What is Hemlock Woolly Adelgid (HWA)?

An invasive pest of hemlock trees.

*Adelges tsugae*

Family *Adelgidae* is closely related to aphids

(sometimes referred to as woolly conifer aphids)
Hemlock Woolly Adelgid: The Problem

Asexual reproduction (all females)
• One individual can start a new population
• High Reproductive Potential
  ▪ 2 generations per year & up to 200 eggs/female, but generally less
  ▪ $1 \times 100 \times 50 = 5,000$ potential progeny from 1 female/yr.

Native natural enemies are lacking in the Eastern US
• Classical biocontrol efforts are ongoing

No documented resistance by Eastern or Carolina hemlock
Adult
Worldwide distribution of HWA and Tsuga species.
Havill 2008.
Hemlock distribution/density in New York
simplified life cycle
“crawlers” hatching from egg masses
March - June
Nymphs on new growth
Summer aestivation June-September
2nd-4th instar nymphs begin forming egg masses

September – February = ideal time to survey!

Easy to see, little to no risk of accidental transport
Very heavy, late stage infestation
Slow growth to no growth
Buds die first as wound response stops movement of water & nutrients
Needle loss
Heavy infestation/ older, tattered egg mass remnants on older twigs
May still be visible for 2-3 years, but does weather off
Looking for & Identifying HWA
Hemlock Woolly Adelgid, Photograph credit: Chris Evans, The University of Georgia, http://www.forestryimages.org/
Other things you will see on hemlock twigs

- Spider webbing, egg sacs
- Various insects, pupal cases
- Cottonwood fluff
- Bird poop
- Raindrops, snow
Elongate hemlock scale
Circular hemlock scale(s)

Spruce spider mites (feeding damage)
Hemlock borer
Fabrella needle blight
Hemlock twig rust

Sirroccoccus shoot blight
Management of HWA

Biological control
- Long term (generations)
- Large (landscape) scale

Chemical control
- Shorter term (months to years)
- Smaller scale
Predators can be divided into two basic groups:

Spring/Summer feeders: prey on progrediens eggs and nymphs as well as sistens eggs.

*Sasajiscymnus, Scymnus, Leucopis*

Winter/Spring feeders: prey on sistens nymphs through winter and progrediens eggs in spring

*Laricobius*
Laricobius nigrinus

- Native to Pacific Northwest
- Good life cycle synchrony with HWA
- Released in 16 states on east coast since 2003.
- Establishment at many locations in the East.
  - Banner Elk, NC
    - Spread over 30 miles since first introductions in 2003
    - Over 12,000 collected in two weeks for release in 2013
  - Delaware Water Gap, Northern NJ and PA populations are growing since releases began in 2006
**Leucopis argenticollis & piniperda**

- Diptera: Chamaemyiidae
- May be the most abundant predator of HWA in the Pacific NW
  - Released at 3 NY sites in 2015
  - Released at 10 NY sites in 2017
- Larvae feed on both Progrediens and Sistens eggs.
- **Two or three generations a year?**
HWA Biocontrol Lab @ Cornell
SYSTEMIC INSECTICIDES

• Most effective and least costly treatment for HWA
• Treatment with systemic insecticides should be made in spring or fall when the soils are moist and hemlocks are actively growing
IMIDACLOPRID

**ADVANTAGES** - Can be effective for multiple years with just one application

**DRAWBACK** – Moves slowly through the tree, sometimes taking up to a year to reach the canopy. Older trees that may have compromised vascular systems or crown decline from HWA may not be able to move imidacloprid into the crown fast enough to survive
DINOTEFURAN

Under the trade name - Safari 20SG is used as a basal bark spray

ADVANTAGES – Moves into the tree canopy much more rapidly than imidacloprid, usually within 2-3 weeks. Will rapidly reduce HWA so trees can recover

DRAWBACK – efficacy is limited to 1 or 2 years
Balsam Woolly Adelgid
*Adelges piceae*

Hain et al. 1991
Balsam Woolly Adelgid
*Adelges piceae*

- Yet another parthenogenic Adelgid!
- 1930’s Introduced into eastern Canada
- Spread to Pacific Northwest (BC, WA, OR)
- Thought to be restricted to coastal areas because temperatures are warmer
- 1980’s detected inland – ADK’s
- Now even on Mt. Washington
- Now distributed throughout NYS
- Slow decline restricted to crown on twigs
- Stem infestations kill
Two basic infestations:
- Twigs – Gouting
- Stems or main trunk of the tree
- Stem infestations can rapidly kill a tree
  - 3 to 10 years depending on tree vigor
- Twig infestations can linger for years
  - Apparent on trees in the understory
  - Can linger and disfigure crowns for many years – up to 30 years or more in some *Abies* species.
Persistent chronic crown decline

Balsam fir, *Abies balsamea*, in the Adirondack Mountains, NY
Low level crown decline

Persistent crown decline
Thank You

• Jason Denham, Bureau of Invasive Species & Ecosystem Health, Albany
  • Jason.Denham@dec.ny.gov
  • foresthealth@dec.ny.gov
  • (518) 402-9410
iMapInvasives Mobile App Training

Help find small, manageable infestations

Meg Wilkinson
Invasive Species Database Program Coordinator
NY Natural Heritage Program

Username = iMap Username
first three letters of first name & last name (in full)
EXAMPLE: johsmith
PASSWORD: “changeme2018”
How Can iMap Help You?

