

Biological Control of HWA in Eastern Canada

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Forest Pest Forum, Ottawa, ON, Canada

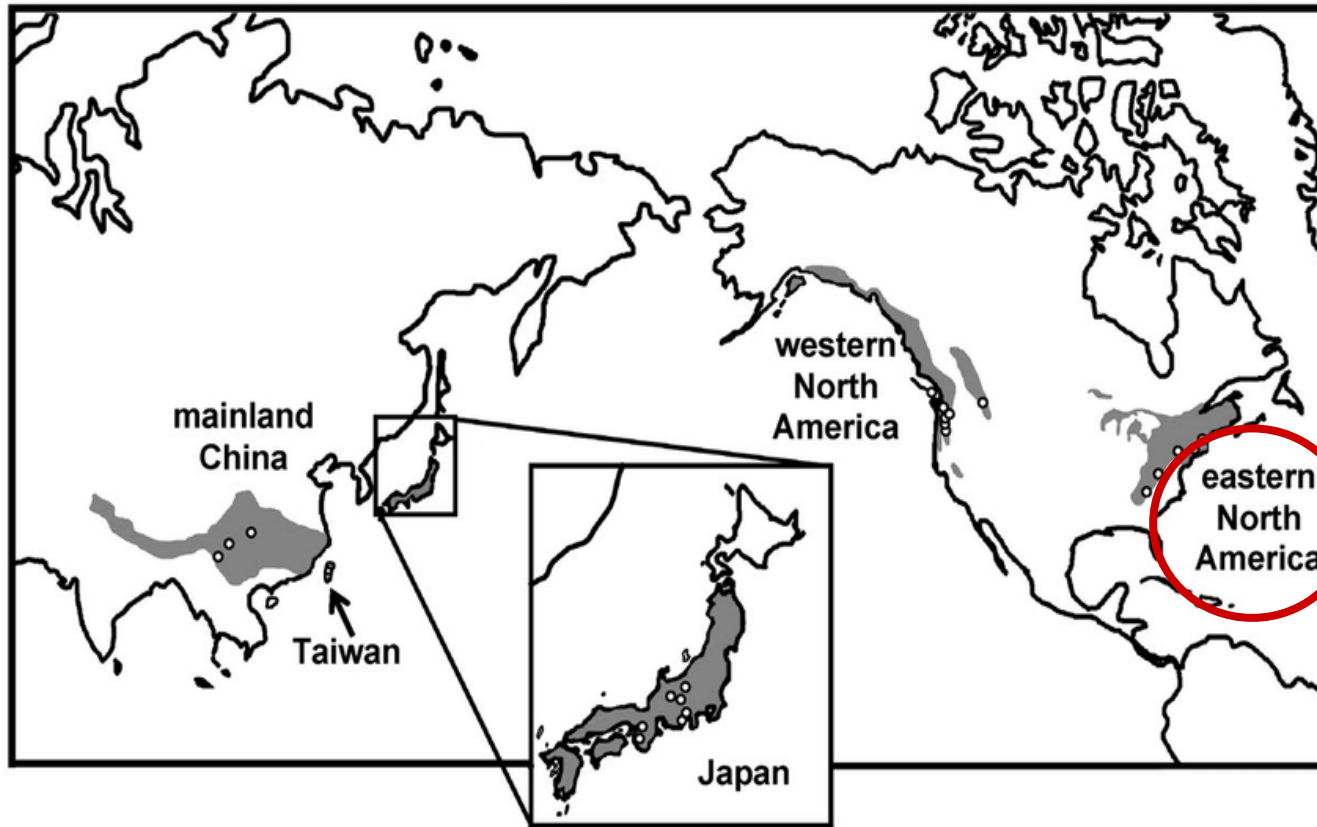
Tuesday, Dec. 6/22

Classical Biological Control of HWA

1. HWA in eastern Canada
2. Justification
3. Research tasks
 - I. Due-diligence
 - II. Optimization and integration
 - III. Post-release monitoring



What is it?



