

i-TREE Pest Detection

Massachusetts Tree Warden and Foresters Association

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Pests, Signs, and Symptoms

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Topics for Today

- ▶ i-Tree Pest Detection Rationale
- ▶ Examining the tree
- ▶ Pest Detection Protocol
- ▶ Reporting



i-Tree Pest Detection RATIONALE

- ▶ Pest detection is based upon careful observation of signs and symptoms
- ▶ Signs are the presence of an insect or disease
- ▶ Symptoms are a plants response or the effect of a pest or other problem
- ▶ Detection not necessarily diagnosis



Examples of signs



Examples of symptoms



Examining the tree

- ▶ The pest detection protocol is based upon a methodical examination of the tree



Tree
Stress
Overall
condition
of tree



Foliage
and
Twigs

Large
Branches,
Bole and
Root
Collar

International Society of Arboriculture, Bugwood.org



<http://wiki.bugwood.org/IPED>

Welcome to the IPED on-line resources

a wiki guide for **US Forest Service's** Urban Forest Pest Detection module for i-Tree



i-Tree

Tools for Assessing and Managing
Community Forests

Get the Tools.



[IPED Resources](#)

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What's new?

- [Project Overview](#)
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Survey Planning Resources

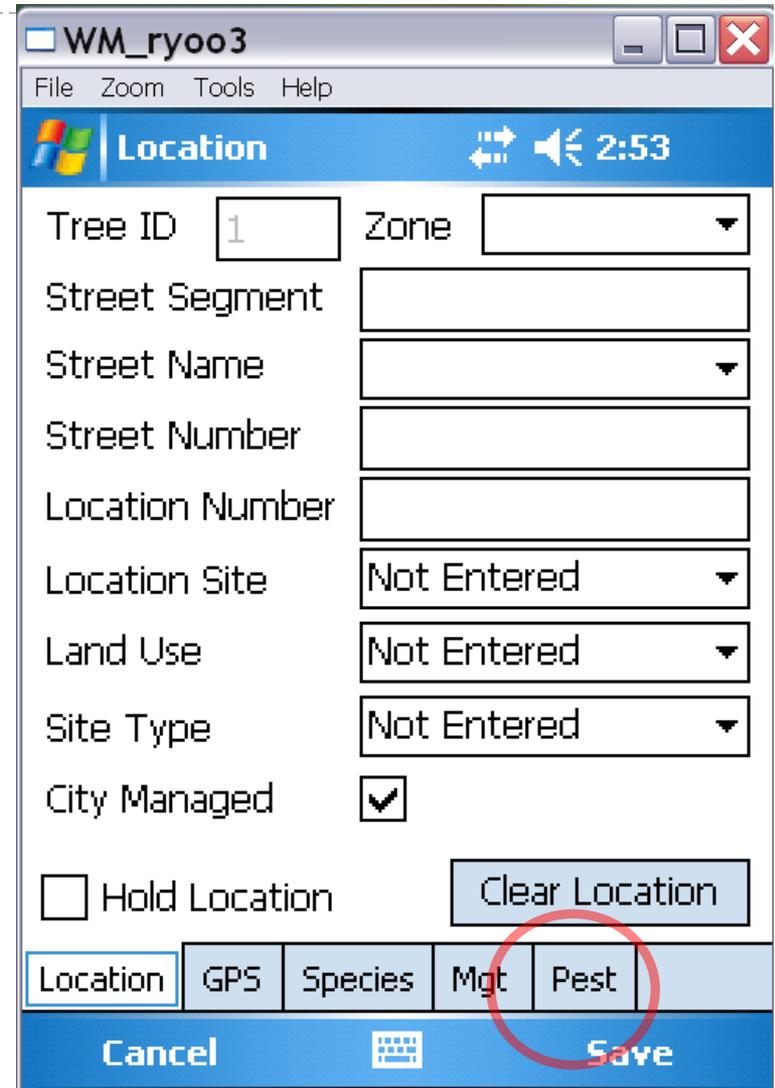
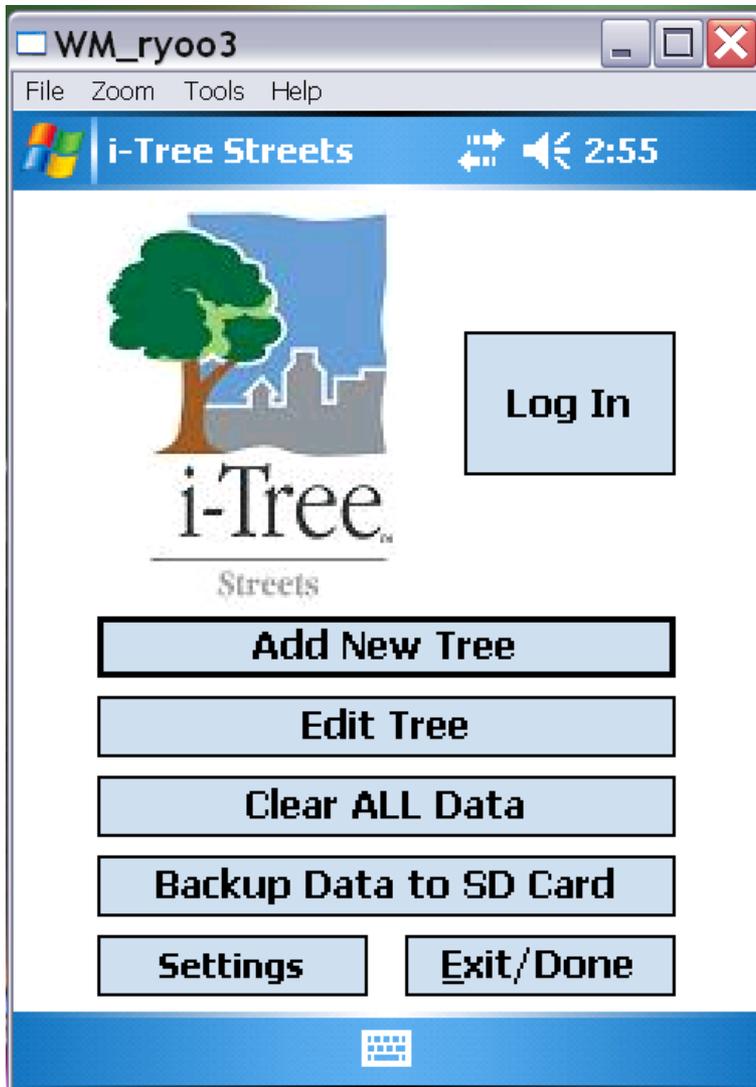
- [Urban Forest Pest Detection](#)
- [An example of the IPED Protocol in Anytown, USA](#)
- [Survey Planning](#)
- [i-Tree Tools User Forum](#)

