Colorado Arborists and Lawn Care Professionals

Planning Your Emerald Ash Borer Management Strategies

Jim Zwack, M.S.

The Davey Institute

January 28, 2015

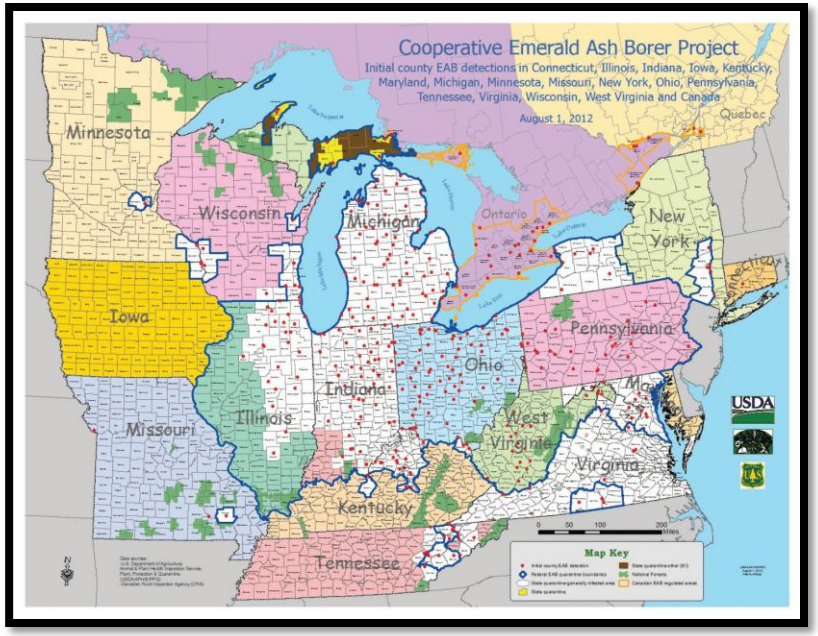
Personal Introduction

- B.S. Urban Forestry
- M.S. Tree Physiology (drought stress)
- University of Minnesota Landscape Arboretum
  - Applied research – cold hardiness
- The Davey Institute
  - Director of Technical Services

DAVEY

The Basics of EAB

- An exotic invasive pest
- First identified in North America in 2002
- Has killed 10's of millions of trees
- Overall impact will be $Billions



The Basics of EAB

In North America, EAB attacks all types of ash trees, including:

Green ash

White ash

Black ash

And all other horticultural varieties of ash.

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The Basics of EAB

- How EAB kills trees:

Adult beetle lands on tree and lays eggs

Eggs hatch and become worm-like larvae

Larvae tunnel through tree's water conducting tissue

Trees begin to thin and decline.

Humans are part of the problem…

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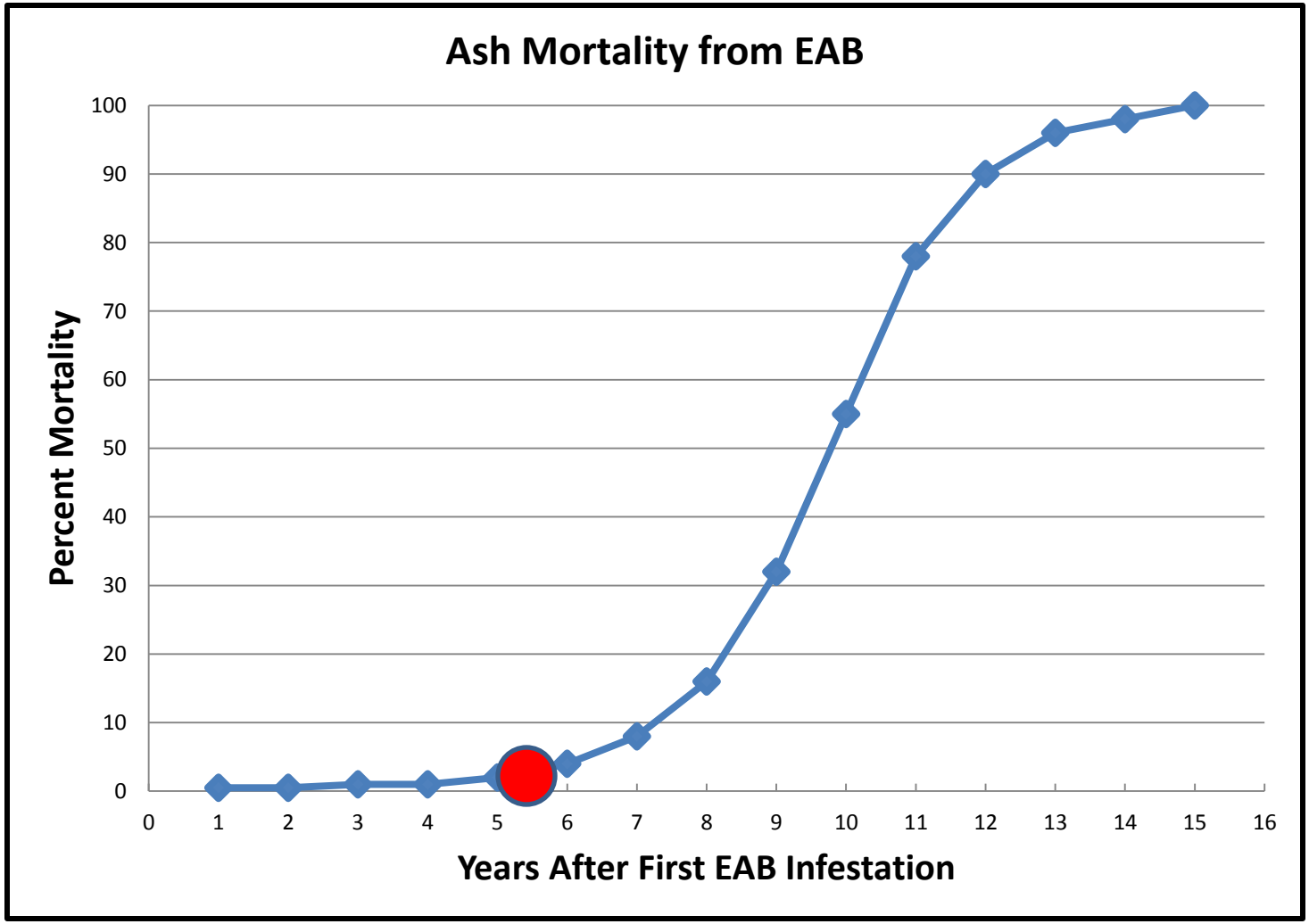
A Predictable Pattern of Losses



Based on data from Dr. Dan Herms, The Ohio State University

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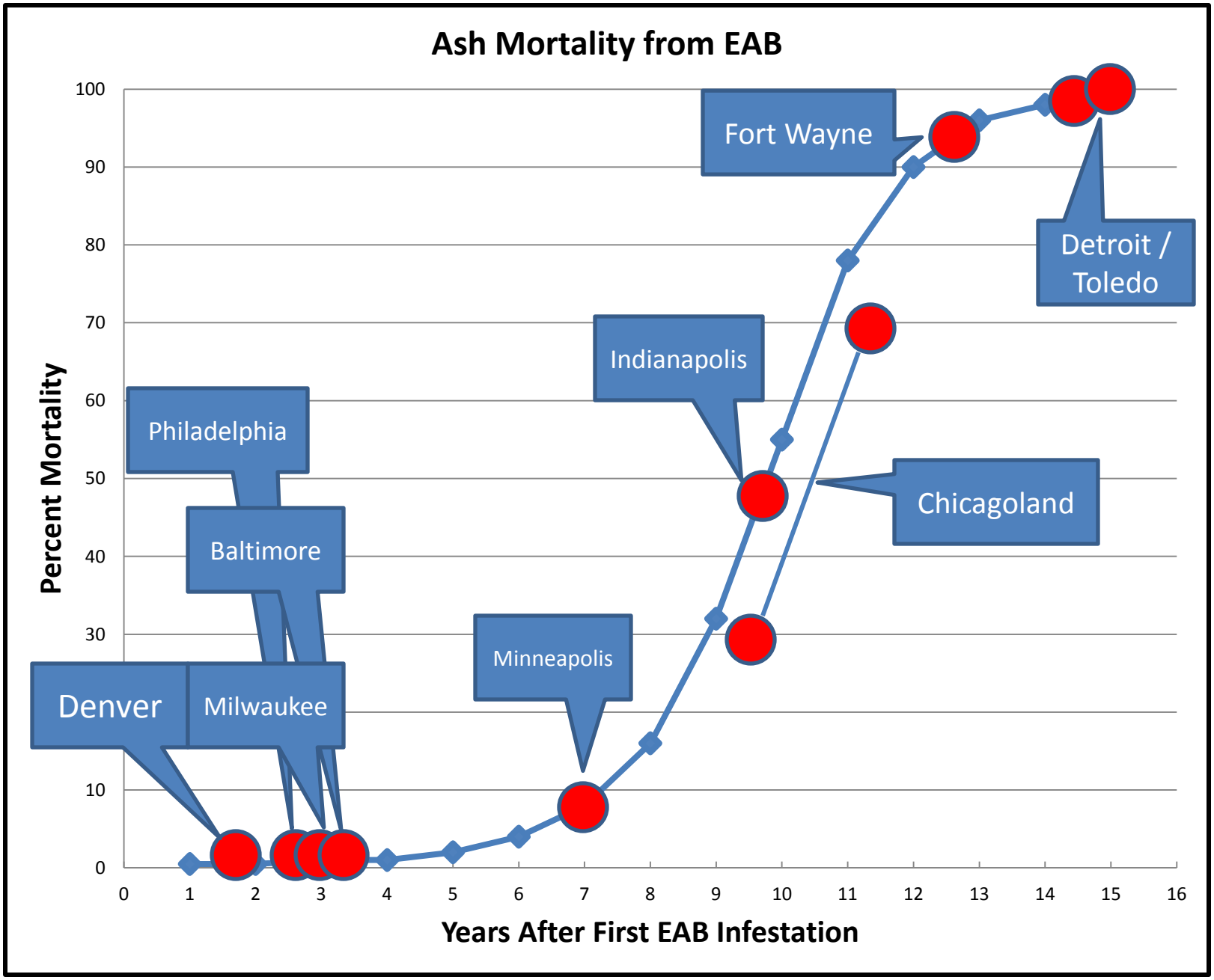
Ash Mortality from EAB
Percent Mortality
Years After First EAB Infestation
0
10
30
40
50
60
70
80
90
100
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Denver
Milwaukee
Baltimore
Philadelphia
Minneapolis
Indianapolis
Fort Wayne
Chicagoland
Detroit / Toledo

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What Have We Learned?

"Those who cannot remember the past are condemned to repeat it."

George Santayana
1863-1952
Author/Philosopher

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What Have We Learned?

- EAB has been a devastating problem already
- A national strategy for the management of EAB does not exist
- There is no “right way” to manage EAB
- Regardless of your plan, if you have ash trees EAB will cost you money

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What Have We Learned?

Strong EAB Plans Use Many Tools…

- Education
  - Of public officials, decision makers, private citizens
- Survey/Detection
- Inventory/Assessment
  - Define the scope of problem
  - Establish an economic conversation
- Management Plan/Decision Making
- Treatments
  - To save trees
  - To stage removals for later budget cycles
- Removals
- Wood Utilization
- Replacement

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EAB Education

- Early EAB educational efforts began with questions:
  - What is this?
  - Can we contain it?
  - Can we eradicate it?
- There are many stakeholders and they listen at different “frequencies”

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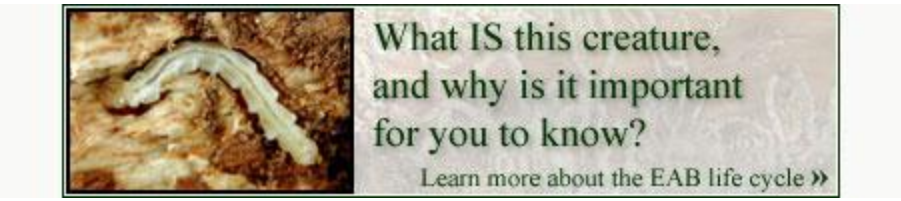
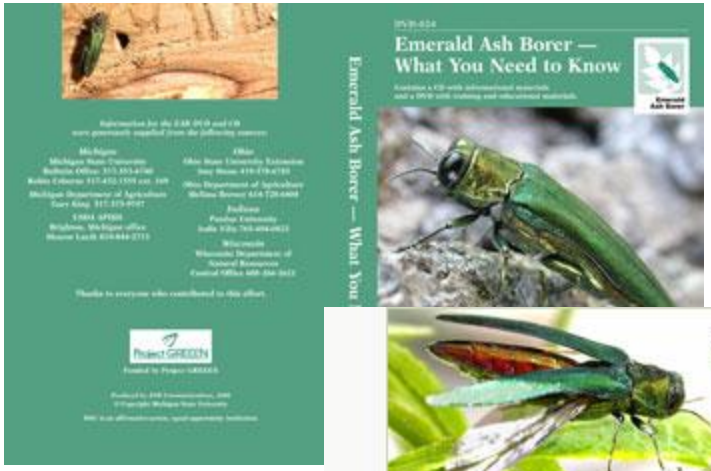
EAB Education - Awareness





EAB Education - Treatments

"We the undersigned strongly endorse ash tree conservation as a critical component of integrated programs to manage emerald ash borer (EAB) in residential and municipal landscapes."