HWA invaded range

*Selection, assessment, and importation of natural enemies from native range of *A. tsugae**

Justification*

- unacceptable damage
- top-down regulation, but not in invaded range
- other tactics insufficient

* Based on existing / ongoing research

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Safety *

- evidence of safety before release
- specificity to target pest

Approvals

- Federal approval - if not native to Canada
- other jurisdictional requirements / consultations

Efficacy *

- demonstrated population regulation in invaded range
- suitable given climate, pest phenology

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Feasibility *

- adoption / adaptation of existing programmes
- operational mass releases / rearing
- scaling up: recovery, establishment, spread

Impacts *

- pest population control
- reduction in tree mortality / decline
- monitoring of non-target effects

* Based on existing / ongoing research

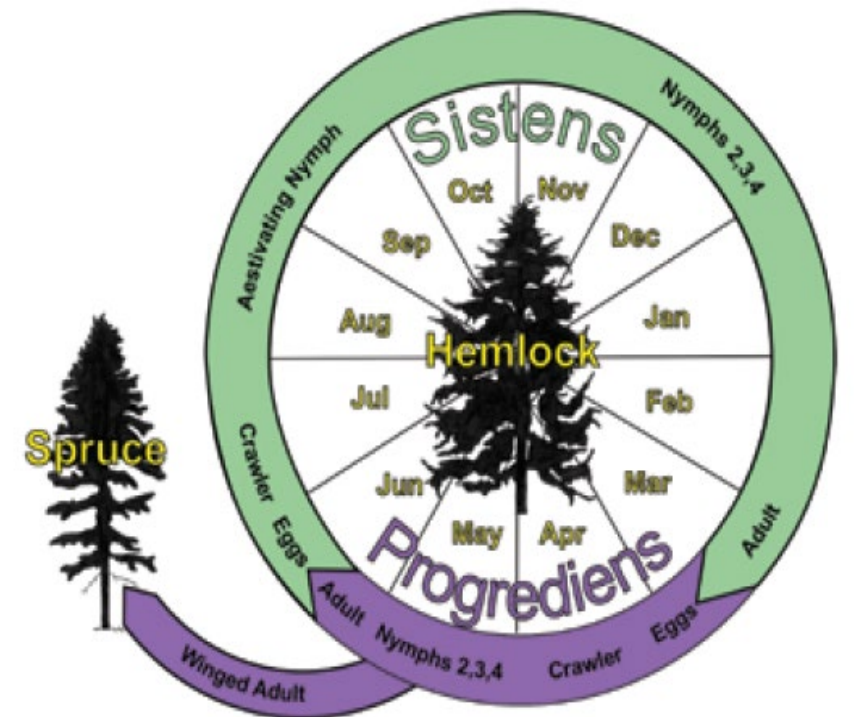
Benefits of Biological Control

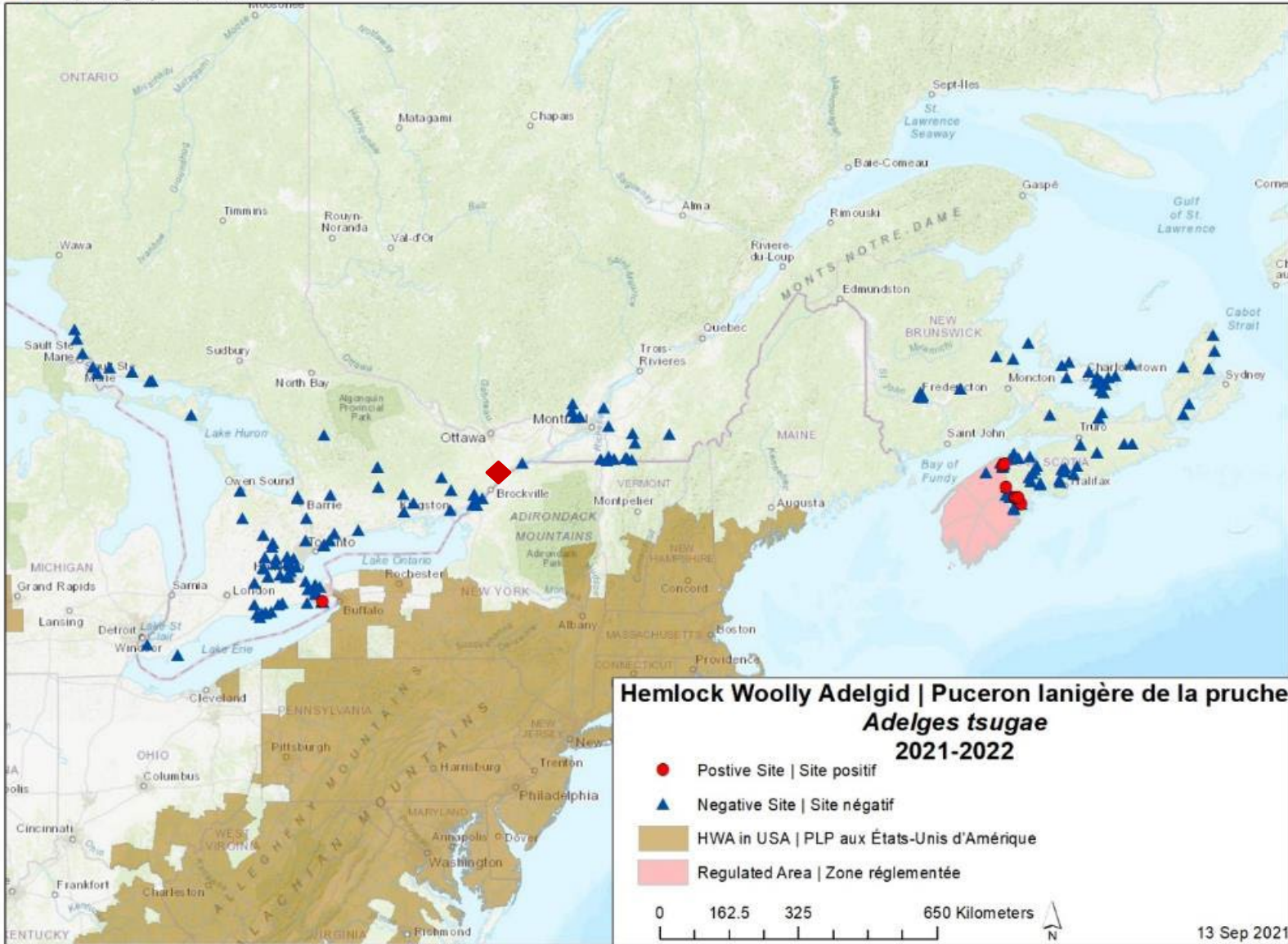
1. Only landscape-level tool (vs. local insecticides)
2. Specific
3. Self-sustaining (cost-effective)
4. Adapts to target
 - ▶ Density-dependent
 - ▶ Follow across range

Hemlock woolly adelgid, *Adelges tsugae*



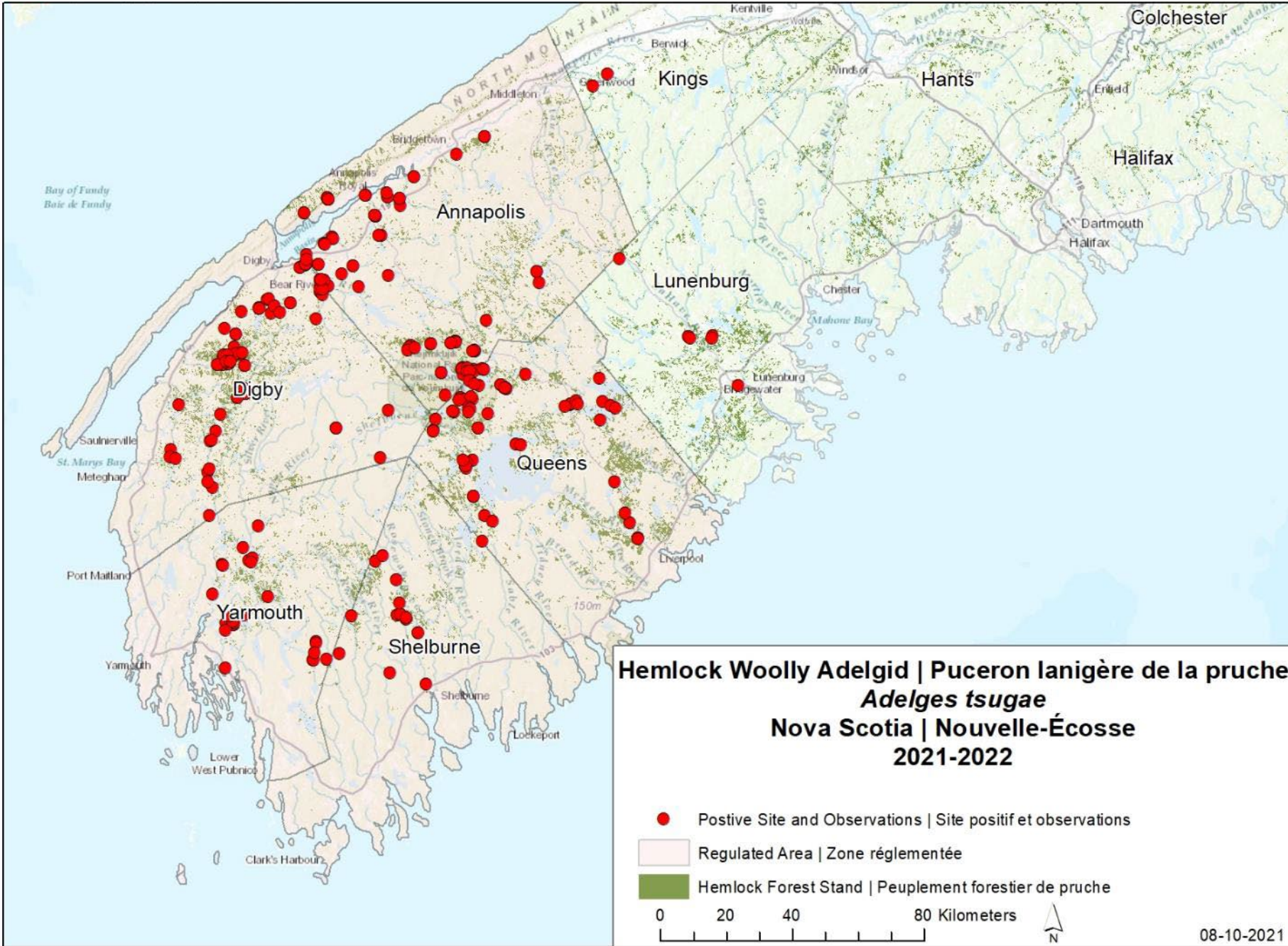
- ▶ Small (<3 mm)
- ▶ Introduced ~1920's (VA)
- ▶ Two generations (all female, mostly static); white waxy ovisac
- ▶ Feeding causes needle loss, tree death
- ▶ Rapid spread (20km/year); long distance movement





