



The Hemlock Woolly Adelgid in Georgia



Date:

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Following in the Footsteps of the Chestnut?





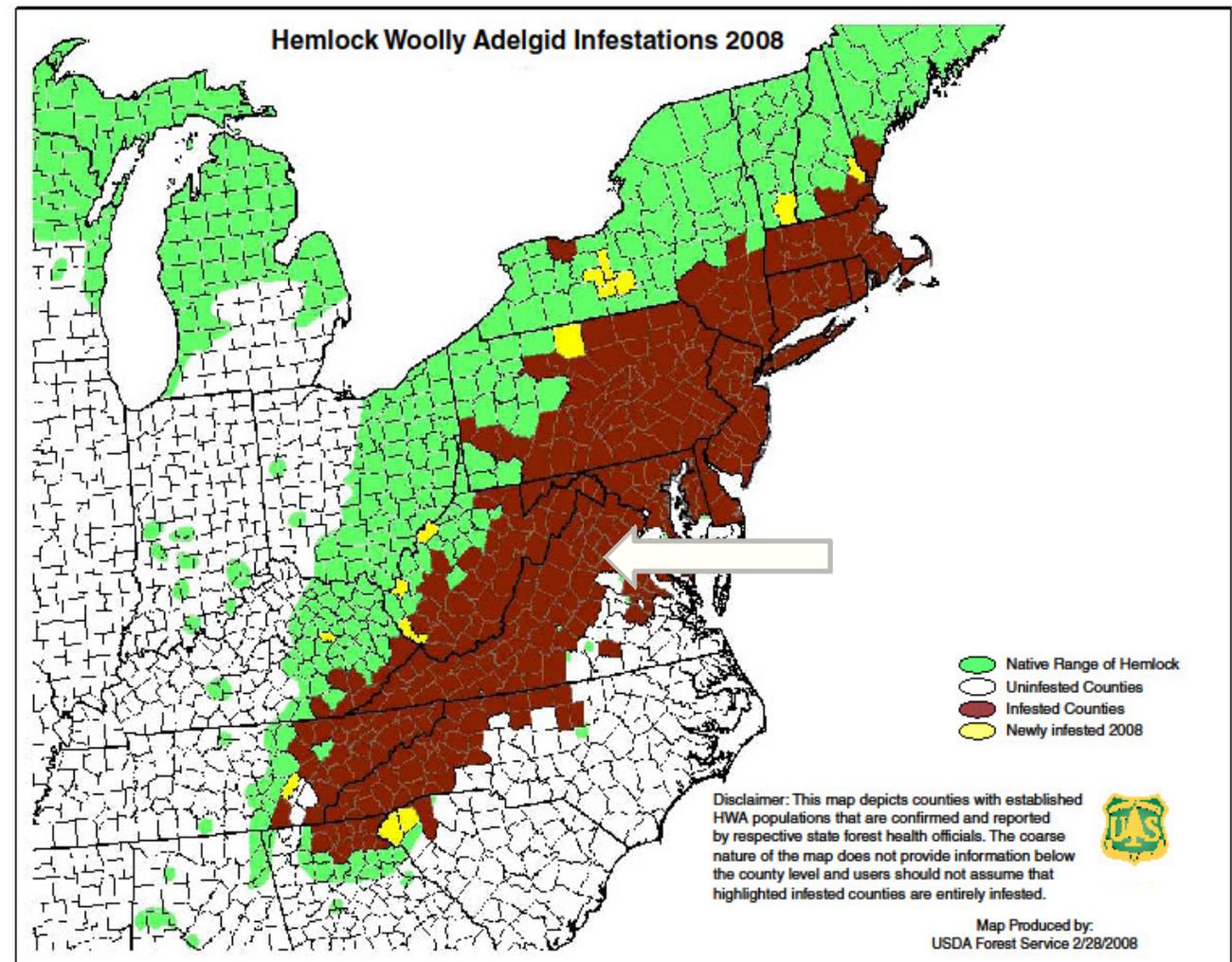
The Hemlock is a Unique Tree





HWA – Where is it from & Where is it at?

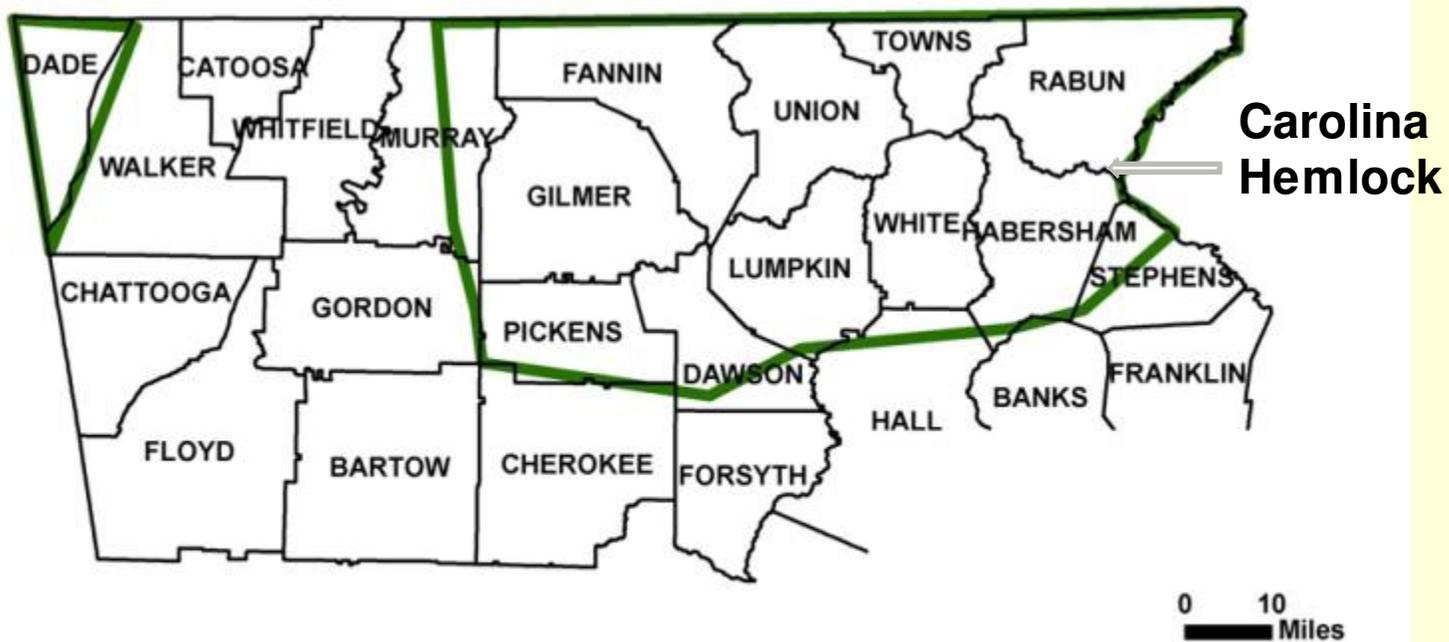
- Exotic insect from Asia (Japan)
- 1950's – HWA detected in Eastern U.S.
- Spreading rapidly to the south