Coalition for Urban Ash Tree Conservation
- Emerald Ash Borer Management Statement -
www.emeraldashborer.info/files/conserve_ash.pdf
signed 06 Jan 2011

Daniel A. Herms, PhD
Prof., Dept. of Entomology
The Ohio State University; Wooster, OH

Ray Iacobucci, Regional Technical Manager
TruGreen; Lewis Center, OH

Dana Irwin, Sr. Director - East Svc. Delivery
Scotts LawnService

Deborah G. McCullough, PhD
Prof., Depts. of Entomology and Forestry
Michigan State University; E. Lansing, MI

Fredric Miller, PhD ^
Prof., Horticulture
Joliet Junior College; Joliet, IL

Michael J. Raupp, PhD
Prof. & Ext. Specialist, Dept. of Entomology
University of Maryland; College Park, MD

Michael Robinson, VP; Mgr. Midwest Div. *
The F. A. Bartlett Tree Expert Company

Clifford S. Sadof, PhD
Prof., Entomology
Purdue University; West Lafayette, IN

Craig Schaar, Forestry Inspector *
City of Toledo, OH

David Smitley, PhD
Prof., Dept. of Entomology
Michigan State University; E. Lansing, MI

Chad Tinkel, Manager, Forestry Operations
City of Ft. Wayne, IN

Chris Williamson, PhD
Assoc. Prof., Dept. of Entomology
University of Wisconsin; Madison, WI

James Zwack, Dir. Technical Services
The Davey Tree Expert Company

Jim Bell, Parks Superintendent
City of Elgin, IL

Shawn Bernick, Director of Research *
Rainbow Treecare Scientific Advancements

Joe Boggs, Asst. Prof.
OSU Extension / OSU Dept. of Entomology
The Ohio State University

J. Bradford Bonham, DVM *
Municipal consultant (OH)

Joe Chamberlin, PhD; Development Mgr, SE
Valent U.S.A. Corporation

Richard S. Cowles, PhD
Agricultural Scientist
The Connecticut Agricultural Experiment Station

Mike Galvin, Deputy Director *~
Casey Trees, Washington, DC

Larry Hanks, Consulting Arborist *~
Pampered Properties, Georgetown, KY

EAB Education – Management

SMA POSITION PAPER

EMERALD ASH BORER

A PERSPECTIVE ON PLANNING AND MANAGEMENT

EXECUTIVE SUMMARY

The SMA believes that every community that includes ash trees (Fraxinus sp.) as a component of its urban forest should adopt an EAB management plan…

EAB Education - Economics

By Invitation

Emerald Ash Borer Management:
New Approaches To Defend Municipal Budgets

A conference to prepare local government with effective and sustainable EAB financial management strategies

Hosted by:
The Regional Development Institute - Northern Illinois University
And **Institute For Work And The Economy**
At Northern Illinois University's Hoffman Estates Campus
On March 7, 2013

The full day conference will provide focused discussion on current EAB management strategies based on the latest science and government data. The conference will review current approaches, and provide a pathway for determining financially sound approaches for individual municipalities. Conference participants will receive an electronic tool kit to implement a municipal EAB management plan. The Steering Committee will summarize and publish conference content and proceedings which will be available from the supporting institutions. The full-day conference will include lunch.

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EAB Education

Then

"Defining"

Now

"Empowering"

What Have We Learned About…

- Education
  - Of public officials, decision makers, private citizens
- **Survey/Detection**
- Inventory/Assessment
  - Define the scope of problem
  - Establish an economic conversation
- Management Plan/Decision Making
- Treatments
  - To save trees
  - To stage removals for later budget cycles
- Removals
- Wood Utilization
- Replacement

DAVEY

Survey/Detection

- Insect characteristics

- Differentiating “look-alikes”

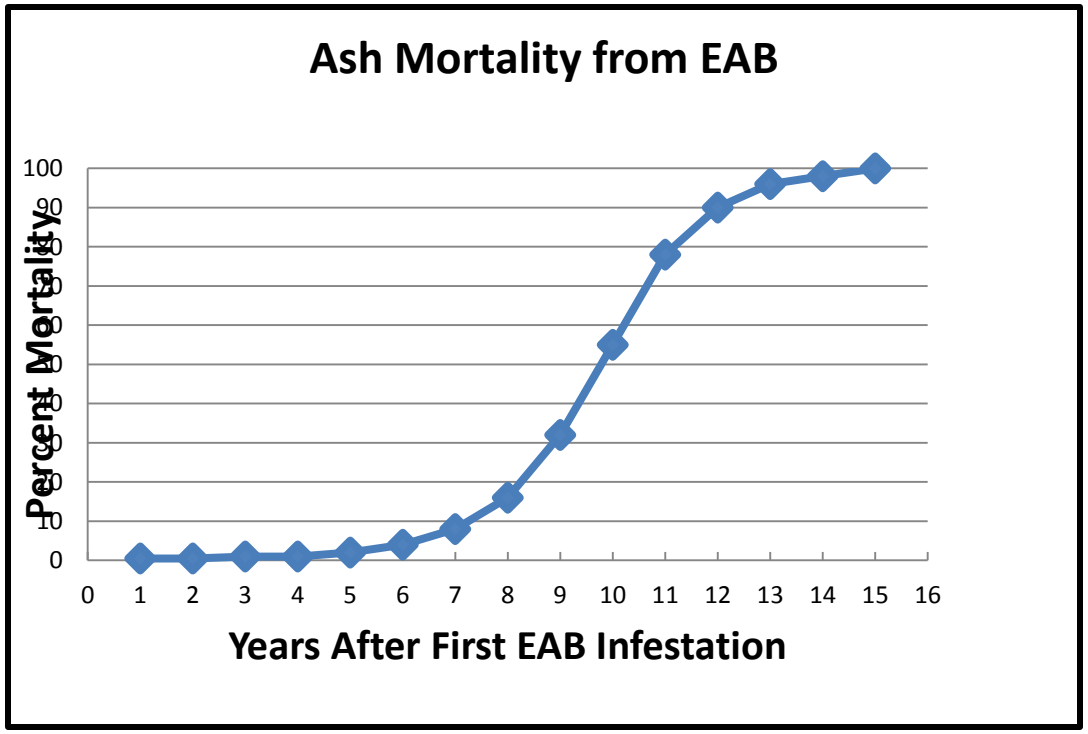
DAVEY

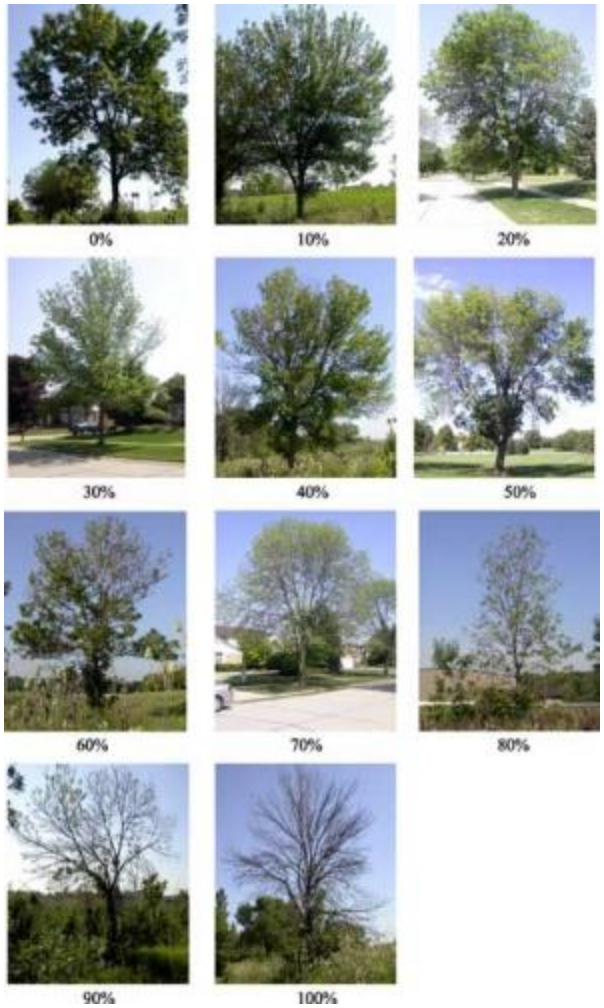
Survey/Detection

- Describing the damage caused

Survey/Detection

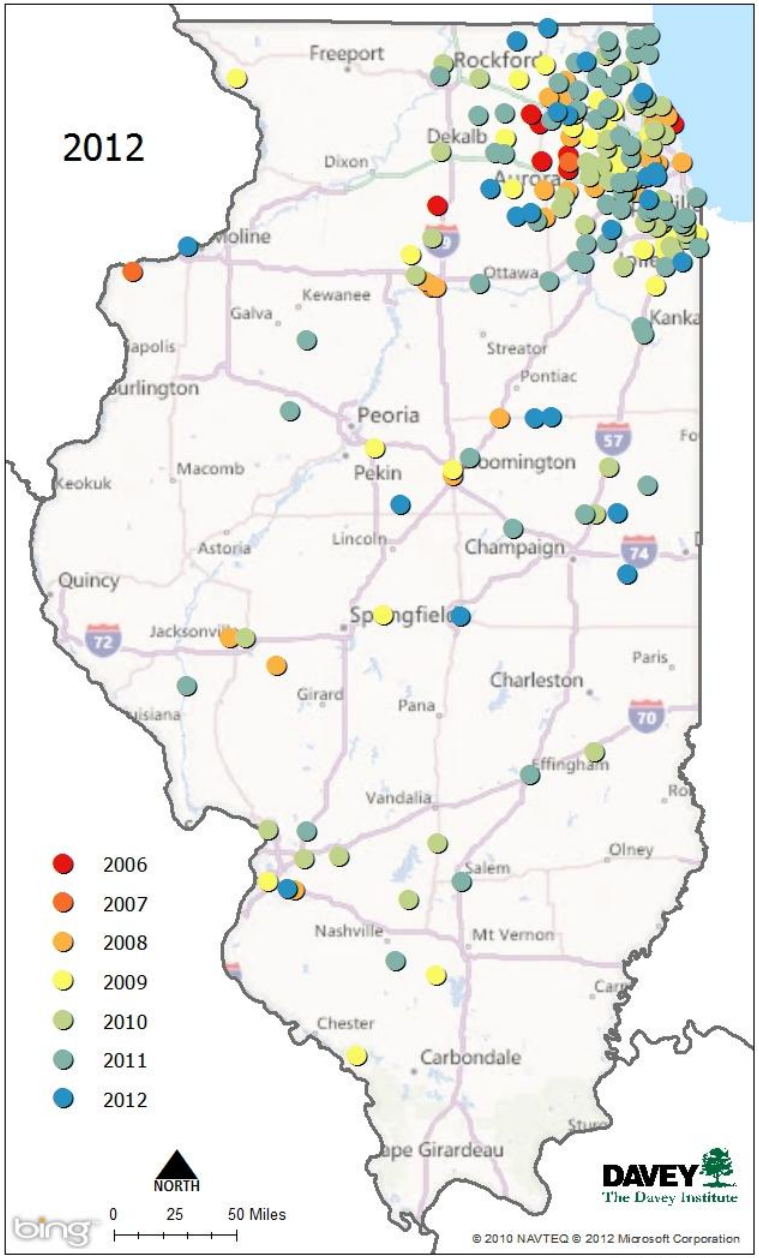
- Progression of Symptoms
- Progression of a Population





