Release and Dispersal of *Laricobius nigrinus* in NW NJ and NE PA

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http://www.nj.gov/agriculture/divisions/pi/prog/biological.html

NEW JERSEY DEPARTMENT OF AGRICULTURE

Hemlock Woolly Adelgid

- Brought in from Japan in the 1950's to the Washington D.C. area (is a native biotype in the Pacific NW).
- Only became a serious pest when it moved into the natural hemlock stands in Northern New Jersey and Connecticut.
- 100% mortality in some stands in New Jersey
- No adelgid parasites are known, only predators

Photo: S. Geloski-Kimmel, Phil. Inq.

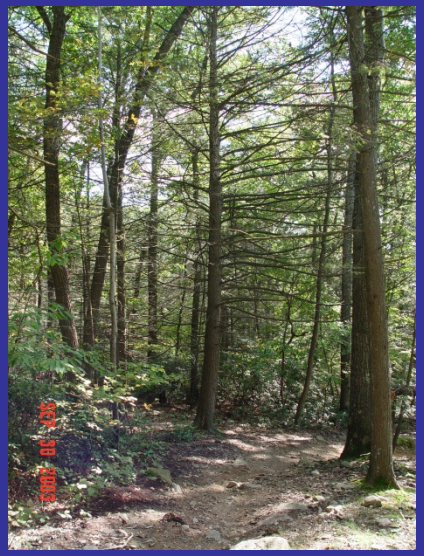
Tree effects

Hemlock trees that have been infested numerous times have thin, reduced crowns; dieback.

Only the upper crown survives for a while, some as long as 15 years until the tree dies.

Closure of areas to public.

Photo: J. Zhang, J. Lashomb



Hemlock Borer damage increases in stands with long term Hemlock Woolly Adelgid infestations. Elongate Hemlock Scale shows up as a secondary pest. E. Preisser at URI has data that shows that if EHS gets to a hemlock stand first that there might be Some protection from the HWA but not vice versa.

Photo: E. Day, VA Tech.

Synergy with EHS?

Sasajiscymnus tsugae (Coleoptera: Coccinellidae) Bivoltine, from Japan

adult

larva

- 281,175 released since 1998.
- 69 release sites, 12 sites with recoveries
- 1 beetle recovered in 2007.
- No longer rearing this species
- Prefers high quality food
- Highest biotic potential of any HWA predator
- Has established in NJ.