• Local Level:
  – Search for invasive species & enter observations
  – View nearby areas .... What is approaching the region?
  – Record treatment/management efforts
  – Great communication tool for organizations, especially over time

• State/PRISM Level:
  – iMap sends nightly emails to PRISM Leaders, and state experts of new observations submitted to iMap – aware of high priority “finds”; assist with confirmation process
  – Refer to iMap data when prioritizing summer crew work
Objective Today

• Learn how to login to online iMap:
  – View data on the map
  – View data in a table
  – Search/Query for data

• Learn how to submit invasive species data to online iMap using a smartphone with the iMap Mobile app & view online
Intro

• PRISMs Partnerships for Regional Invasive Species Management
• Importance of Early Detection

iMapInvasives Online

• Online – Map & Table
• Online – Query/Report & Email Alerts

iMapInvasives App

• App – Download/Set Preferences
• App – Record an Observation
• App - Upload; Test & View Online

Wrap-Up

• 8 Things You Can Do – by Megan Phillips
• Questions
Partnerships for Regional Invasive Species Management
THE INVASION CURVE

- Prevention: Species absent; Small number of localized populations; eradication possible
- Eradication: Rapid increase in distribution and abundance; eradication unlikely
- Containment: Invasive species widespread and abundant; Long-term management aimed at population suppression and asset protection
- Asset Based Protection & Long-term Management

Controls Costs ➞ Time ➞ Area Infested ➞
Water chestnut
*Trapa natans*
**Intro**
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- Questions
Our mission is to facilitate conservation of New York's biodiversity by providing comprehensive information and scientific expertise on rare species and natural ecosystems to resource managers and other conservation partners.

*Partnership between NYS DEC and SUNY ESF*

A collaborative GIS-based, online tool for invasive species management

New York State Invasive Species Database
2010: Live in New York!
Where does the data come from?

1) Bulk uploads from partner organizations

- Local, State, and Federal Agencies
- Land/ Water Managers
- Researchers
- Museum Data
Where does the data come from?

2) User data entry for observations

Online (computer)
App (smartphone: Droid, iPhone)
Data from professionals and citizen scientists

**OBSERVATIONS**

Organization Bulk Uploads: 150,000
Online Data Entry: 36,000
Mobile App (since Fall 2015): 8,470
**TOTAL:** 194,000

**Trained iMap Users**

>3,000 since 2010

<table>
<thead>
<tr>
<th>Species type</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Animals</td>
<td>14,393</td>
</tr>
<tr>
<td>Aquatic Plants</td>
<td>23,527</td>
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<tr>
<td>Insects</td>
<td>7,660</td>
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<tr>
<td>Terrestrial Animals</td>
<td>472</td>
</tr>
<tr>
<td>Terrestrial Plants</td>
<td>150,161</td>
</tr>
</tbody>
</table>
Who uses iMap?

- Managing a Geography
- NYS DEC Invasive Species Program Staff
- PRISM Leaders
- HWA Initiative
- NYS Parks
- Lake Associations
- Town/County staff

Contributing to NYS Knowledge Base & Informing EDRR Work & Response Efforts

- Botanists/Ecologists
- Consultants
- DEC staff
- Parks staff
- CCE staff
- Master Gardeners
- Outdoor Enthusiasts
- College Students

Key Reports

- Jumps & Anomalies
X-HWA-Not Detected
Giant Hogweed

DEC

[Map of Hogweed distribution]

[Photo of Hogweed with DEC logo]
Yellow Iris
Where to Focus: Species Prioritization by PRISM

• Tier 1 – not present
• Tier 2 – might be able to eliminate it
• Tier 3 – manage on local basis
• Tier 4 – well-established
Spatial Prioritization: Where to focus?