EAB discovered in Illinois in 2006

- Evanston
- Wilmette
- Winnetka
- Batavia
- Elburn
- St. Charles
- Lilly Lake



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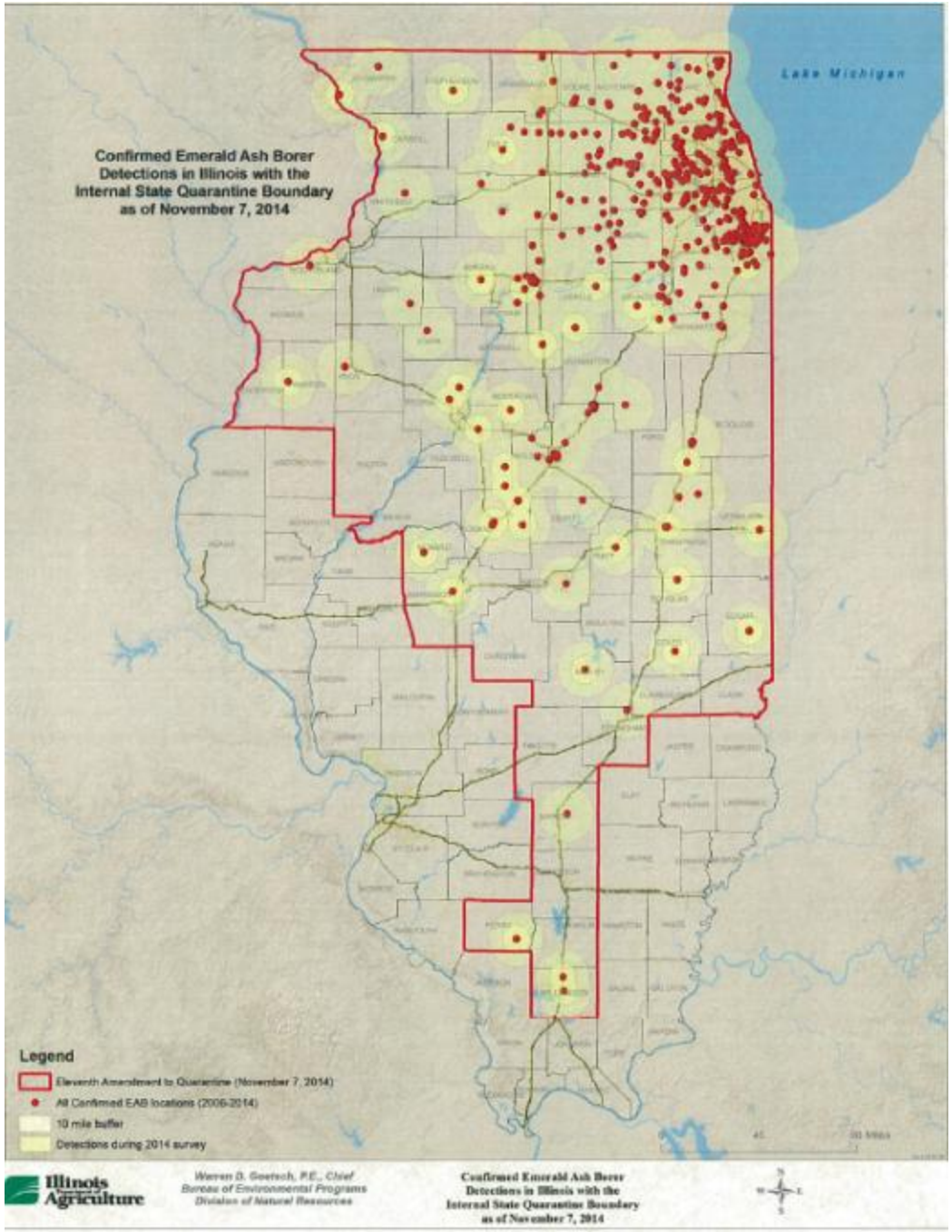

History: Illinois

- First Discovered in 2006
  - Confirmations (as of 11-7-14)

	Counties	Towns
2006	2	10
2007	2	5
2008	4	32
2009	2	37
2010	7	54
2011	4	70
2012	5	44
2013	4	33
2014	14	32

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EAB Management
Initial Reports

Core

0-10 Mile High Risk Zone

Area of Greatest Risk

Many Trees Likely Infested

10-20 Mile Moderate Risk Zone

Some trees already likely infested

New outbreaks likely

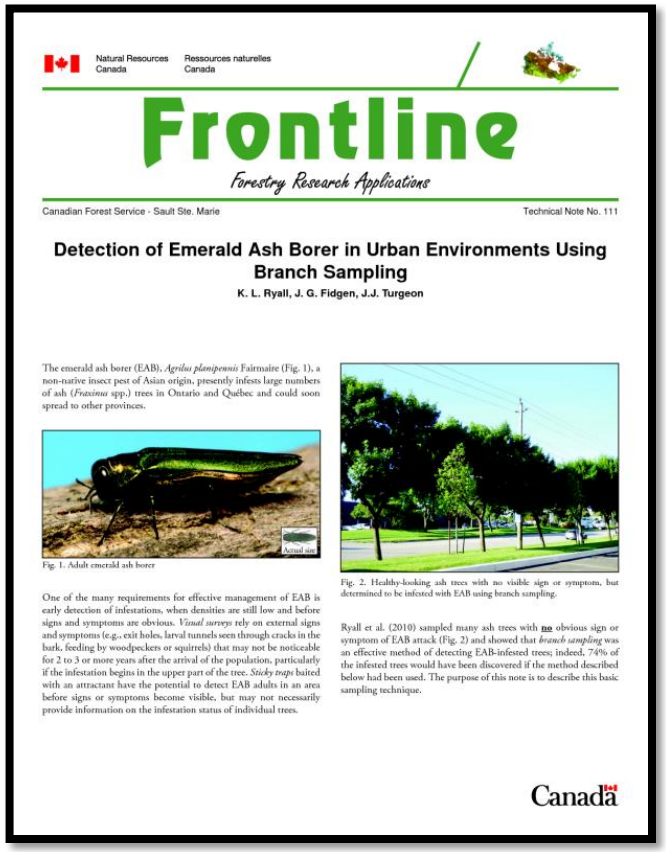
Low Risk Zone

This Will Change as Infestation Spreads

Survey/Detection

- City of Montreal

- Canadian Forest Service model
- Assume 3% of ash trees are infested in a population of 5000
- You have to sample 200 in order to have 95% probability to detect at least one of the 150 infested…



Natural Resources Canada / Ressources naturelles Canada

Frontline

Forestry Research Applications

Canadian Forest Service · Sault Ste. Marie — Technical Note No. 111

Detection of Emerald Ash Borer in Urban Environments Using Branch Sampling

K. L. Ryall, J. G. Fidgen, J.J. Turgeon

The emerald ash borer (EAB), *Agrilus planipennis* Fairmaire (Fig. 1), a non-native insect pest of Asian origin, presently infests large numbers of ash (*Fraxinus* spp.) trees in Ontario and Québec and could soon spread to other provinces.

Fig. 1. Adult emerald ash borer

One of the many requirements for effective management of EAB is early detection of infestations, when densities are still low and before signs and symptoms are obvious. *Visual surveys* rely on external signs and symptoms (e.g., exit holes, larval tunnels seen through cracks in the bark, feeding by woodpeckers or squirrels) that may not be noticeable for 2 to 3 or more years after the arrival of the population, particularly if the infestation begins in the upper part of the tree. *Sticky traps* baited with an attractant have the potential to detect EAB adults in an area before signs or symptoms become visible, but may not necessarily provide information on the infestation status of individual trees.

Fig. 2. Healthy-looking ash trees with no visible sign or symptom, but determined to be infested with EAB using branch sampling.

Ryall et al. (2010) sampled many ash trees with **no** obvious sign or symptom of EAB attack (Fig. 2) and showed that *branch sampling* was an effective method of detecting EAB-infested trees; indeed, 74% of the infested trees would have been discovered if the method described below had been used. The purpose of this note is to describe this basic sampling technique.

Canada

$$CO = K_c\left[E + \frac{1}{T_i}\int E \cdot dt\right] \times \left[1 + T_d \frac{d\cdot}{dt}\right]$$

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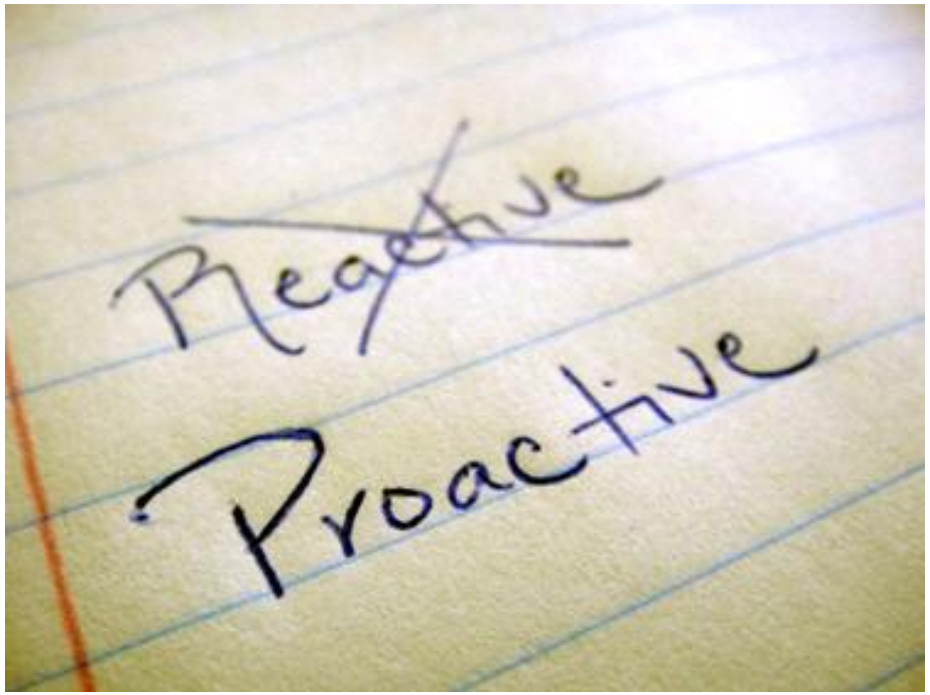
EAB Survey/Detection

Then

"Reactive"

Now

"Proactive"



What Have We Learned About…

- Education
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- Survey/Detection
- **Inventory/Assessment**
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- Removals
- Wood Utilization
- Replacement

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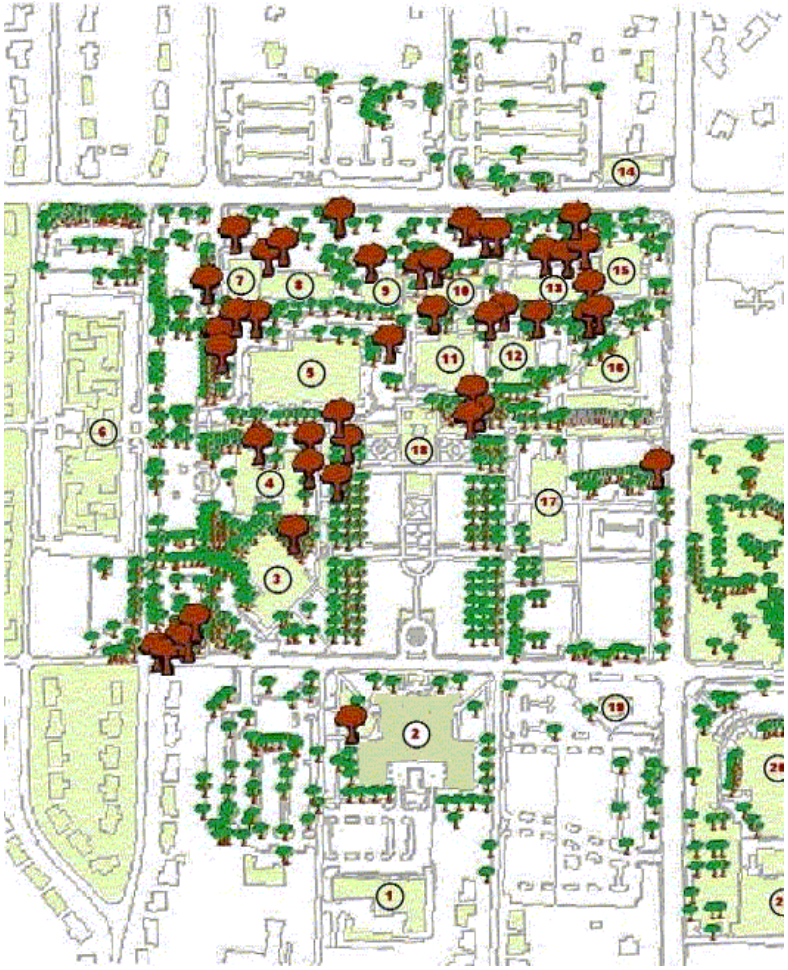
Inventory/Assessment

- Inventory
  - How many?
  - What kind?
  - How big?
  - What condition?
  - Etc.



