The Cost of NOT Maintaining Trees

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College of Natural Resources
University of Wisconsin-Stevens Point

1

What is your favorite tree?

2

If there were no humans, would trees have value?

3

What is the Value of Urban Trees?

Photo from Mark Stennes, Victory Memorial Parkway, Minneapolis, MN USA

Depends: size, location, condition, species

4

i-Tree Results

Relatively easy way to quantify urban forest values

5

A Benefit – Cost Summary

Stevens Point UWSP Campus Urban Forest

Total Annual Benefits, Net Benefits, and Costs for Public Trees

11/13/2012

Benefits	Total ($) Standard Error	$/tree Standard Error	$/capita Standard Error
Energy	25,464 (N/A)	12.84 (N/A)	0.00 (N/A)
CO2	3,979 (N/A)	2.01 (N/A)	0.00 (N/A)
Air Quality	5,062 (N/A)	2.55 (N/A)	0.00 (N/A)
Stormwater	35,736 (N/A)	18.02 (N/A)	0.00 (N/A)
Aesthetic/Other	25,770 (N/A)	13.00 (N/A)	0.00 (N/A)
Total Benefits	96,011 (N/A)	48.42 (N/A)	0.00 (N/A)
Costs			
Planting	8,000	4.03	0.00
Contract Pruning	2,000	1.01	0.00
Pest Management	100	0.05	0.00
Irrigation	3,000	1.51	0.00
Removal	3,000	1.51	0.00
Administration	10,000	5.04	0.00
Inspection/Service	0	0.00	0.00
Infrastructure Repairs	12,000	6.05	0.00
Litter Clean-up	4,000	2.02	0.00
Liability/Claims	0	0.00	0.00
Other Costs	10,000	5.04	0.00
Total Costs	52,100	26.27	0.00
Net Benefits	43,911 (N/A)	22.14 (N/A)	0.00 (N/A)
Benefit-cost ratio	1.84 (N/A)		

Annual B's & C's and B/C … per capita and per tree

6

Just What is the Value of a Tree?

Many Ways to Measure

7

What is the Value of Urban Trees?

Just ask the NYC Central Park Users

8

What is the Value of Urban Trees?

Just ask the NYC Central Park Users

9

Hypothesis: Can Donald Trump Buy Central Park?

Just ask him

10

Value of Donald Trump

Forbes gave Donald Trump's net worth a $5.5 billion haircut

Published: Sept 30, 2015 9:56 a.m. ET

I am worth 10 billion USD

Hypothesis: Can Donald Trump Buy Central Park?

11

Land Value Manhattan

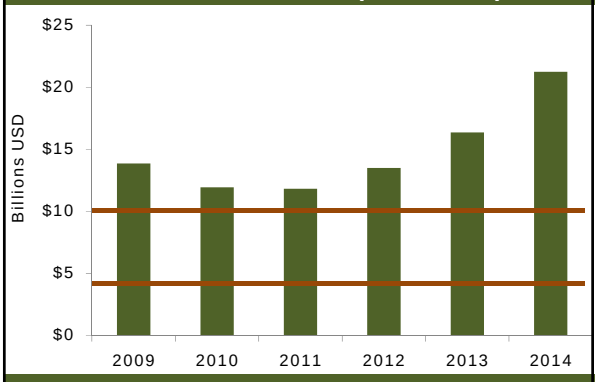
Priciest NYC Neighborhood by Square Foot? It's Central Park South

Manhattan Luxury-Condo Glut Ends Developer Rush for Land Deals ...
https://www.bloomberg.com/.../manhattan-luxury-condo-glut-ends-devel...
Aug 4, 2016 - Manhattan Luxury-Condo Glut Ends Developer Rush for Land Deals .... That price equates to about $1,138 per buildable square foot, making it ...

What is he worth & what is Central Park worth?

12

Estimated Central Park Value ($ USD total)



Conclusion: No Trump Can Not Afford Central Park

13

What is the Value of Urban Trees?

