What's going on with my trees?

Climate effects on forest health

Forestry In South Carolina

- ~ 12 million acres
- Forestry is big industry!
- 73% of the forest land is privately owned

Climate Change…

- Modify tree defenses
- Damage trees: wind, snow, frosts, or ice
- Change boundaries of species
- Change in plant species
- Understory vegetation
- Soil organisms

Forest Change Responses…

- Affect nutrient cycling
  - soil nutrient availability
  - amount and seasonality of litter inputs
  - decomposition rates
  - plant litter quality
- Hydrological processes
- Soil moisture
- Debris = fire risk/intensity


SC Forestry Commission


SC Forestry Commission

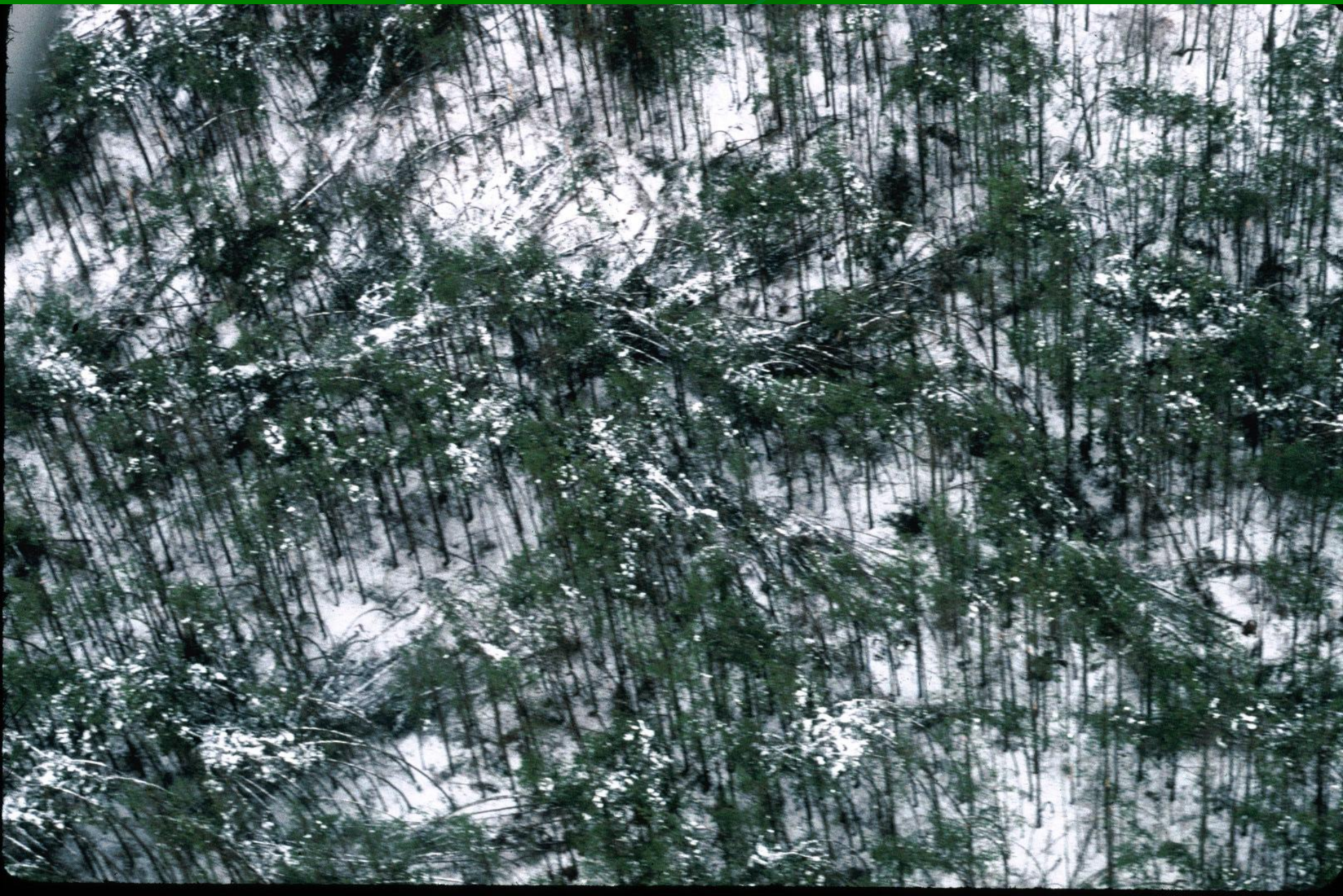

SC Forestry Commission

Fire Damage

Direct Events

- **High winds/ice/snow damage to trees:**
  - **branch breaking**
  - **crown loss**
  - **trunk breakage**
  - **stand destruction**

Snow/Ice Damage



Tornado Damage

Hurricane Damage

Warmer/Drier…

- Larger populations of insects survive winter
- Allows them to develop faster
  - additional generations
  - reduced parasitism opportunity
- Ranges expand northward
- Trees' ability to resist insect attack reduced

Ticks

Male

Female

Specific Examples

- Armillaria root disease
- Hypoxylon canker
- Defoliators
- Hemlock Woolly Adelgid
- Pine beetles

Armillaria Root Disease

- Conifers and hardwoods
- Grows on tree roots
- Stressed trees

- Warmer/drier conditions trees @ > risk
  - grows exponentially on stressed trees

Shoestring Root Rot

- Rot of roots and lower trunk; trees susceptible to wind throw
- Opportunistic; attack weakened plants
- Eastern oak species

Armillaria

- spread primarily through root-to-root contact
- spread along root to root collar
- spreads to other primary roots
- death: tree girdled at the root collar
- bark beetles or windthrow

Hypoxylon Canker

Hypoxylon Canker

- Affects various hardwoods
  - Oak Beech
  - Hickory Maple
- Most trees have the fungus living innocuously under the bark
- Kills trees when they are stressed:
  - <u>drought</u>, damage, root disease, etc.