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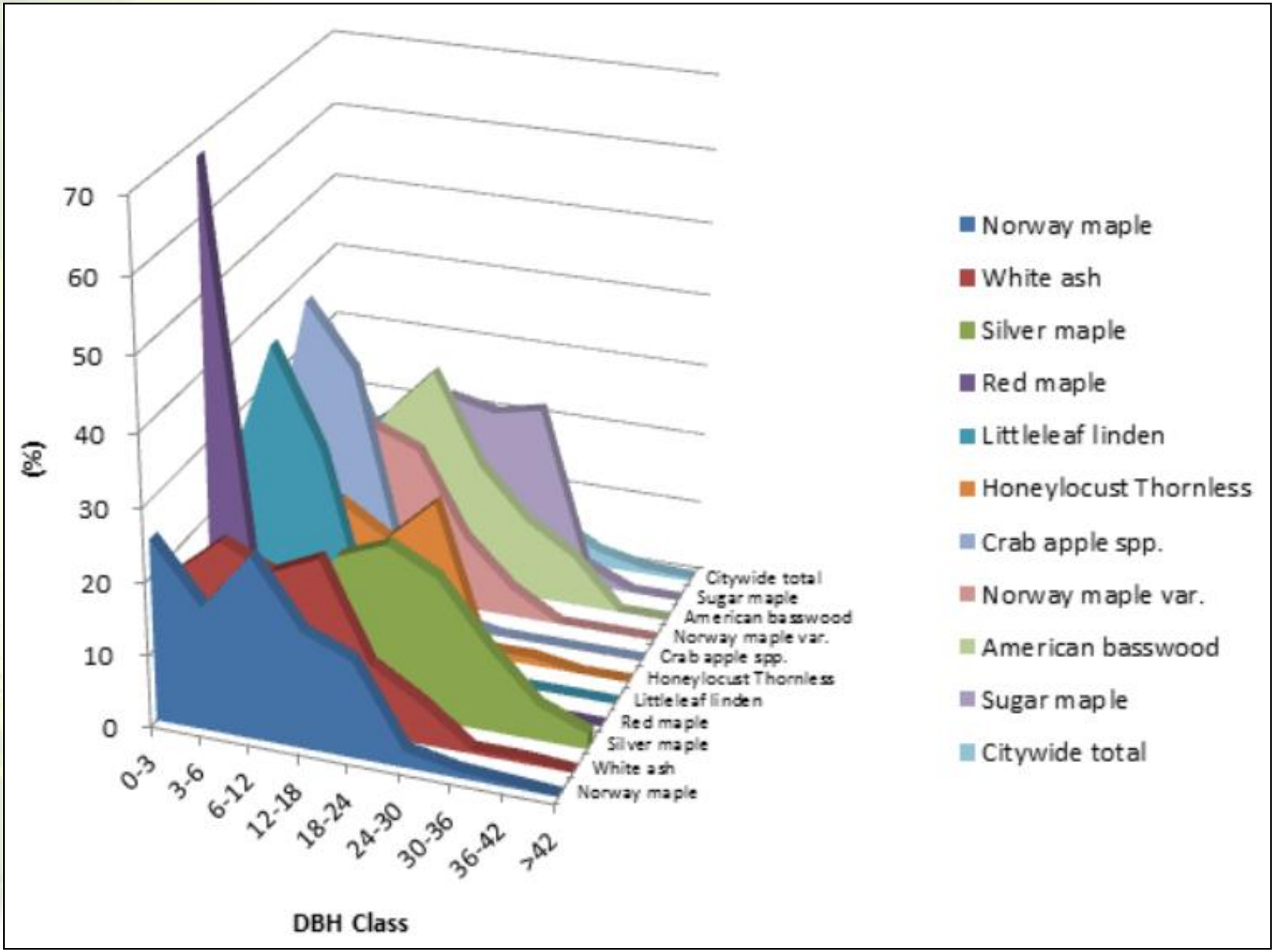
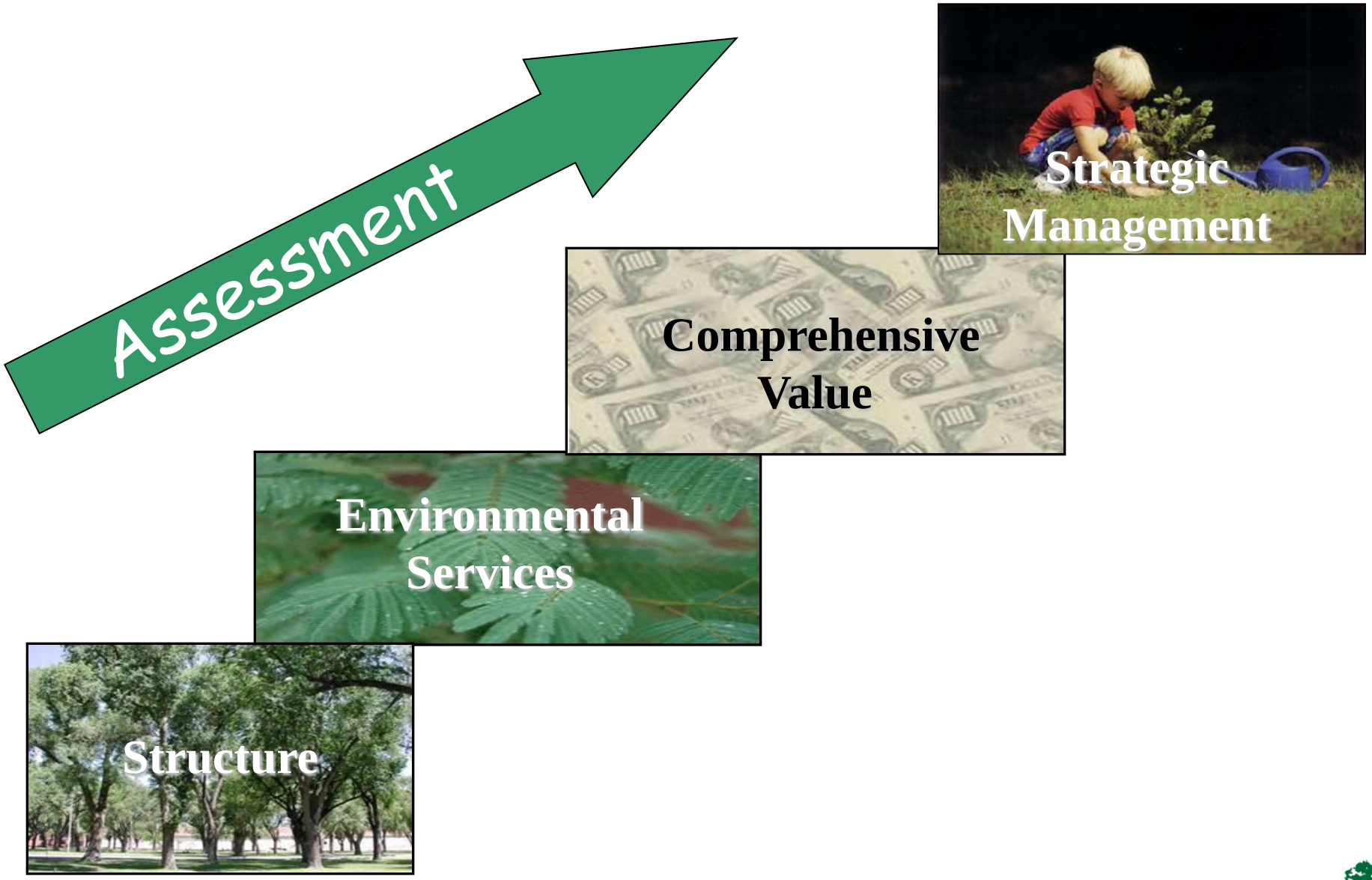
Information from an Inventory



Benefit Based Approach



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Ash Tree Benefit Loss

Oconomowoc, WI

Replace. value	$1.75M
Stormwater	$53,334/yr.
Air Quality	$7,556/yr.
Energy Cons.	$46,507/yr.
Carbon	$6,250/yr.
Aesthetic	$68,265/yr.

(based on 1872 street trees)

Replacement val.	$1.53 M
Stormwater	$45,313/yr.
Air Quality	$6,295/yr.
Energy Cons.	$39,092/yr.
Carbon	$5,227/yr.
Aesthetic	$55,933/yr.

(Less 304 Ash trees or 16% of street tree population)

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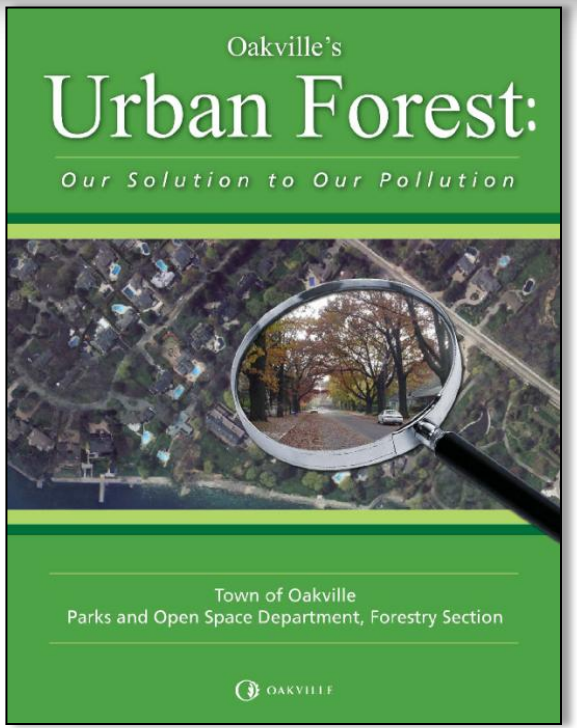
i-Tree: Demonstrating Tree Value



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What Have We Learned About…

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- Replacement

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We used to think “All or Nothing”

Management Plan/Decision Making

- Eradication of host trees within infested area
- Objective: contain/slow

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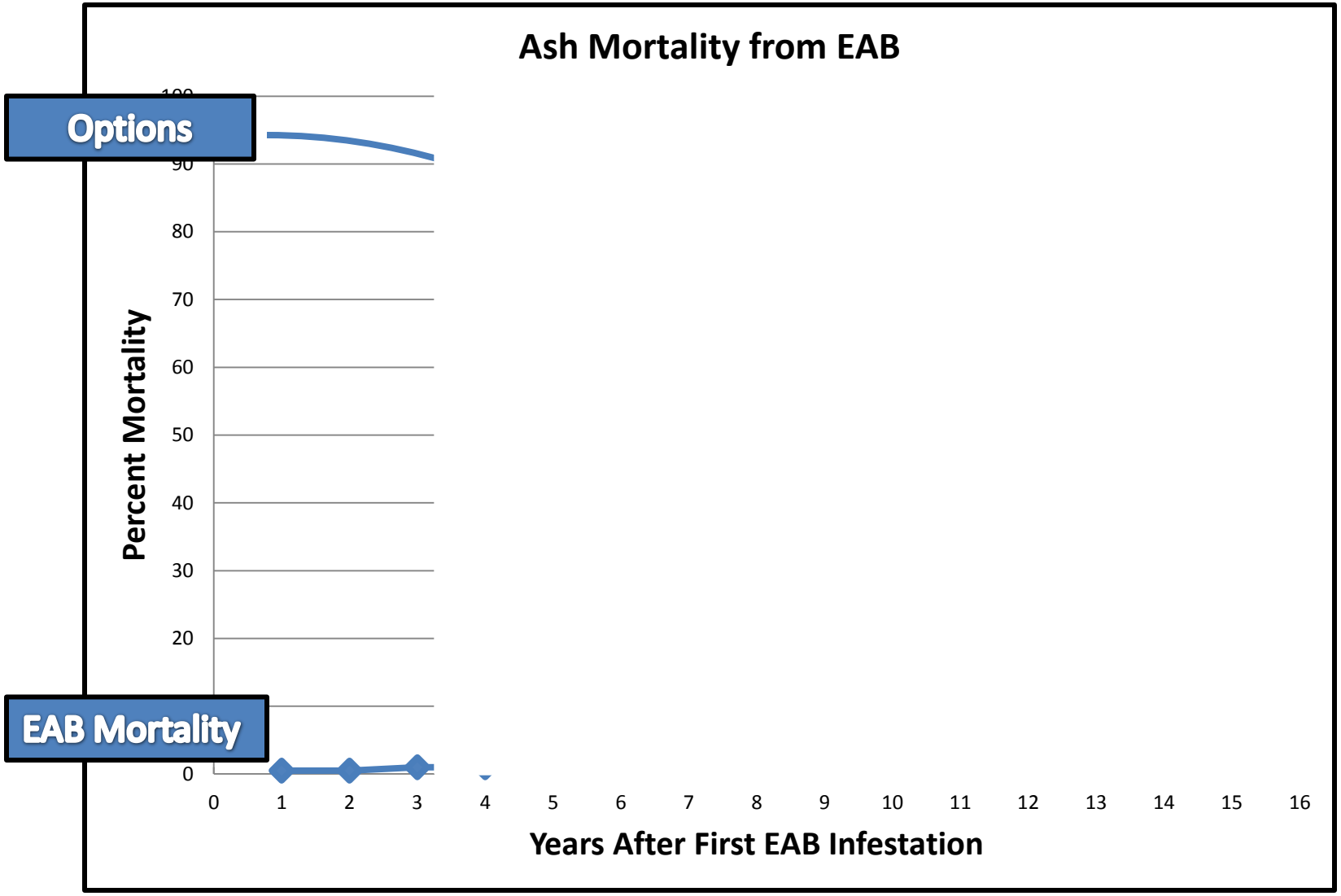
An Inverse Relationship



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Management Plan/Decision Making

- A “toolbox” approach
- Different stakeholders have different EAB management objectives
- One size does not fit all…
- What’s right?