Hemlock Woolly Adelgid Annual Spread in Georgia

From Georgia Forestry Commission
Forest Health Program Data

 Hemlock Range



Hemlock Woolly Adelgid Annual Spread in Georgia

From Georgia Forestry Commission
Forest Health Program Data

 2003

 Hemlock Range



0 10
Miles

Hemlock Woolly Adelgid Annual Spread in Georgia

From Georgia Forestry Commission
Forest Health Program Data

2003
2004

Hemlock Range



Hemlock Woolly Adelgid Annual Spread in Georgia

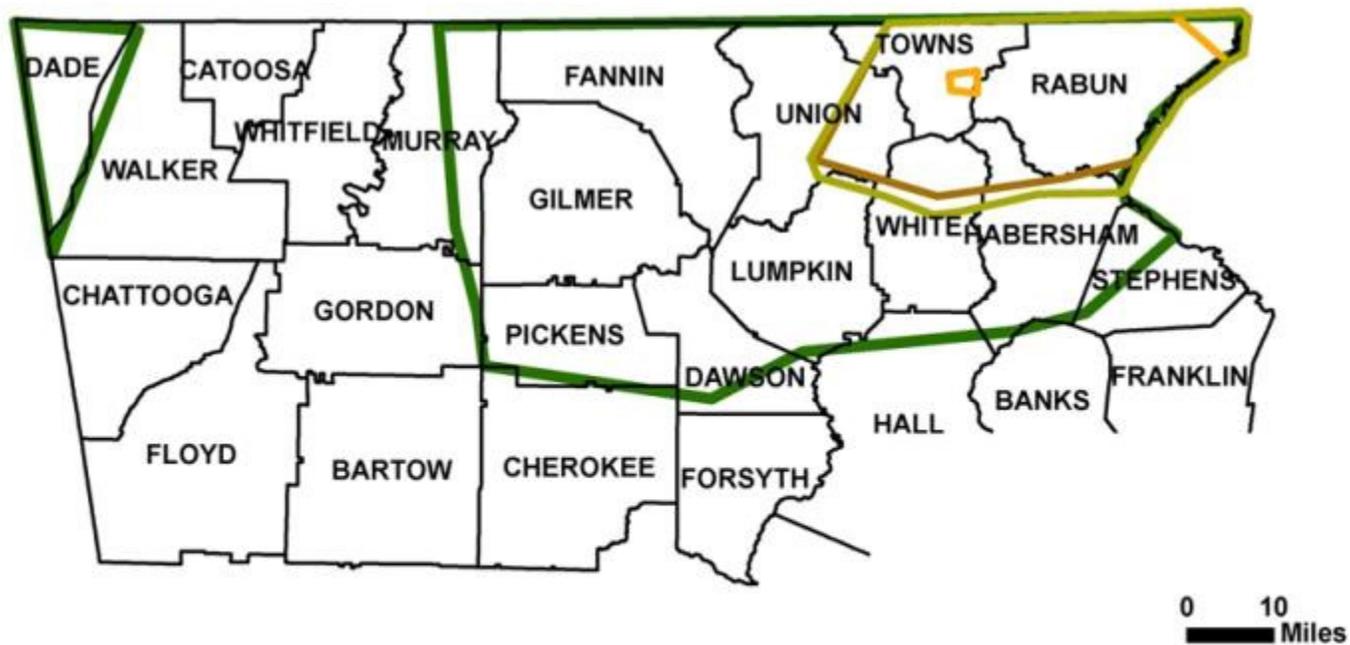
From Georgia Forestry Commission
Forest Health Program Data

