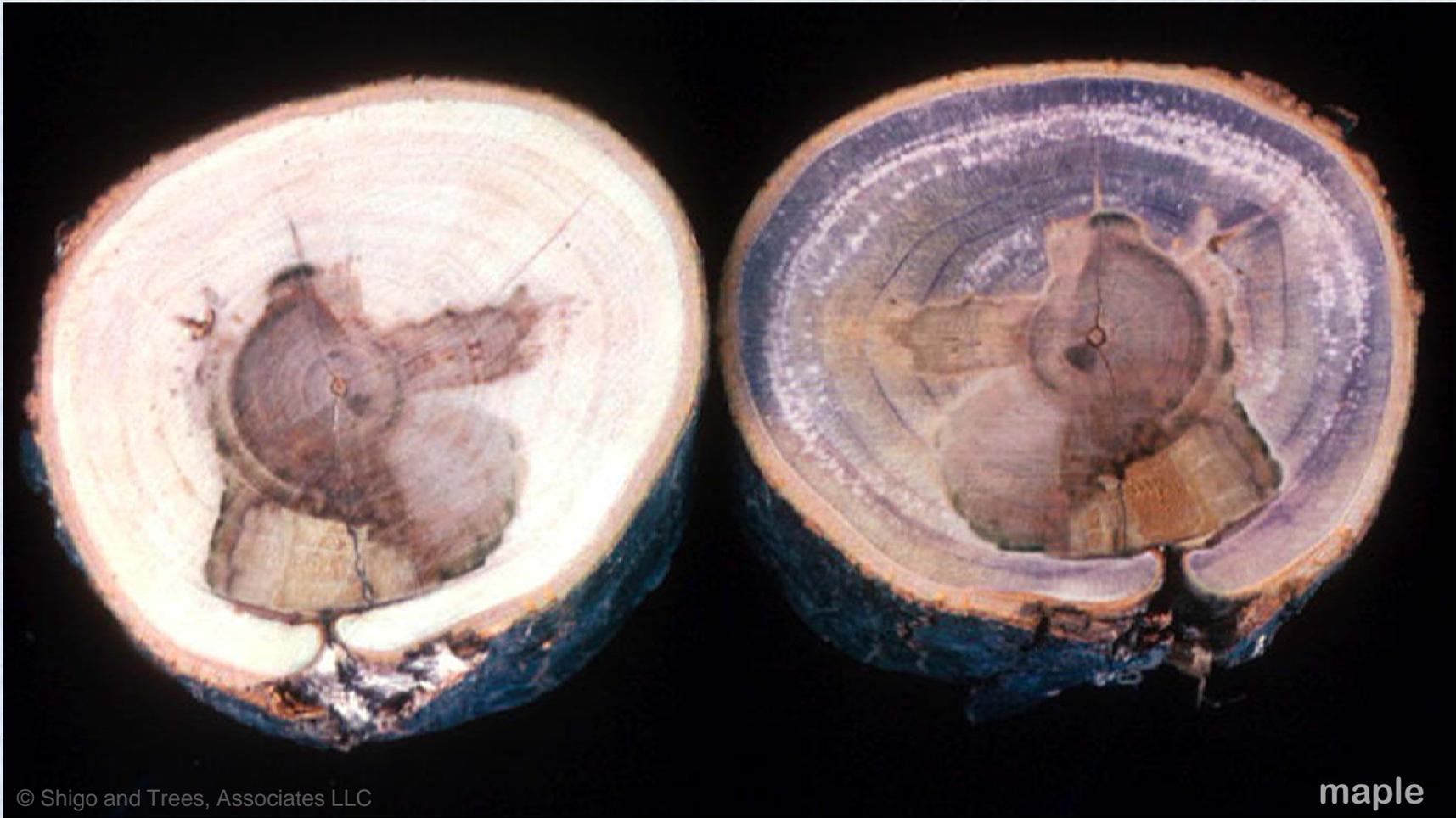
© Shigo and Trees, Associates LLC



© Shigo and Trees,  
Associates LLC

maple

# Compartmentalization and Energy



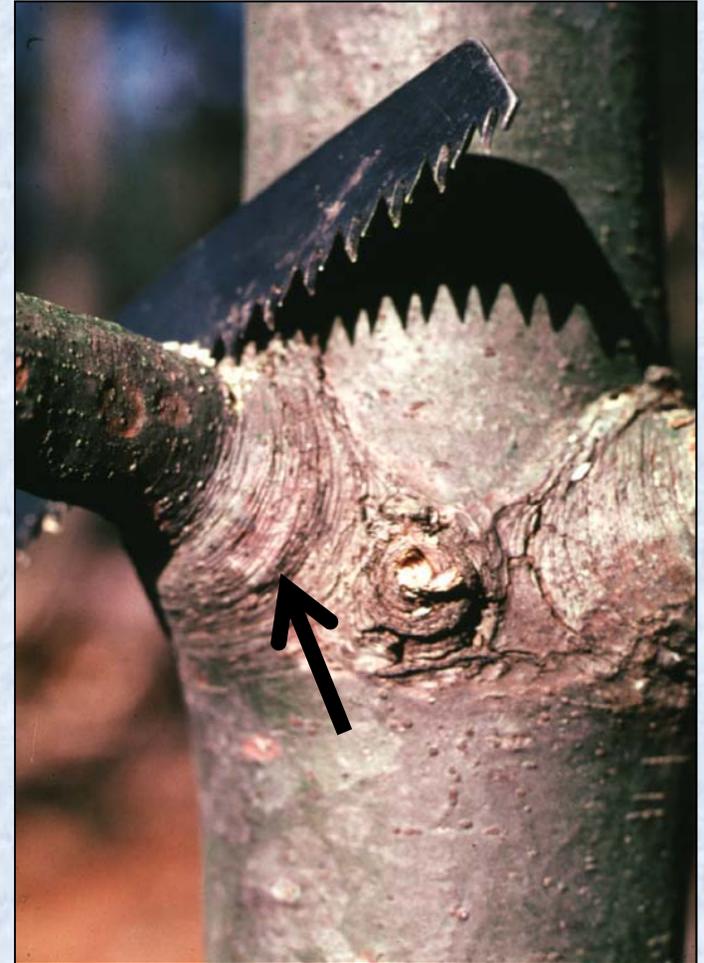
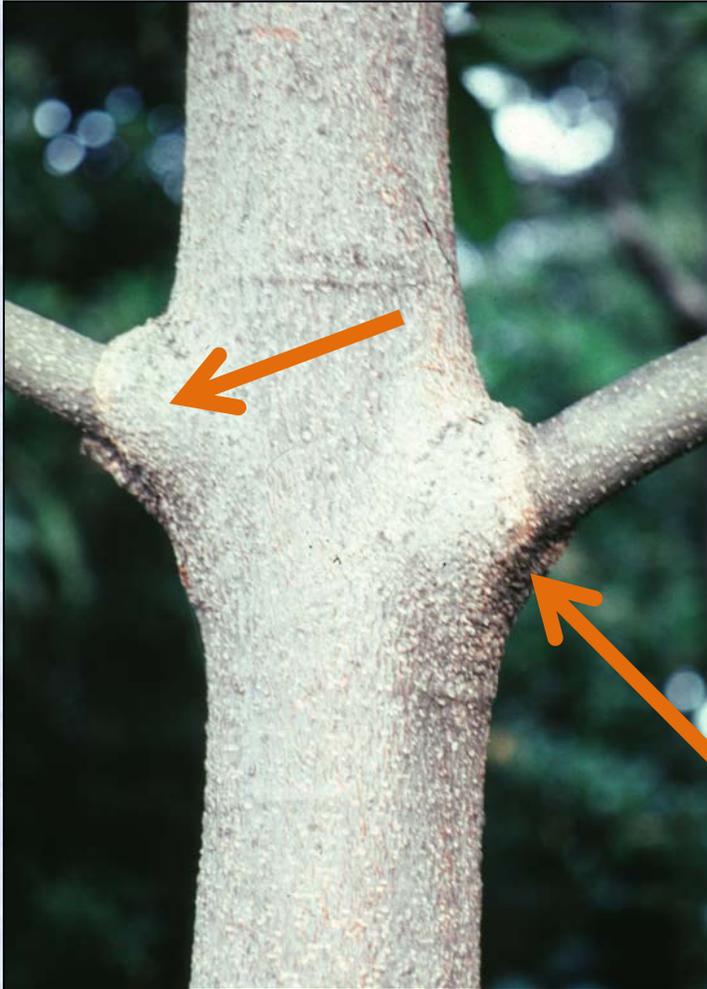
Walling off injuries → loss of starch → weakened trees

## Breaking walls can sink the ship



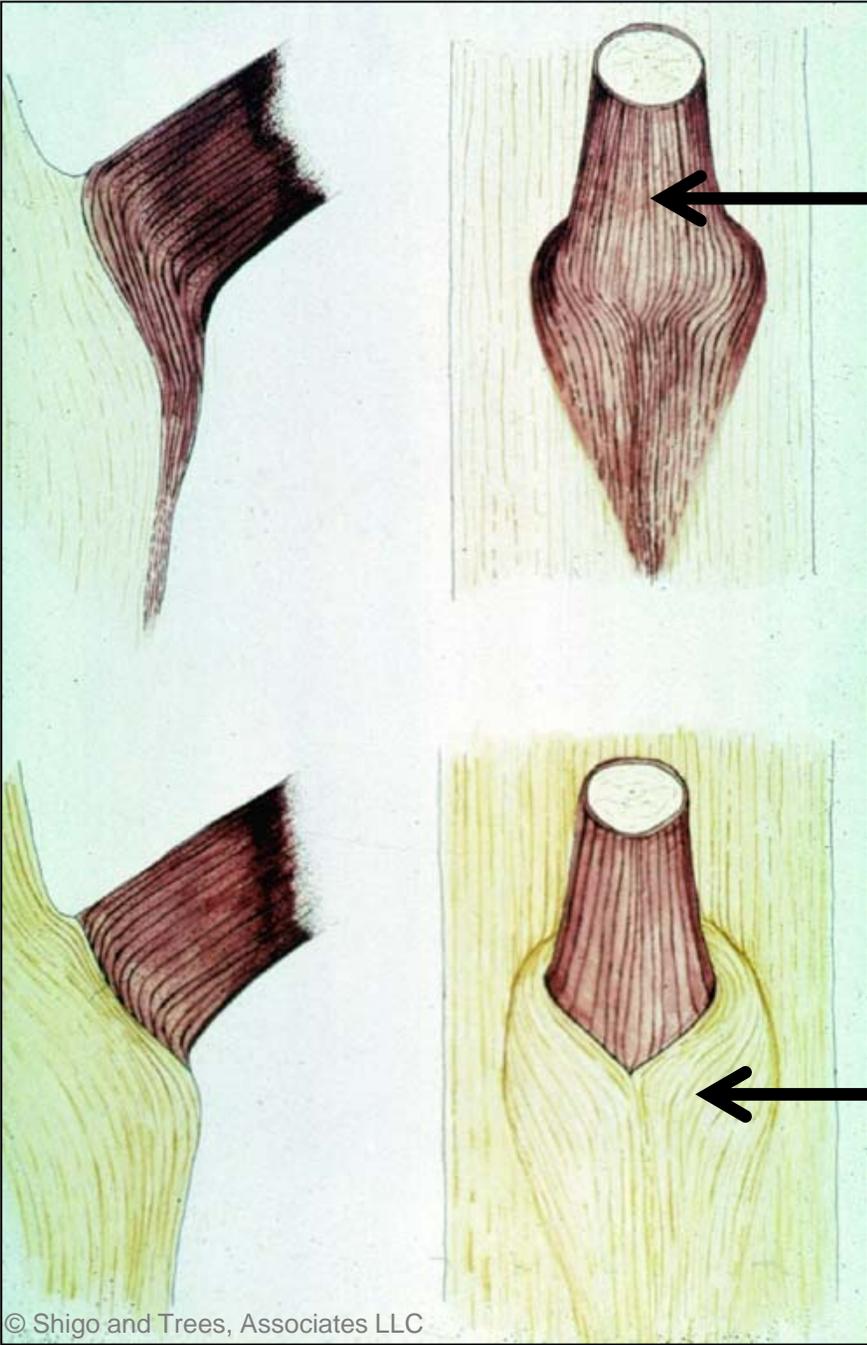
Injury from  
injections  
and  
implants