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Management Plan/Decision Making

- WHEREAS, The SMA found that the two extremes of removing trees and doing

…WHEREAS, The SMA found that an integrated approach that utilizes treatment along with the removal of low-grade ash trees is the best management option;

- WHEREAS, The International Society Arboriculture, the premier tree care organization in the world, supports the findings and recommendations of the SMA

…therefore, be it RESOLVED, BY THE SENATE OF THE NINETY-SEVENTH GENERAL ASSEMBLY OF THE STATE OF ILLINOIS, that we urge every village, town, and city within the State of Illinois to reevaluate its EAB management plan in light of the latest facts and recommendations presented by the leading experts

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What Have We Learned About…

- Education
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- **Treatments**
  - To save trees
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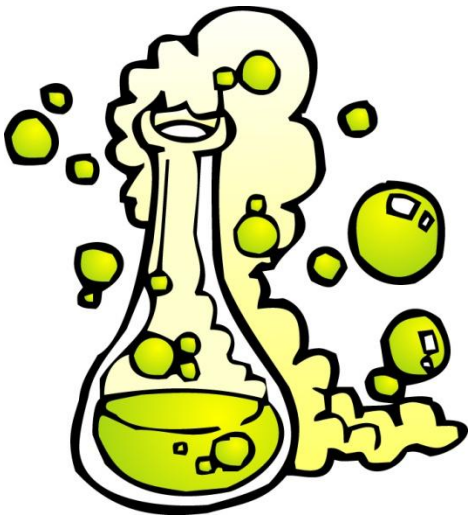
Treatments

- "Then" = Experimental
  - What would work?
  - What wouldn't work?
  - What dose?
  - What frequency?



Cost Effective Treatments that Work

- What are the options?
- Three active ingredients in the US have held up to the scrutiny of peer-reviewed research:
  - Imidacloprid
  - Dinotefuran
  - Emamectin benzoate
- *"When applied using formulations, products, and protocols documented as effective by university research, these treatments can provide environmentally sound control of EAB, sufficient to maintain a functional and aesthetically pleasing ash canopy."*

http://www.emeraldashborer.info/files/conserve_ash.pdf

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SECOND EDITION

Insecticide Options for Protecting Ash Trees from Emerald Ash Borer

North Central IPM Center

Daniel A. Herms,
Deborah G. McCullough,
David R. Smitley,
Clifford S. Sadof,
Whitney Cranshaw

The Ohio State University
College of Food, Agricultural, and Environmental Sciences

Michigan State University

Purdue Extension | Local Faces Countless Connections

Colorado State University Extension

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Imidacloprid Soil Drenches

1X rate (1.4 g ai / inch DBH)	spring
1X rate (1.4 g ai / inch DBH)	fall
2X rate (2.8 g ai / inch DBH)	spring
2x rate (2.8 g ai / inch DBH)	fall

Dr. Dan Herms, The Ohio State University

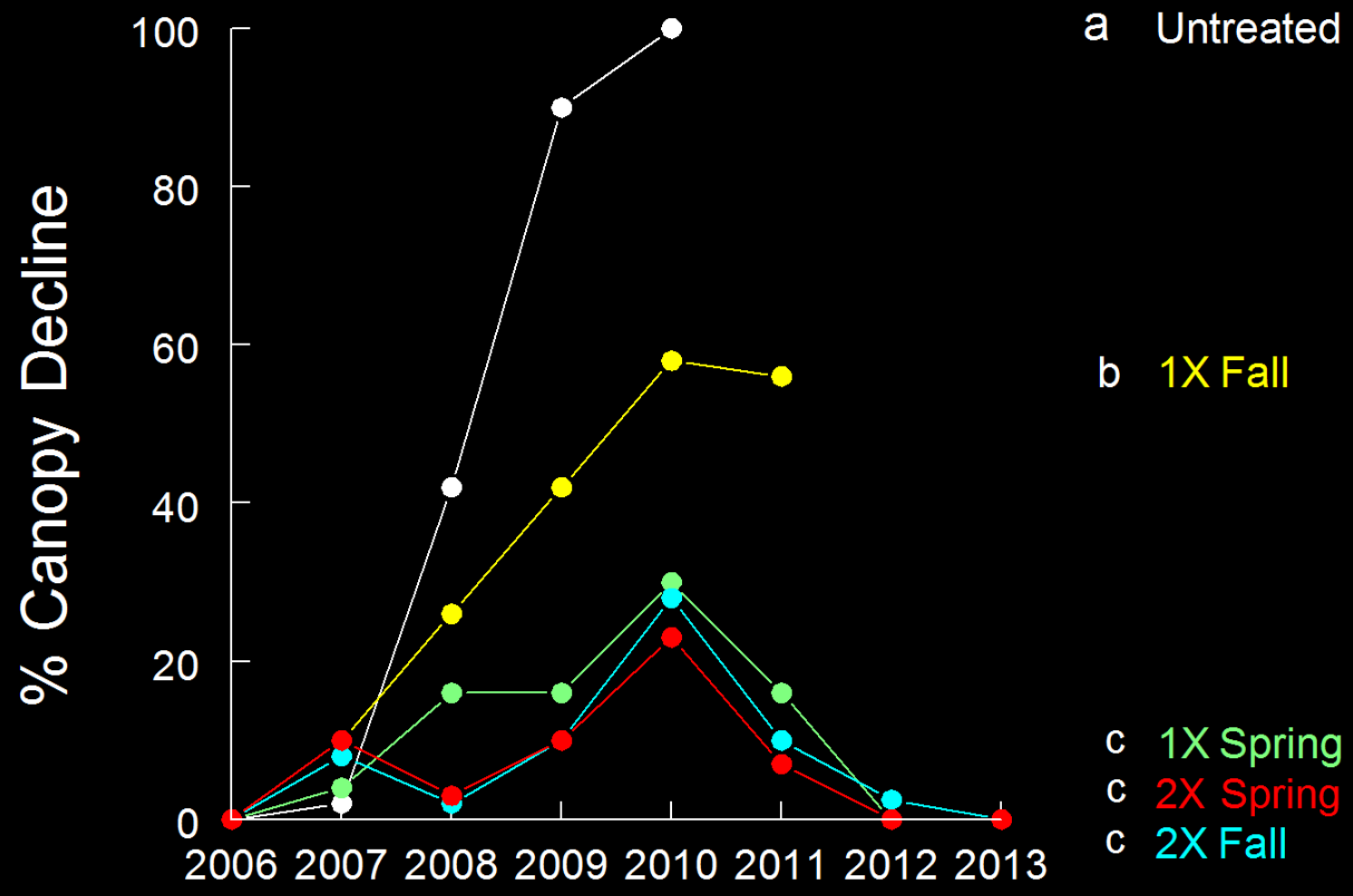
Treatment evaluation:

- Canopy decline rating using photographic scale (Smitley et al. 2008. *J. Econ. Entomol.* 101:1643-1650)

- Exit hole density in canopy branches

Dr. Dan Herms, The Ohio State University

Imidacloprid Soil Drenches
(16-23 inch DBH)



Dr. Dan Herms, The Ohio State University

2006

2009

Dr. Dan Herms, The Ohio State University

Emamectin Benzoate: duration of control at different rates (DBH: 20-25”)

Emamectin benzoate (Tree-äge)

0.1 g ai / inch DBH (2.5 ml / inch - low)

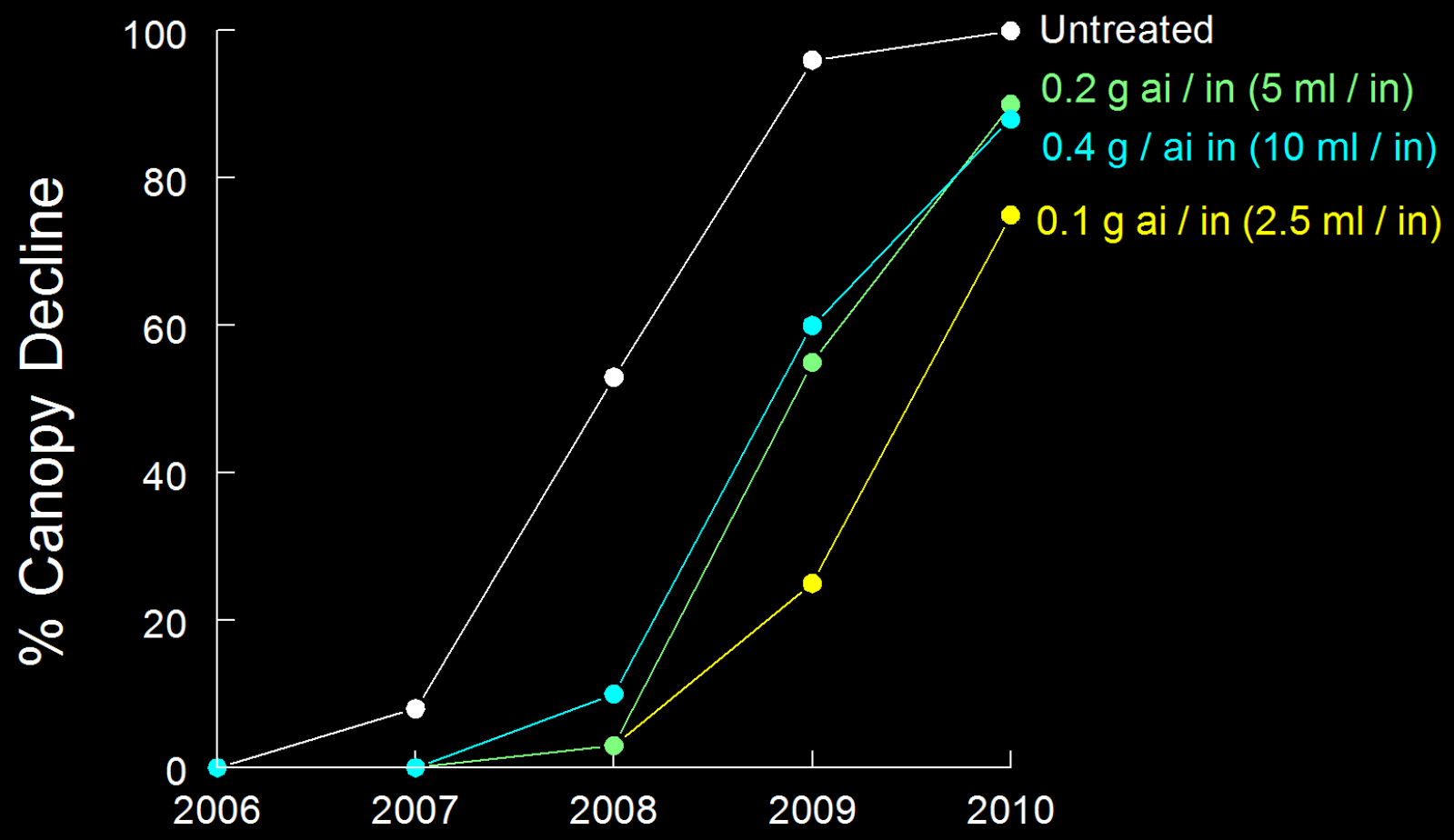
0.2 g ai / inch DBH (5 ml / inch – med)

0.4 g ai / inch DBH (10 ml / inch – med / high)

Treat in 2006 and see how long they work.