13 Sep 2021

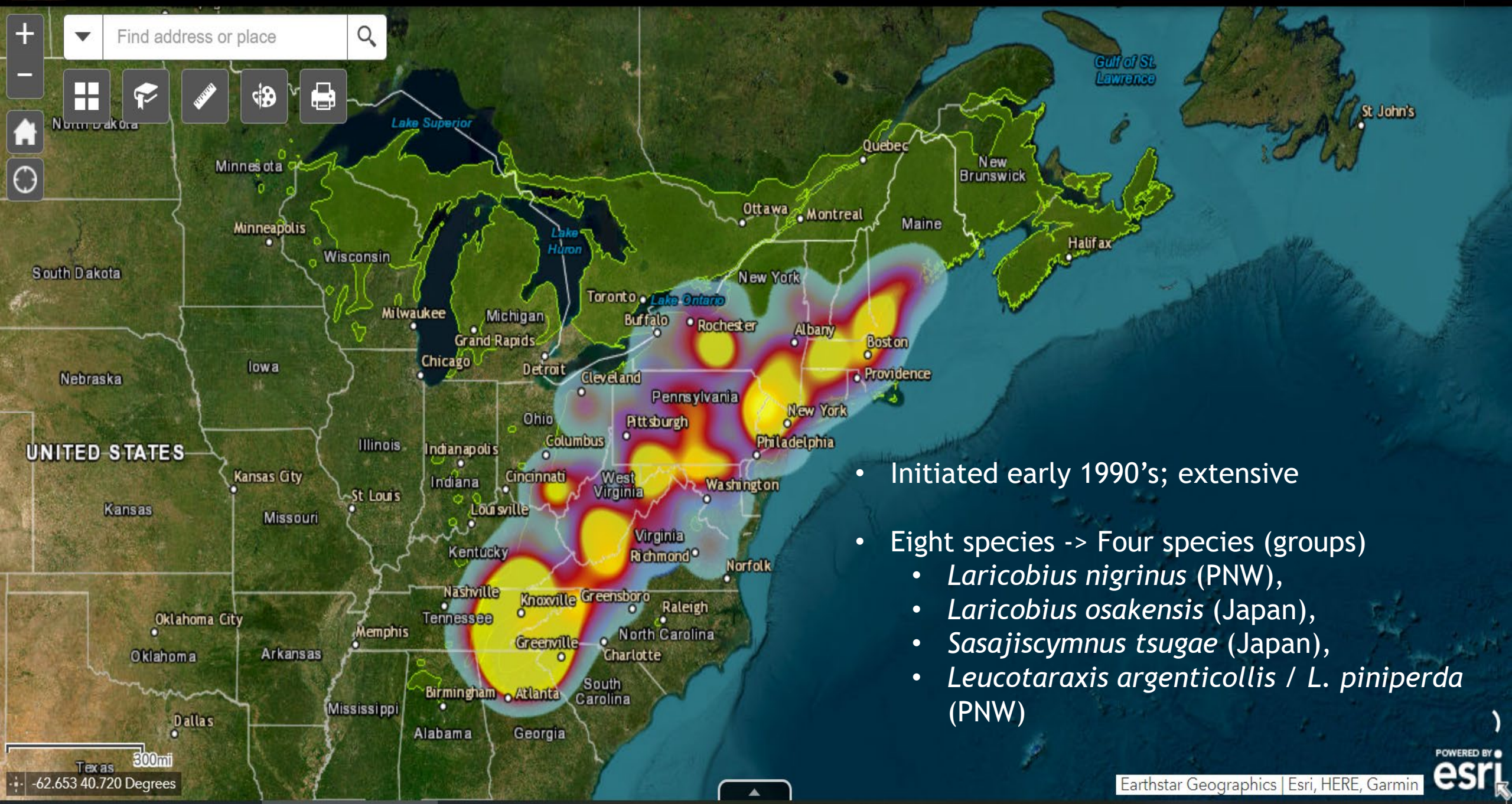




Distribution Layers