2003

2004

2005

Hemlock Range

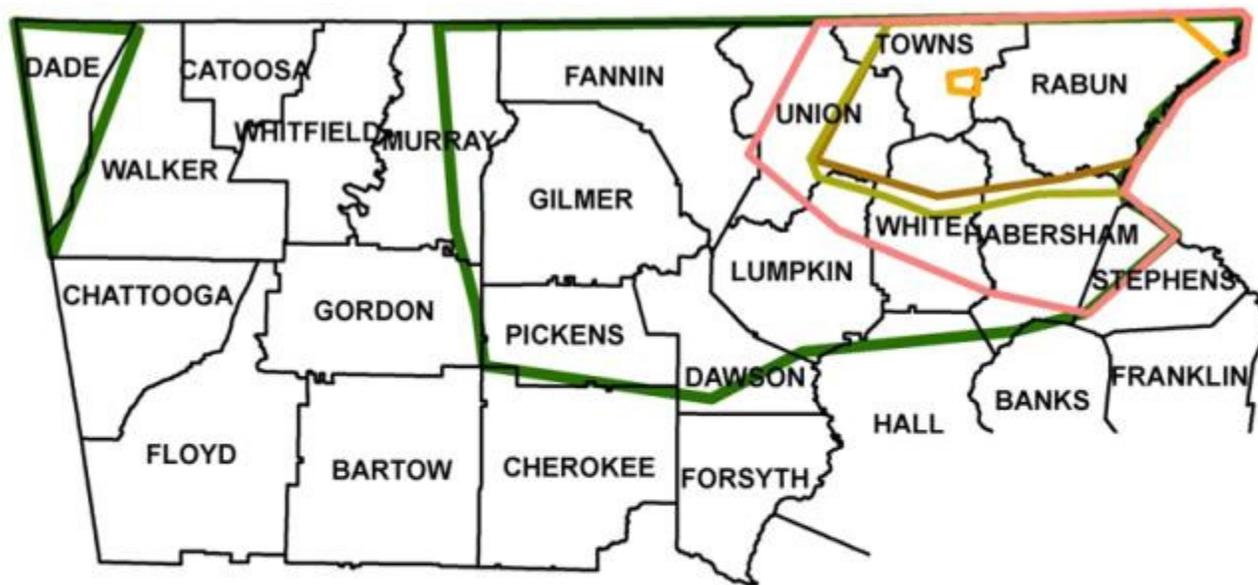


Hemlock Woolly Adelgid Annual Spread in Georgia

From Georgia Forestry Commission
Forest Health Program Data

 Hemlock Range

-  2003
-  2004
-  2005
-  2006

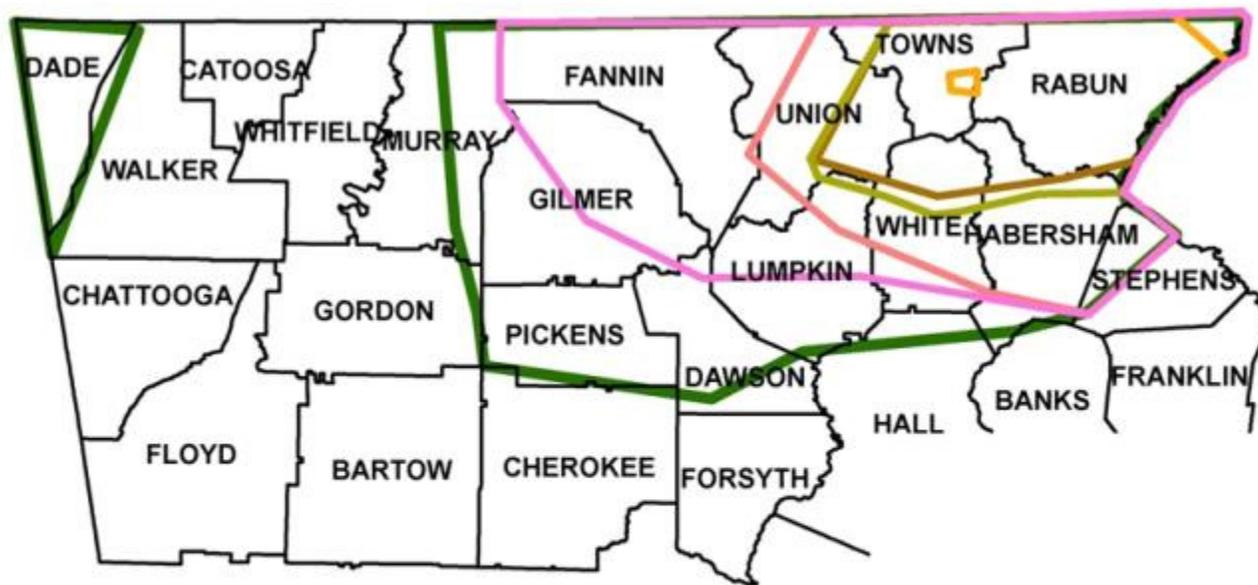


0 10
Miles

Hemlock Woolly Adelgid Annual Spread in Georgia

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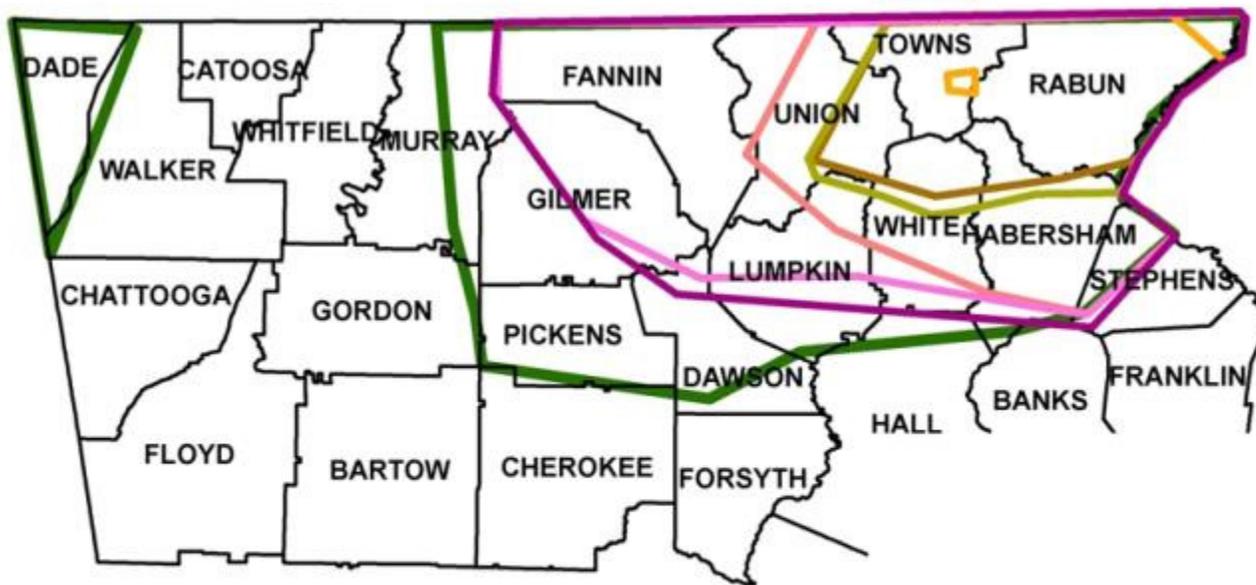