Dr. Dan Herms, The Ohio State University

Tree-äge rate study: 2 yrs control even at low rate (20-25 inch DBH)



Dr. Dan Herms, The Ohio State University

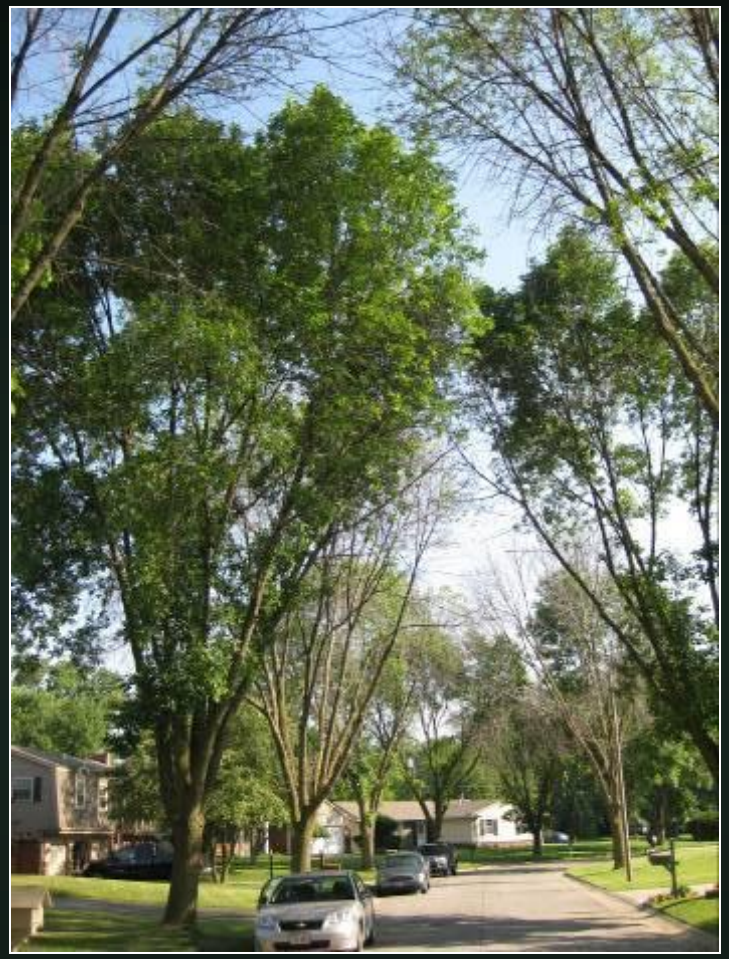
Emamectin Benzoate Applied in 2006

Treatment	Exit Holes / m^2 2008	Exit Holes / m^2 2009
Untreated	19.2 a	24.6 a
0.1 g ai / inch DBH	0.2 b	2.9 c
0.2 g ai / inch DBH	0.5 b	10.1 ab
0.4 g ai / inch DBH	1.4 b	3.3 c

Dr. Dan Herms, The Ohio State University

2006

Dr. Dan Herms, The Ohio State University

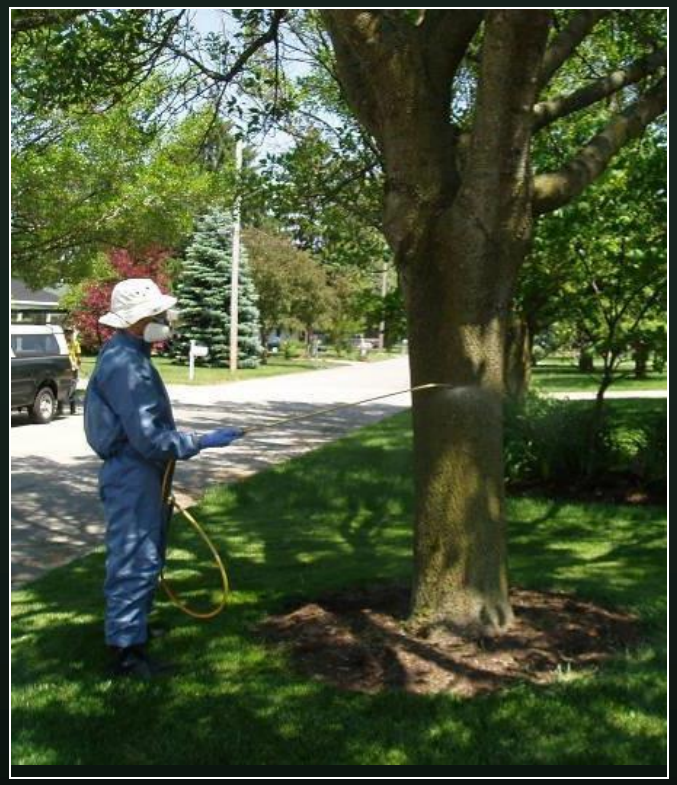


2009

Dr. Dan Herms, The Ohio State University

Safari (Dinotefuran) Trials in Bowling Green

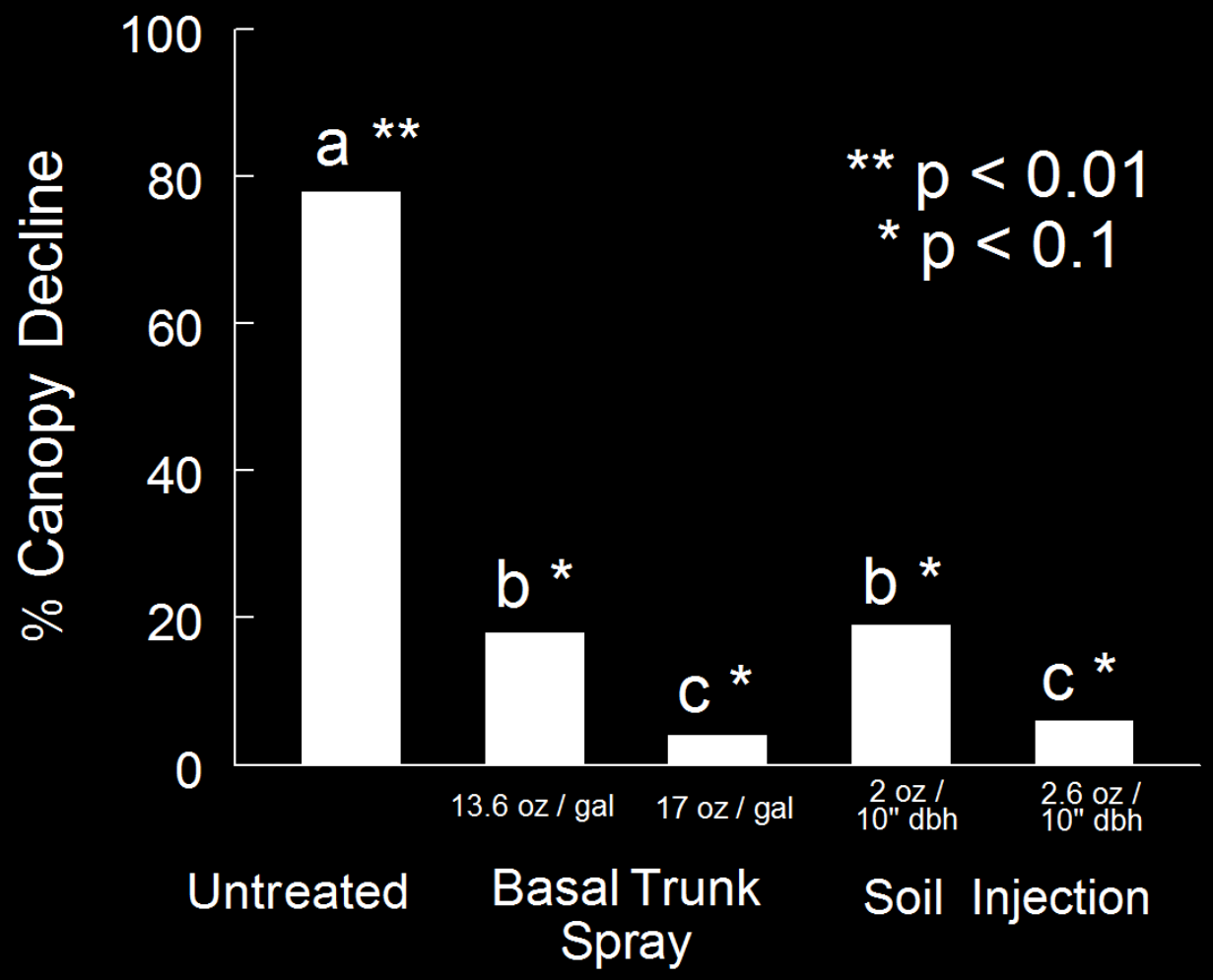
- Basal trunk sprays
- Low volume soil injection



Dr. Dan Herms, The Ohio State University

Dinotefuran (Safari) Treatments for EAB

Treated 2008-2012; evaluated 2013



Dr. Dan Herms, The Ohio State University

Key Conclusions:

1. Insecticides are effective on large trees even under intense pest pressure.
2. Imidacloprid soil drenches most effective on large trees (>15 inch DBH) when applied at the 2X rate.
3. Fall imidacloprid soil drench requires higher rate than spring.
4. Dinotefuran soil and basal bark spray treatments providing good and equivalent control.
5. Emamectin benzoate provides 2 years of control on large trees even at lowest rate.

Other Treatment Options

- Azadirachtin
  - Trunk injection every other year
  - Growing evidence for annual treatments when pressure rises
  - Ongoing research
- Trunk injection of imidacloprid
  - Annual application
- Canopy spray with bifenthrin, permethrin, etc.
  - 2 sprays
  - Targets adults
  - Does not affect larvae in the tree

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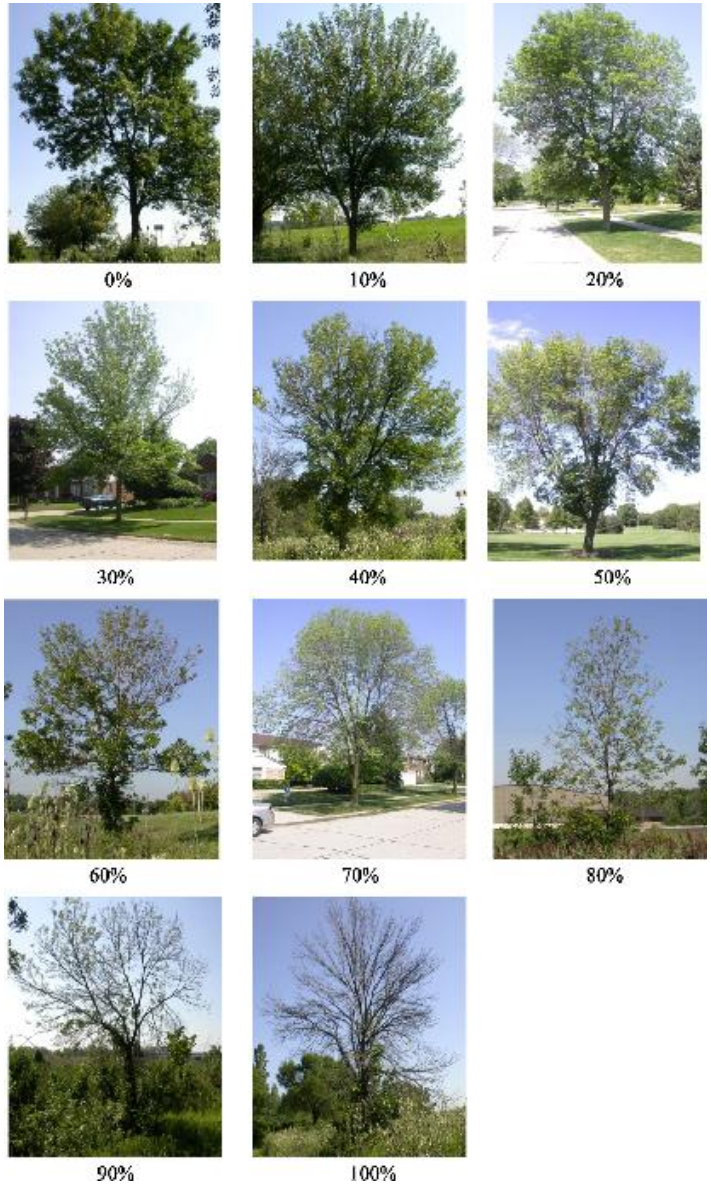
To Treat or Not to Treat?