# Branches



Branch  
collar

# Collar Formation



Branch wood

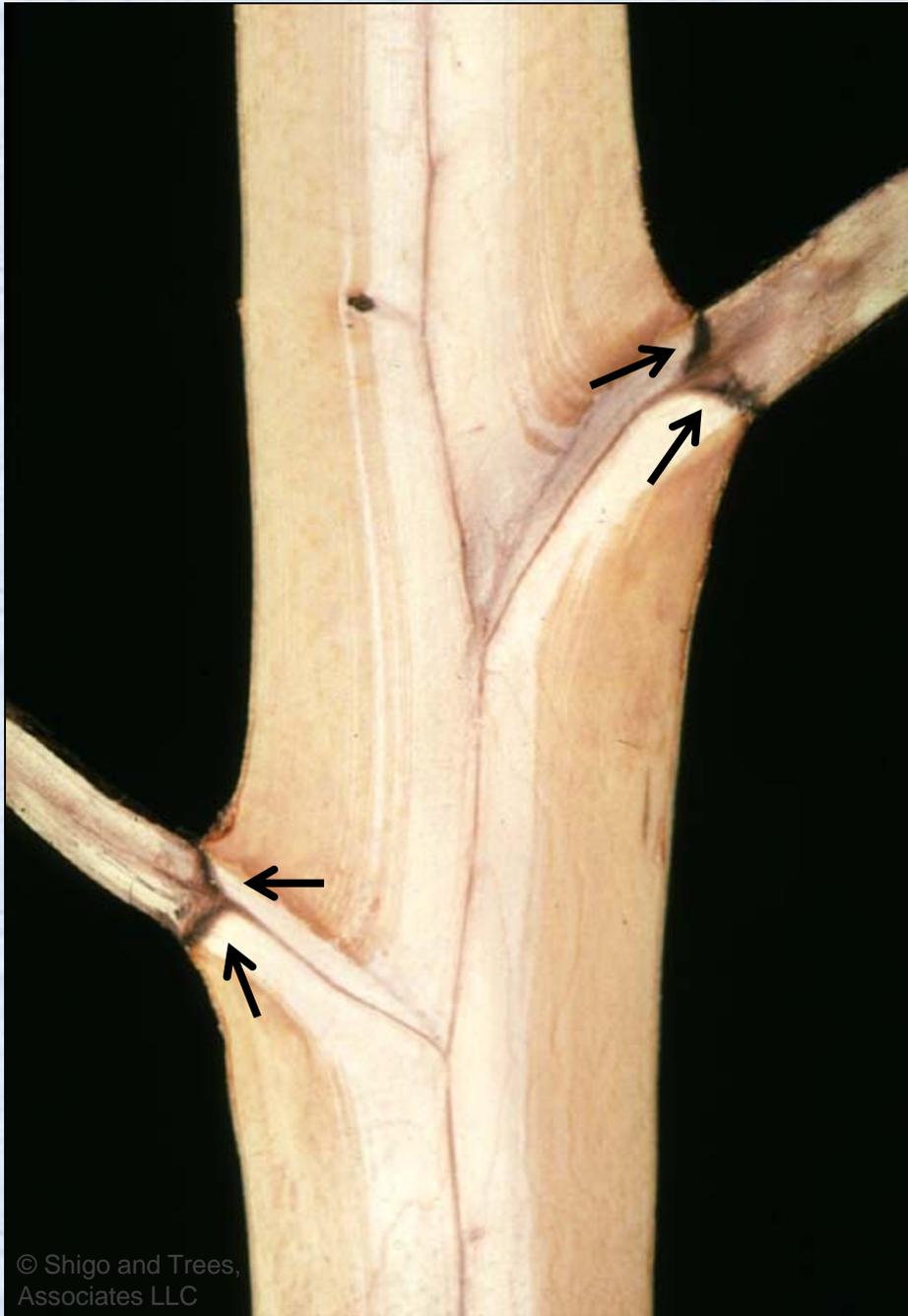
Trunk wood



**Avoid branch collar**

**Don't flush cut**





## Reaction zones within collar

Do not flush cut

Do not leave stubs;  
Stubs = Food base for  
decay fungi

# Topping



Mark Harrell  
Nebraska Forest Service



Unknown



© Shigo and Trees,  
Associates LLC



© Shigo and Trees,  
Associates LLC



**Topped tree sprouting  
Nov 2002**

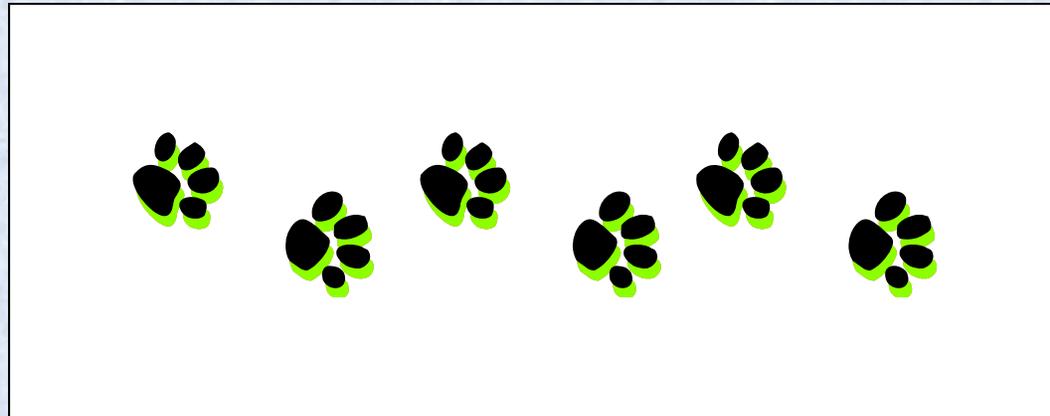
Chip Murrow  
Nebraska Forest Service



**After ice storm  
Dec 2007**

Chip Murrow  
Nebraska Forest Service

*Pause . . .*



# Preparing for Emerald Ash Borer (EAB)

Exotic species



Aggressive killer



All native ash susceptible

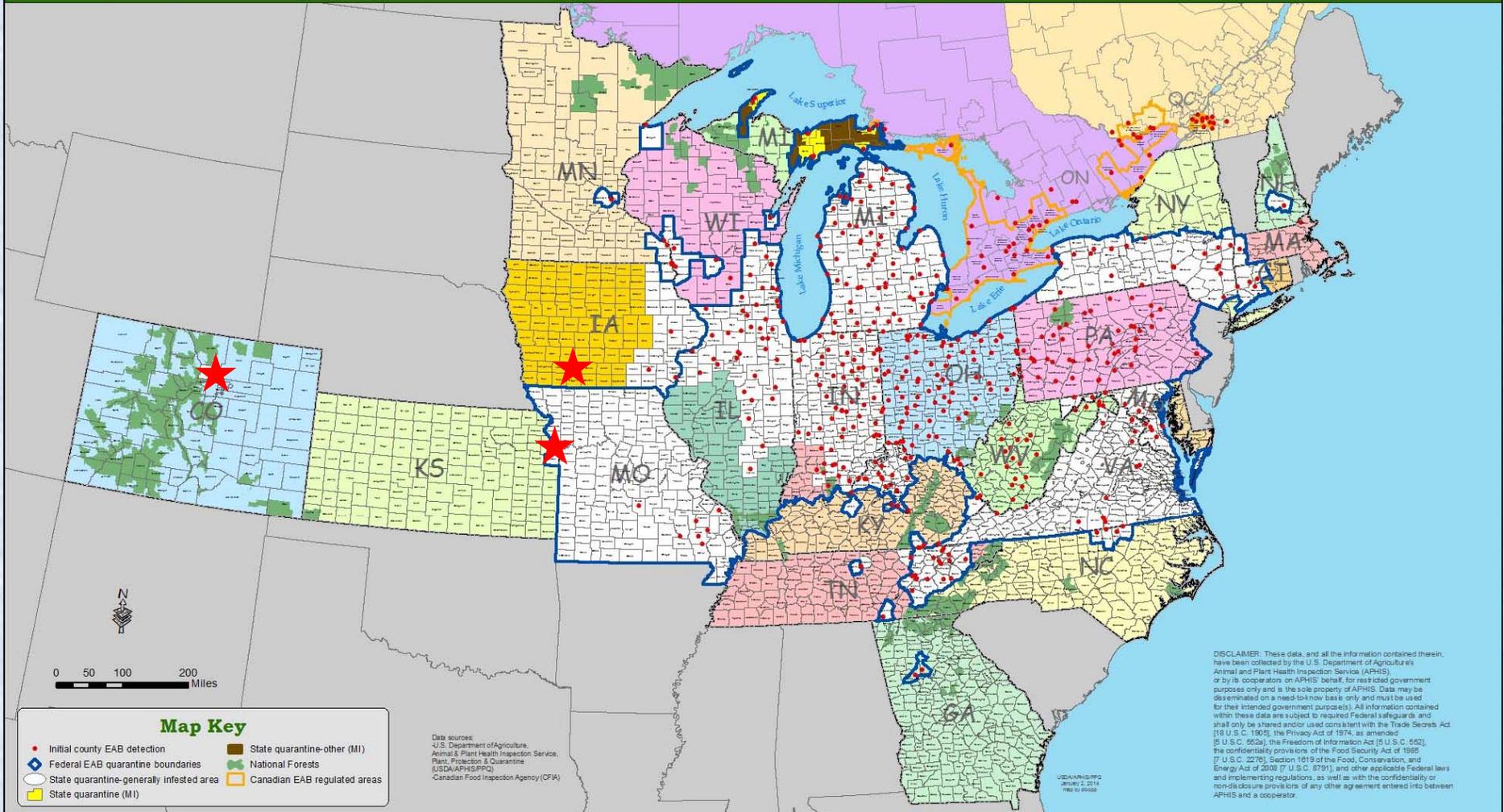
Easily transported in firewood



# Cooperative Emerald Ash Borer Project

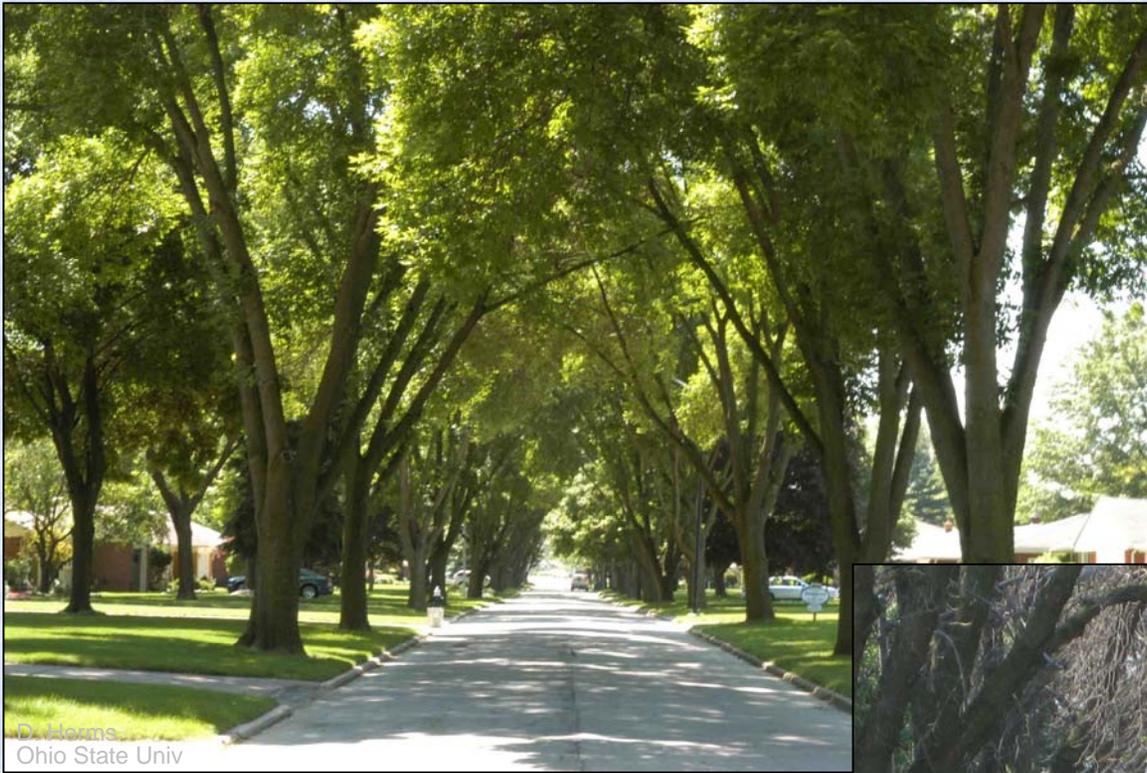
Initial county EAB detections in North America