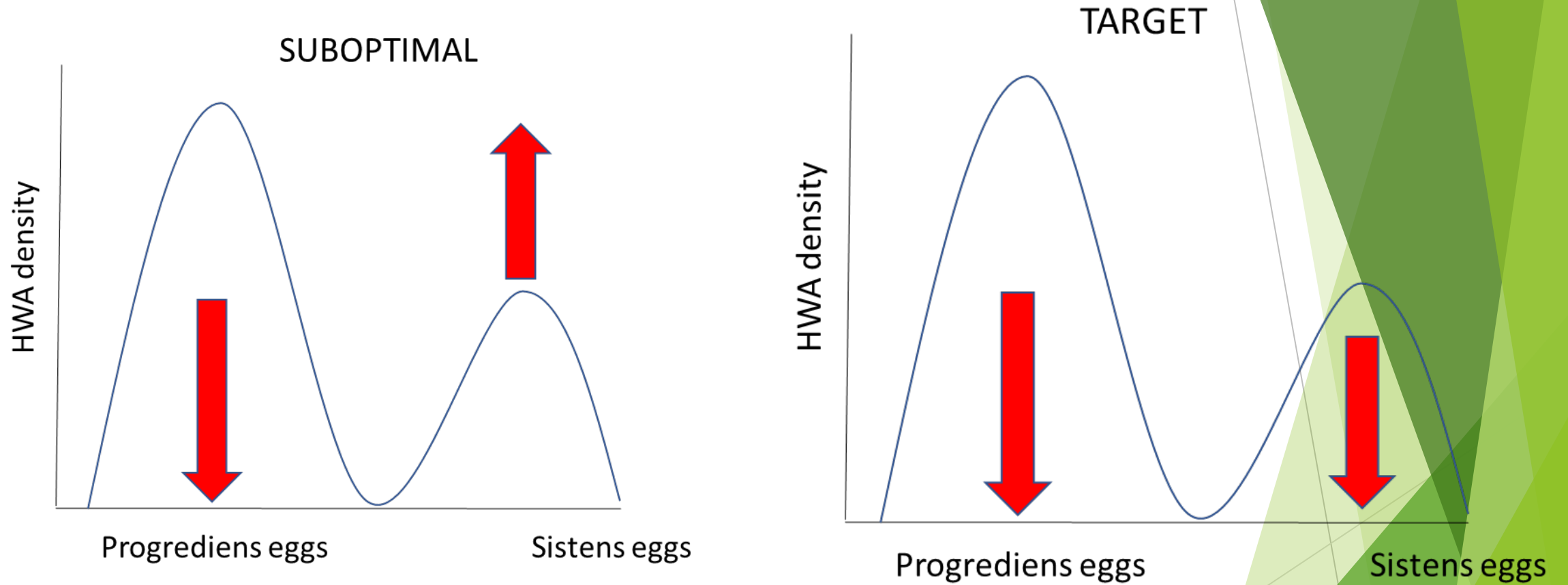
Hemlock forest extents and predator project activities