- Treatments applied beyond 30% thinning are likely to be unsuccessful
  - Note that a tree with 30% thinning still looks pretty good

EAB Biology: Symptoms and Signs
Crown Thinning

- Crown Thinning
  - Dieback follows thinning
- Don’t confuse the amount of dieback with the amount of thinning

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EAB Biology: Symptoms and Signs
Crown Thinning

- It is common to see trees with varying levels of thinning on the same site

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Situations to Consider Treatments

- Mature trees (deliver the most benefits)
- Prominent locations
- Historical value
- Where removal is inefficient
- Urban canopy initiatives
- To stage removals

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EAB Treatment Overview

- Focus on protecting healthy trees
- Set expectations that treatments will be needed for many years.
  - Lapses in treatments may compromise the level of protection/success.
- Trees infested by EAB will decline, get brittle, break apart, and present safety risks.
- Certain infested trees may be candidates for therapeutic treatments, but client expectations must be carefully managed.
  - <u>Prevention is highly preferable.</u>

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4 Management Approaches

Do Nothing - Try to Keep Up with Removals	Proactively Remove All Ash Trees in Community	Use Treatments to Stage Removals	Use Treatments to Preserve Tree Canopy
Advantages:	**Advantages:**	**Advantages:**	**Advantages:**
• Less spending ahead of time	• Done on your schedule	• Spread costs into more years	• No spikes in budget
• Works for low populations	• Costs less than dead trees	• Puts you in control	• Retains tree benefits
Disadvantages:	**Disadvantages:**	• Retain econ/social benefits	• Minimizes liability
• Need capacity to stay on top	• Outcry - live tree removals	**Disadvantages:**	**Disadvantages:**
• Higher liability - dead trees	• Lost economic/social benefit	• Requires ongoing treatments	• Need long term continuity
• $$$$ - high cash cost now	• Are you far enough ahead?	• Still removing live trees	• Remain ash “overstocked”?

DAVEY

Do Nothing

- Detroit
  - Didn't know what hit them
- Urbana, IL
  - Only has 400 ash trees
- Tinley Park, IL
  - No forester on staff
  - 8,000 removals of infested trees
  - $2 - $3M removal and replacement

Do Nothing - Try to Keep Up with Removals
Advantages:
• Less spending ahead of time
• Works for low populations
Disadvantages:
• Need capacity to stay on top
• Higher liability - dead trees
• $$$$ - high cash cost now

DAVEY

Case Study
Fort Wayne, IN

- Discovered in 2006 (~16,000 municipal ash trees)
- By 2011 there were 11,500 ash left
  - About 3,700 removals in 2011
  - About 4,500 removals in 2012
  - About 2,500 removals in 2013
- 10,000 trees treated for 1 year – lost funding
  - Good sense of “what” to do
  - Little support to get traction
- Treating approximately 1,000 trees annually
  - ~95% of the treated trees still remain
- Replacement with an eye for diversity
  - The risk of lawsuits from falling limbs is real

DAVEY

Fort Wayne – Before/After

Photos courtesy of Chad Tinkel,
City of Fort Wayne, IN

DAVEY

Proactive Removals

- Wheaton, IL
  - 5,500 ash trees
  - $3.4M to remove all by 2017
  - Hybrid approach – high pressure
- Minneapolis, MN
  - 8 year plan to remove 40,000 ash
  - Will EAB observe this timeline?

Proactively Remove All Ash Trees in Community
Advantages:
• Done on your schedule
• Costs less than dead trees
Disadvantages:
• Outcry - live tree removals
• Lost economic/social benefit
• Are you far enough ahead?

DAVEY

Stage Removals

- Milwaukee
  - 33,000 ash trees
  - Treatment every other year, phase out ash over 20 years
  - <$100 to treat using City Labor, $700+ to remove and replace
  - Funding from EPA stormwater "bucket"

- "While an added maintenance program and expense, the tree injections prevent the catastrophic loss of 17% of Milwaukee's street tree population over a short period of time and their associated ecological service benefits, including the sudden loss of all trees in residential blocks forested exclusively with ash.
- The tree injections also enable the Forestry Division to continue providing other valued core services such as cyclical pruning, tree planting, boulevard beautification, tree protection, and tree removal while effectively managing public risk accompanying an EAB outbreak."

Use Treatments to Stage Removals
Advantages:
• Spread costs into more years
• Puts you in control
• Retain econ/social benefits
Disadvantages:
• Requires ongoing treatments
• Still removing live trees

DAVEY

Stage Removals

- Schaumburg, IL
  - Preserve 700 high value trees
  - Treat 5,400 to stage removal
  - 5 year phase out planned
- Elgin, IL
  - 6,900 public ash trees (15%)
  - Preserve 2,000
  - Removed 1,400
  - Phase out 3,500 at 500 per year

Use Treatments to Stage Removals
Advantages:
• Spread costs into more years
• Puts you in control
• Retain econ/social benefits
Disadvantages:
• Requires ongoing treatments
• Still removing live trees

DAVEY

Preservation

- Naperville, IL
  - 16,000 ash trees
  - Removed about 2,000
  - Calculated removal and replacement would cost $14M
  - 6 year treatment plan = $4M

Use Treatments to Preserve Tree Canopy
Advantages:
• No spikes in budget
• Retains tree benefits
• Minimizes liability
Disadvantages:
• Need long term continuity
• Remain ash "overstocked"?

DAVEY

Naperville, IL

~17,000 ash trees on city rights of way

- 2008
  - 367 Treated
  - 13 Removed
- 2009
  - 478 Treated
  - 23 Removed
- 2010
  - 835 Treated
  - 68 Removed
- 2011
  - 4,024 Treated
  - 438 Removed
- 2012
  - 15,972 Treated
  - 705 Removed
- 2013
  - 12,865 Treated
  - 759 Removed
- 2014
  - 12,851 Treated
  - 150 Removed

DAVEY

Economics of Treatment vs. Removal

- The cost of EAB treatments can be considerable for a community.
- Treatments make economic sense in some cases and should be considered while developing a management plan.

DAVEY

Cost/Benefits of Treating or Removing Ash Trees
Municipal Example

Cost for treating a Mature ash tree over 22 years:

Cost of Imidacloprid for Legacy size tree per year: **$45/year**

x 22 years

Total cost: **$990**

Cost for removing and replacing a Mature ash tree over 22 years:

Average removal, disposal, and stump grinding of Legacy size ash tree: **$495**

Replacement, replanting, and 22 years of care and maintenance: + **$200**

Total cost: **$695**

Maximum benefit to urban forest

DAVEY

extension.entm.purdue.edu/treecomputer/index.php?page=comparator/master.php

For quick access, place your bookmarks here on the bookmarks bar. Import bookmarks now... Other bookmarks

EXTENSION ENTOMOLOGY | EAB IN INDIANA

Emerald Ash Borer Cost Calculator

PURDUE UNIVERSITY

- Instructions
- Forests
- Input
- Comparisons
- About EAB Calculator
- Contact Us
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You're using **Chrome 15** on Windows.

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Welcome **Grant Jones** (logout)

Active Forest: **Demo**

Print

Option 1	Option 2	Option 3
Remove All	Remove All	Remove All
Replace All	Replace All	Replace All
Treat All	Treat All	Treat All
Remove >12	Remove >12	Remove
Replace >12	Replace >12	Replace
Replace <12	Replace <12	Replace
Replace <6 and >12	Replace <6 and >12	Replace
Replace <24	Replace <24	Replace

Plan Matrix

Size Span	# of Trees	Remove	Replace	Treat	Total
1 - 3	354	50 %	50 %	0 %	100%
3 - 6	376	50 %	50 %	0 %	100%
6 - 12	522	25 %	50 %	25 %	100%
12 - 18	322	10 %	45 %	45 %	100%
18 - 24	152	10 %	35 %	55 %	100%
24 - 30	51	10 %	25 %	65 %	100%
30 -	22	10 %	15 %	75 %	100%

Save Changes

UW-Stevens Point Model

- Modeled costs and benefits for:
  1) Removing all ash as they died
  2) Removing all ash as they died and replacing
  3) Treating all ash
- Study modeled for 20 years into future
- Benefit to Cost Analysis

DAVEY

VanNatta, A.R., N.M. Schuettpelz, and R.H. Hauer[1]. 2010. Cost Analysis of Removal and Replacement vs. Treatment of Ash Trees Susceptible to Emerald Ash Borer (*Agrilus planipennis*) on the UW-Stevens Point Campus. Proceedings of the International Society of Arboriculture 86th Annual Conference. Chicago, IL, July 23 – 28, 2010. [1]College of Natural Resources, University of Wisconsin–Stevens Point

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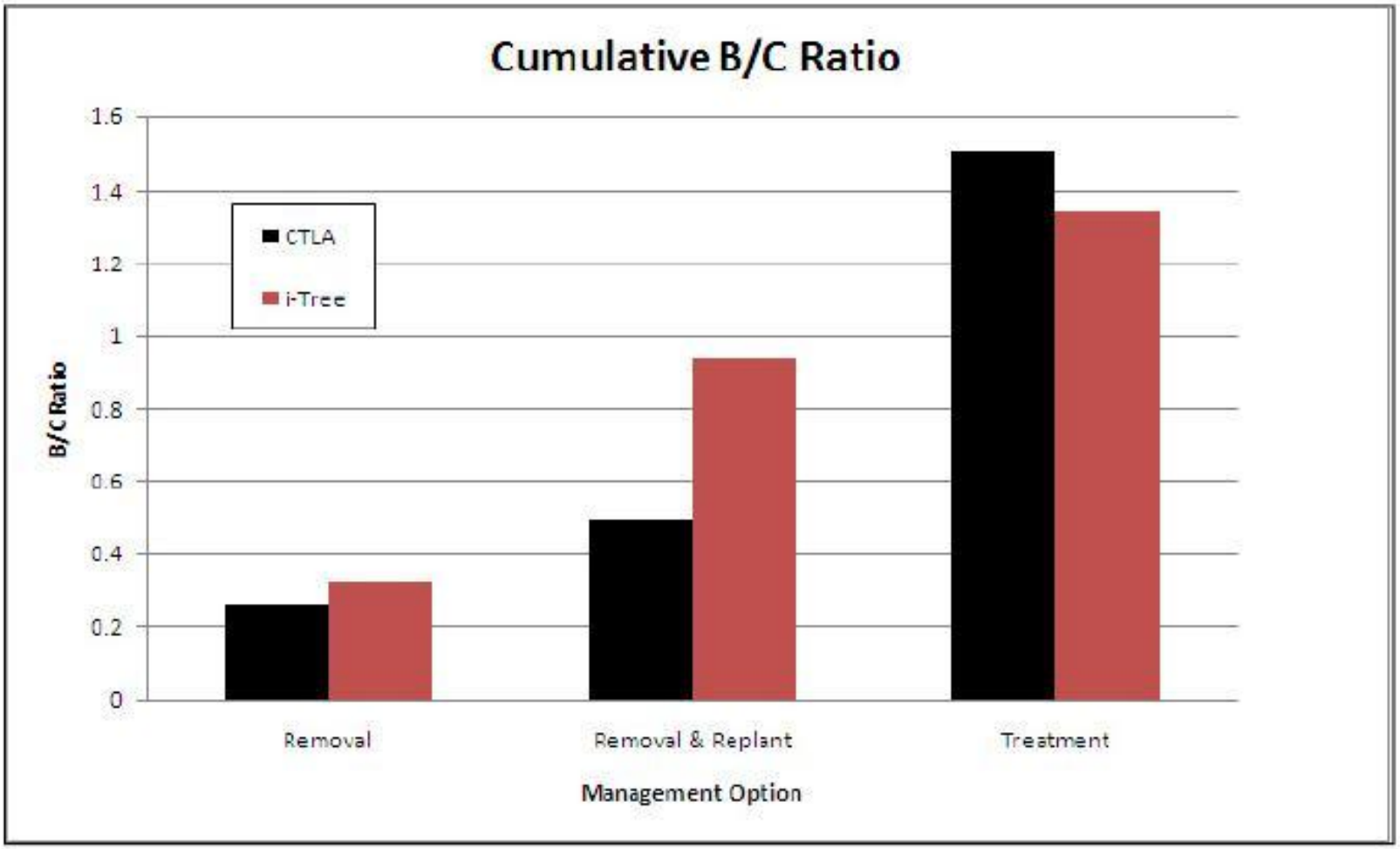
Figure 5. Cumulative results over 20 years of cost/benefit comparison of CTLA and i-Tree Streets valuation approaches over a 20 year time period for preemptive removal, preemptive removal and replacement, and treatment compared to doing nothing.