January 2, 2014



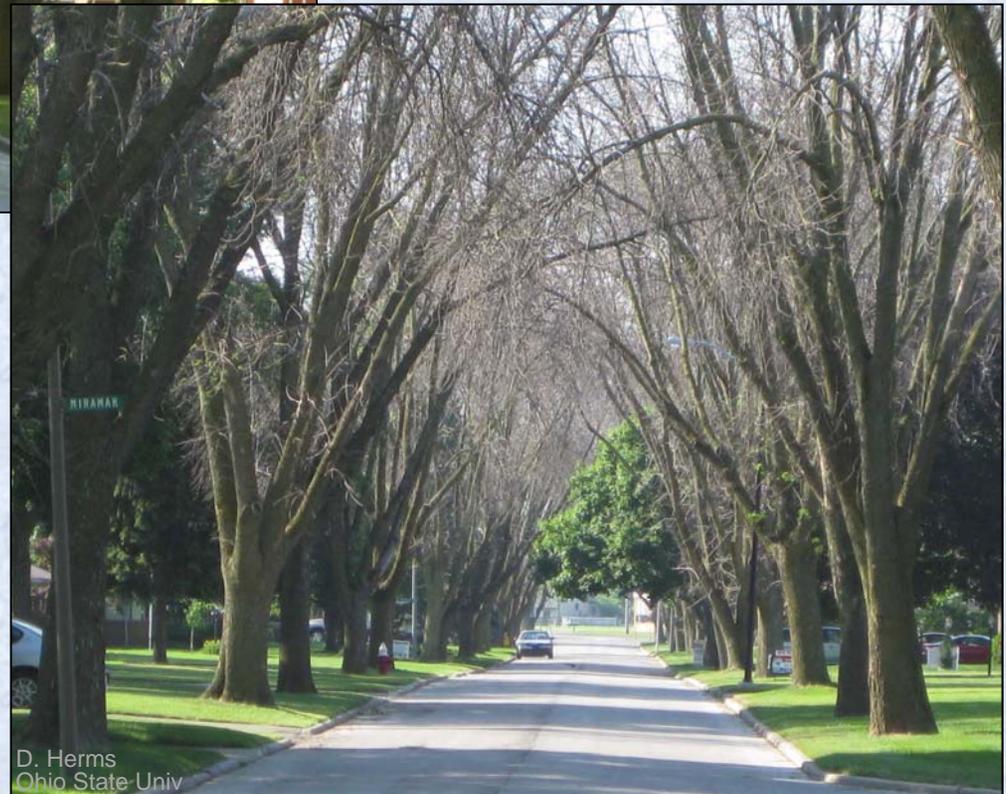
★ Boulder, CO  
★ Creston, IA  
★ Kansas City