- High Quality Natural Areas
  - With high risk of spread

- Ecological Significance
Email Alerts

*Communicating important findings to stakeholders*

- Regulated or High Priority Species
  - Reviewed by state iMap administrator
  - Set to “confirmed” by state iMap admin
  - Alerts sent to state authorities
  - Verified by expert

- Other Species
  - User email alerts
Project

- Group data
- Project Leader: confirm/review data
- Download data
Enter data online
**OBSERVATION** – location of a specific species (location, date)

**ASSESSMENT** – detailed information about a specific observation

**TREATMENT** – control effort details

**SURVEY** – search for presence or absence of a species

**INFESTATION MANAGEMENT RECORD**
Online: Managing advanced data

Managing a Geography
PRISMs Partnerships for Regional Invasive Species Management

Importance of Early Detection

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Watercraft Inspection Station Program App ("WISPA")

8 Things You Can Do – by Megan Phillips

Questions

Username = iMap Username
first three letters of first name & last name (in full)
EXAMPLE: johsmith
PASSWORD: “changeme2017”
The iMap Mobile app is a convenient way to collect new records for viewing and editing on the full online interface
(You will use the same iMapinvasives username and password for both)

iMapInvasives Mobile App
Collect observations using your phone GPS and camera. Upload to server on wi-fi.

iMapInvasives Online
Full browser-based mapping functionality to search the data, produce maps, and enter data, from new locations, to detailed treatments and surveys.
Observation Data-entry in the field... without connectivity
App - smartphone
Download iMapInvasives Mobile App

Method 1:     OR     Method 2:

• Android: playstore
• iPhone: AppStore
• Download - FREE
  
  Search: “imapinvasives mobile”

• Phone Browser: (e.g. Chrome or Safari)
  • [http://www.nyimapinvasives.org/](http://www.nyimapinvasives.org/)
  “Mobile” tab
• Click icon
• Download - FREE
Method 2: www.NYimapinvasives.org

New York iMapInvasives

Sharing information for strategic management

Mobile

Report invasive species with your smartphone!

iMapInvasives Mobile App - Collect observations on your phone, then upload directly to your iMapInvasives online account once back in connectivity.

Check out the Quick Start Guide or iMapMobile User Manual for help.

iMapInvasives Mobile App Minimum Requirements:

Android: 5+

Available on the App Store

GET IT ON Google play
How to: Turn on Location Services (iPhone)

1. Tap on "Settings".
2. Tap on "Privacy".
3. Tap on "Location Services".

- **Location Services**:
  - Turn "On" to use Location Services.
  - "Location Services uses GPS, Bluetooth, and crowd-sourced Wi-Fi hotspot and cell tower locations to determine your approximate location. About Location Services & Privacy..."

- **Share My Location**:
  - This iPhone is being used for location sharing.

- **Allow Location Access**:
  - "Never".
  - "While Using the App".

Access to your location is available only when this app or one of its features is visible on screen.
How to: Turn on Location Services (Android)
Open the App & Set Preferences

Username = iMap Username first three letters of first name last name (in full)
EXAMPLE: johsmith
PASSWORD: “changeme2018”
Preferences:
Custom species list

“Presence”
Hemlock Wooly Adelgid

“Absence”
X-HWA NOT Detected

Comments:
Search effort - # trees & # branches
Menu Bars

• Help Text
Add Observation

Tips:
- Close other mapping apps
- Make sure the phone’s GPS is on and allowed to talk to the app

Take Photo

Default in Preferences

Select species

Uncheck to move point

Comment – “X” – Search Effort

Save
Cancel
“Fake Species (for testing)"

- Comments: “Test”
In Field

• No Connectivity
• No map
• GPS On
• Coordinates
  – With 73-ish & 42-ish;
  – NOT “0,0”
How to: Upload Your Point
(Wifi suggested)
“Cards”
phone → iMap
Test & Then View Online

Username = iMap Username
Check email
Default: xxxzzzzzzzz
X = first three letters of first name
Z = last name (in full)
LIVE – Check Table
Test & Then View Online
## New York Administrator Tools

### Observations Table

<table>
<thead>
<tr>
<th>ID</th>
<th>Status</th>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Observer</th>
<th>Organization</th>
<th>Date</th>
<th>County</th>
<th>Photo(s)</th>
<th>Entry Date</th>
<th>Entry Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>NY-412244U</td>
<td>Unconfirmed</td>
<td>Lonicera maackii</td>
<td>Amur Honeysuckle</td>
<td>julgrinstead</td>
<td>State University of New York College of Environmental Science and Forestry</td>
<td>2016-06-21</td>
<td>Onondaga</td>
<td>Yes</td>
<td>2016-06-27</td>
<td>julgrinstead</td>
</tr>
<tr>
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Things You Can Do
From Megan Phillips

1. Don’t Move Firewood
2. Clean, Drain, Dry boat/kayak, etc
3. Know Before You Grow (“Plant Native”)
4. Don’t Let It Loose (exotic pets/fish)
5. Play, Clean, Go bike/4-wheel/hiking shoes
6. Don’t take the (Invasive) Bait
7. Report to iMap
8. Keep Up With Your PRISM
READY to Search 😊
✓ Know how to ID some invasive species
✓ App downloaded to smartphone
✓ Local observation point uploaded to iMap
✓ Checked local obs point - online iMap (view Map & view Table)
✓ Checked online for known invasive species locations
Comments:

Search effort - # trees & # branches