Just ask the bike owner

14

Urban Tree Value … Can be Negative

Depends: age, location, condition, species

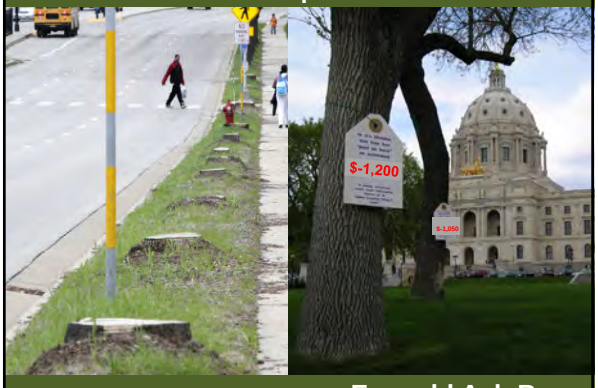
15

Urban Tree Value … Can be Negative

Just ask the person living by el stinkgo ginkgo

16

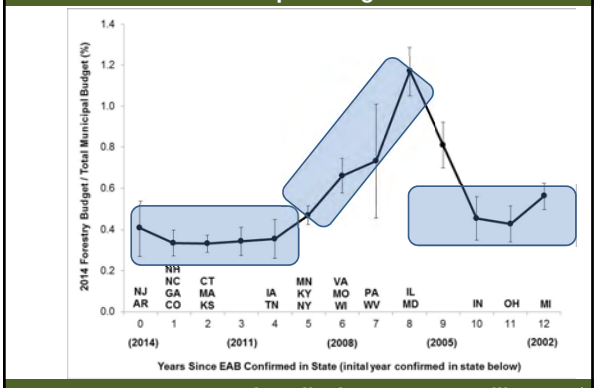
An Urban Forest … Response to



Emerald Ash Borer

17

Effect of EAB on Municipal Budgets



EAB Management Works, Like it or not EAB will costs $

18

The Urban Forest Ledger Sheet

- **Benefits** (Social, Ecological, Economic)
- Urban Trees **Appreciate** in **Value** Over **Time**
- **Liabilities** (Litter, Blocked View, Maintenance)

Benefits – Liabilities = Net Benefits

19

Just What is the Value of a Tree?

Hedonic Pricing

Contingent Valuation

Willingness to Pay

Real Estate Value

Ecosystem Services

Benefits

Costs

Money Value Time

Many Ways to Measure

20

Literature Review: Benefit and Cost of Trees

- Collected and read ~**400** articles
- **~150** within arboriculture/urban forestry deemed "useful" and "relevant" (incl. utility management literature)
- **95** discussed economic costs
  - **65** of these actually calculated costs (others inferred)

CONTINUING EDUCATION UNIT

The Cost of Not Maintaining the Urban Forest

By Richard J. Hauer, Jessica M. Vogt, and Burnell C. Fischer

Audio

21

Literature Review: Benefit and Cost of Trees

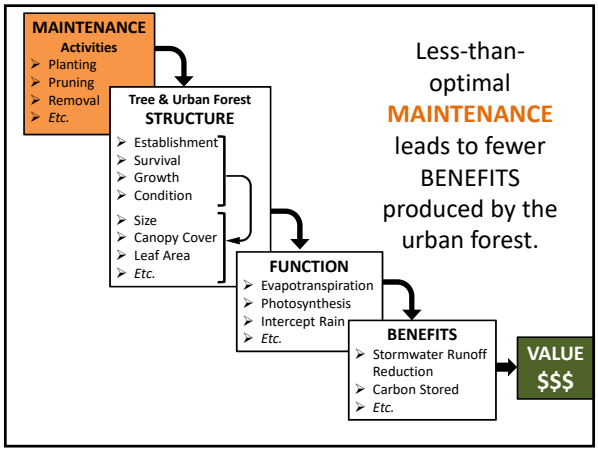
Arboriculture & Urban Forestry 41(6): November 2015 293

Arboriculture & Urban Forestry 2015. 41(6): 293–323

The Costs of Maintaining and Not Maintaining the Urban Forest: A Review of the Urban Forestry and Arboriculture Literature

Jess Vogt, Richard J. Hauer, and Burnell C. Fischer

22



23

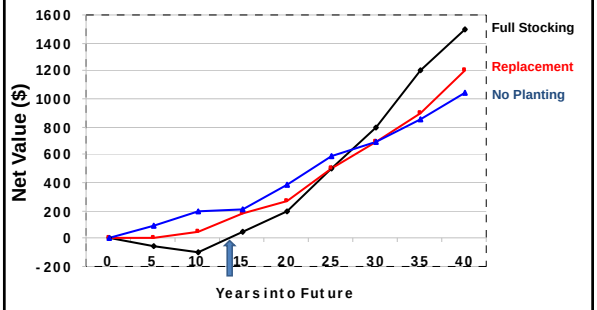
Benefits of Trees … Benefit of Time

- **Years before benefits = costs of tree planting?**
  - **Public housing sites** — 9 years
  - **Yard/street trees** — 13-14 years
  - **Parks & highways** — 15 years
- **All sites Chicago region** (McPherson 1993, GTR NE-186)