**EAB:  
aggressive  
tree killer**



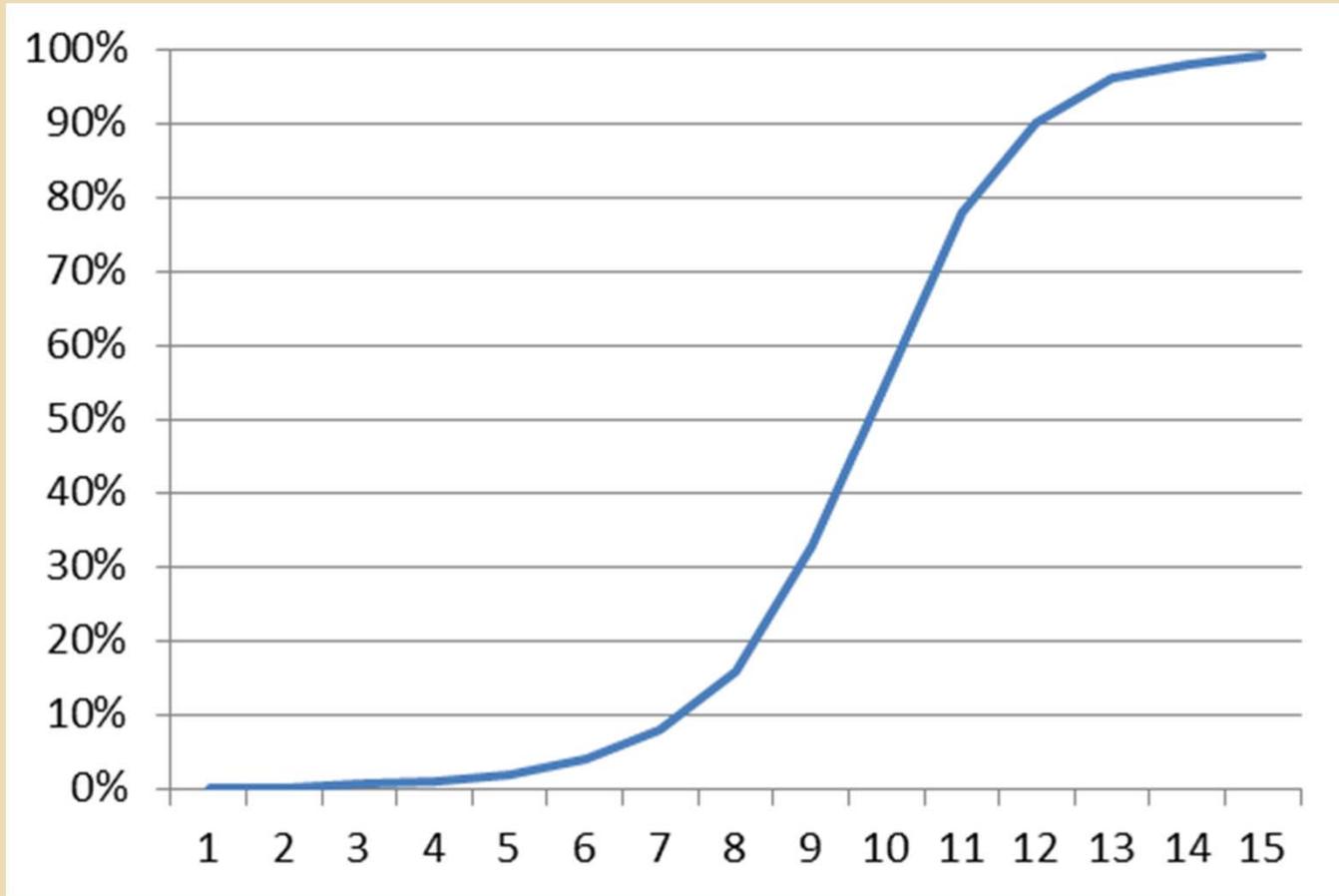
**Ash-lined street**

**3 years later**



# Ash Death Curve

↑  
Ash  
Mortality

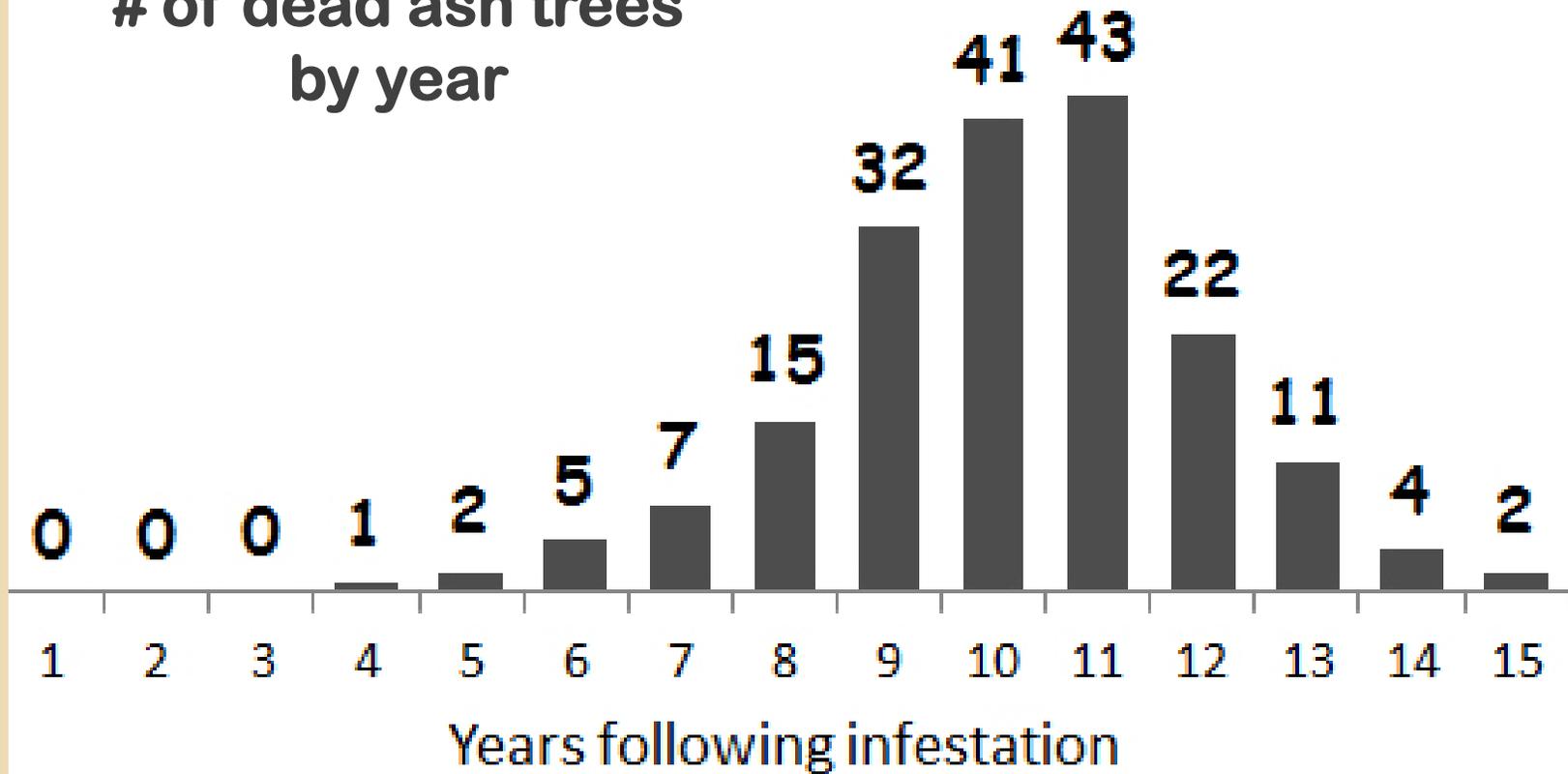


Years →

# Auburn

Public Ash Tree Population: **186**

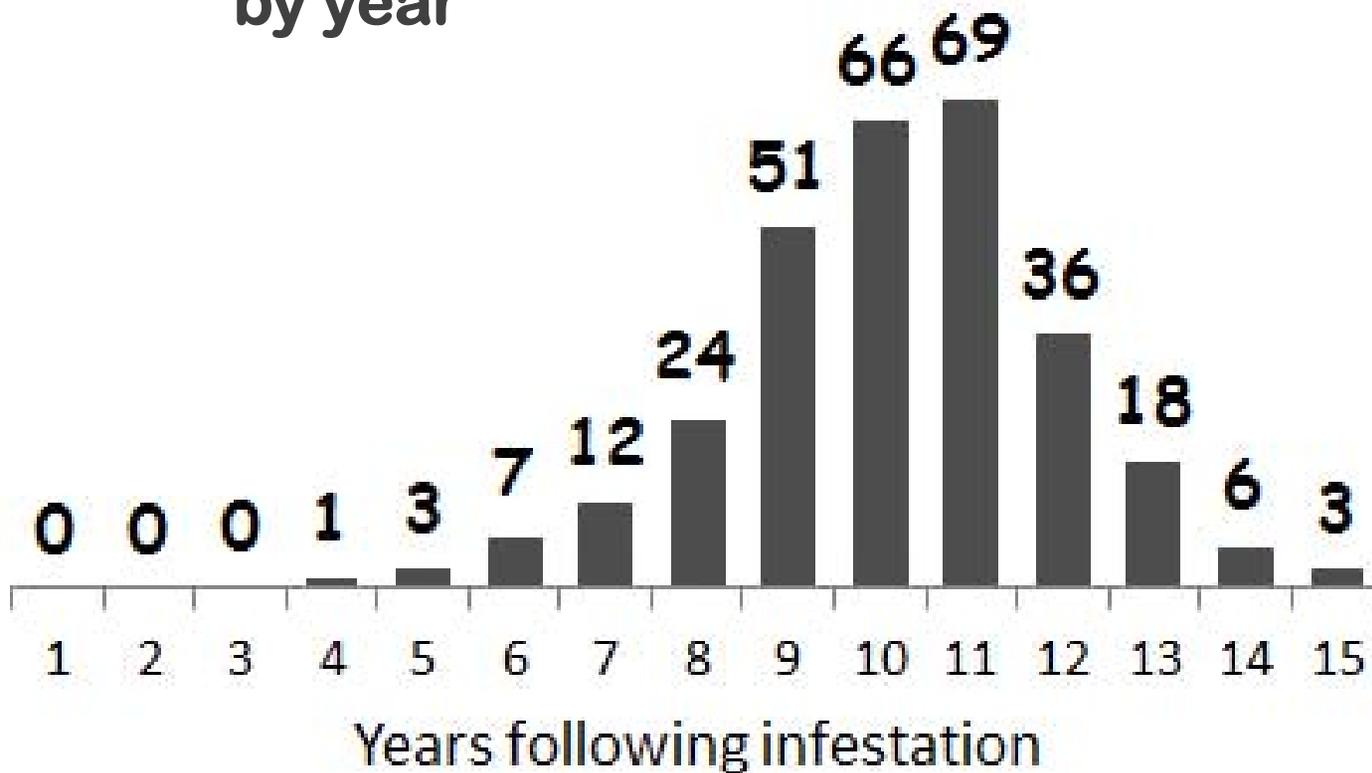
# of dead ash trees  
by year



# Aurora

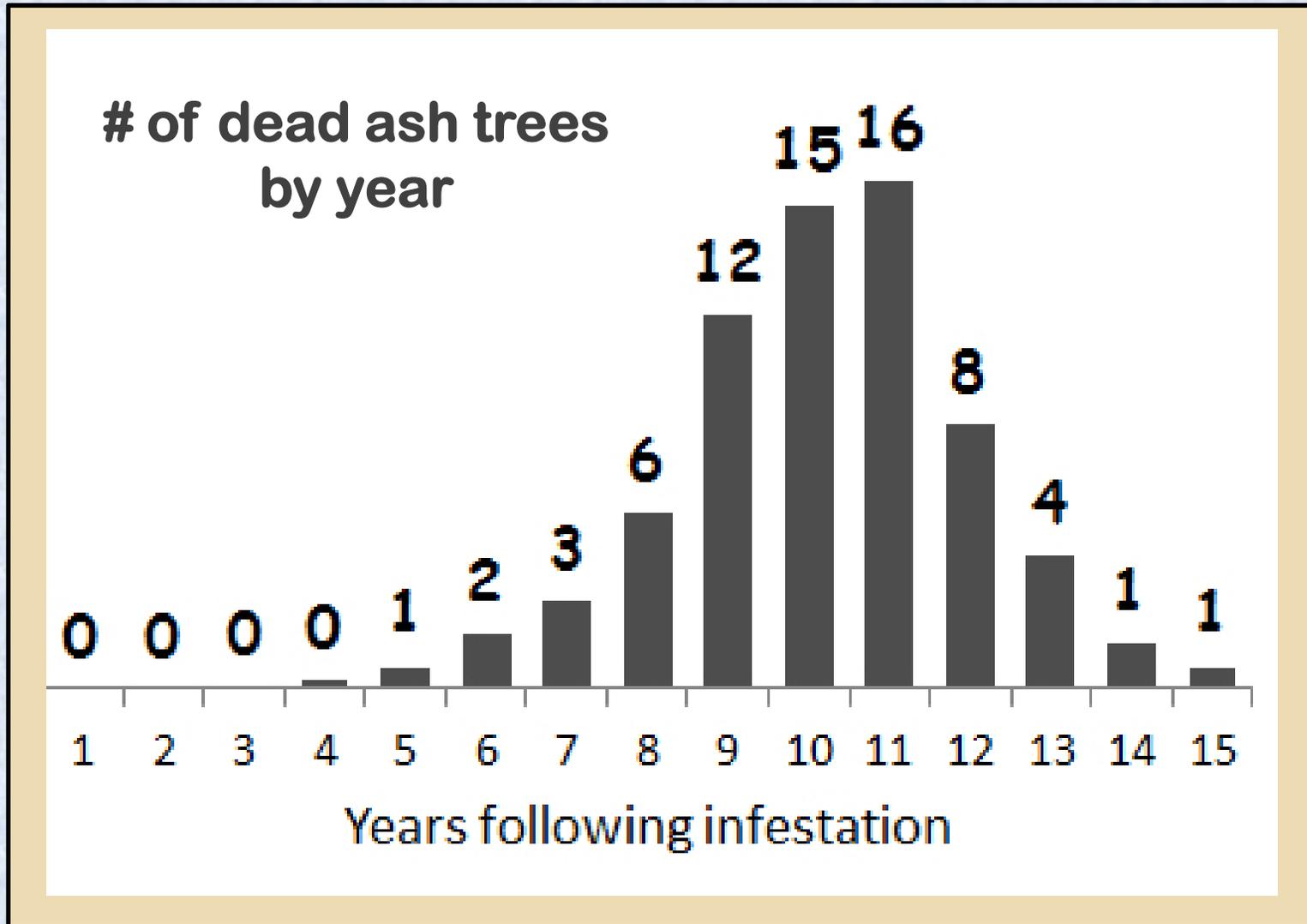
Public Ash Tree Population: **298**

# of dead ash trees  
by year



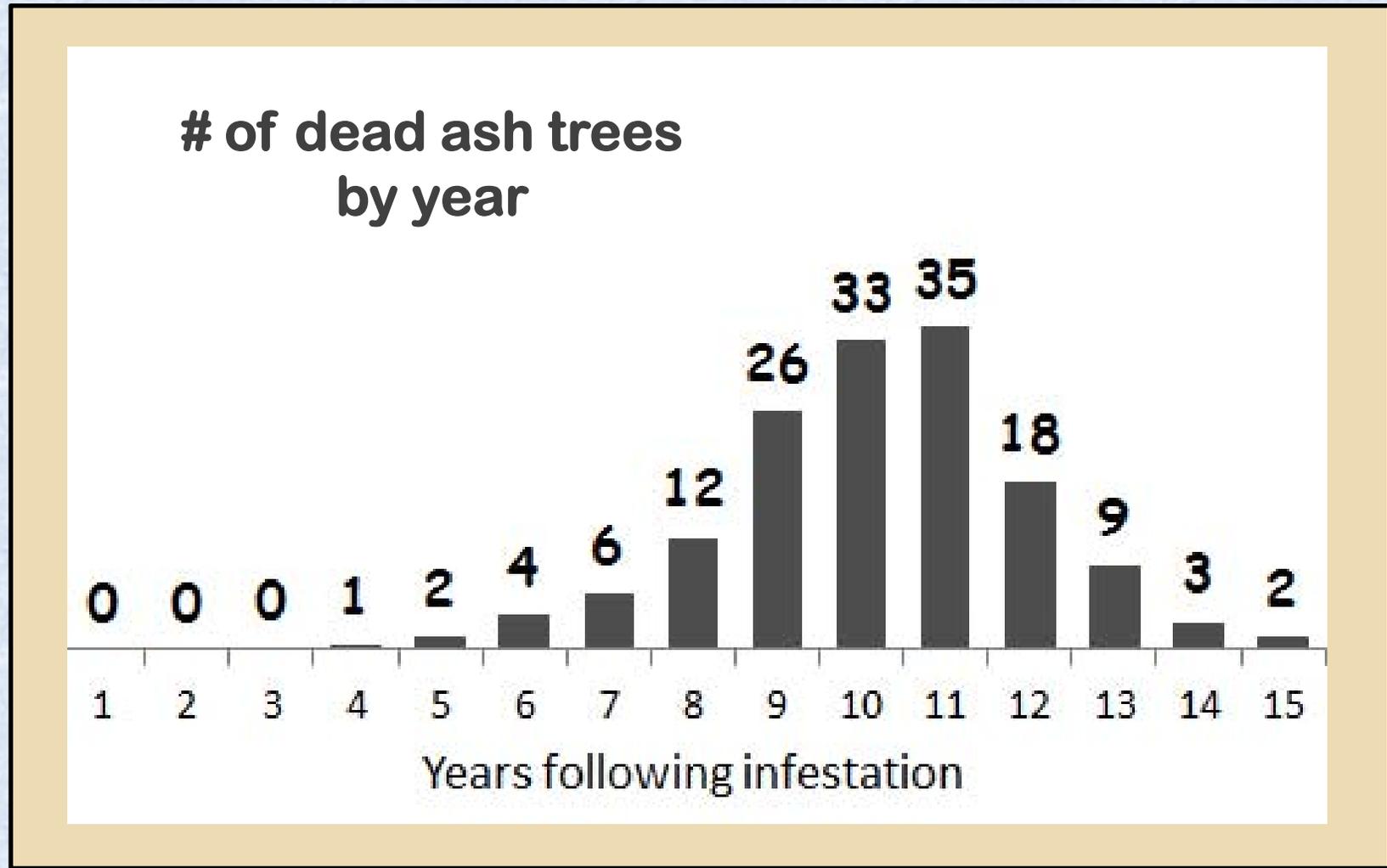
# Bassett

Public Ash Tree Population: **70**



# Beatrice

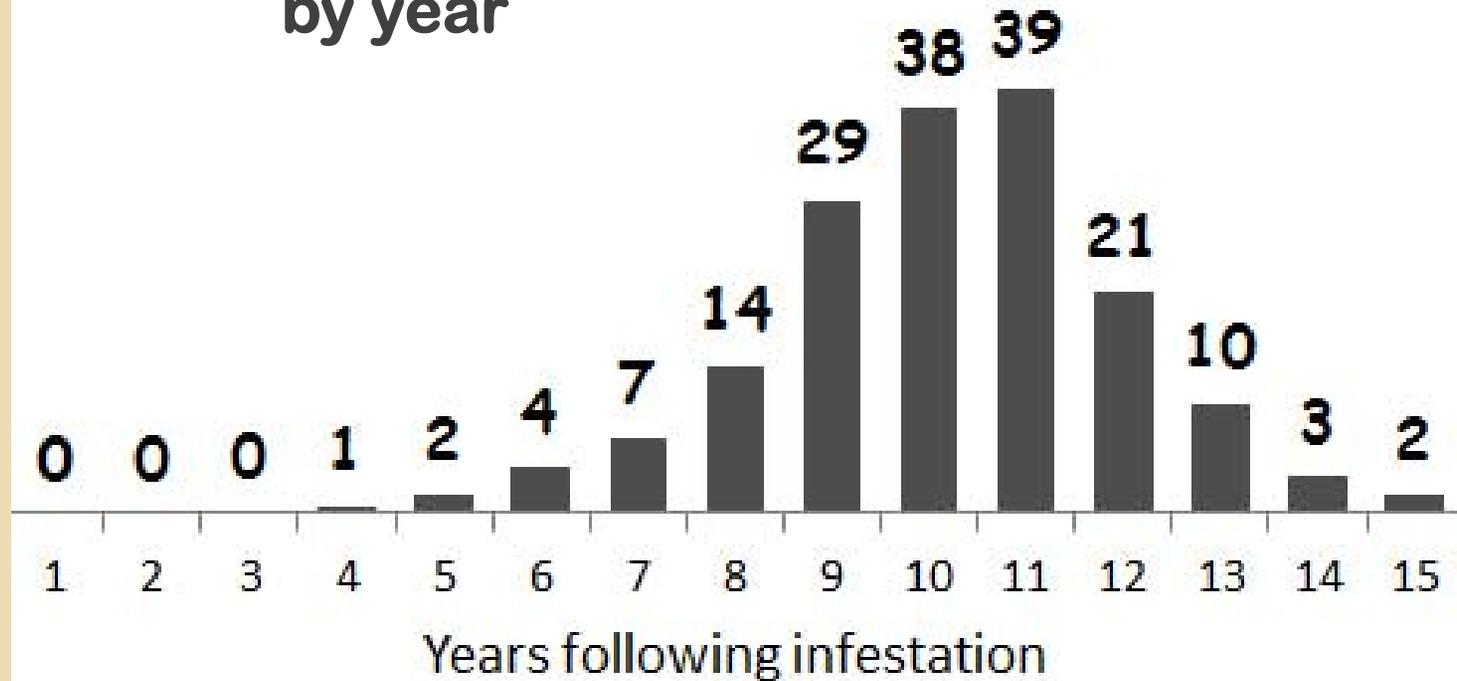