Survey Resources

- [Pest detection protocol](#)
- [Tree stress](#)
- [Signs and symptoms of foliage and twigs](#)
- [Signs and symptoms of branches and bole](#)
- [Glossary](#)
- [IPED Pest Detection Protocol Manual](#)
- [IPED Field Guide](#)
- [IPED Field Guide - Printer Friendly Version](#)
- [IPED Tatum Guide](#)

Post Survey and Follow-up Resources

- [What to do after the survey](#)
- [Interpreting IPED reports](#)
- [Early Detection Target Factsheets](#)
- [IPED Pest and Disease Key](#)
- [Using raw data](#)
- [What happens if a new pest or disease is found?](#)



First Step: Choose one of three general categories of problems

1. Is *Tree Stress* causing problems?
2. Are *Foliage and/or Twigs* affected?
3. Are there problems with the *Branches and/or Bole*?

WM_ryoo3

File Zoom Tools Help

Pest 3:01

Pest Detection

Tree Stress Yes No

Foliage / Twigs Yes No

Branches / Bole Yes No

Primary Pest

Location GPS Species Mgt Pest

Cancel Save

Protocol Outline

First Step: Choose one of three general categories of problems

1. Is *Tree Stress* causing problems?
2. Are *Foliage and Twigs* affected?
3. Are there problems with the *Branches or Bole*?