Tree payback … break even time in different locations

24

Net Tree Value = Tree Value (CTLA) – Management Costs



Liability of not planting trees

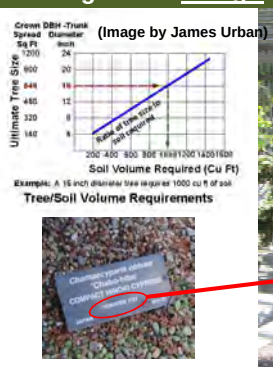
25

Costs of No Site Evaluation

The Life of a Tree Depends on …

26

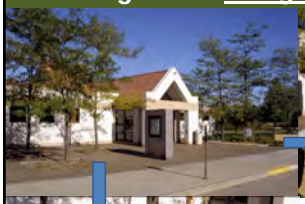
Selecting Trees: *Design* for *Final Size*



Restricted Planting Sites, Try Small Stature Trees

27

Selecting Trees: *Design* for *Decline*



In this corner …

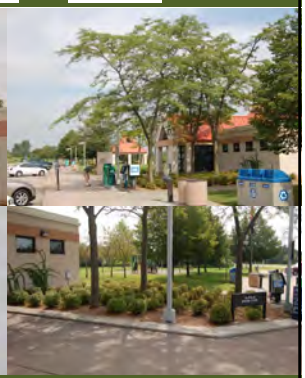
Pit versus Bed

Green versus Grey

Trees planted ~ 1988 and look similar in 1998

28

Selecting Trees: *Design* for *Decline*

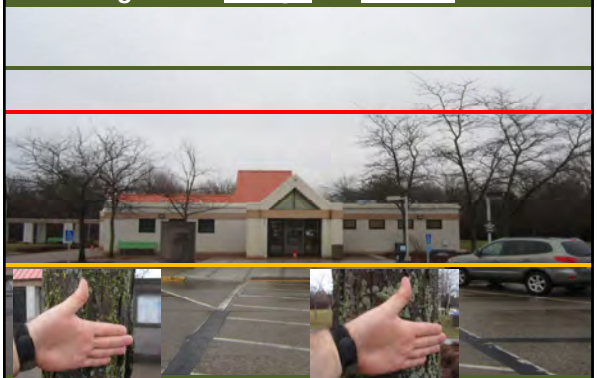


De-energized in 2010

Still Energized in 2010

29

Selecting Trees: *Design* for *Decline*



De-energized in 2016

Still Energized in 2016

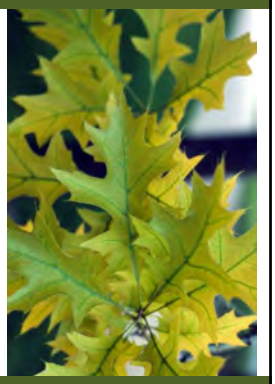
30

Selecting Trees: *Design* for *Decline*

Trees planted ~ 1975 and relatively healthy in 2018

31

Soil Chemical Properties



A Tree Litmus Test, Foliar Chlorosis

32

Planting a Tree

Nothing to it, Right?

33

Non Apparent | Norway Maple Decline | Initial Decline

Abiotic stress often leads to biotic failure

34

Moderate | Norway Maple Decline | Advanced

Abiotic stress often leads to biotic failure

35

The Root of the Cause: Stem Girdling Roots (SGR's)

Sugar maple with 100% SGR's with decline evident

36

How Soon Can SGR's Form?

Little leaf linden 1 year after planting 10 inches deep.

37

How Soon Can SGR's Form?

Freeman maple 4 years after planting 6 inches deep.

38

Plant Part Grafting Commonly Occurs in Nature

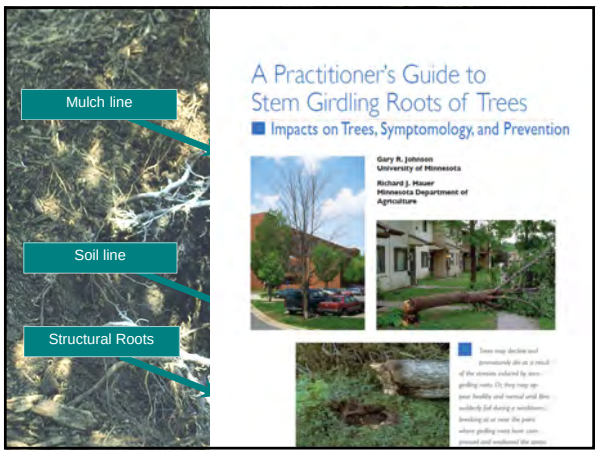
Root and stem tissue do not graft!