Public Ash Tree Population: **150**



# Bellevue

Public Ash Tree Population: **171**

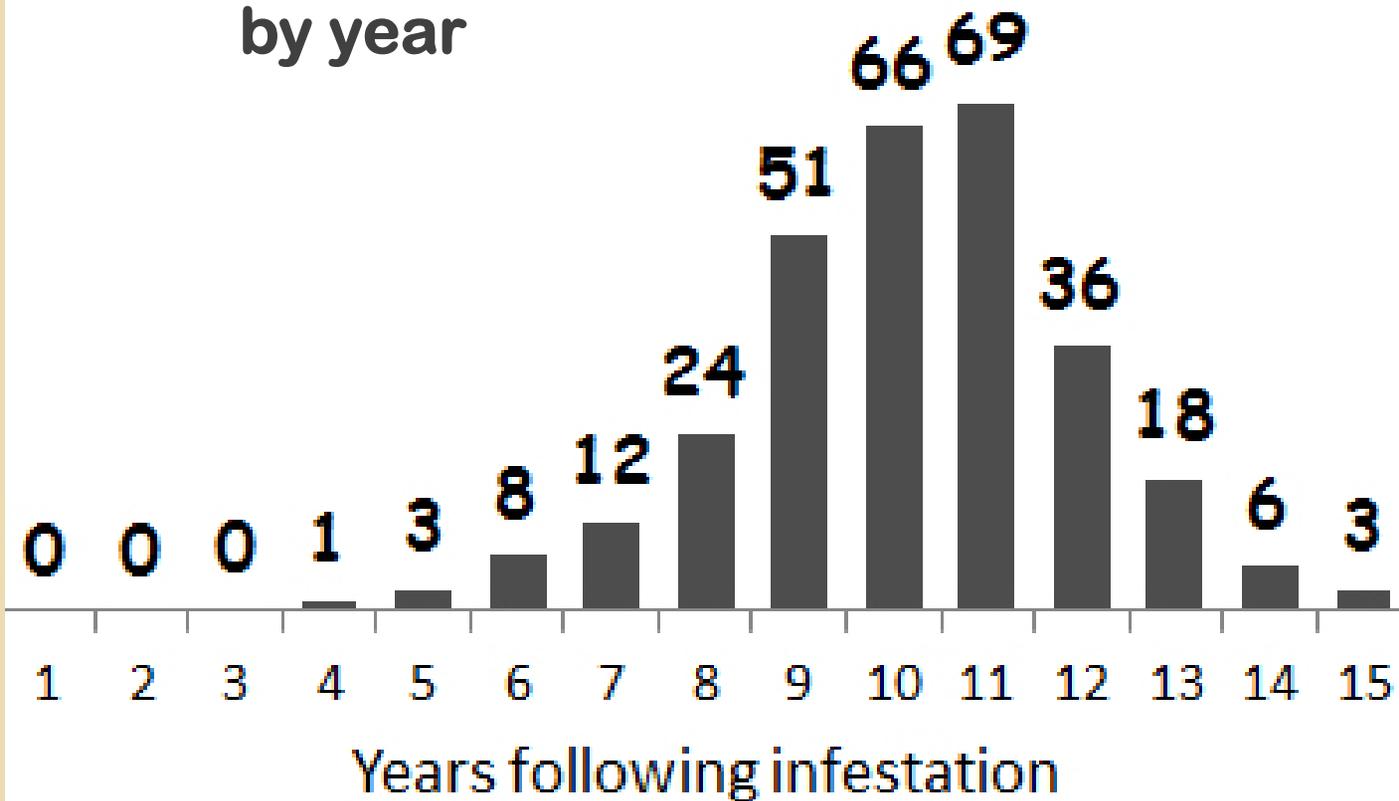
# of dead ash trees  
by year



# Central City

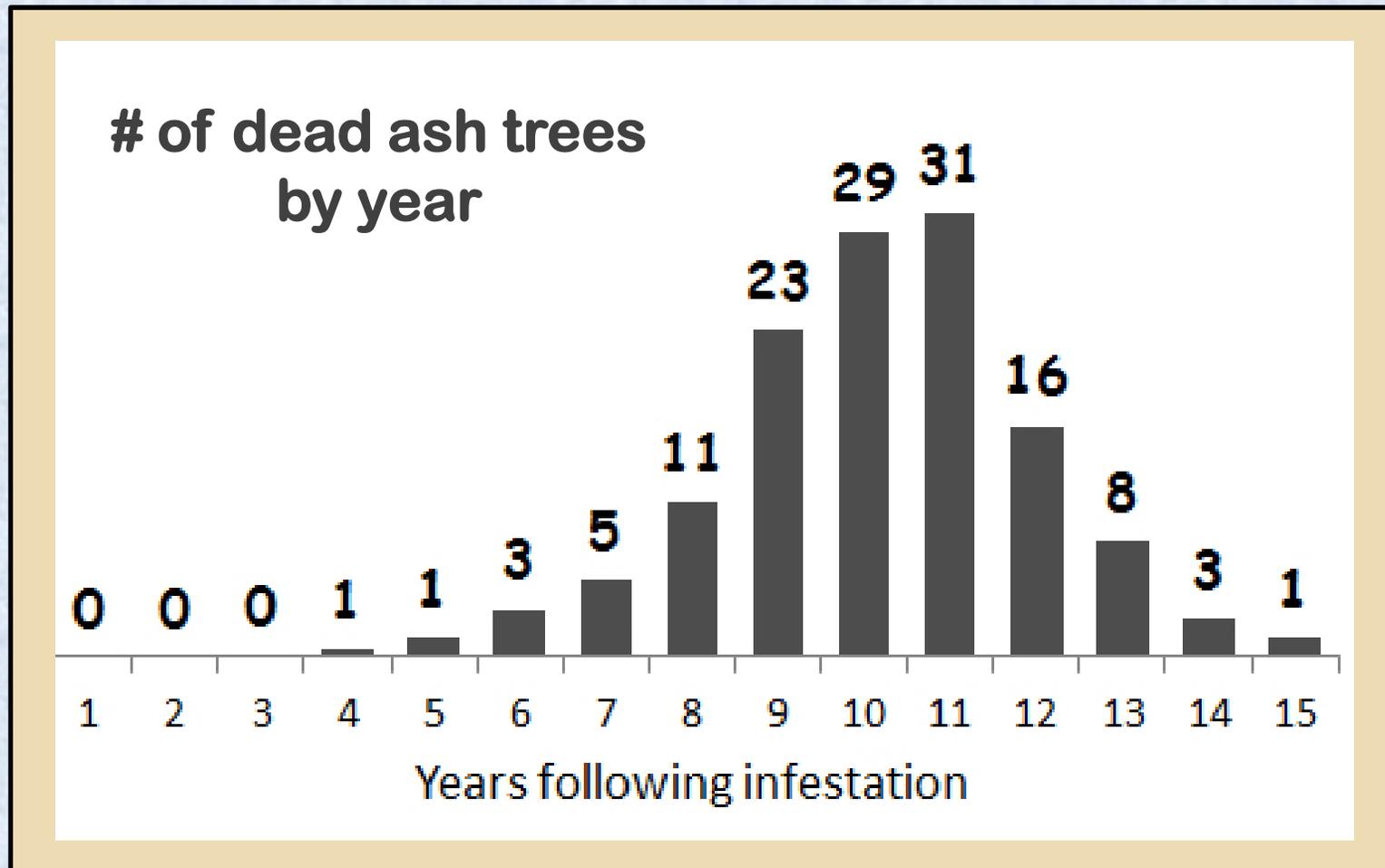
Public Ash Tree Population: **301**

# of dead ash trees  
by year



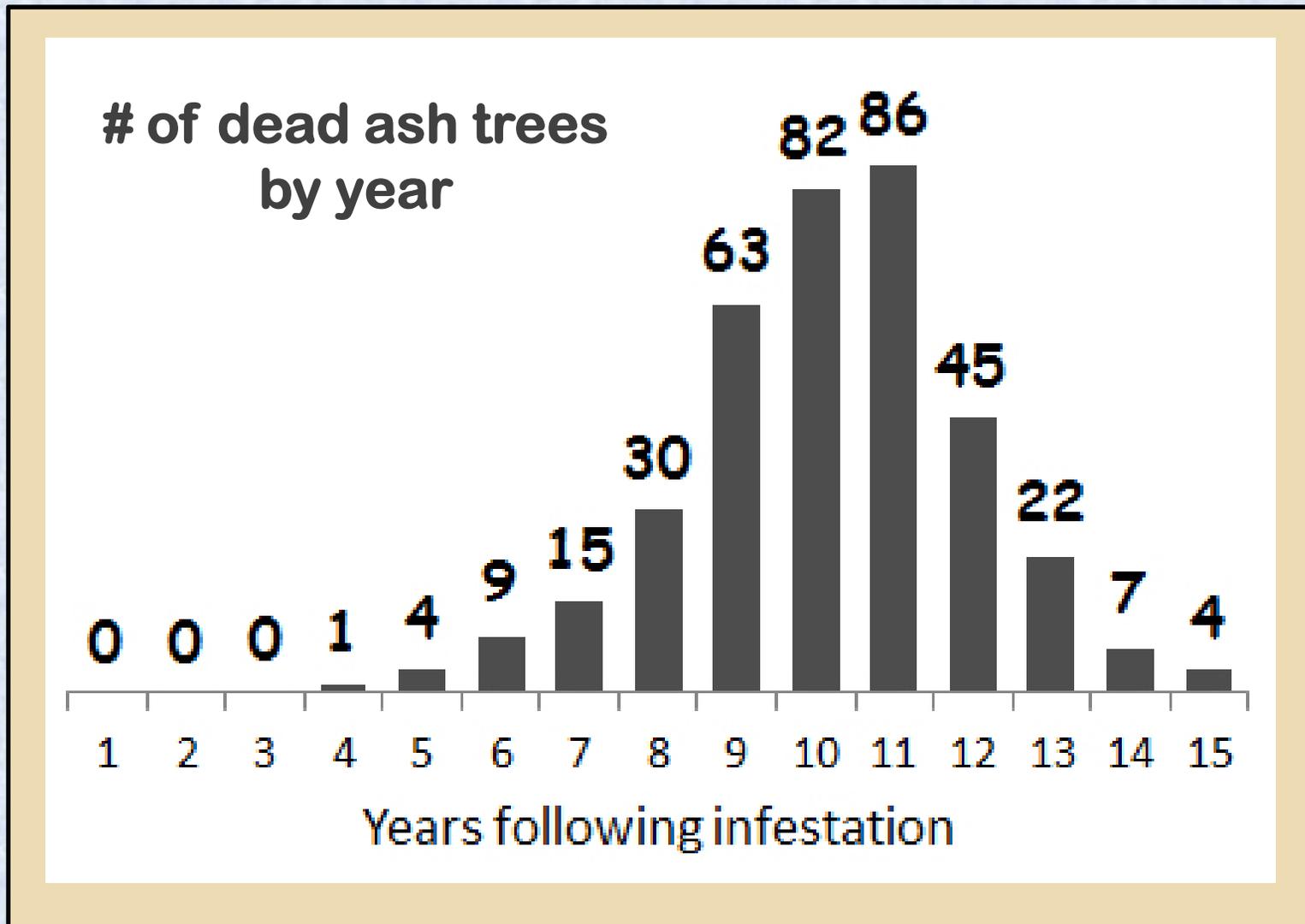
# Creighton

Public Ash Tree Population: **134**



# Hartington

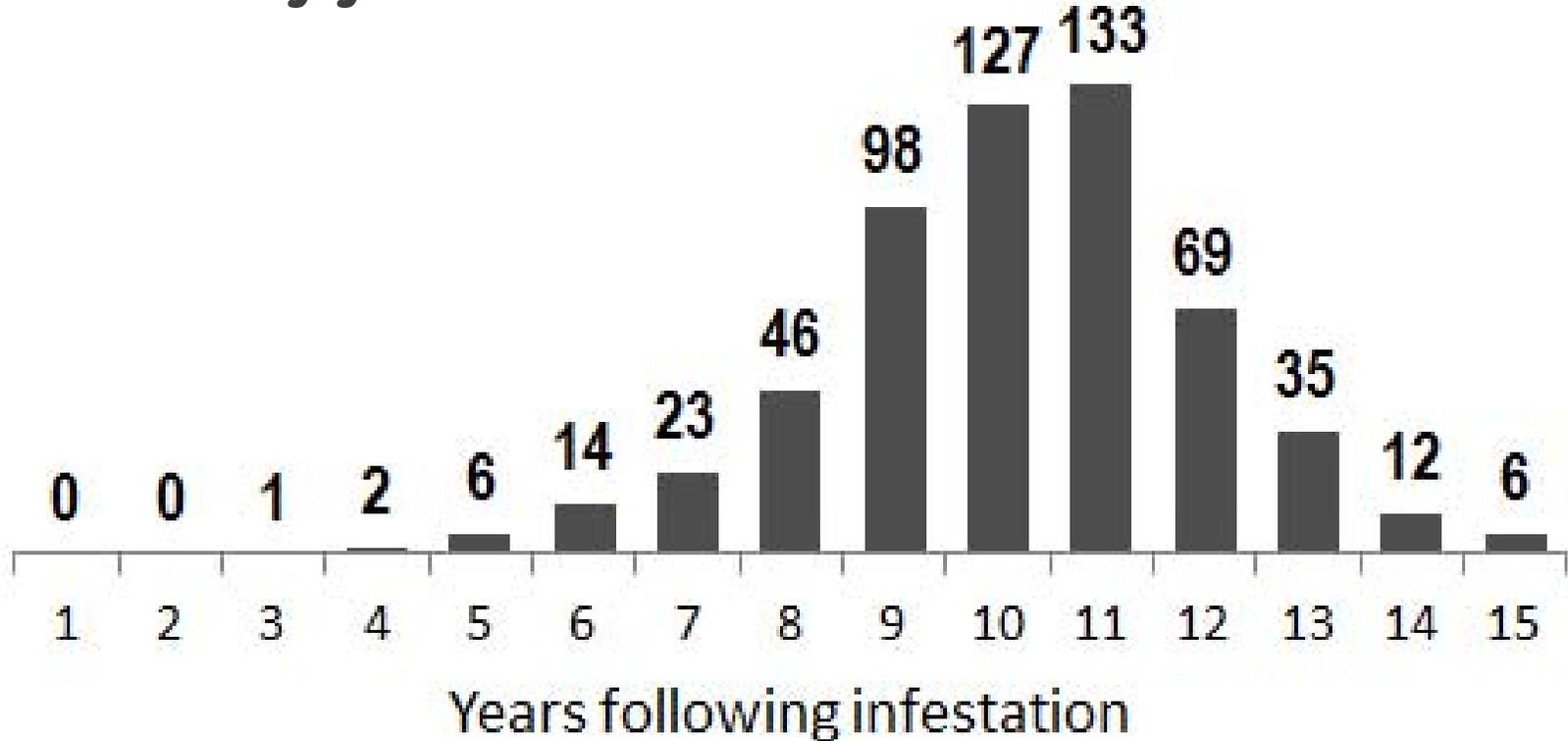
Public Ash Tree Population: **373**



# Kearney

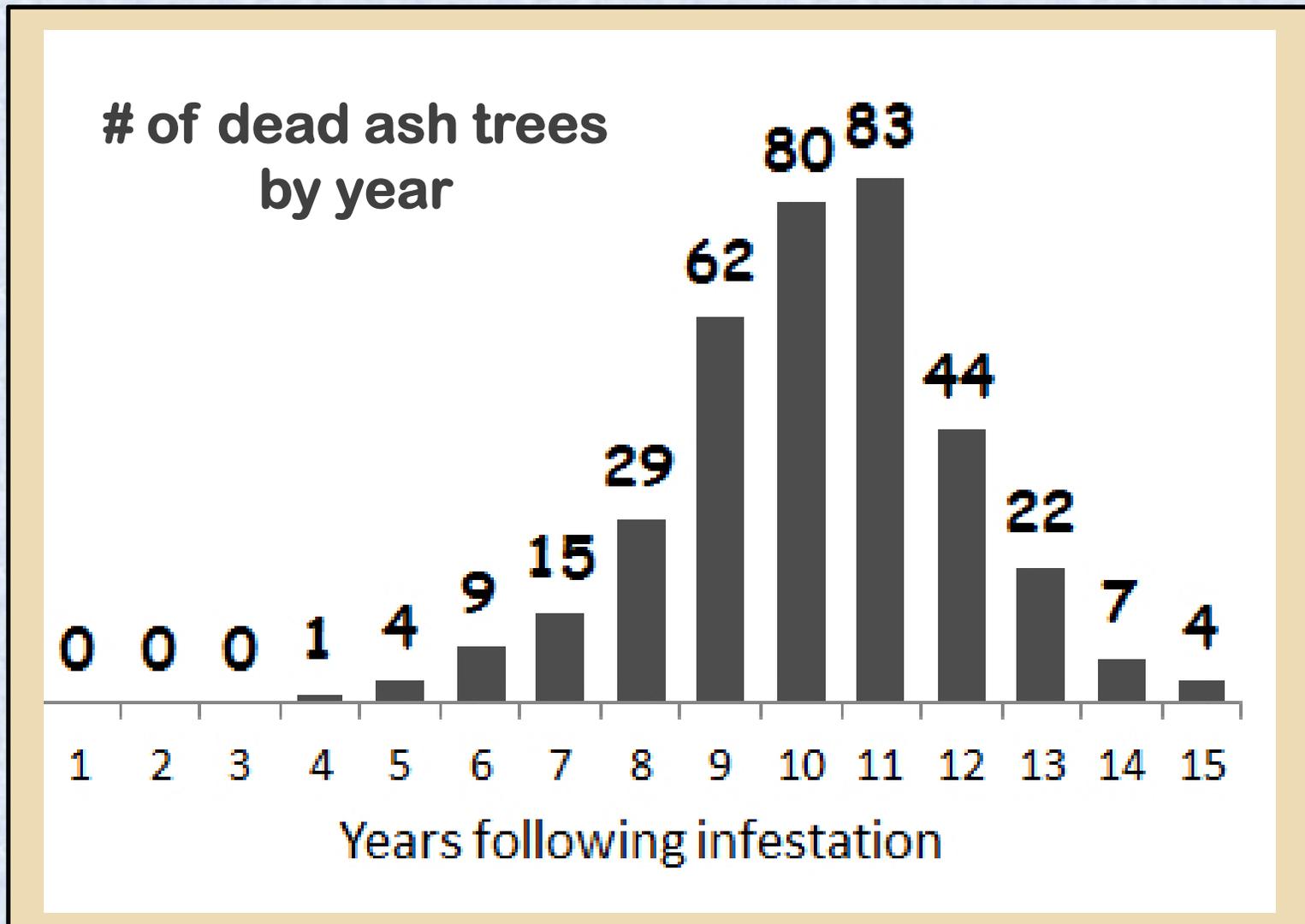
Public Ash Tree Population: **578**

# of dead ash trees  
by year