Tatum Guide

i-Tree 4.0 Pest Detection Protocol *Tatum Guide*

I. Tree Stress:

- Dieback
 - Twig dieback (>10%), but not pervasive
 - Pervasive twig dieback throughout crown
- Epicormic sprouts
- Wilted Foliage (biotic or abiotic)
 - Wilt, whole crown
 - Wilt, partial crown
- Environmental Stress
 - Frost Cracks
 - Lightning Strike
 - Hail Injury
 - Sunscald
 - Broken Branches
 - Flooding
 - Drought/Poor Soil
- Human-caused stress/injury
 - Topping/Poor pruning
 - Poor or restricted planting/mulching
 - Wounding of Woody Tissues
 - Salt/Chemicals

II. Signs and symptoms of Foliage and Twigs:

- Defoliation (10% threshold)
 - Defoliation, >10%, but not pervasive
 - Defoliation, pervasive throughout the crown
 - Leaf mining, >10%, but not pervasive
 - Leaf mining, pervasive throughout the crown
 - Chewing of the mid-rib only (any level)
- Discolored Foliage (10% threshold)
 - Mottling, Spots, Blotches (any color)
 - Marginal Scorching (browning) of leaves
 - Interveinal Scorching (browning) of leaves
 - White coating
 - Black coating
 - Complete browning/bronzing of leaves
 - Complete yellowing of leaves
 - Stippling
 - Yellow/orange/white pustules
- Abnormal Foliage
 - Foliage/twigs distorted (including galls)
 - Witches' brooms present

- Insect Signs
 - Caterpillars/sawflies throughout the crown
 - Beetles feeding throughout the crown
 - Aphids/white cotton pervasive throughout the crown
 - Bags pervasive throughout the crown
 - Scales pervasive throughout the crown
 - Tents/webbing on more than one branch
- % Foliage Affected (10% threshold)
 - >10; <30%
 - >30% but not the whole crown
 - Whole crown affected

III. Signs and Symptoms of Branches and Bole:

- Insect Signs
 - Frass only
 - Sawdust
 - Pitch/resin exudation
 - D-shaped exit holes
 - Pencil round or oval exit holes (≈2mm)
 - Shot holes (<2mm)
 - Other holes
- Insect Presence
 - Caterpillars
 - Beetles
 - Aphids
 - Scale
 - Carpenter ants
- Disease Signs and Symptoms
 - Decay
 - Conks
 - Fleshy mushrooms
 - Cankers
 - Bleeding/slime flux
 - Resinosis/gummosis
 - Woody galls or burls
- Problem Location
 - Branches
 - Bole and/or root collar
 - Both
- Loose bark
 - Loose bark only
 - Rhizomorphs present
 - Mycelial fans present
 - Insect boring or galleries causing loose bark

For all signs and symptoms noted, a reasonable threshold level should be exceeded. Generally, 10% of the foliage should be affected before a pest is noted.



I. Symptoms of tree stress

Dieback, Epicormic Branching, Wilt,
Environmental, Human- caused Stress



- Is dieback present?

- ▶ Scattered twigs ($> 10\%$), but not pervasive
- ▶ Pervasive twig dieback throughout the crown



$<10\%$ (does not meet threshold)



Twig dieback in upper/outer crown, $> 10\%$ but not pervasive (training issue)



Pervasive dieback throughout the crown

- Are epicormic sprouts present?

“Yes or no” field, but some threshold should be exceeded.



- Are wilt symptoms present?

- ▶ Wilt present, whole crown
- ▶ Wilt present, partial crown



Wilt can be caused by biotic or abiotic factors



Verticillium wilt on silver maple



Pinewood nematode
on Austrian pine

- Environmental stress or injury

- ▶ Frost cracks
- ▶ Lightning
- ▶ Hail
- ▶ Sunscald
- ▶ Broken branches
- ▶ Flooding
- ▶ Drought/poor soil