Scymnus sinuanodolus (Coleoptera: Coccinellidae) Univoltine, from China

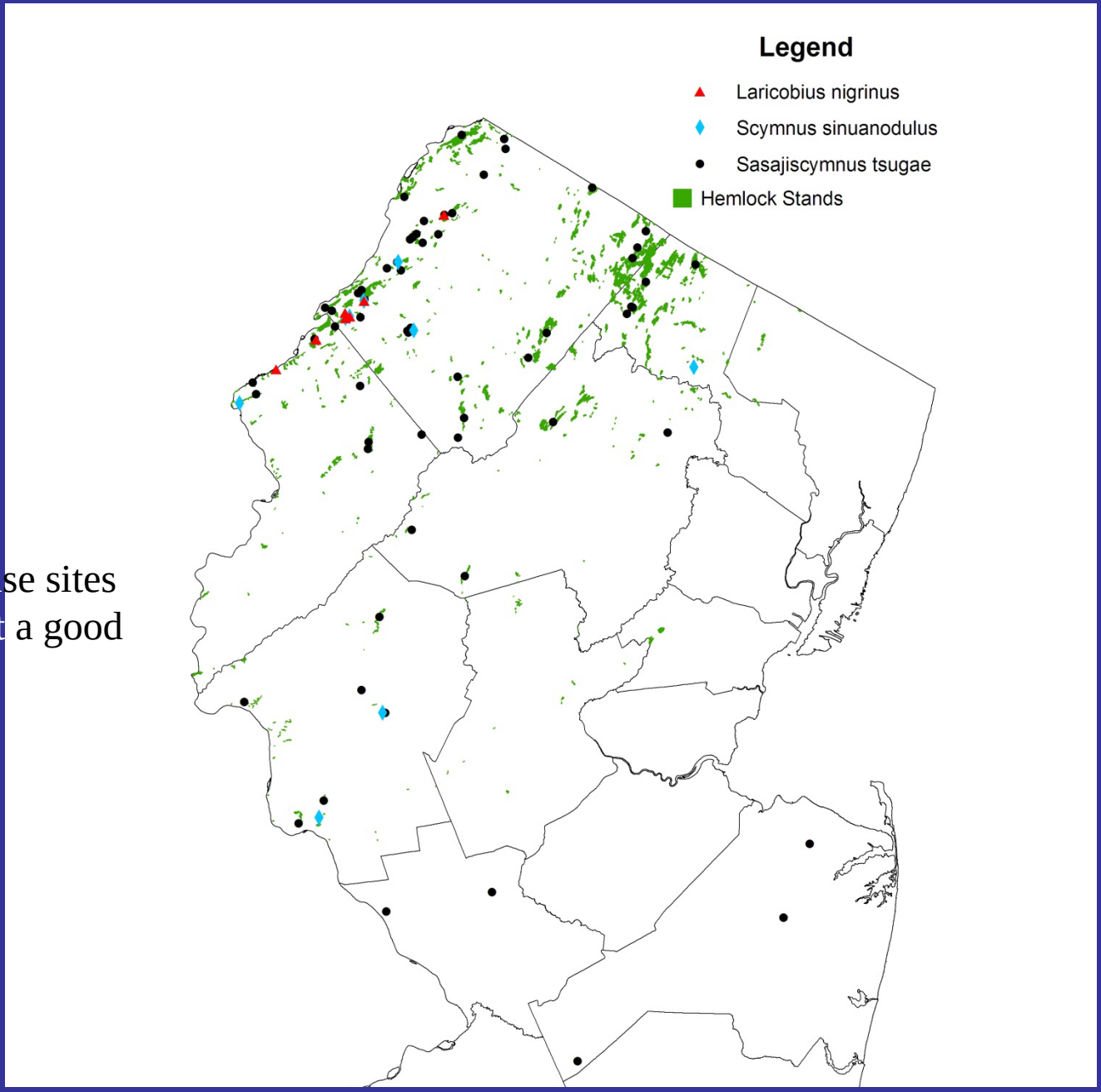
Photos: David Lesage

Started with 100 beetles in December 2003.

Released 13,335 in 9 sites; About 10,000 shipped to other states (PA, NC, NY, WV, TN and MD)

No overwintering recoveries have been made from the release sites in NJ; recovered in Southern Appalachians. No longer rearing this species; not a good climate match for NJ.

Hemlock Stands and Beneficial Releases



Many release sites
For ST; not a good