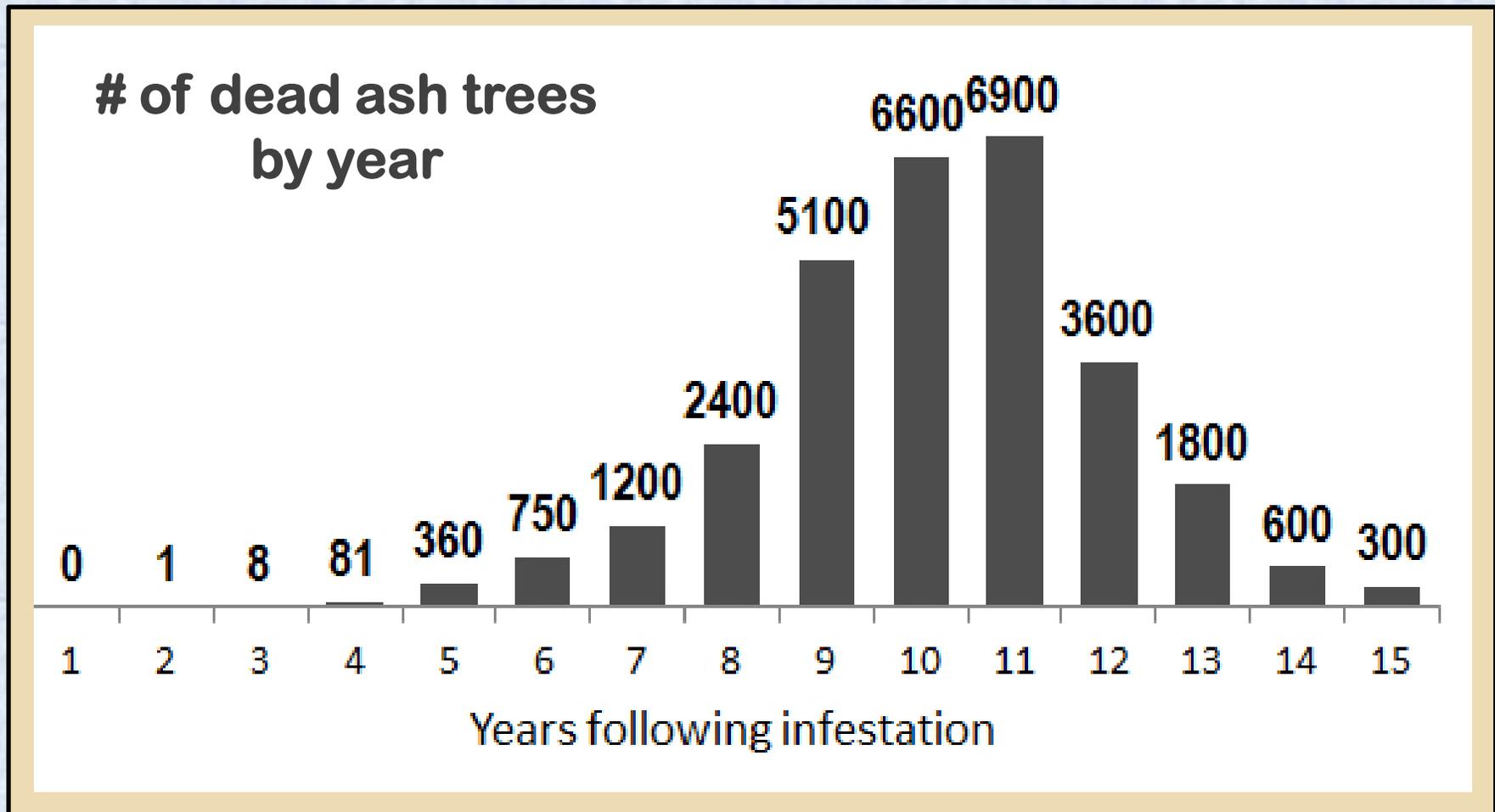
# La Vista

Public Ash Tree Population: **363**



# Lincoln

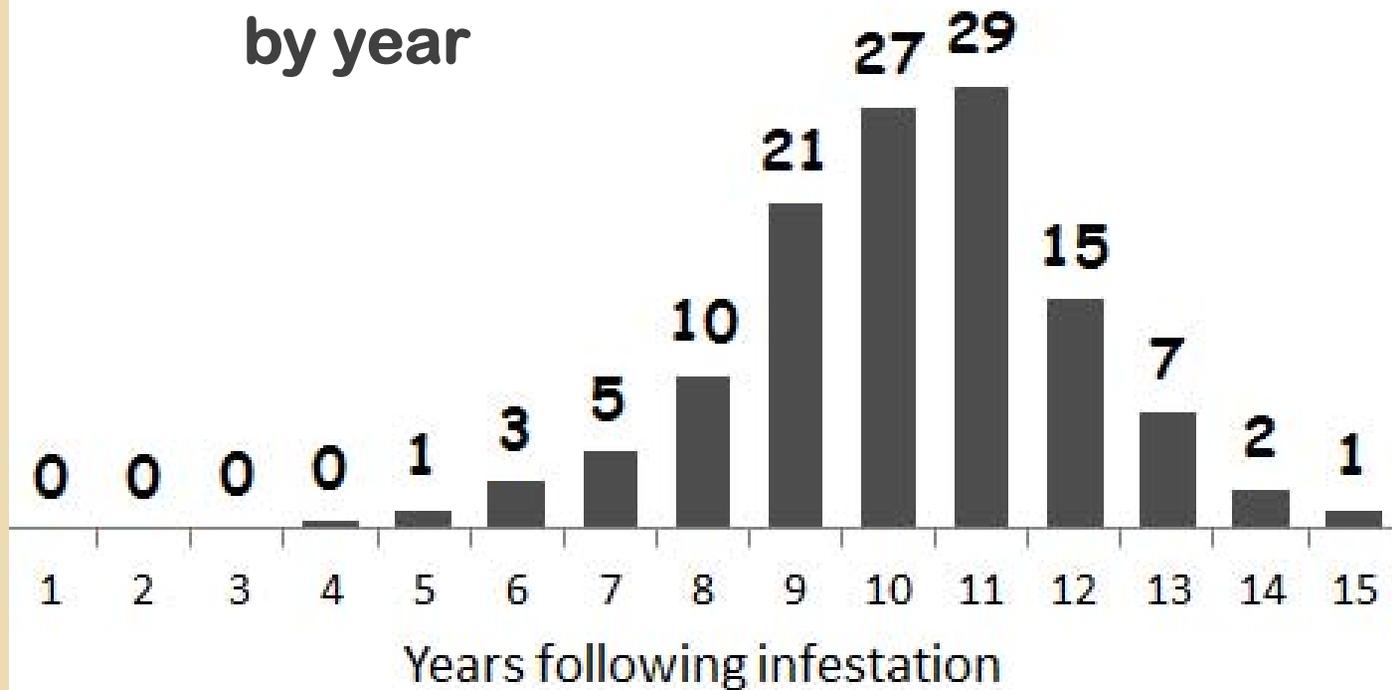
Public Ash Tree Population: **30,000**



# Minden

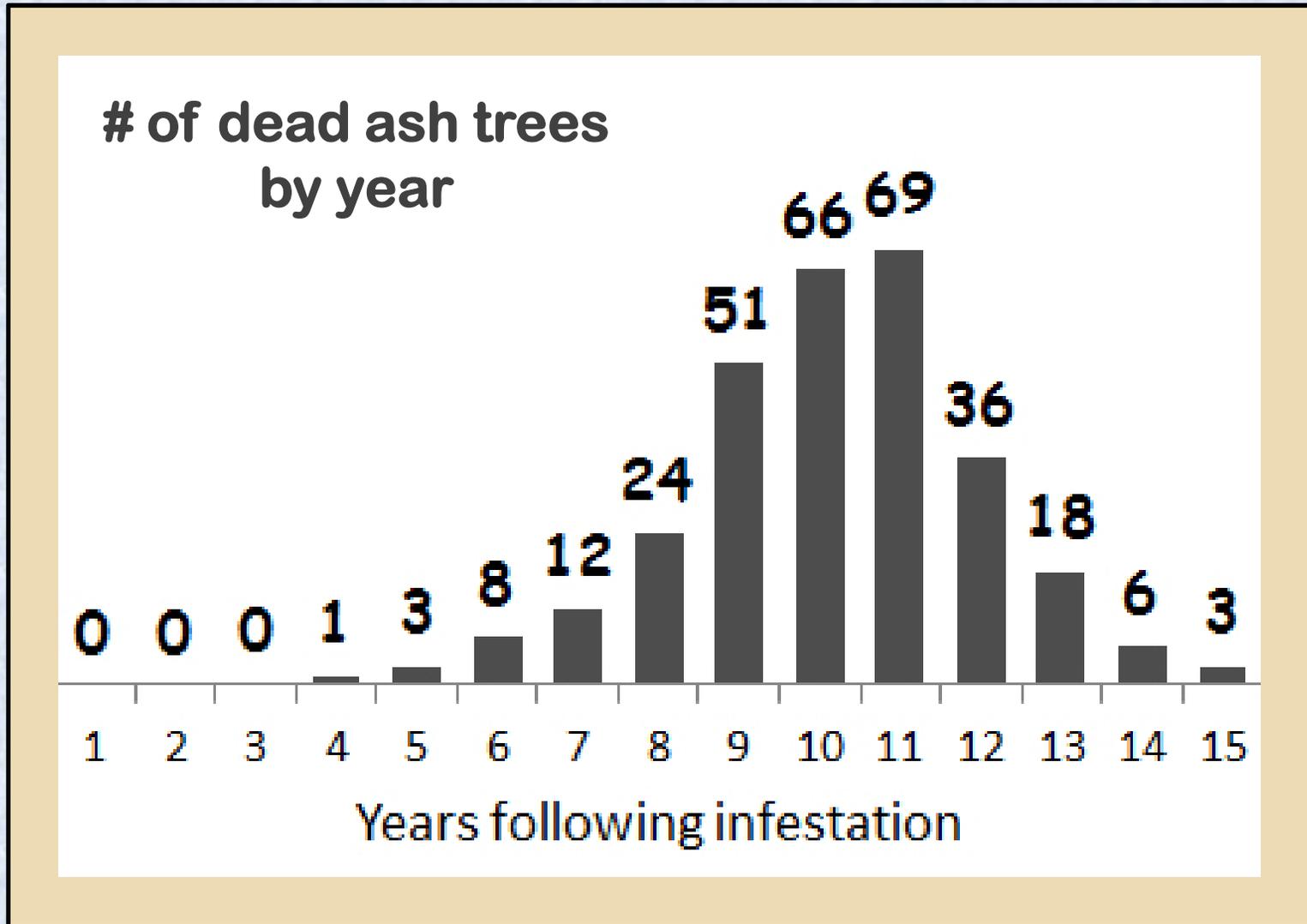
Public Ash Tree Population: **124**

# of dead ash trees  
by year



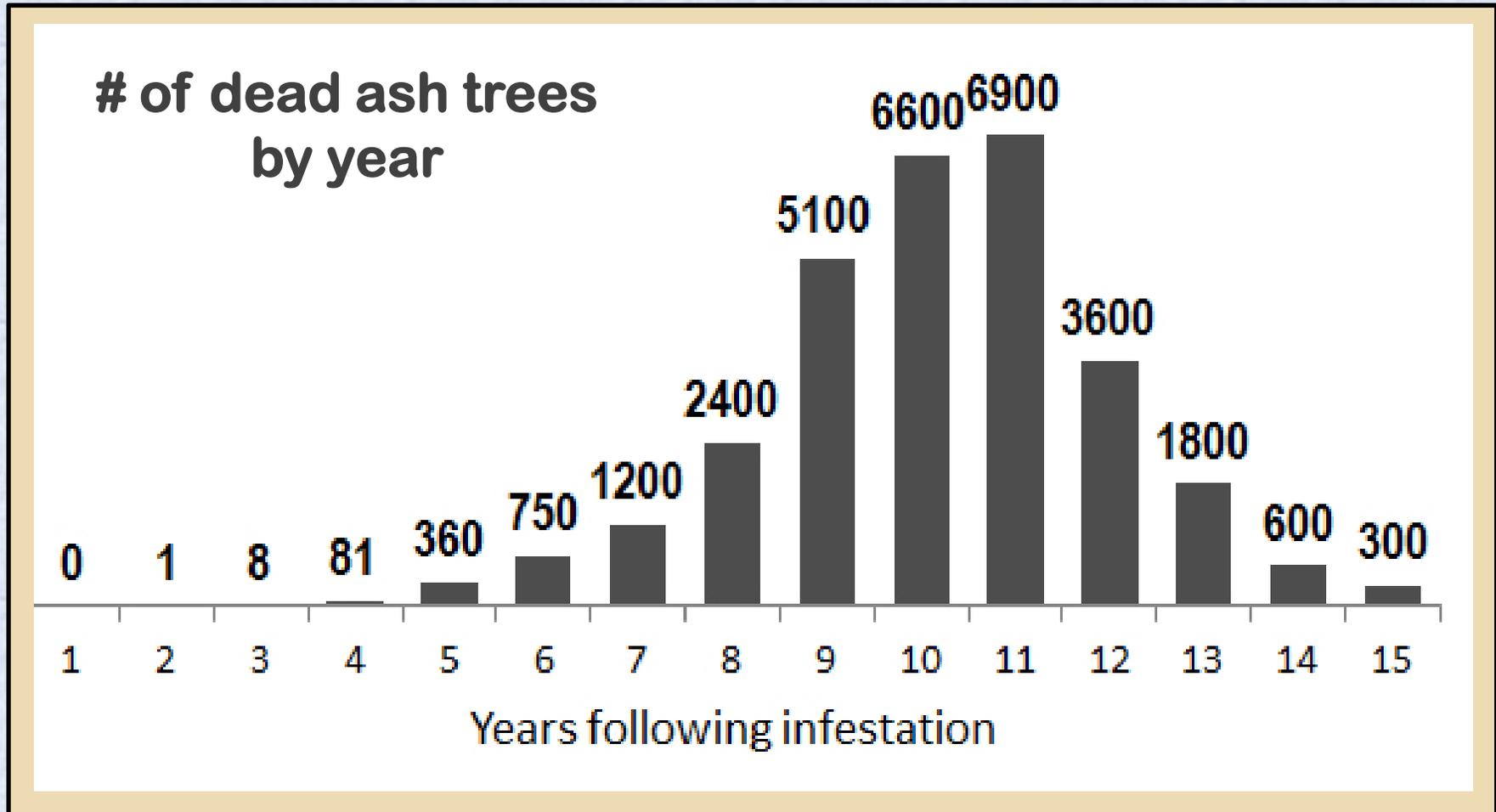
# Nebraska City

Public Ash Tree Population: **301**



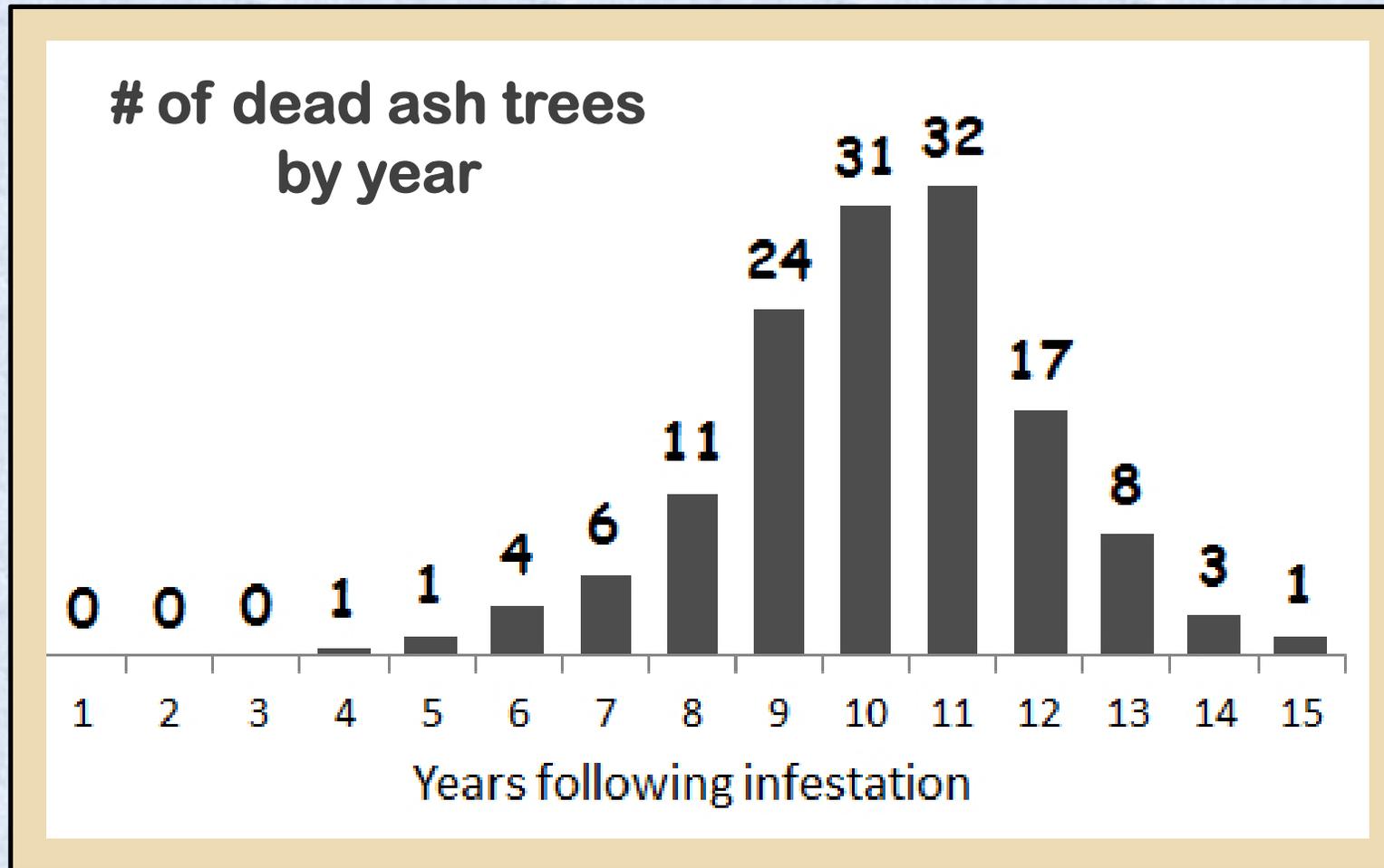
# Omaha

Public Ash Tree Population: **30,000**



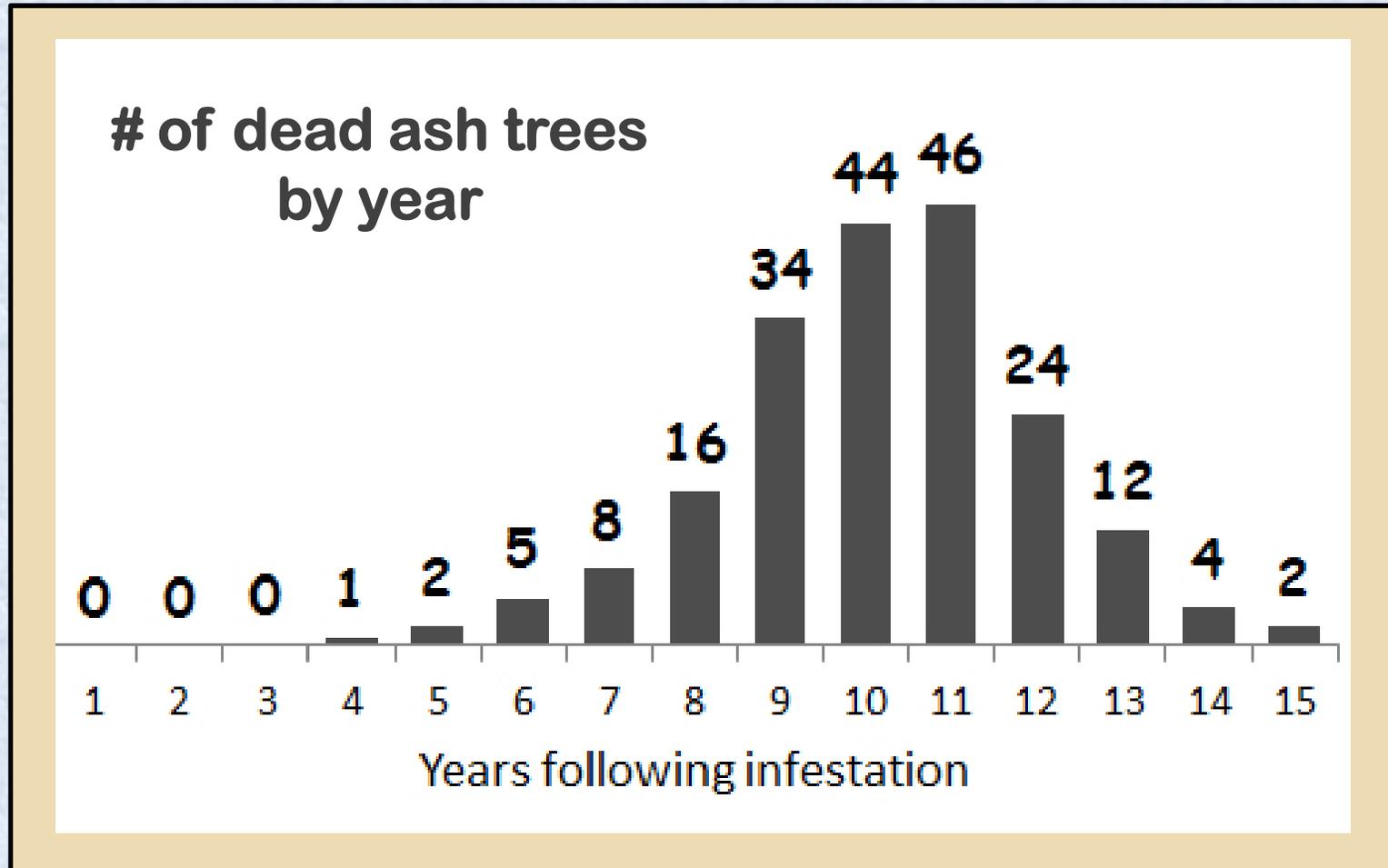
# Ord

Public Ash Tree Population: **141**