Sunscald



Lightning



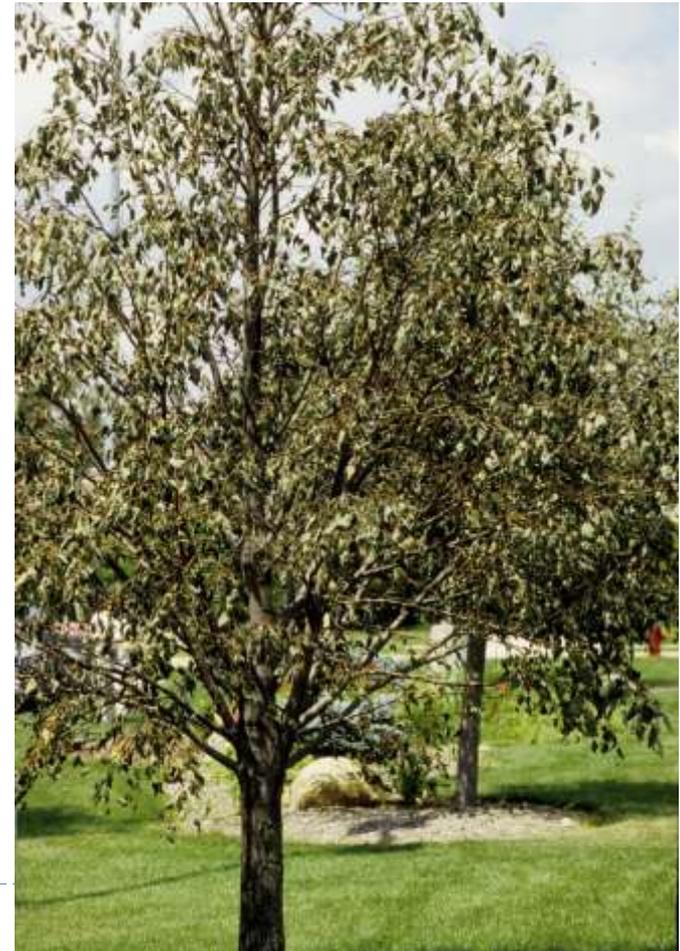
- Human-caused stress or injury

- ▶ Topping/poor pruning
- ▶ Poor or restricted planting or mulching
- ▶ Wounding of woody tissues
- ▶ Salt/chemical injury



Human-caused stress or injury

- ▶ Topping/poor pruning
- ▶ Poor or restricted planting or mulching
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II. Signs and Symptoms on Foliage and Twigs

Defoliation, Discolored Foliage, Abnormal Foliage, Insect Signs



• Defoliation present?

- ▶ Defoliation, > 10% of foliage, but not pervasive
- ▶ Defoliation, pervasive throughout the crown
- ▶ Leaf mining, > 10% of foliage, but not pervasive
- ▶ Leaf mining, pervasive throughout the crown
- ▶ Chewing of the mid-rib only (**ALB-specific**)



- Is foliage discolored, but not defoliated (chewed)?
 - ▶ Mottling, spots or blotches (any color)
 - ▶ Marginal scorching (browning)
 - ▶ Interveinal scorching
 - ▶ White coating
 - ▶ Black coating, often sticky
 - ▶ Complete browning/bronzing of leaves or needles
 - ▶ Complete yellowing of leaves or needles
 - ▶ Stippling
 - ▶ Yellow/orange/white pustules

Ozone injury on tuliptree (interveinal stippling)



Mottling, spots and blotches





Marginal leaf scorch (dogwood anthracnose)



Interveinal leaf scorch
(soybean sudden death)

White coating (powdery mildew
on honeysuckle)



Sticky black coating (sooty molds)



Complete browning (*Diplodia* on red pine)



Complete yellowing
(iron deficiency, pin oak)





Stippling (lace bugs)

Pustules (pine needle rust)

• Abnormal Foliage

- ▶ Foliage and/or twigs distorted
- ▶ Witches' brooms present

Frost injury

Leaf blister on oak



A witches' broom caused by
balsam fir broom rust



- Insect signs present on foliage or twigs?

- ▶ Caterpillars, sawflies feeding throughout the crown
- ▶ Beetles feeding throughout the crown
- ▶ Aphids/white cotton pervasive throughout the crown
- ▶ Bags pervasive throughout the crown
- ▶ Scales pervasive throughout the crown
- ▶ Tents/webbing on > one branch

Larch sawfly



Hemlock woolly adelgid

Eastern tent caterpillar



Bagworm on pine



- How much of the foliage/twigs is affected?