Idea!

Laricobius nigrinus (Coleoptera: Derodontidae) from Pacific Northwest

Larvae hard to see on white beating sheet

- Active from October to April on aestivating HWA sistens
- 10,577 released through 2011.
- Recovered and dispersing; **SURVEY TECHNIQUE and WHERE YOU RELEASE/LOOK IS IMPORTANT!**
- Extremely difficult to rear.
- Recovered LN at 143 sites in DWGNRA and NE Pennsylvania.
- **Trees at one site showing recovery without an attendant twig dieback.**

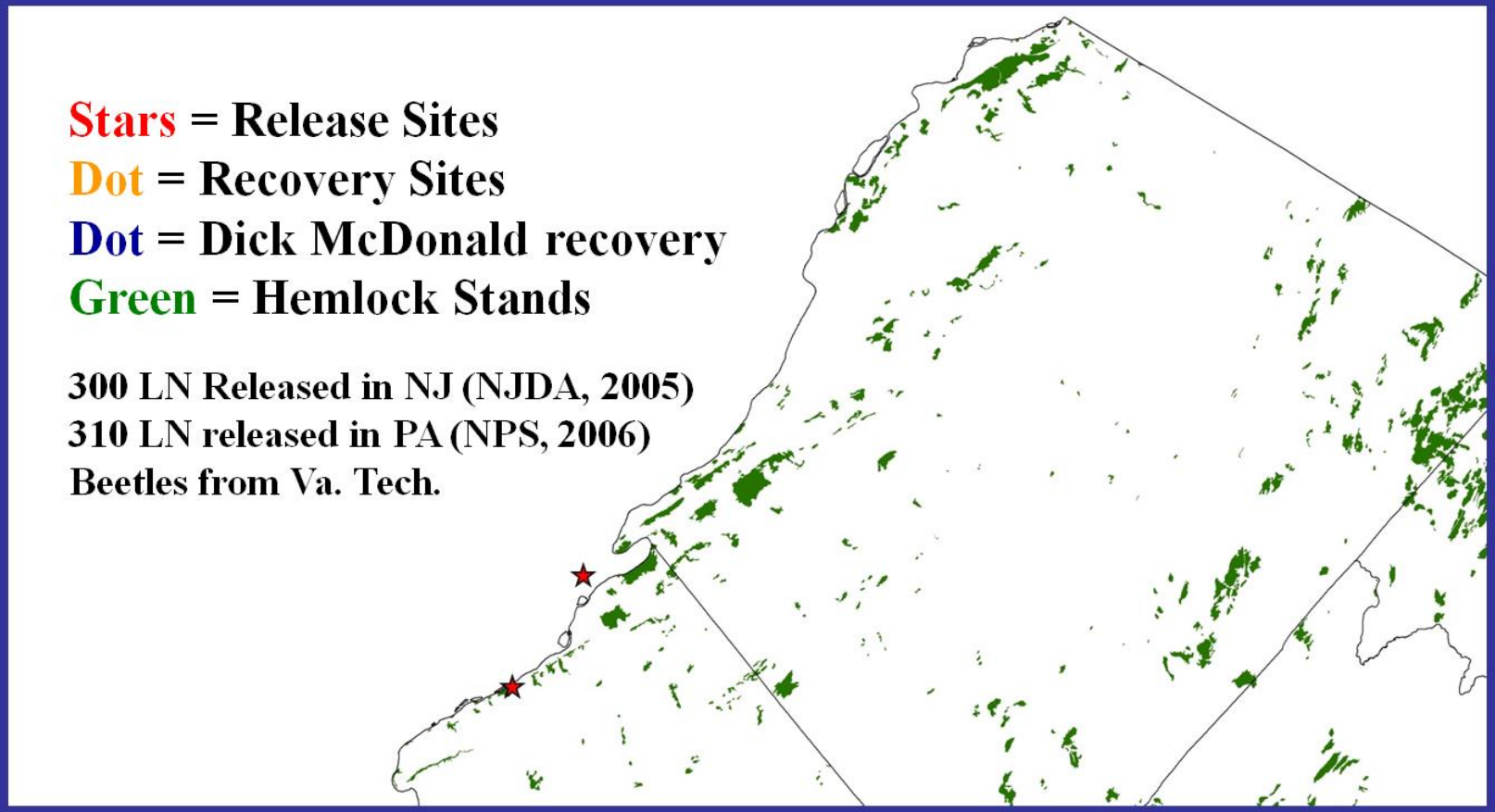
LN-Where are they?