Hemlock Woolly Adelgid Annual Spread in Georgia

From Georgia Forestry Commission
Forest Health Program Data

 Hemlock Range

-  2003
-  2004
-  2005
-  2006
-  2007
-  2008



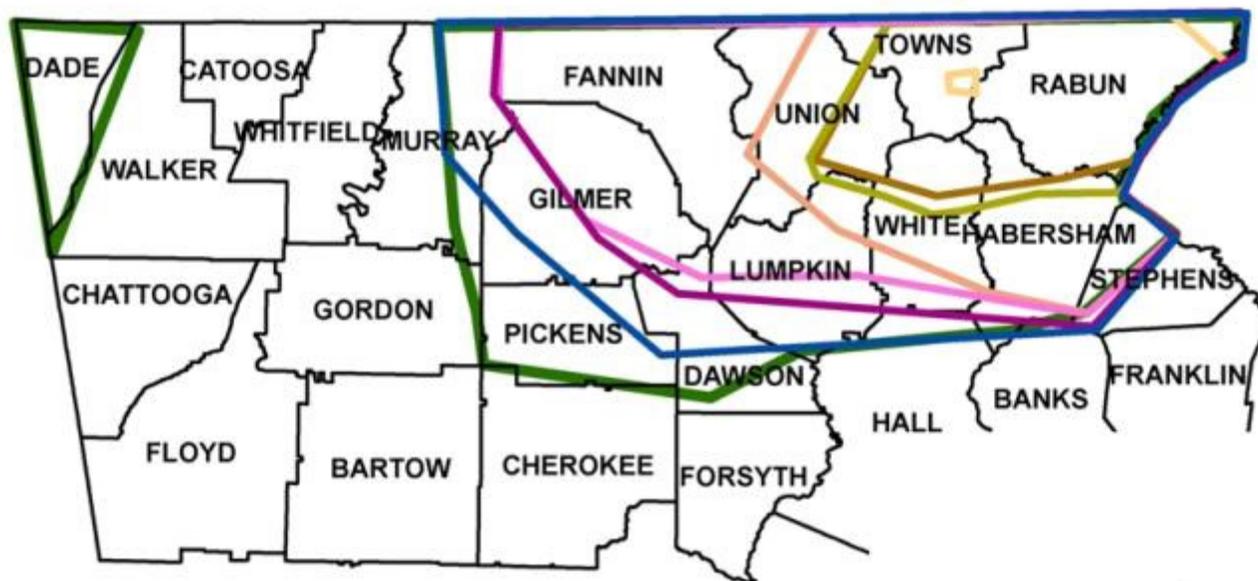
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Hemlock Woolly Adelgid Annual Spread in Georgia

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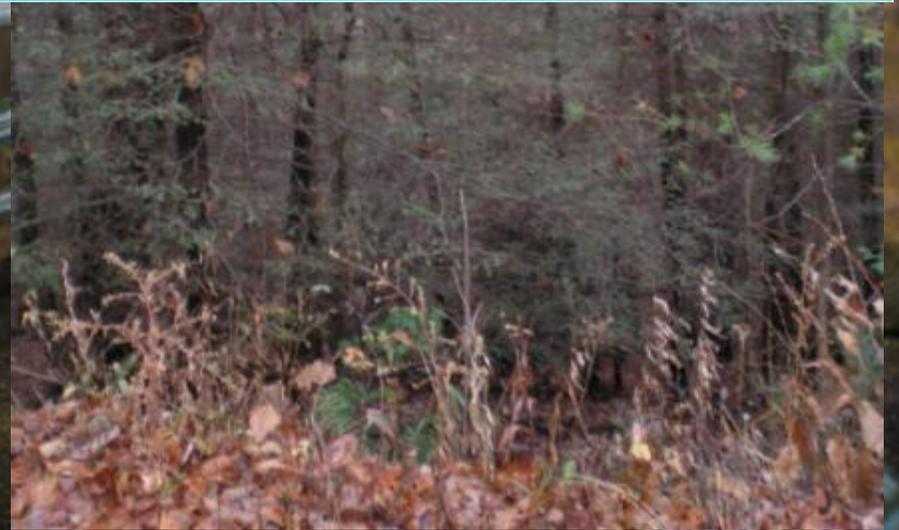
-  2003
-  2004
-  2005
-  2006
-  2007
-  2008
-  2009