- Spores
- Produced in spring or summer

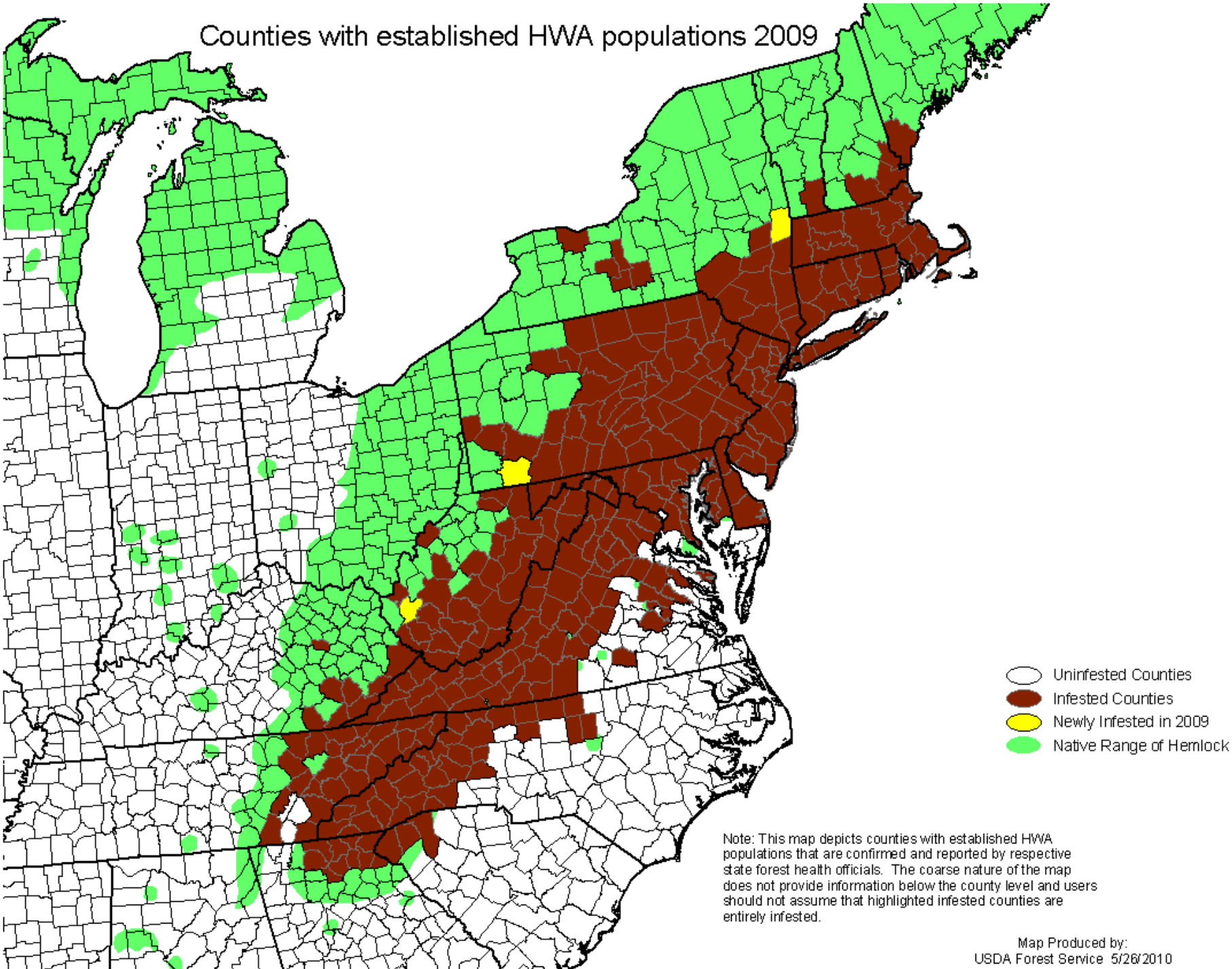
Defoliation

Forest Tent Caterpillar

Forest Tent Caterpillar

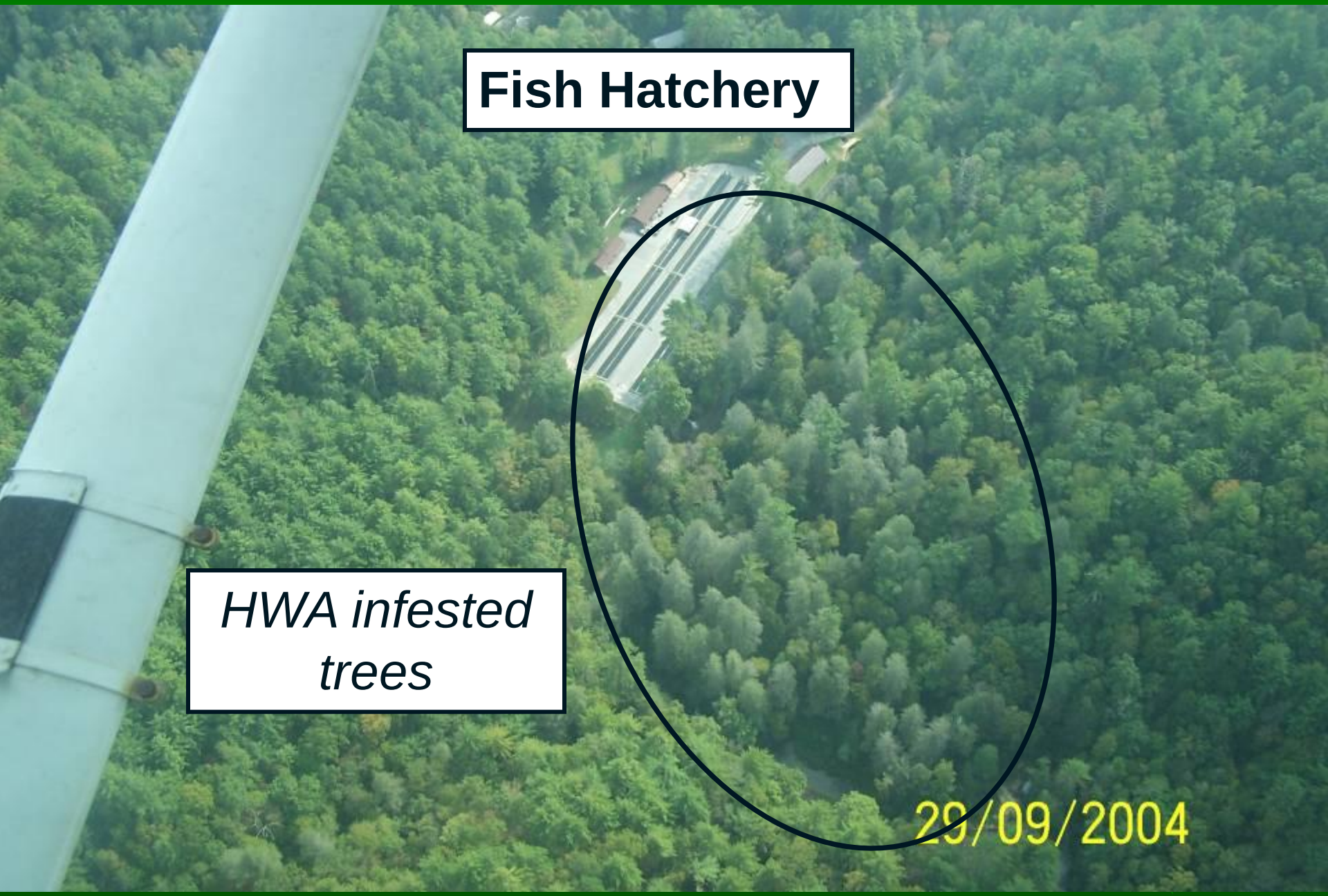
- One generation/year
- Synchrony with leaf out
- Early leaf out
  - reduced growth rates
  - longer larval stages
  - lower pupal masses
  - reduced female fecundity

Hemlock Woolly Adelgid


Counties with established HWA populations 2009
Uninfested Counties
Infested Counties
Newly Infested in 2009
Native Range of Hemlock
Note: This map depicts counties with established HWA populations that are confirmed and reported by respective state forest health officials. The coarse nature of the map does not provide information below the county level and users should not assume that highlighted infested counties are entirely infested.
Map Produced by:
USDA Forest Service 5/26/2010