- They will be in sunny areas with high HWA populations on the edge of the forest or clearing; not readily found in the deep woods.
- Gina Davis of Va. Tech. found that 85% of them are above 3 meters in a tree. Bring a small stepladder when you survey.
- Are not always where they are released.
- Release them in high HWA populations and make multiple releases in the same site!

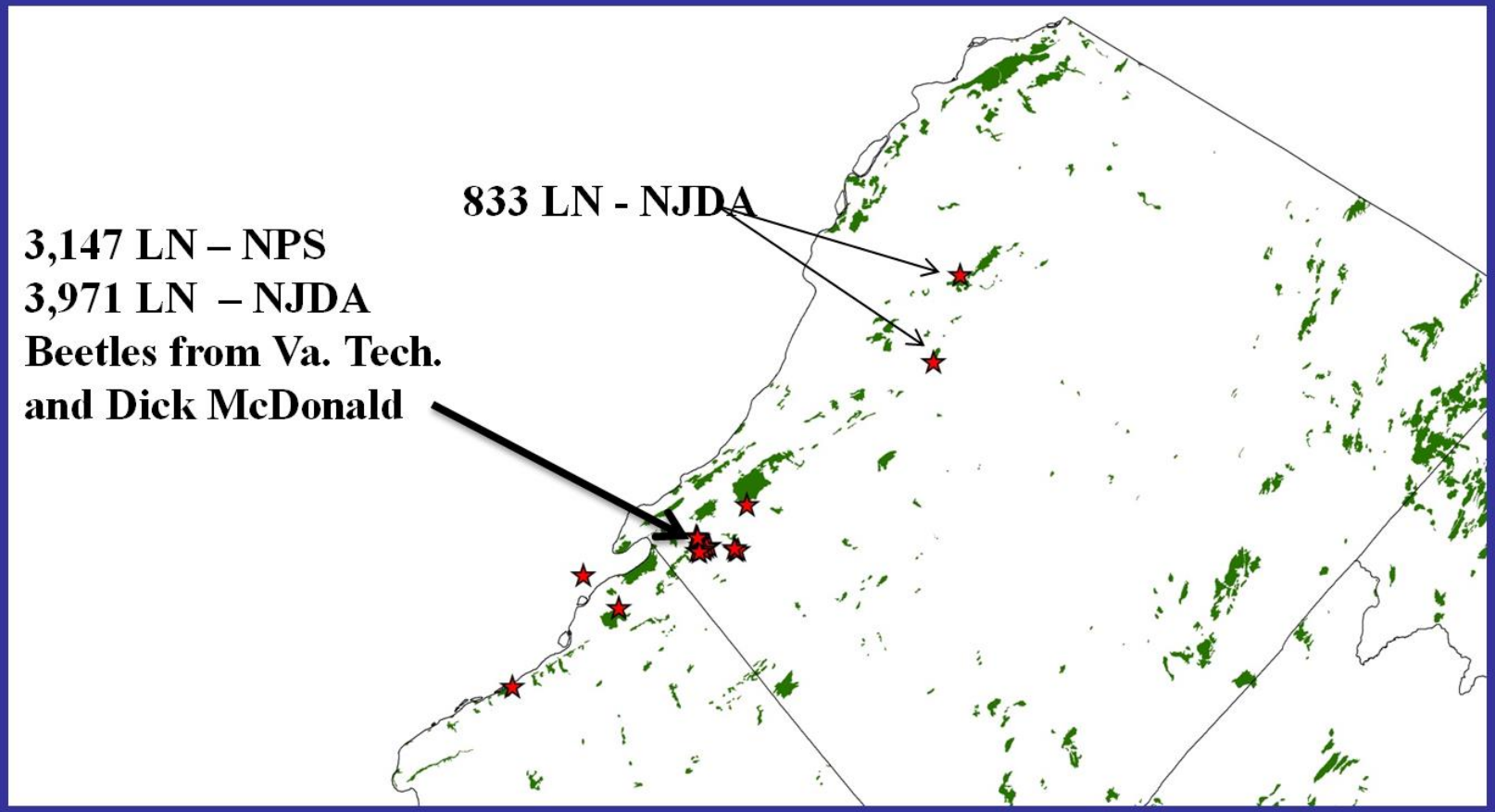
Photo: Ashley Lamb, Va. Tech

Hedges, golf courses and cemeteries are the best collecting locations!