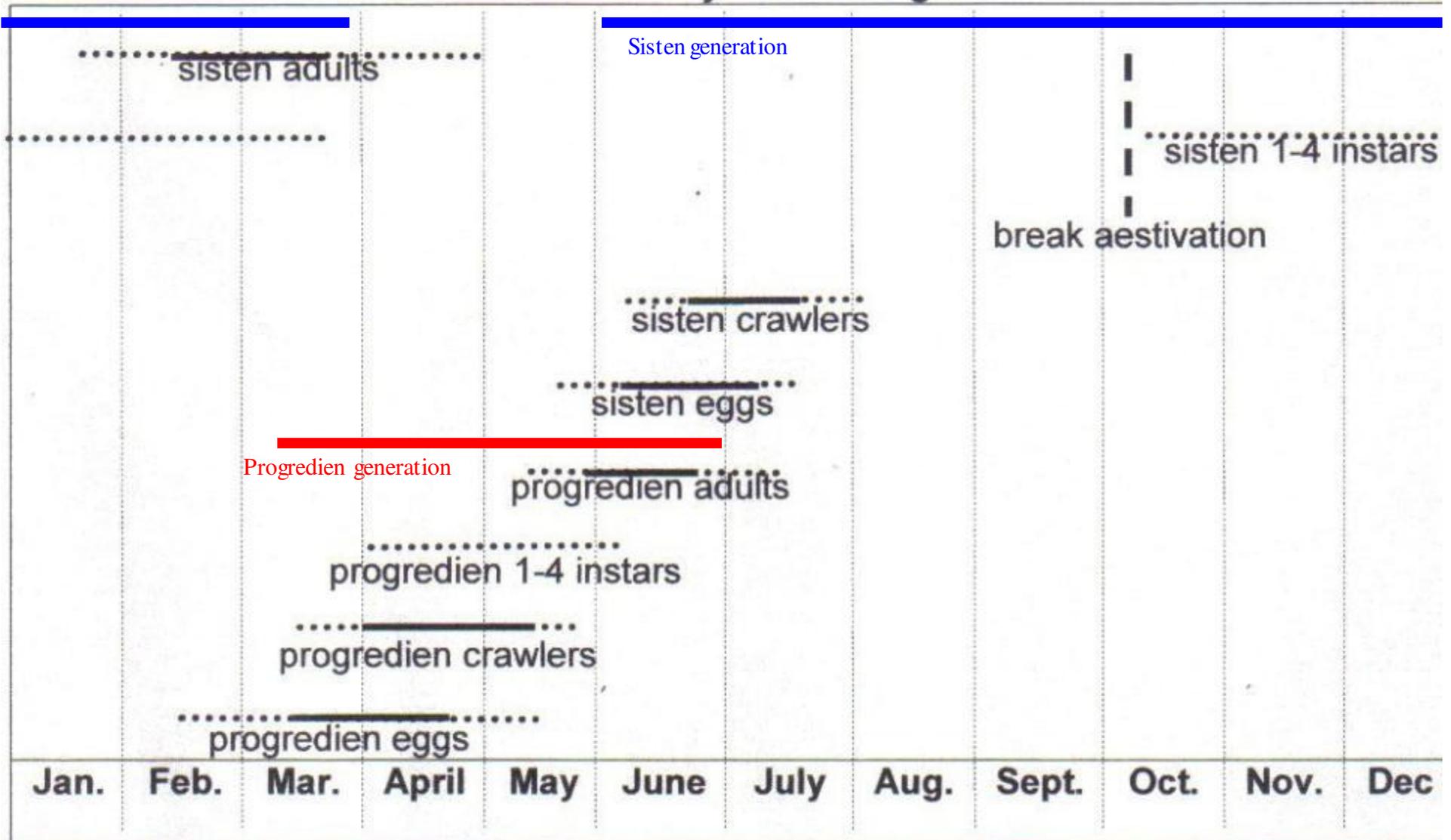


Identification of HWA

- *Adelges tsugae*
- Look on new growth on underside of branches
- Woolly masses are present from late fall to early summer
- 10X lens is a necessity during summer
- Sucking mouthparts – where the needles attach to the stem
- 3-10 years – tree death (Georgia)
- HWA can attack and damage all ages and sizes of hemlock



HWA Life Cycle in Georgia



*From 2004-2006 data

..... presence of adelgid life stage
 _____ peak occurrence of adelgid life stage



Lifecycle - EGGS

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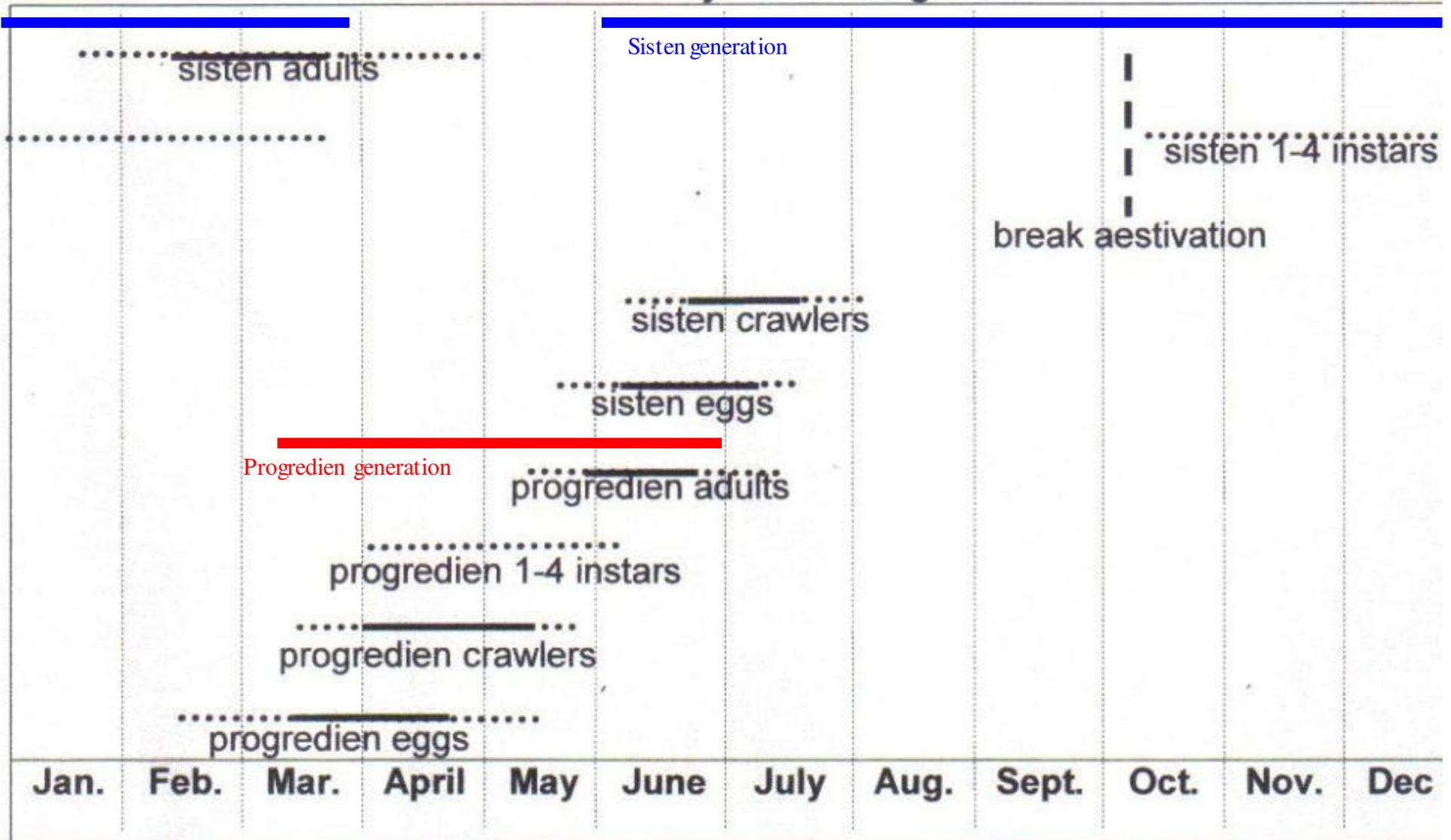