39

Planted Tree: Just when they are getting big

Stem Girdling Roots

40



41

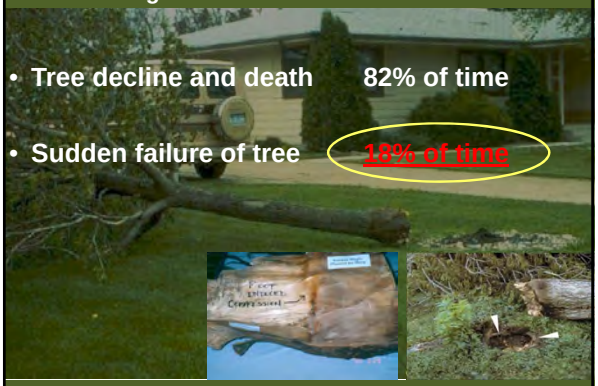
Storms of 1998 and Tree Failures'

- 73% of Little leaf linden's
- **18% of all tree failures**
- 30% of all tree failures outside of storm center's
- 50% of trees in 6 to 10" DBH with SGR's

Trees Planted to Deep and SGR's

42

Stem Girdling Roots and Tree Loss



What practitioners said in 1997 Survey

43

Economic Impact of Deep Root Systems and SGR's

- 125,000 X 18% = 22,250 trees lost
- 22,500 X $500 = $11 Million
  Preventable Loss
  Tree Value Only

and estimated 125,000 lost: the Storms of 1998 in MN

44

Moving the Tree into the Street

Bumper Guard Needed? (Uppsala, Sweden)

45

Moving the Tree into the Street

Modern Tree Selection Bumper Guard (Uppsala, Sweden)

46

Moving the Tree into the Street

Trees + People = Urban Forest (Horb, Germany)

47

Moving the Tree into the Street

Trees + People = Urban Forest (Melbourne, Australia)

48

Moving the Tree into the Street

Trees + People = Urban Forest (Melbourne, Australia)

49

Moving the Tree into the Street 2.0

Bumper Tree Guard (Melbourne, Australia)

50

Silva Cells

Soil volume
H2O storage
Drivable final surface possible

Suitable Tree Growth Site is Value Added

51

It's Planted, See You in a 100 years

I Hope!

52

Establishment: Don't set it and forget it

I am a chicken I am a tree

53

Importance of Water

Explains 80 to 90% of Plant Growth

54

Transplant Shock … Establishment Indicators

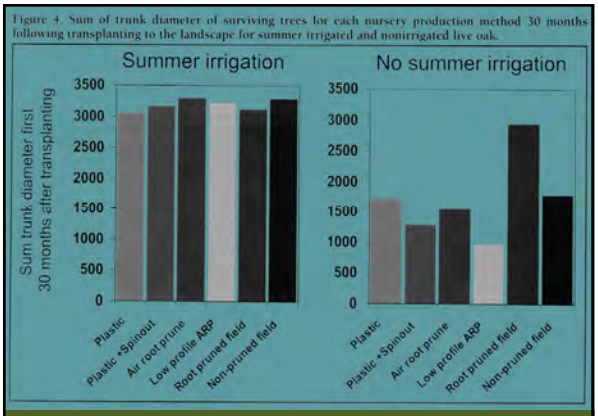
Allocation of Resources (Smaller Foliage & Reduced Shoot Growth)

55

Establishment: Water Deficits, Sunscald and Borers

What came first the chicken or the sunscald?

56



Proper watering, better growth Gilman (2001) J. Arbor.

57

Establishment: Water & Economics 101 (Gilman J. Arbor 2001)

	Number of Trees		Percent
Treatment	Planted	Dead	Survival
Plastic container	14	6	57
Plastic container with SpinOut	14	8	43
Air root-pruning (ARP)	14	7	50
Low-profile ARP container	14	10	29
Root-pruned, field-grown B&B	14	0	100
Non-root-pruned, field-grown B&B	14	4	71

	Cost per live tree		
Treatment	Irrigation	No Irrigation	Savings
Plastic container	445	588	143
Plastic container with SpinOut	445	784	339
Air root-pruning (ARP)	445	672	227
Low-profile ARP container	445	1,176	731
Root-pruned, field-grown B&B	383	274	-109
Non-root-pruned, field-grown B&B	383	383	0

58

Establishment: Weed whips, killing trees since 1972

Inventor George Ballas envisioned no damage to tree bark

59

Establishment: Mulching Dosage and Spread

The more is not always the merrier

60

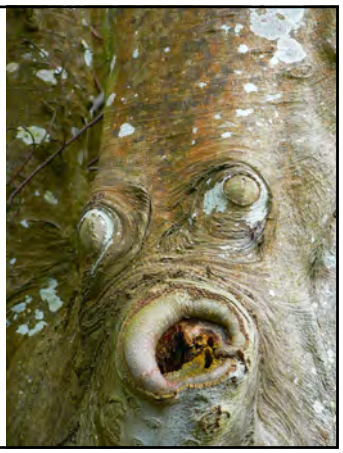
Establishment: Mulching

Dose and dispersal appropriate mulching

61

Pruning Trees

Is it Really Needed?