2005 and 2006 LN Releases

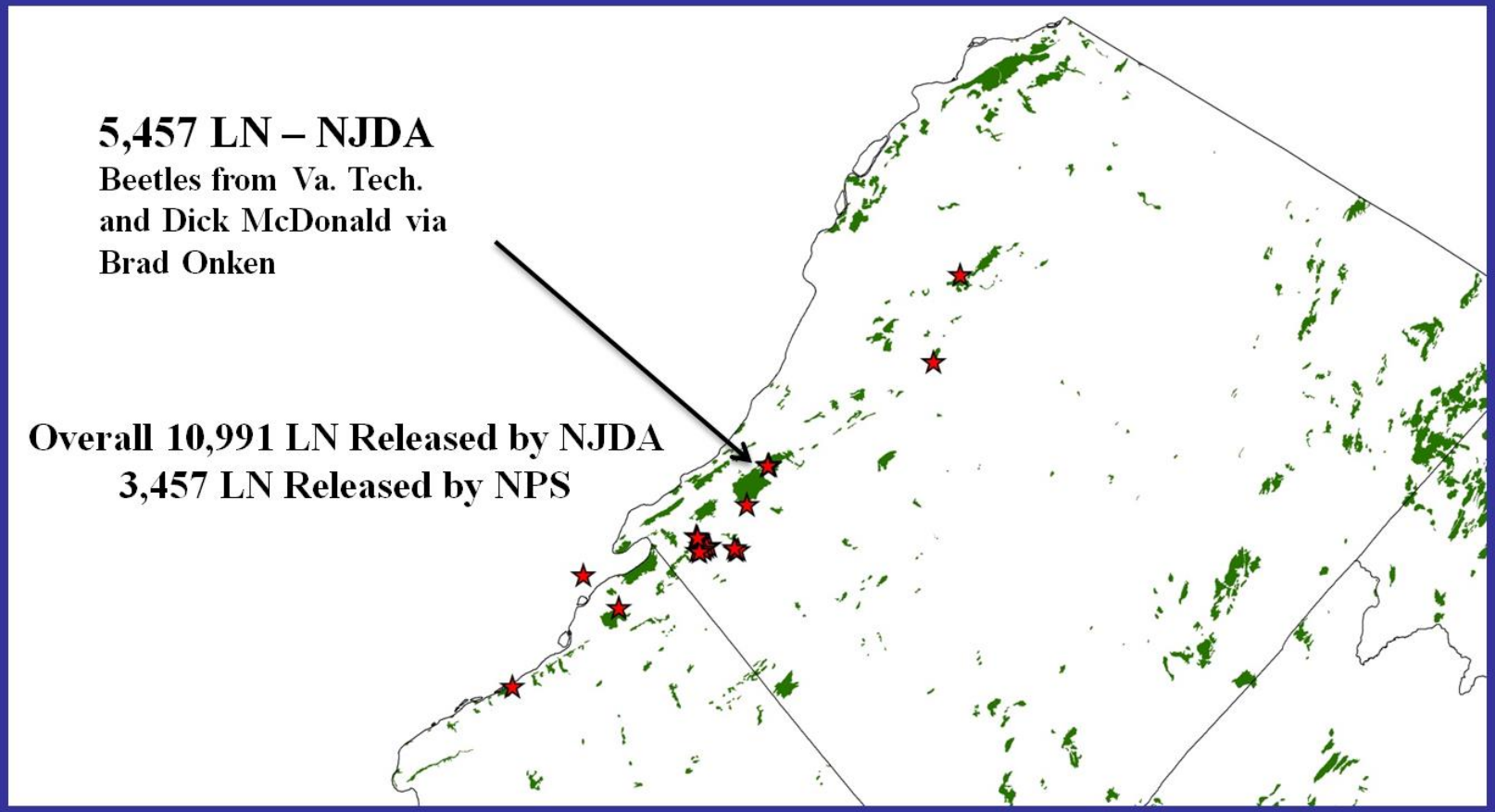


2007 to 2009 LN Releases

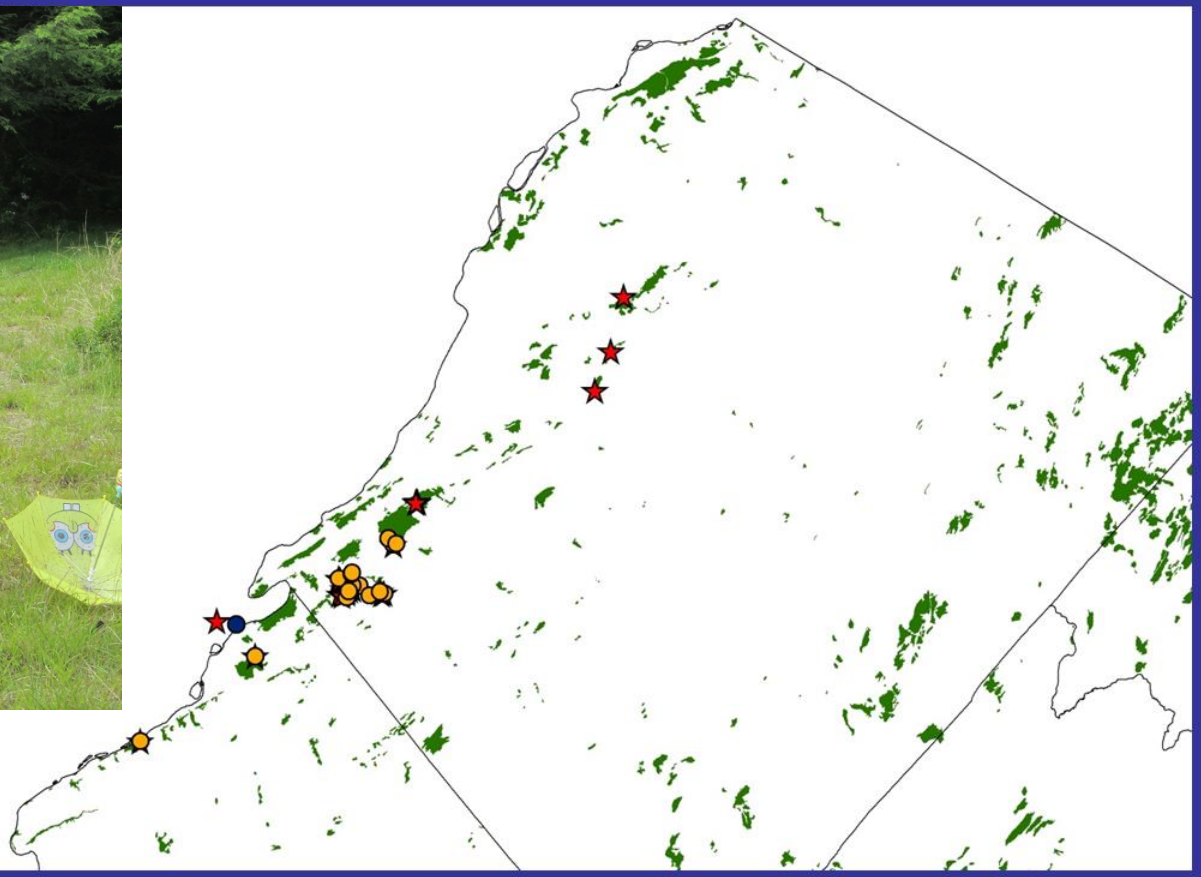


Made multiple releases over three years in sites that were within 2.5 miles of each other; outsmarted ourselves and concentrated the beetles.