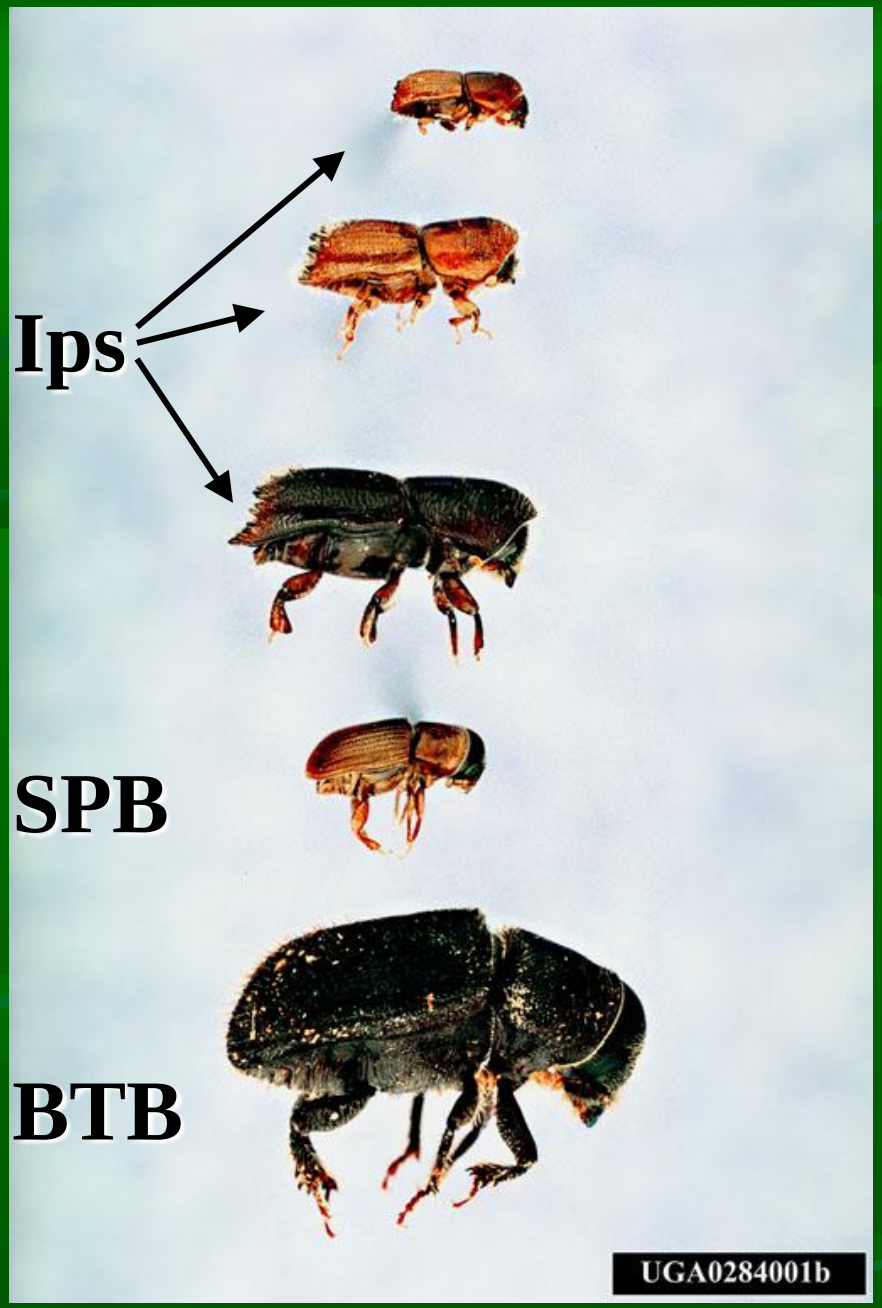

HWA Adult
HWA Eggs
UGA1276002

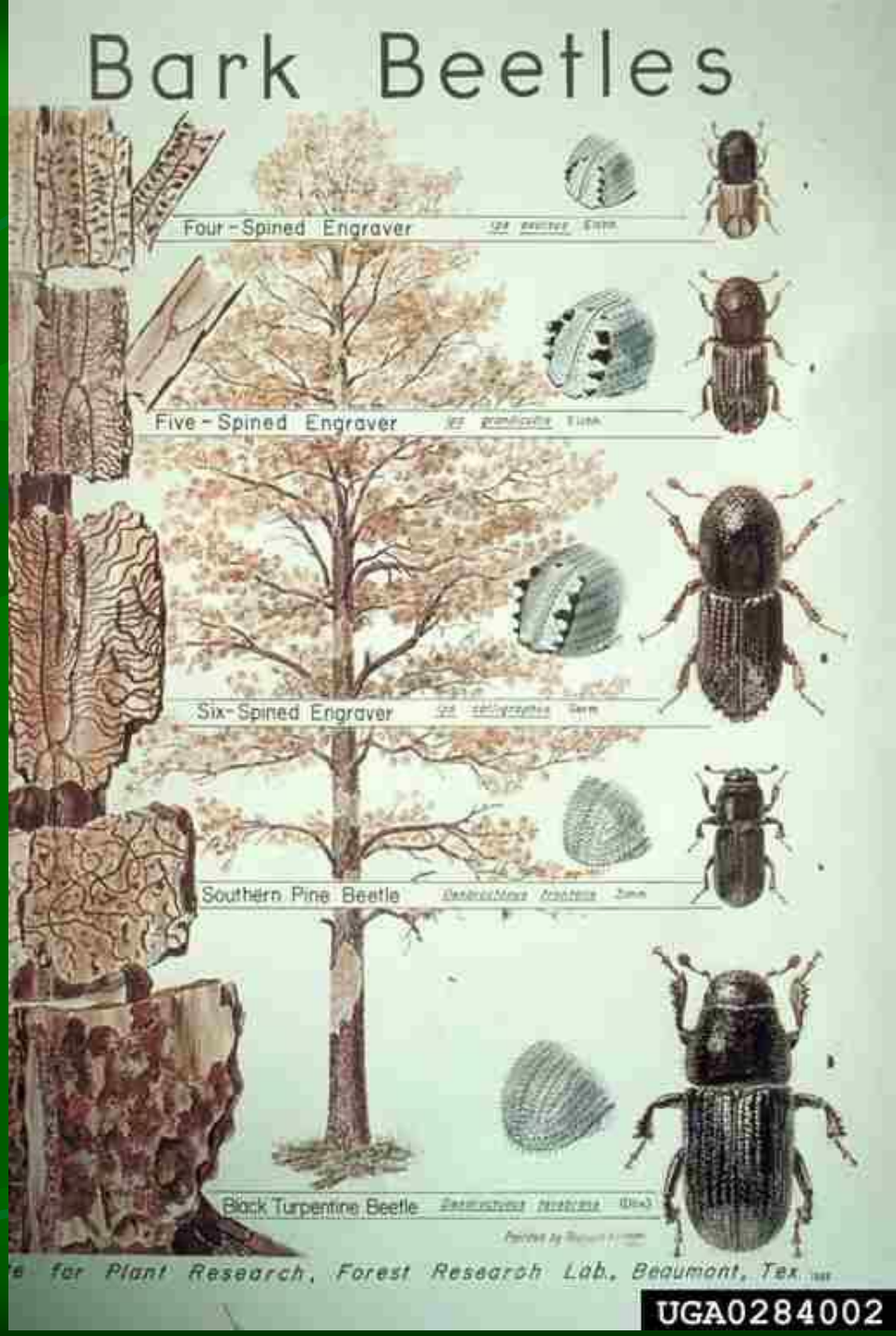

Adult HWA
without wax
UGA1276003


Fish Hatchery
HWA infested trees
29/09/2004

Hemlock Woolly Adelgid

- Stabilized mean winter temps -5º C or less
  - keep HWA from expanding
- Changes in forest composition, structure, nutrient cycling, surface water quality, and populations of associated wildlife


Ips
SPB
BTB
UGA0284001b


Bark Beetles
Four-Spined Engraver
Five-Spined Engraver
Six-Spined Engraver
Southern Pine Beetle
Black Turpentine Beetle
for Plant Research, Forest Research Lab., Beaumont, Tex.
UGA0284002


29/09/2008


UGA2716114


2007/05/08

Ips

Prefer stressed trees:

- drought stress

- lightning struck

- root/logging damage

Ips Galleries


28/01/2008

Southern Pine Beetle

- Strong fliers
- Move easily from tree to tree and stand to stand

Southern Pine Beetle

Climate Change

- Modify tree defenses
  - Pine trees reduced resin
- Influences the survival and spread of pathogens
  - susceptibility of their hosts
- Direct Damage: wind, snow, frosts, or ice
- Allow for northern expansion
- Change in overstory, change in understory
- Change in insect winter survival/biology

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Eastern Tent Caterpillar

Laurie Reid, SCFC


28/03/2006
Laurie Reid, SCFC

Brown Widow

http://www.bugwood.org

http://www.fs.fed.us/r8/foresthealth/laurelwilt/index.shtml

http://www.state.sc.us/forest/id.htm