62

Formative Pruning … Structural Pruning … Training

Pruning a necessary part of tree structure and health

63

Maturing: Now which limb to remove?

Included Bark

What will the tree look like, how will it respond?

64

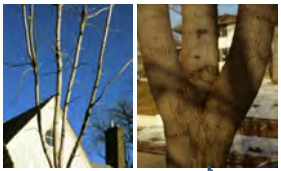
Maturing: Where to Prune

Hackberry and decay from included bark

65

Costs of Formative Pruning

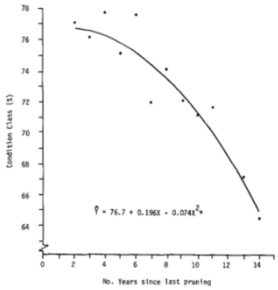
- Ryder and Moore 2013
- **$2.79** (AUD) **Formative** pruning new tree
- **$44.59** (AUD) **Structural** prune mature tree
- **~15 times less costly to structural prune**



Pruning a necessary part of tree structure and health

66

Costs of Pruning



*Sig. (.005)

Fig. 1. Relationship between average tree condition class

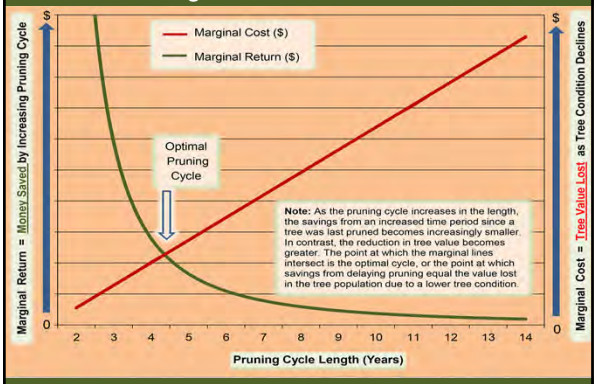
- Miller & Sylvester (1981) – "An economic evaluation of the pruning cycle"
- Municipal trees in Milwaukee, WI
- More years since last pruning → lower condition class rating

Miller & Sylvester 1981

Pruning a necessary part of tree structure and health

67

Costs of Pruning



Pruning a necessary part of tree structure and health

68

Costs of Utility Pruning

Utility line pruning: Costs of *not* pruning = power outages, lost service billing time, repair costs, more pruning later

Browning & Wiant (1997) – "The economic impacts of deferring electric utility tree maintenance"

- Defer $1 of routine maintenance, more than $1 must be spent later to make up.

Table 3. Projected impact of deferred maintenance on the average cost of pruning trees for line clearance.

Utility	Length of Optimum Line Clearance Cycle	Relative Cost* To Prune Trees At A Site That Is: At The Conductor**	1-Yr. Past Optimum	2 Yrs. Past Optimum	3 Yrs. Past Optimum	4 Yrs. Past Optimum
A	5 Years	$1	$1.23	$1.43	$1.59	$1.69
B	5 Years	$1	$1.21	$1.39	$1.53	$1.64
C	6 Years	$1	$1.16	$1.30	$1.40	$1.47

* Excludes an adjustment for inflation.
** Optimum time is based on the industry standard of 10-15% maximum tree-to-conductor contact, referenced in this table as "At The Conductor".

Pruning a necessary part of power transmission

69

Trees Need a Buddy (Ginkgo)

Trees often grow near a neighbor (Washington D.C.)

70

Trees Need a Buddy (London Plane Tree)

Trees often grow near a neighbor (Melbourne, Australia)

71

Local Citizen Advocacy Tree Protection

Chiang Mai, Thailand

72

Trees, Construction & Infrastructure

73

Must Be an Act of … August 1978

Just Simple Physics, Root Pruning Gone Bad

74

Meet the "Tree Cop" Jim Kringer

Wisconsin Urban & Community Forests

Volume 12 Number 2 Summer 2004

Hired 1981

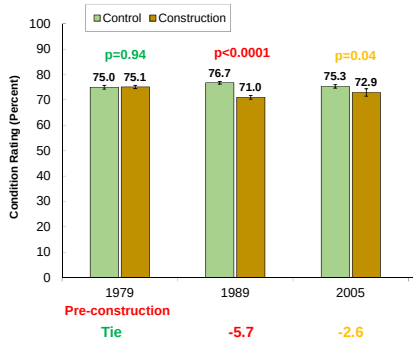
~ two years learn to speak contractor

~ mid 1980's program in place

Did a Tree Preservation Program Pay Dividends?