<https://gmsts.maps.arcgis.com/apps/webappviewer/index.html?id=afcf479bcbb24a2dbd1853e89dd4fe6e>



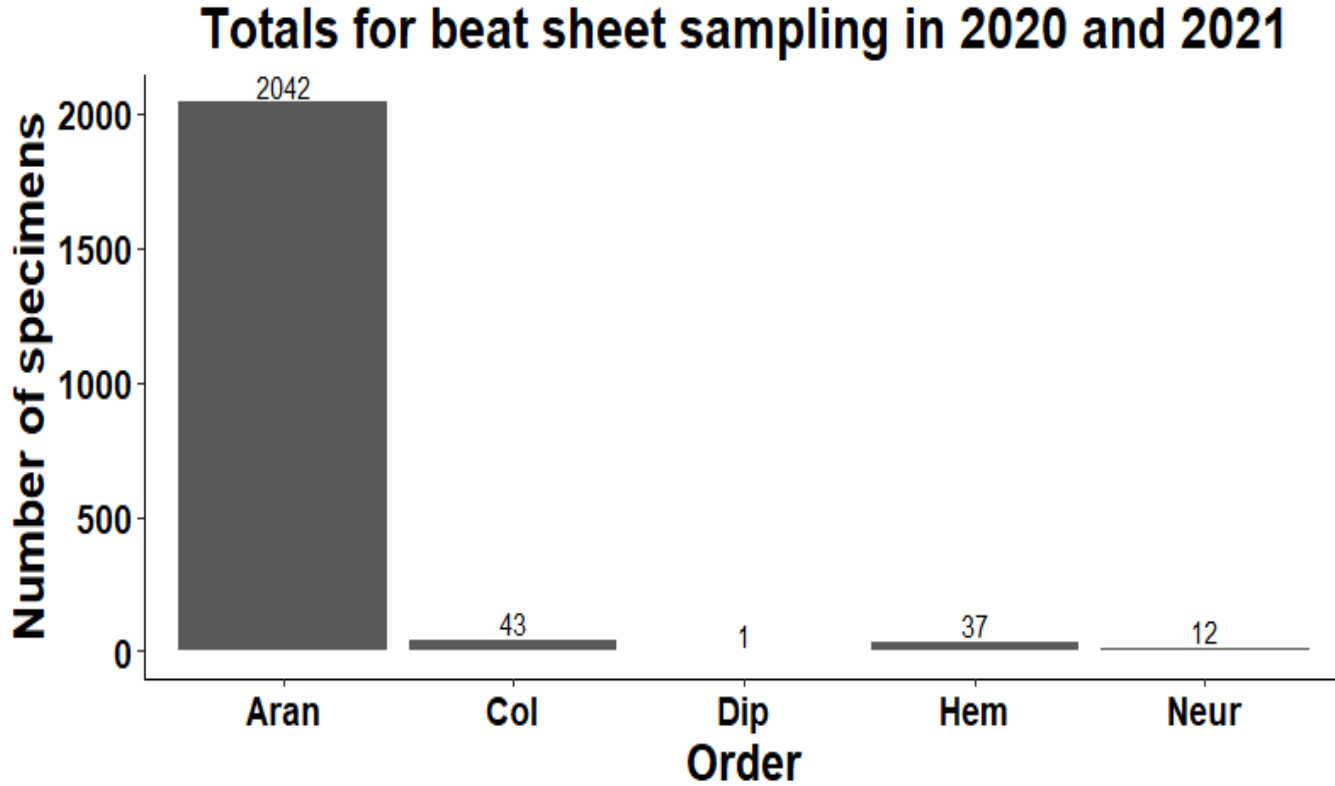
- Initiated early 1990's; extensive
- Eight species -> Four species (groups)
 - *Laricobius nigrinus* (PNW),
 - *Laricobius osakensis* (Japan),
 - *Sasajiscymnus tsugae* (Japan),
 - *Leucotaraxis argenticollis* / *L. piniperda* (PNW)

Optimal Program (after Elkinton et al 2011)