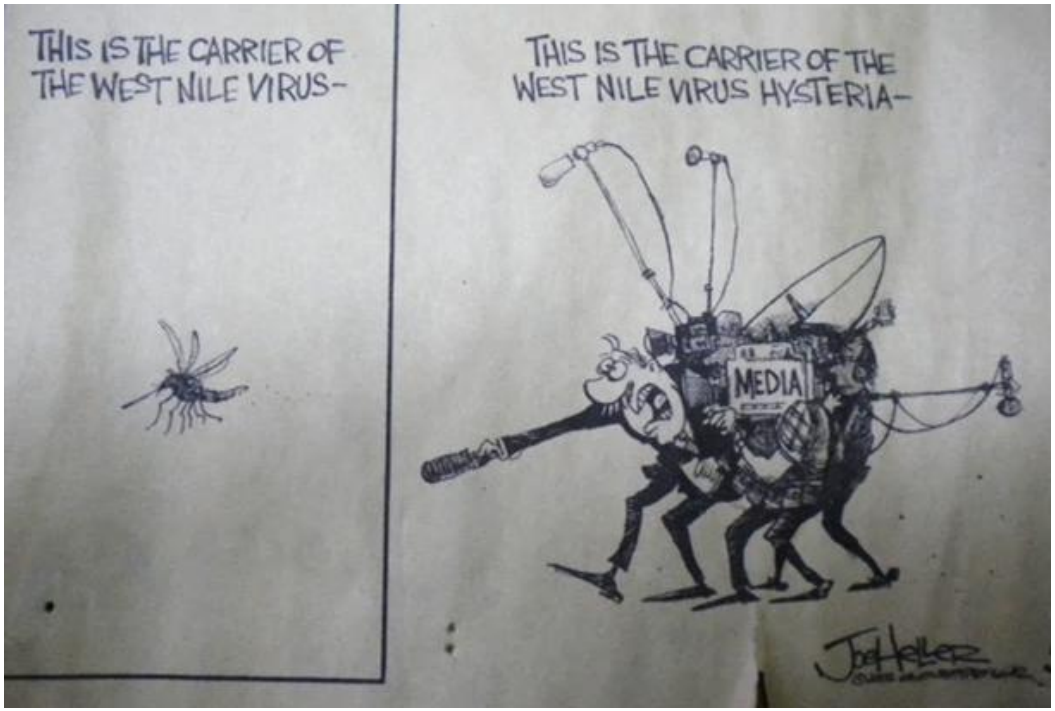


UW Stevens Point - 2010

- “Our analysis found that treatment provided the best value when compared to the control scenario versus the replace & remove option.
- The results of this study show that the removal and remove & replace approaches, although seemingly logical, provides less value to the urban forest over a 20 year period.
- By prolonging the life of large mature ash trees, you receive exponentially greater benefits through aesthetics, energy savings and ecological improvement than you will from small newly planted trees.”

DAVEY

EAB Management: Social Aspects
Media Considerations



- Why do we care about this?
  - Negative messages
    - cut them all down
  - Wrong messages
    - nothing can be done
    - one borer will kill the tree
  - Old messages
    - eradication
    - clear cuts
  - All of these get in our way and confuse us and our clients into inaction

DAVEY

EAB Management: Social Aspects
Client Service Considerations

- Why do we care about this?
  - Our clients provide the mouthpiece for what they are hearing
    - Do they express hope?
    - Are they resigned that all is lost?
  - Client perceptions can make our job easier or more difficult
- Offering options they may not be aware of or tailored to their specific needs may solve the problem.

DAVEY

Chicago EAB History - 2006

- Discovered in June of 2006
  - Found ~15-20 infested trees in a Far West suburb
    - State contemplated a large clear cut
  - Month later: Found in 2 Near North suburbs
  - Trap Tree study initiated
  - Found other infested suburbs
  - Arborist mass marketing mailings not well received by State
- Very High Media Interest
- Not sure what would happen

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Chicago EAB History - 2007

- More infestations found
  - Outside original planned clear-cut zone
  - Other distant communities infested
- Lots of media interest
- State recommends 15 mile treatment radius
- TCOT: Began “quietly” making soil applications of imidacloprid

thecareoftrees.

Chicago EAB History - 2008

- EAB popping up everywhere
- Emamectin benzoate begins getting press “silver bullet”
  - 4 different rates
  - Multiple application techniques
  - Confusing
- Media still following new finds

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Chicago EAB History - 2012

- Ash disappearing in some communities
  - Major impact in most communities
  - Just beginning in others
- Local media providing updates
- Economics of EAB is a prevalent concept

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What Have We Learned About…

- Education
  - Of public officials, decision makers, private citizens
- Survey/Detection
- Inventory/Assessment
  - Define the scope of problem
  - Establish an economic conversation
- Management Plan/Decision Making
- Treatments
  - To save trees
  - To stage removals for later budget cycles
- **Removals**
- Wood Utilization
- Replacement

DAVEY

Removals

- Can we eradicate EAB with removal strategy?
- How fine to grind?
- Transport?
- Quarantines?

Removals

- Heavily stocked? Hard to keep up…

DAVEY

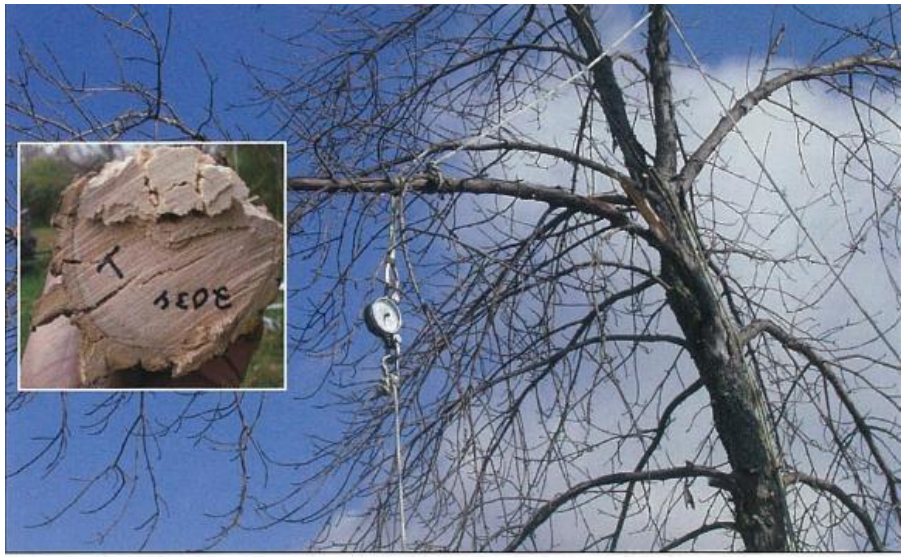
Case Study
Village of Algonquin, IL

- Decision made to not treat any street trees
- (~4,200 parkway ash trees)
  - EAB discovered in 2008
    - 2008: 44 trees removed
    - 2009: 116 removed
    - 2010: 739 removed
    - 2011: 1200 removed
    - 2012/13: ~1600 removed
    - 2014 ~500 left

DAVEY

Removals - EAB and Wood Strength

Moisture levels in EAB infested trees are lower and wood in those trees, upon breaking, has significantly more cracking.



Load was applied by pulling down on the branch with a "load" rope that was attached to a dynamometer. Inset: Cracking evidence in a test branch. Images courtesy of Davey Tree Expert Company.

- Moisture content in EAB infested trees was lower than healthy trees
- EAB trees had more wood cracking
- Limbs from EAB trees failed close to the branch union

DAVEY

EAB and Wood Strength

- EAB infested trees are losing strength even if no other visual hazards are apparent.
- Take extra care if bark is sloughing off
- Make sure tie-in branches can support the climbers load.

DAVEY

- Inspect each tree canopy, trunk and root flare. Look for buds or signs of life when judging canopy dieback.
- EAB activity decreases ash wood moisture levels and wood strength thereby increasing risk
- **When climbing trees with canopy life the minimum crotch diameter used must be no less than 3 inches diameter, with rope tied-in around the parent (main) stem or leader.**

  Note: Larger longer branches have more weight and may not mean safer branches
- Do not shock load any tree that has had EAB activity greater than 1-2 years even if tree appears sound.
- Upper branches in the tree canopy are most susceptible to branch breakage after an EAB infestation of 1-2 years.
- Standing dead ash trees (with more than 2/3 canopy dieback) should be removed by bucket truck or crane methods; or where site conditions will allow, by whole tree felling method.

Inspect each tree prior to entry or work. Carefully assess the base for signs of bark sloughing and lower branches for brittleness. Risk increases as you ascend the canopy!

Do Not Climb If No Canopy Life Is Present!

Emerald Ash Borer

DAVEY
The Davey Institute

How Did We Get Here?

- Dutch elm disease led to American elms being replaced by:
  - Species tolerant of urban conditions
  - Readily available
  - “Pest- or Problem-Free”
    - Ash
    - Honeylocust
    - Norway Maple
    - Silver Maple
    - Littleleaf Linden

DAVEY

Importance of Diversity

- Incidence of boring insects is increasing
- EAB only attacks ash (Fraxinus spp.)
- Asian longhorned beetle attacks at least 11 different genera
- Increased tree diversity reduces or hedges the potential impact of a pest

DAVEY

Species Diversity Guidelines

- 10% of a single species, 20% of a single genus, & 30% of a single family (Santamour, 1990)
- No more than 10-15% of a single species (Gerhold & Porter, 2000)
- No more than 5% of a single species, 10% of the same genus (Moll, 1989)
- Bottom Line:
  - Create a **diverse** tree population!

DAVEY

What to do with this info?

- Ask yourself a series of questions:
  - How many ash do I have?
  - When EAB is “all over with”, what do you want to be left with?
  - Do I have community canopy initiatives?
  - What does the public want?
  - What is the motivation of the Council? Mayor? CFO?
- Your goals drive your decision making
- Your place on the curve drives decision making
  - The further along the curve, the fewer choices

DAVEY

Words of Wisdom

- Different stakeholders have different goals
  - A state forester with hundreds of millions of trees will approach this issue differently than a private company taking care of individual trees.
  - One size does <u>not</u> fit all…
- The media can lose interest in EAB stories long before the worst of the problem
  - How will <u>you</u> keep educating the public?
- For municipalities and ash population managers, there will be significant costs regardless of what your plan looks like.
  - Get the finance people involved early.

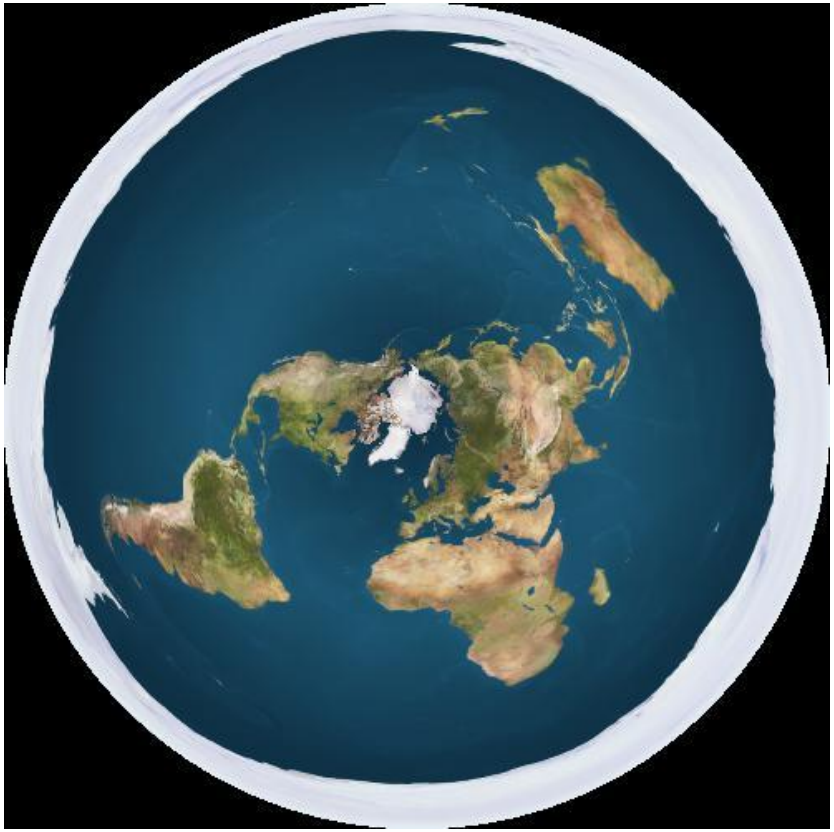
DAVEY

Words of Wisdom

- The more “tools” you can use to manage EAB the more pain you can avoid.
- Common words from the hardest hit areas:
  - “I would have started sooner…”

DAVEY

Our Knowledge is Evolving



james.zwack@davey.com