75

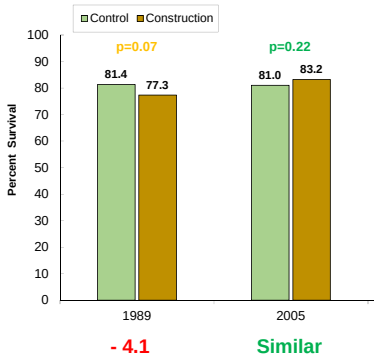
Percent Tree Condition 1979, 1989, 2005, 2018



Did a Tree Preservation Program Pay Dividends?

76

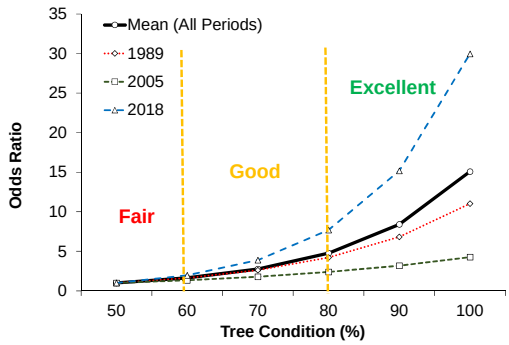
Percent Tree Survival Since 1989



Did a Tree Preservation Program Pay Dividends?

77

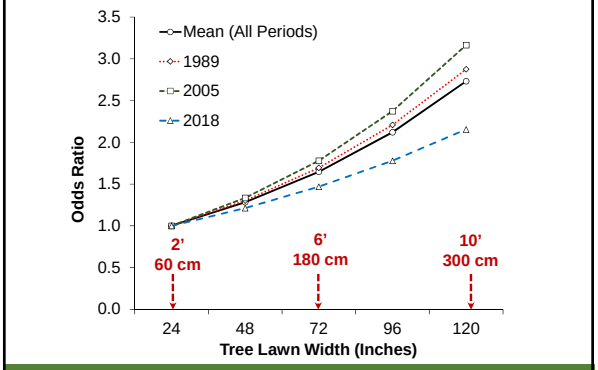
Odds of Tree Survival: Preexisting Condition



Compared to a Base Level 50% Condition Tree

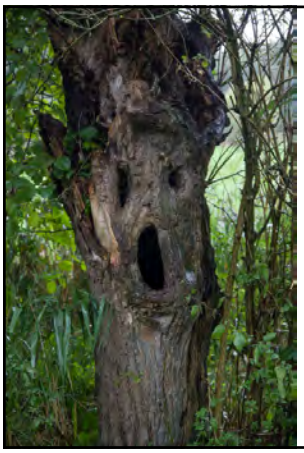
78

Odds of Tree Survival: Terrace Width



Compared to a Base Level 60 cm (24 in) Tree Lawn

79



Costs of a Major Disease:

The Dutch Elm Disease Case Study

Pays for Itself & Much More

80

Minnesota neighborhood before trees lost to Dutch elm disease. (MPRB)

81

Same neighborhood after trees lost to Dutch elm disease. (MPRB)