Lifecycle - Crawlers



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HWA Life Cycle in Georgia

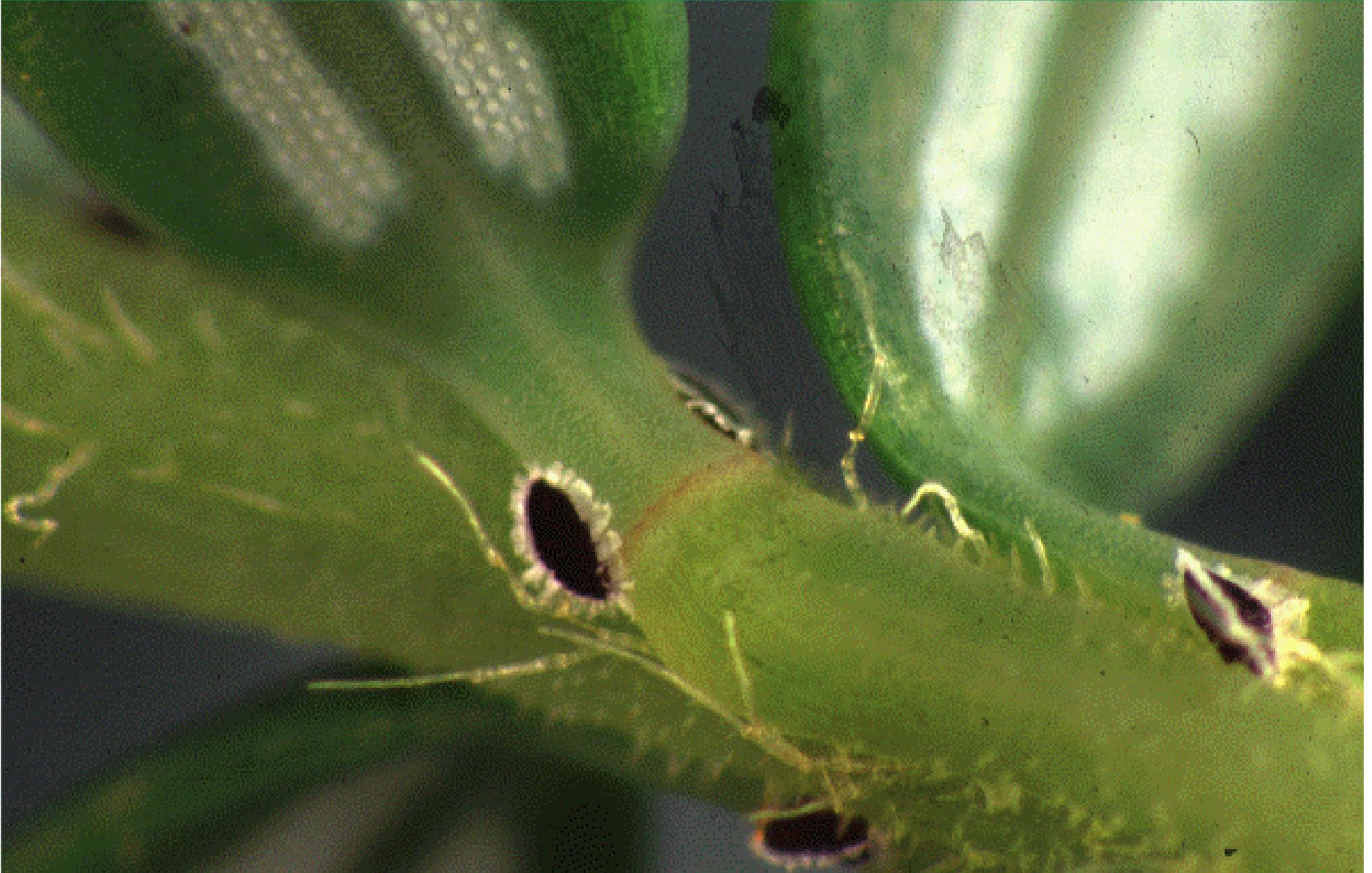


*From 2004-2006 data

..... presence of adelgid life stage
 _____ peak occurrence of adelgid life stage