2010 Release

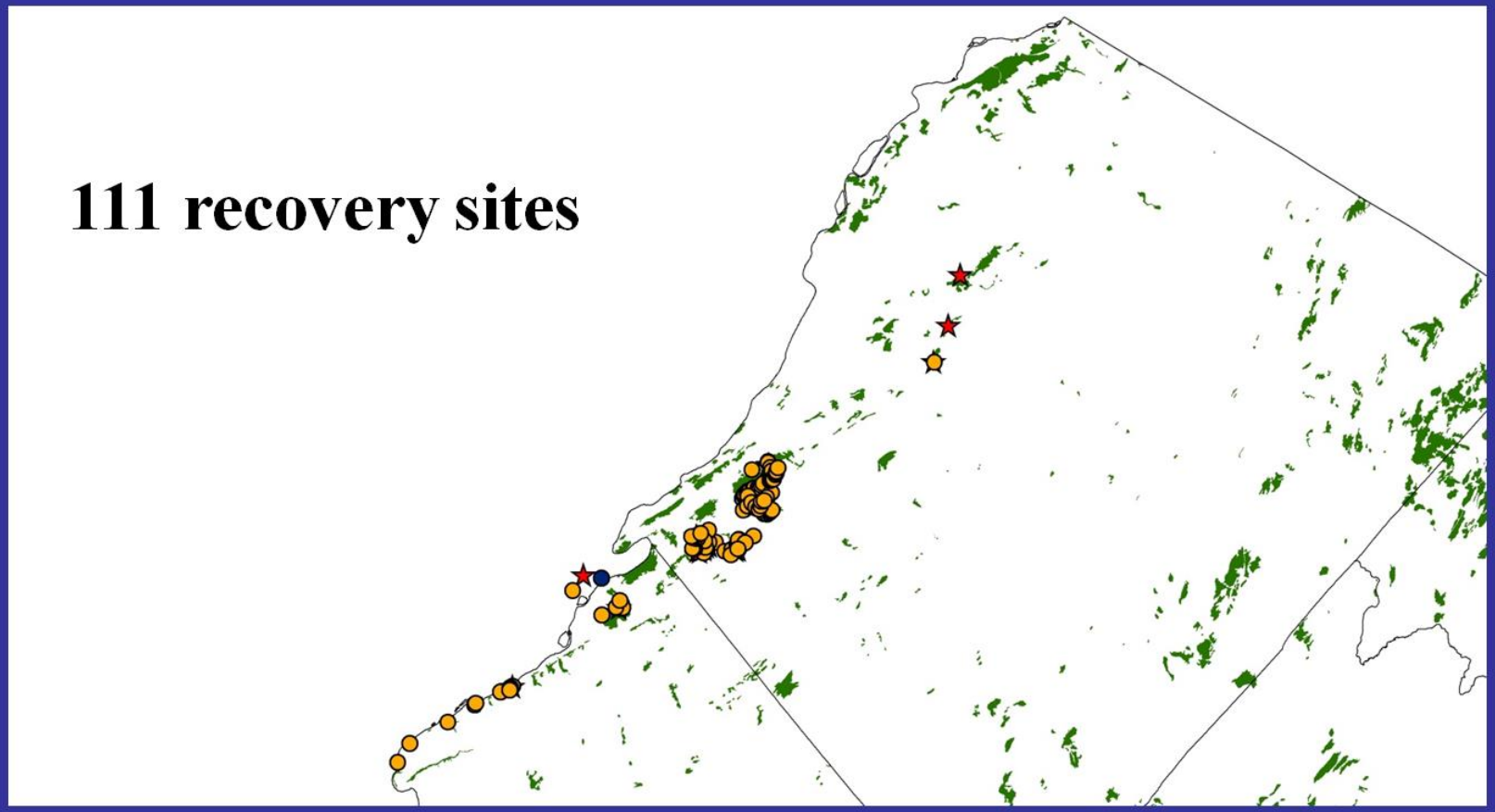


LN Dispersal Through 2012 (Spring Larval Survey)