82

American Elm (*Ulmus americana*): The Tolerant One

Alberta, Canada Still DED Free

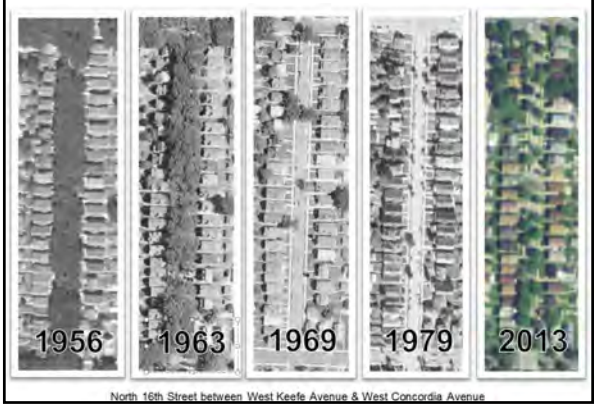
83

English Elm (*Ulmus procera*): The Tolerant One

Australia Still DED Free

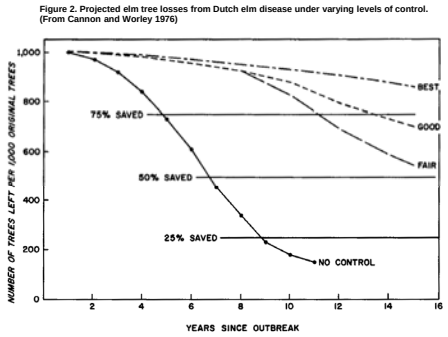
84

A Lost Generation ~ 40 to 50 years to recover



85

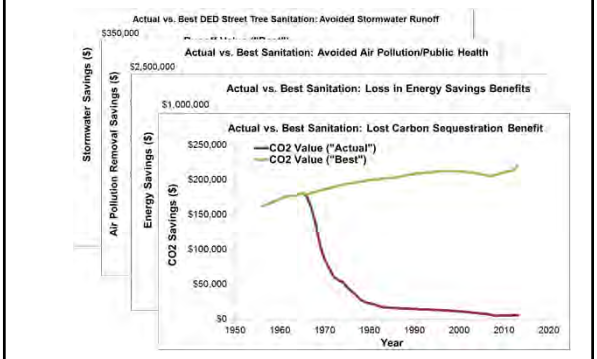
Whether You Like it or Not, DED Will Cost You Money



How much will it cost? A DED Example circa 1970's

86

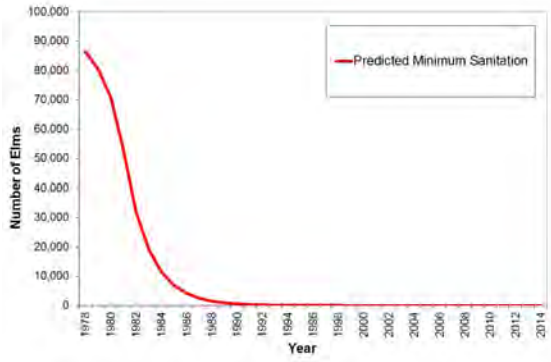
Ecosystem Service Types: Actual vs. "Best"



And wait if you act now…

87

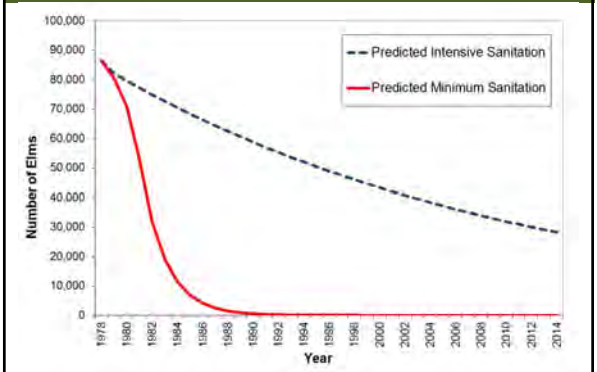
Ulmus americana (American elm)



Dutch elm disease (*Ophiostoma ulmi*) in Minneapolis

88

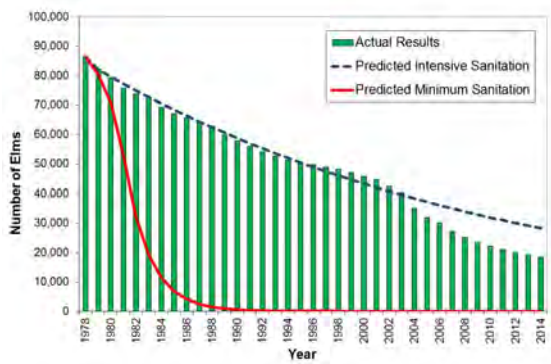
Ulmus americana (American elm)



Dutch elm disease (*Ophiostoma ulmi*) in Minneapolis

89

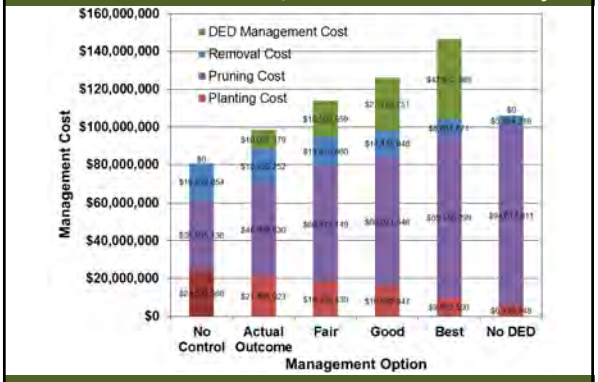
Ulmus americana (American elm)