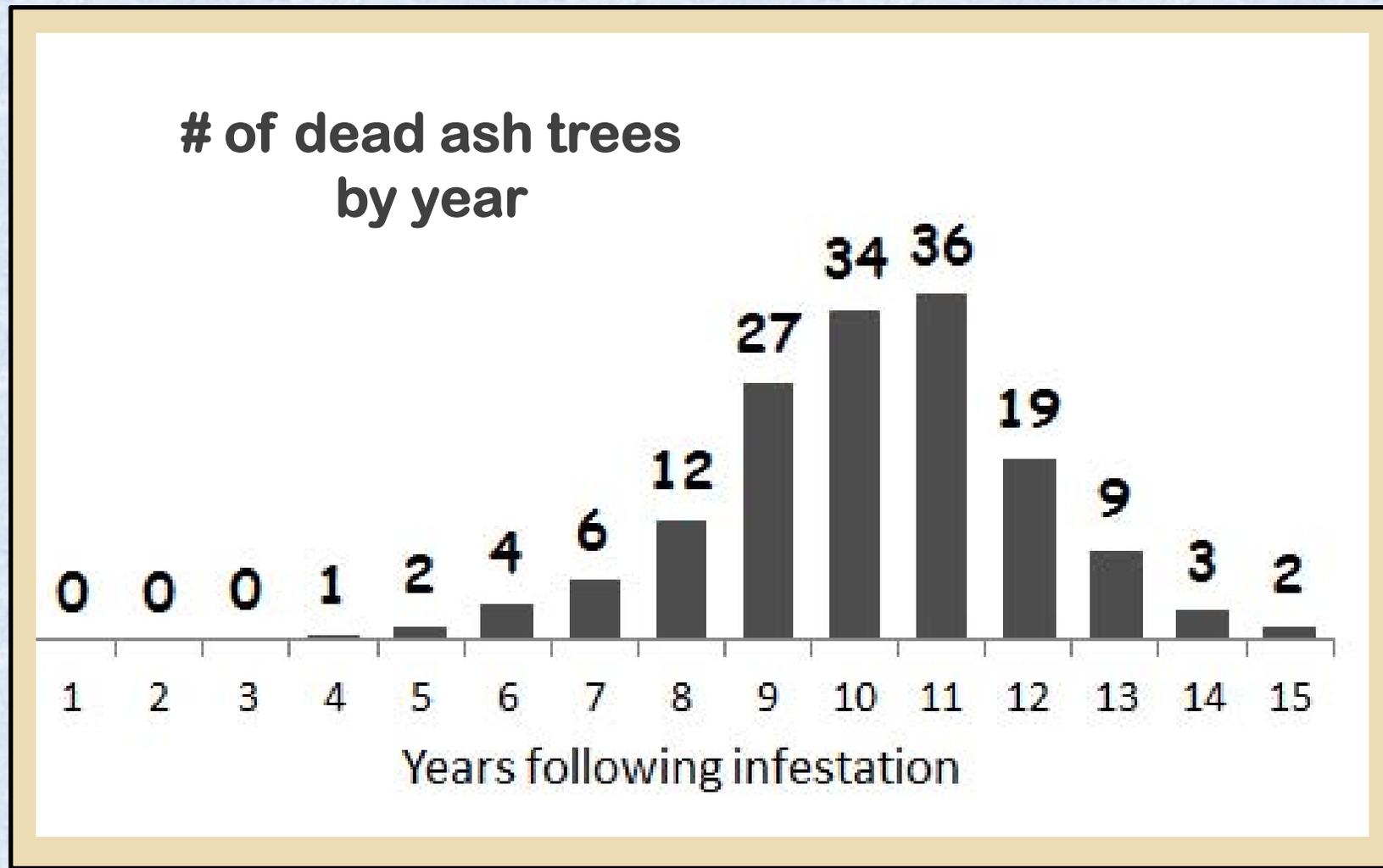
# Pierce

Public Ash Tree Population: **202**



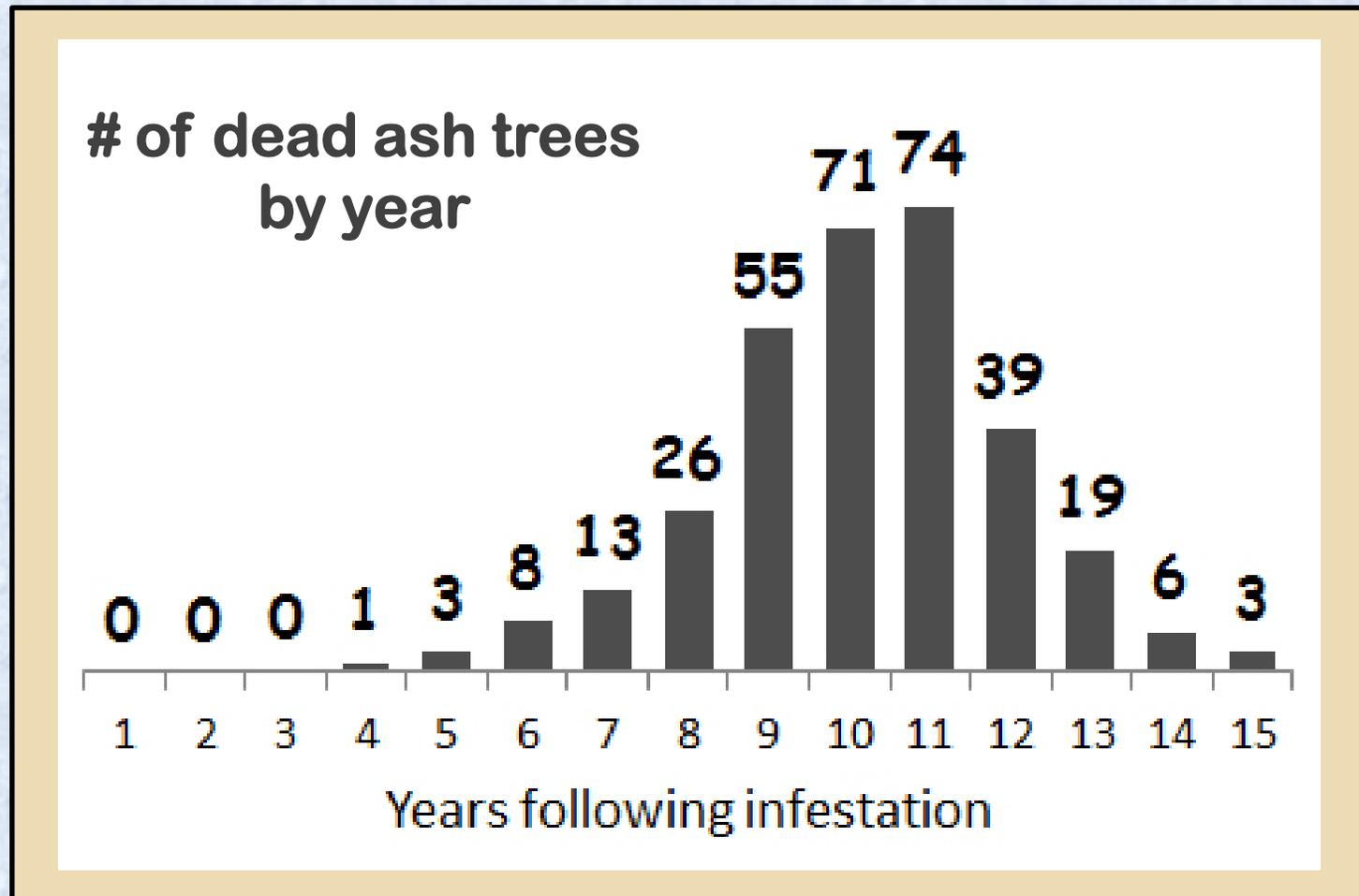
# Waverly

Public Ash Tree Population: **156**



# Wayne

Public Ash Tree Population: **321**



# Readiness Planning

## What can we do?

- Check ash trees as they are pruned or removed
- Remove marginal trees
- Public awareness to gain citizen support

Nebraska Forest Service

### ***Emerald Ash Borer:*** Readiness Planning for Nebraska Communities

*Is your community ready . . .*



Ash-lined street in 2006, Toledo, Ohio.

*. . . for this?*



Same street three years later—all ash trees dead.

Emerald ash borer (EAB) is a pest of historical significance that will change the face of the landscape in your community. The Nebraska Forest Service can help you prepare!

FH22-2014

UNIVERSITY OF  
**Nebraska**

# Additional EAB Publications for Nebraska

- Treatment Options
- Guidelines for Nebraska Homeowners
- FAQs
- Decline in Ash Trees: Borers & Bark Beetles
- Decline in Ash Trees: Diseases & Environmental Stresses

Nebraska Forest Service EAB website:  
[nfs.unl.edu/EAB](http://nfs.unl.edu/EAB)

# Questions?

**Laurie Stepanek**  
**Nebraska Forest Service**