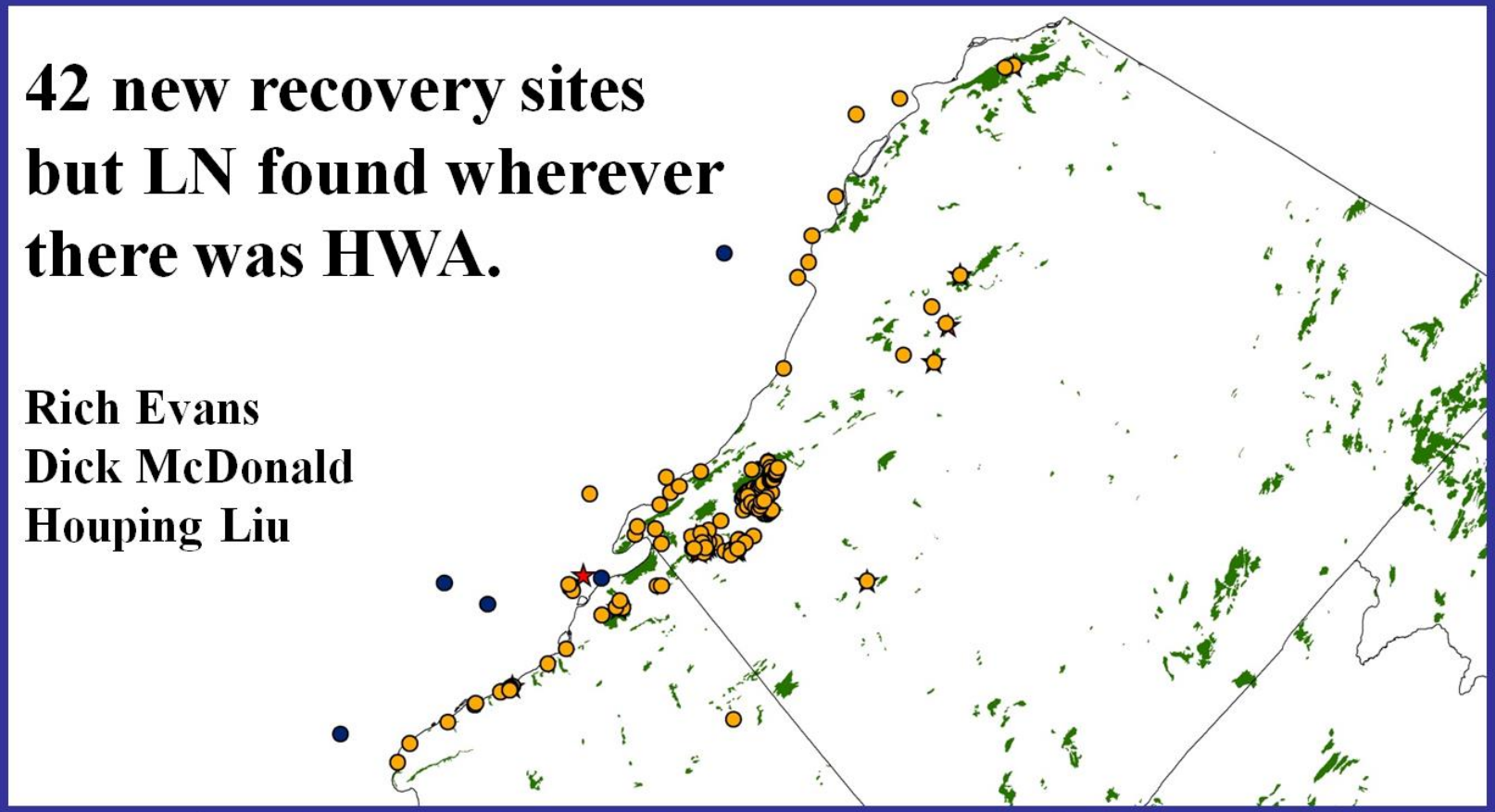


Until 2011 – Did not find many until training by Dick McDonald and escape from the Gypsy Moth Suppression Program