Dutch elm disease (*Ophiostoma ulmi*) in Minneapolis

90

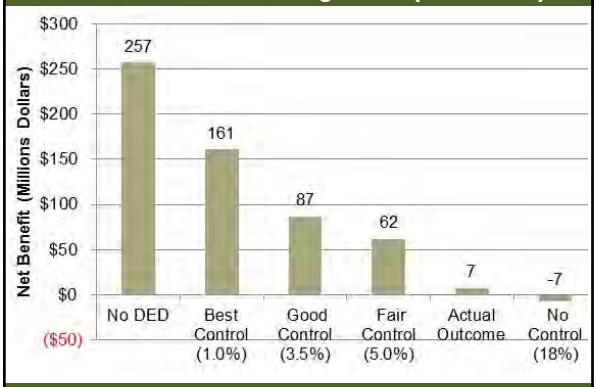
Whether You Like it or Not, DED Will Cost You Money



Modeled Outcomes for Milwaukee WI

91

NPV and B/C of DED Management (i-Tree Eco)



Comparison Study Milwaukee, WI USA

92

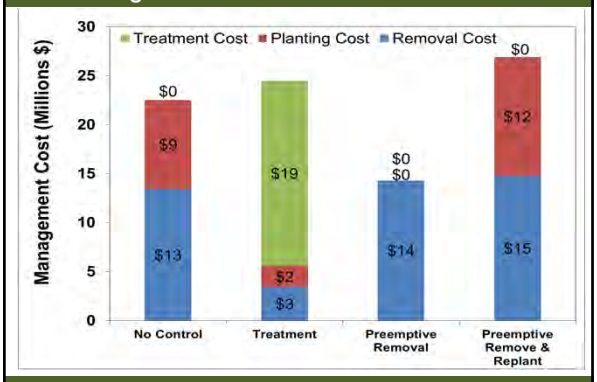
Costs of a Major Insect:

The Emerald Ash Borer Case Study

Pays for Itself & Much More

93

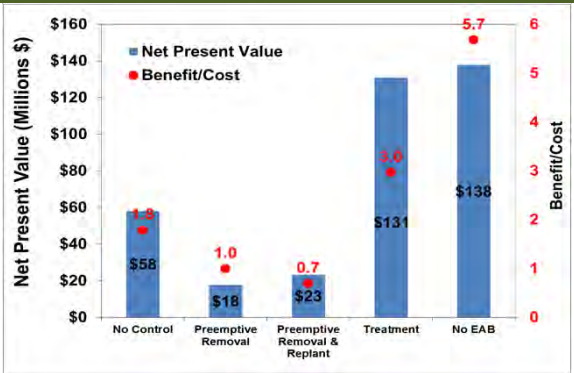
EAB Management Costs



Milwaukee, WI,USA

94

EAB Management: Net Benefit



Milwaukee, WI,USA

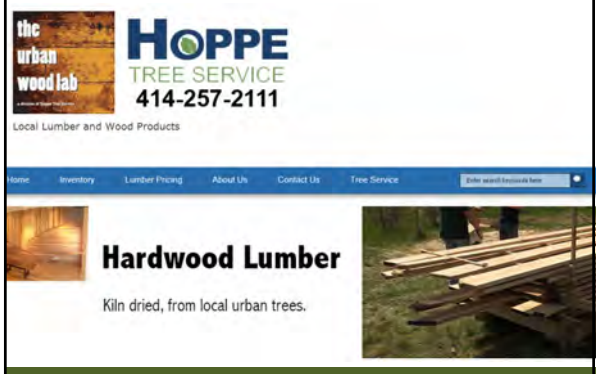
95

Trees & Wood Products

Repurposing

96

Urban Forest Wood Products



Existing and Building Companies

97

Urban Forest Wood Products

WISCONSIN URBAN WOOD™

Building a Brand … A Public & Private Venture

98

Urban Forest Wood Products

WOOD FROM THE HOOD
Reclaiming Wood From Your Neighborhood

Building a Brand … Private Ventures

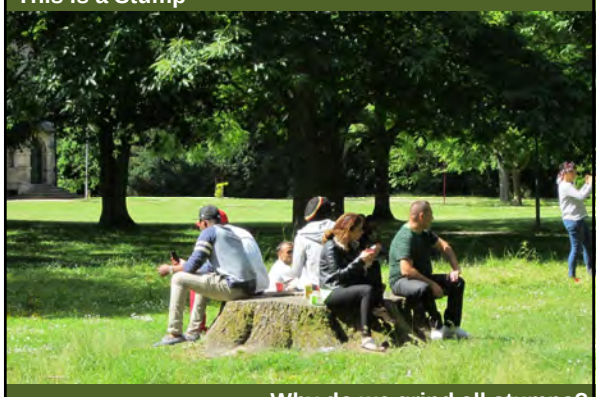
99

This is a Stump

Why do we grind all stumps?

100

This is a Stump



Why do we grind all stumps?

101

Stop

and Enjoy

the Day

102