Lifecycle - Instars









Lifecycle - Adult





Georgia Snapshot







TALLULAH RIVER 1
TATE BRANCH 4
SANDY BOTTOMS 5



SOUTHERN NANTAHALA
WILDERNESS 9









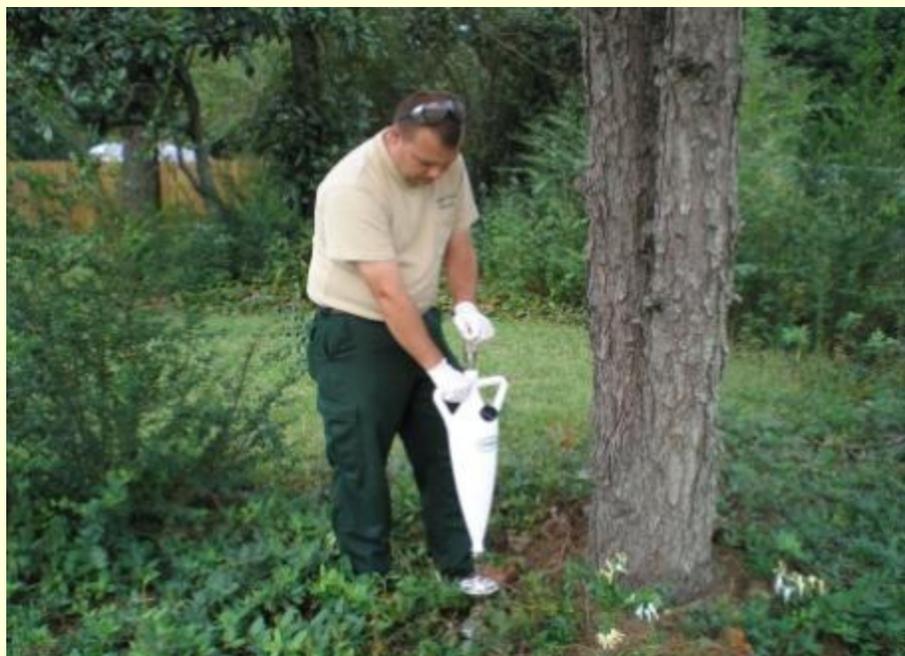




How are we going to control
HWA?



Control Options – Application Techniques



Soil injection

- 1-4 inches deep (don't go too deep)
- Basal soil application
- One injection per inch DBH
- 6 pumps = 1 fl. Ounce (calibrate)
- Easy to meter product between tree sizes
- Less water required
- Less human/chemical contact
- Tilt to fill / screen
- Holds around 96 ounces
- GFC Soil Injector Loan Program (Habersham, Rabun, Union, Lumpkin, Gilmer, Fannin & Murray)
- Triple rinse
- Consider predicted weather

DBH* in inches	Pumps per inch	Grams of active ingredient/inch
1-11	1	.5
12-18	1.5	.75
19-22	2	1
23 or greater	3	1.5



Control Options – Application Techniques



Soil Drench

- Desired method for those with just a few trees
- No special equipment needed
- Pour around tree base
- Rake back debris and form trench
- Return debris after solution soaks in
- 1 gallon minimum
- Add 1 pint of water for each inch DBH over 12
- Rinse bucket and pour around tree
- Consider alternate methods for stream bank trees
- Consider predicted weather



Control Options – Application Techniques



Foliar Spray

- Imidacloprid, dinotefuran, Talstar®, dormant oils, insecticidal soaps, etc.
- Best used on small trees or hemlock hedges
- Thorough drenching a must
- Coat underside of branches
- Dormant oils and insecticidal soaps may cause needle browning – follow label
- Oils and soaps would need to be applied at least annually
- Best applied April – mid May & Late June – end of October



Control Options – Application Techniques

Trunk spray application

- Safari 20SG
- apply at a rate of 1.5 fluid ounces of solution per inch
- Calibrate sprayer
- Spray from ground line up to 4 feet on trunk
- Consider predicted weather

Imidacloprid tablets

- 2-3 tablets per inch
- “PHWS” method
- No water or mixing required
- Great for remote locations
- Rainfall required to activate
- Slow release



Control Options - Imidacloprid

Product	Chemical Form	Span of control	Application Technique	Cost
1.47% imidacloprid	Liquid 32 Fl. Oz. or 1 gallon	1 year	Soil drench	\$2 / inch DBH
21.4% imidacloprid	Liquid 20 Fl. Oz. or 32 Fl. Oz.	4+ years	Soil drench or soil injection	\$.22 - \$.43 / inch DBH
75% imidacloprid wsb or wsp	Powder in a dissolvable bag -1.6 oz./bag - Envelope (4) , case (16) & drum (88)	4+ years	Soil drench or soil injection	\$.25 - \$.74 / inch DBH
75% imidacloprid wp	Powder 2 ounce container	4+ years	Soil drench or soil injection	\$1 - \$2 per inch DBH
20% CoreTect®	Tablets 250 per bottle / 4 per case	4+ years	“PHWS” method	\$.64 - \$.96 per inch

Imidacloprid Quick Facts

- Conveniently packaged for homeowner use
- Treat trees 25+ inches DBH for 2 consecutive years
- Can take up to a year to act but lasts 4-5 years
- Peak amounts of imidacloprid are found at the growing tips two years after treatment
- Apply imidacloprid any time of year but avoid December and January if possible (don't apply during extremely dry periods)



Control Options - Imidacloprid

Drier soil (avoid application during drought)

Mix 1.6 ounce packet in 24 ounces of water (1.5 grams active ingredient per ounce). Apply at the following rate.

(Trees 25" DBH or greater should be treated 2 consecutive years)

DBH* in inches	Pumps per inch	Grams of active ingredient/inch
1-11	2	.5
12-18	3	.75
19-22	4	1
23 or greater	6	1.5