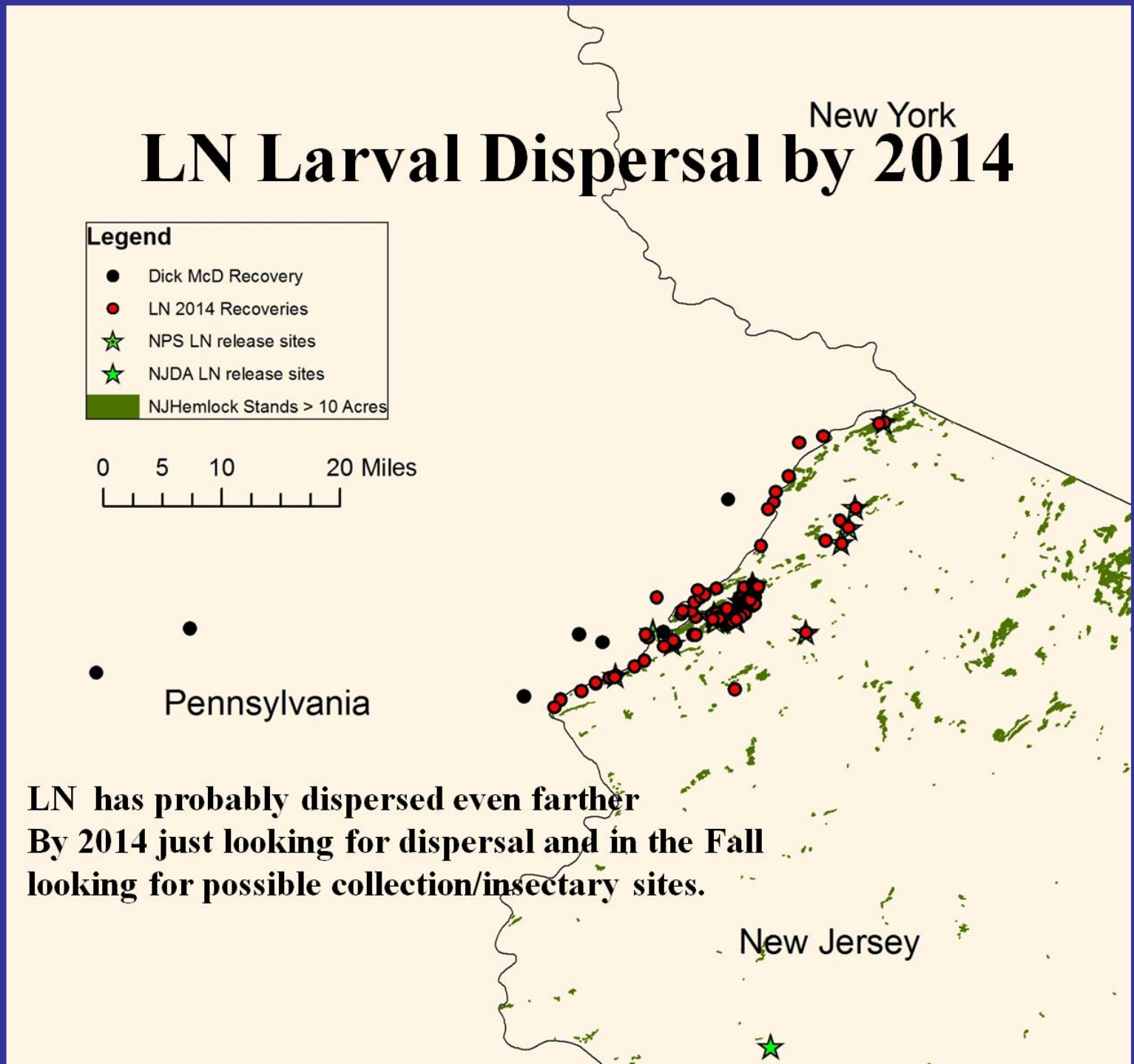
LN Larval Dispersal Through 2013



LN Larval Dispersal Through 2014



Encouraging despite the cold temperatures in January 2013 and low HWA populations.



LN has probably dispersed even farther
By 2014 just looking for dispersal and in the Fall looking for possible collection/insectary sites.

Resistant Trees

“Bulletproof Stand”

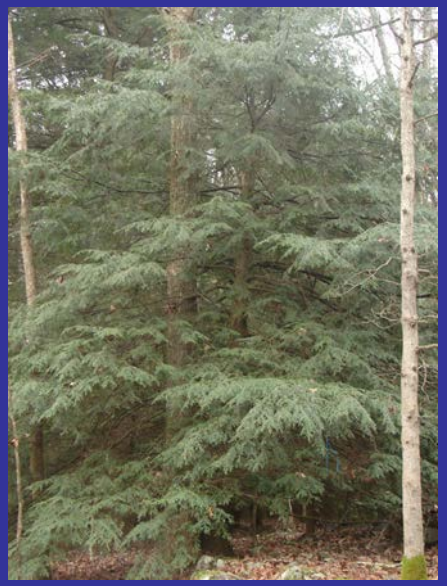
- Dick Casagrande

4 Infestations of HWA since 2004, no mortality

- Induced Resistance
- There is more than one stand in NJ

Mckenzie, E. Alexa, 2015 found that there were differences in Terpene chemistry between The “resistant trees” and the control trees

Characteristics of Resistant Stands



- Multiple years of infestations with trees remaining healthy.
- High Crown Ratios and Regeneration.
- High HWA mortality in the FALL before temperatures get really cold. The sistens don’t develop.
- D. Casagrande and E. Preisser at URI controlled for all other variables in their experiments.

Hybrids

Laricobius nigrinus

***L. nigrinus/rubidus* hybrid?**

Fischer et. al 2015 found hybrids of the two species with LN dominant on hemlock LR dominant on White Pine and the hybrids primarily on hemlock

Other Potential Predators

Scymnus coniferaum

- Summer predator in Pacific NW
- may help keep HWA under control there along with LN

Photo: http://www.nrs.fs.fed.us/disturbance/invasive_species/hwa/control_management/scymnus_coniferarum/

Laricobius osakensis

- From Japan
- Released and under evaluation by Va. Tech.
- Similar to *L. rubidus* in appearance

Summary

- In NJ the best time to look for larvae is mid-April to the third week of May.
  - Problematic for NJ in that this is gypsy moth and Mexican bean beetle season.
- Some sites we did not recover at for years
  - Don't give up, the beetles may not always be where you put them.
- Technique is important and you have to look at the right time of year!
- Looking for new sites and possible outdoor insectaries in 2015; NE PA looks like it might have potential because of higher HWA populations than NJ but LN are not in large numbers, yet.

HWA Summary

- *L. nigrinus* has established; overwintering adults and larvae have been recovered at 142 sites.
- *L. nigrinus* has dispersed over 33 miles in the Delaware Water Gap NRA and into PA.
- The winters of 2013-2014 and 2014-2015 has caused above 95% HWA mortality so it may be difficult to find predators but it is good for the trees.
- We are optimistic! Dr. Dick McDonald is reporting improved tree health in NC. His releases started earlier with more LN than in NJ but NJ also has had HWA longer.
- Studies are currently underway to get data on the efficacy of LN by B. Mayfield (USFS), S. Salom (Va. Tech) and J. Elkinton (UMASS).

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