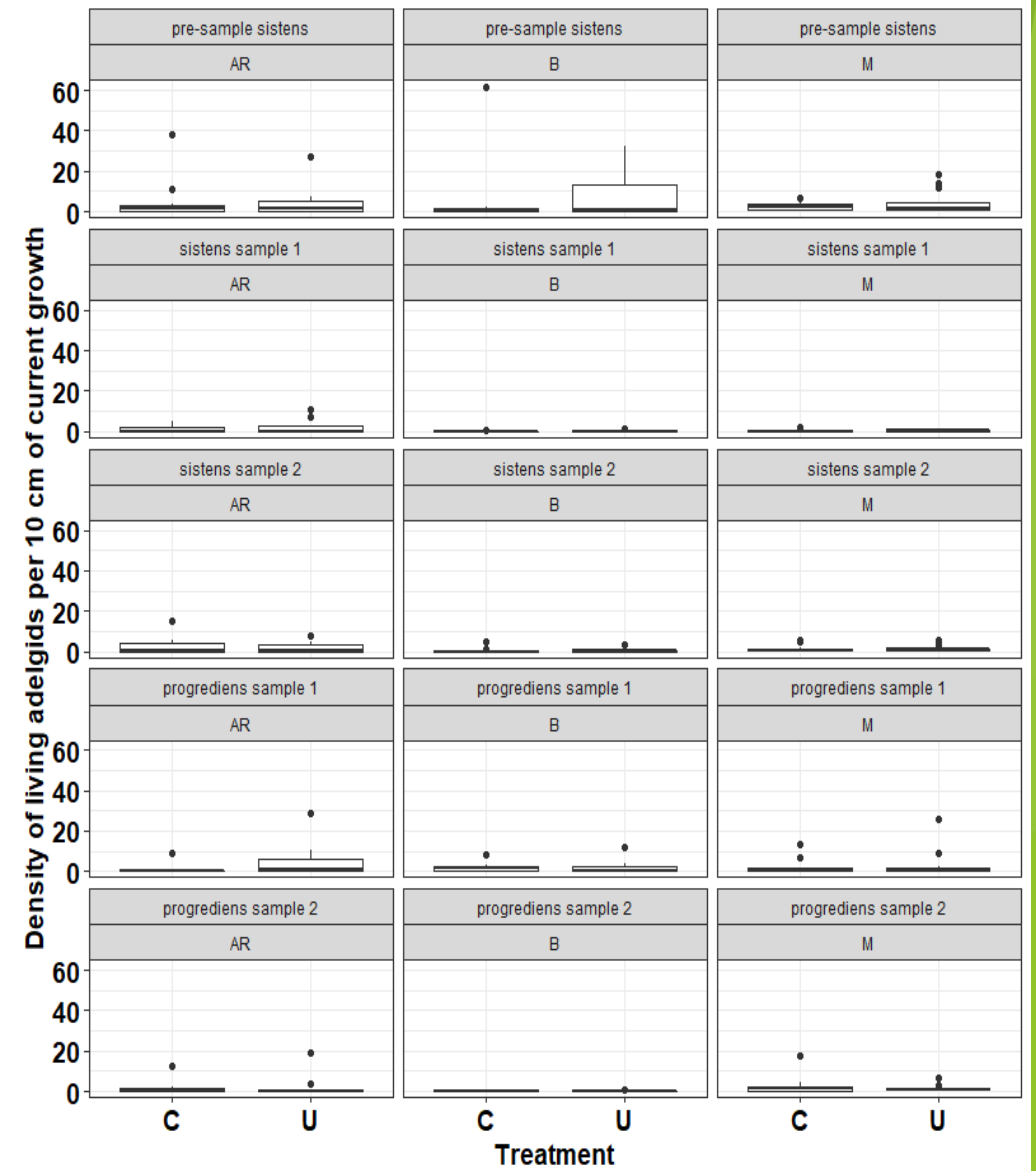


'Rebounding' (biotic or abiotic) will occur
Important to affect both generations
Target: 2+ HWA-specific predators per generation

Existing Natural Enemies in NS



- ▶ Three-year study; caged v. uncaged
- ▶ Mortality: No difference (progreidentes and sistentes)
- ▶ Beat sheet, twig sampling: generalists only



PRE-RELEASE DUE DILIGENCE

- predator selection & sourcing
- host specificity testing
- petitions

OPTIMIZATION

- collections & releases
- mass rearing
- integration with other tactics

POST-RELEASE MONITORING

- establishment & spread
- efficacy & impacts, incl. non-target
- re-assessment of agents