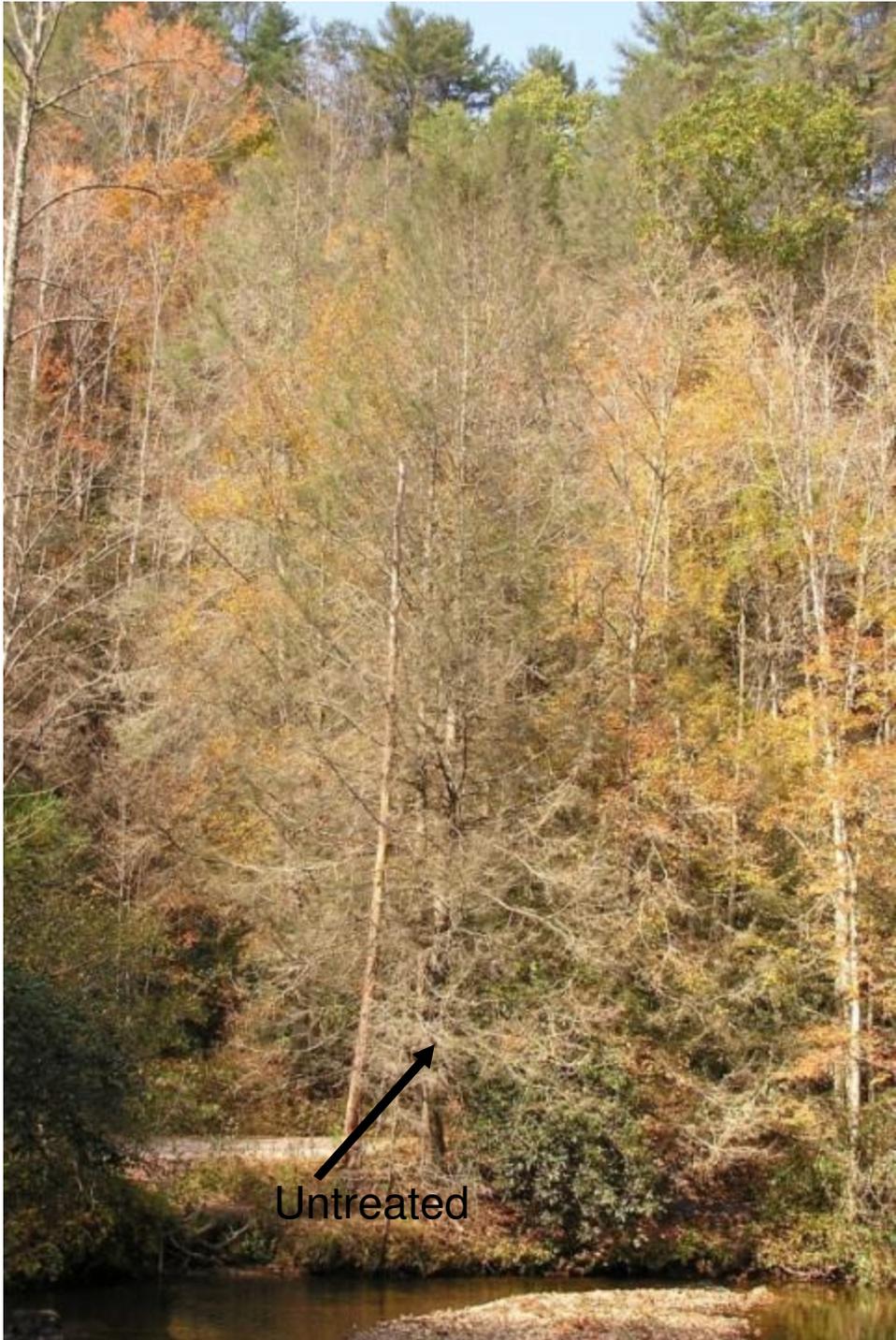


Control Options - Safari

Product	Chemical Form	Span of control	Application Technique	Cost
Safari 2G	Granular 20 lb. container	2+ years	Sprinkle around trunk & water in if no rainfall	\$1.44 - \$2.88 / inch
Safari 20 SG	Powder 3 lb. container	2+ years	Soil drench, soil injection or trunk spray	\$.83 - \$3.29 / inch

Safari Quick Facts

- 79 times more soluble in water than imidacloprid
- Works very fast – in as little as 8 weeks
- Good to use on trees that are declining
- Very effective on large trees
- Apply from February to November (Avoid making applications to very dry soil or before heavy rains are predicted)
- Do not apply within 20 feet of water – in forests (State, National)
- Normally used by professionals but available to the general public



Untreated

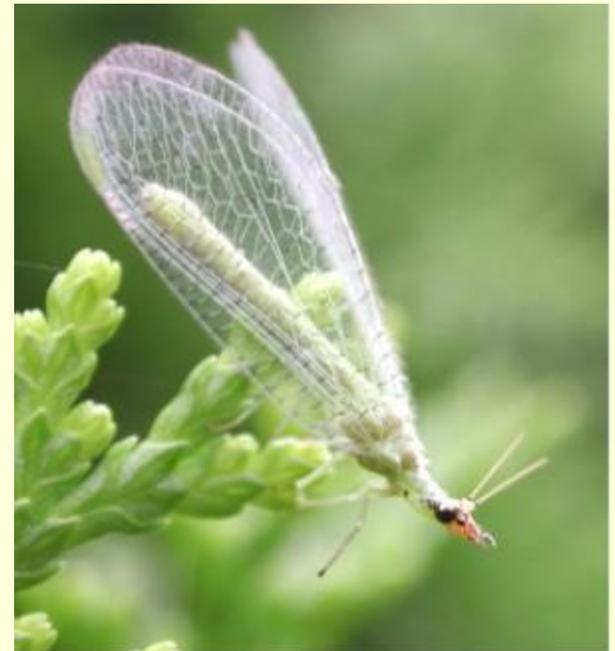


Treated



Control Options - Biological

- Biological Control is defined as the reduction of pest populations by natural enemies and typically involves an active human role.
- Predators, parasitoids, or pathogens
- Used on several agricultural pests in US
- Must be specific feeders





Control Options - Biological



Scymnus sinuanodulus



Laricobius nigrinus



Sasajiscymnus tsugae



Control Options - Biological



- Rearing facilities:
 - University of Georgia
 - Young Harris College
 - N. GA College
 - Clemson University
 - Univ. of Tennessee
 - N.C. Dept of Ag
 - Virginia Tech University



Rearing cages for *Laricobious* beetles at UGA

Raising insects is a highly specialized, technically demanding and expensive discipline!







Control Options - Biological

- Continued research on rearing and release
- Continued research on other biologicals (Lari from Japan) Entomopathogens: fungi, bacteria, virus, etc.





Conclusions

- HWA threatens to eliminate hemlocks from the wild in GA
- HWA is a worthy opponent with a high reproduction potential and a taste for GA's hemlocks.
- Chemicals are the only guaranteed way to save specimen trees at this time.
- There is hopeful news on the biological control front but the jury is still out.
- We have a limited amount of time in which to work.

Special thanks to the U.S.D.A. Forest Service for providing funding.





Questions?