- ▶ >10% but <30%
- ▶ >30%, but not the whole crown
- ▶ Whole crown



Cicada injury
>=10% <30%

Oak anthracnose
>30%, but not the whole crown

Birch leaf miner,
whole crown affected



UGA4212011

III. Signs and Symptoms on Branches and Bole

Insect Signs, Insect Presence, Disease Signs and Symptoms,



- Are there signs or symptoms of insect activity?
 - ▶ Frass
 - ▶ Sawdust
 - ▶ Pitch/resin exudation
 - ▶ D-shaped exit holes
 - ▶ Pencil round or oval exit holes (>2mm)
 - ▶ Shot holes (<2mm)
 - ▶ Other holes (might include sapsucker activity)





Frass
Pine webworm



Sawdust
Carpenter ants



Resin exudation
Ips

UGA5179072

Insect hole descriptions

Shot holes < 2mm (SPB)



D-shaped
(EAB)



Pencil round or oval > 2mm (ALB)



- Are there (actual) insects present?

- ▶ Caterpillars
- ▶ Beetles
- ▶ Aphids
- ▶ Scales
- ▶ Carpenter ants



GM



BBD

EAB



- Are there signs or symptoms of disease?

- ▶ Conks
- ▶ Fleshy mushrooms
- ▶ Cankers
- ▶ Bleeding/slime flux
- ▶ Rhizomorphs
- ▶ Mycelial fans
- ▶ Resinosis/gummosis
- ▶ Other





Conks & bracket fungi





Fleshy mushrooms



Cankers

Eutypella canker on Norway maple



Slime flux (American elm)



Bleeding (SOD)



Resinosis (WPBR)

Woody galls and burls



Is loose bark present?

- ▶ Loose bark only present
- ▶ Rhizomorphs present
- ▶ Mycelial fans present
- ▶ Insect boring or galleries causing loose bark



Mycelial fans



Rhizomorphs



EAB galleries, causing loose bark



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The signs of insect or disease activity are located on:

- ▶ Branches
- ▶ Bole and/or root collar
- ▶ Both



Enter the name of the primary pest, if known



Reports

Eastern hemlock	Tree Stress	Dieback	1	N/A (N/A)	4.76	0.07	0.17
		Epicormic Sprouts	0	N/A (N/A)	0.00	0.00	0.00
		Wilted Foliage	1	N/A (N/A)	4.76	0.07	0.17
		Environmental Stress	2	N/A (N/A)	9.52	0.14	0.34
		Human-caused Stress	1	N/A (N/A)	4.76	0.07	0.17
		Notes Present	0	N/A (N/A)	0.00	0.00	0.00
		Trees Affected	3	N/A (N/A)	14.29	0.21	0.51
	Foliage/Twigs	Defoliation	2	N/A (N/A)	9.52	0.14	0.34
		Discolored Foliage	2	N/A (N/A)	9.52	0.14	0.34
		Abnormal Foliage	0	N/A (N/A)	0.00	0.00	0.00
		Insect Signs	8	N/A (N/A)	38.10	0.57	1.35
		% Foliage Affected	7	N/A (N/A)	33.33	0.50	1.18
		Notes Present	2	N/A (N/A)	9.52	0.14	0.34
		Trees Affected	12	N/A (N/A)	57.14	0.85	2.02
	Branches/Bole	Insect Signs	0	N/A (N/A)	0.00	0.00	0.00
		Insect Presence	1	N/A (N/A)	4.76	0.07	0.17
		Disease Signs	0	N/A (N/A)	0.00	0.00	0.00
		Problem Location	0	N/A (N/A)	0.00	0.00	0.00
		Loose Bark	0	N/A (N/A)	0.00	0.00	0.00
		Notes Present	0	N/A (N/A)	0.00	0.00	0.00
		Trees Affected	1	N/A (N/A)	4.76	0.07	0.17
	Trees Affected	All Symptoms	14	N/A (N/A)	66.67	0.99	2.36