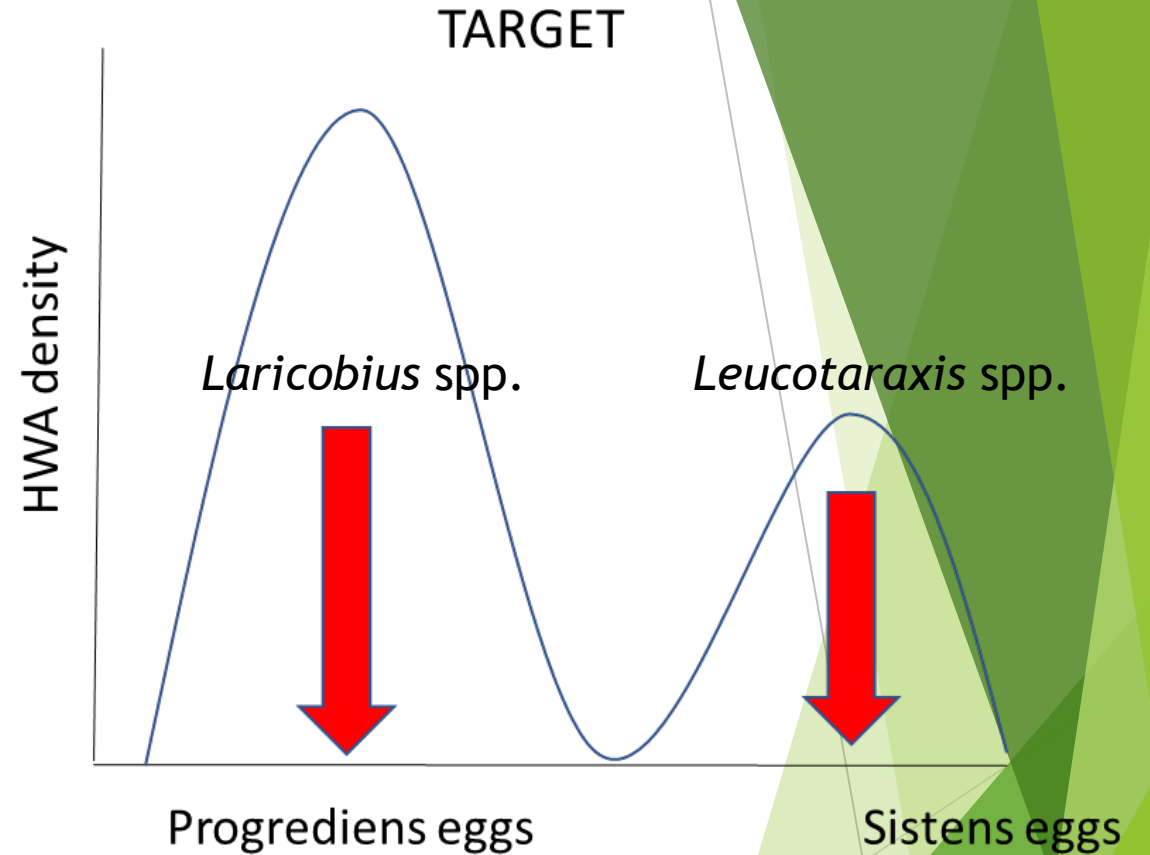
Predators

▶ Beetles

- ▶ *Laricobius nigrinus* (PNW, BC),
- ▶ *Laricobius osakensis* (Japan, NE)

▶ Silverflies

- ▶ *Leucotaraxis argenticollis* (PNW, BC)
- ▶ *L. piniperda* (PNW, BC)



Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.
				Scouting (<i>Lari</i> + <i>Leuco</i> , BC+PNW)							
	Release site scouting (<i>Lari.</i> , NS)					Release site scouting (<i>Leuco.</i> , NS)					
	Collections (<i>Lari.</i> , BC)				Collections (<i>Leuco.</i> branches, BC)						
	Release (<i>Lari.</i>)						Release (<i>Leuco.</i>)		Release (<i>Leuco.</i>)		
	Post- release mon.*						Post-release mon.*				
								Post-release mon.*			

* Beginning one-year post-release

Integration w/ chemical control

Stand prioritization and releases:

- strategic site selection
- priority stands (e.g. along riparian corridors)
- scaling up establishment across larger areas

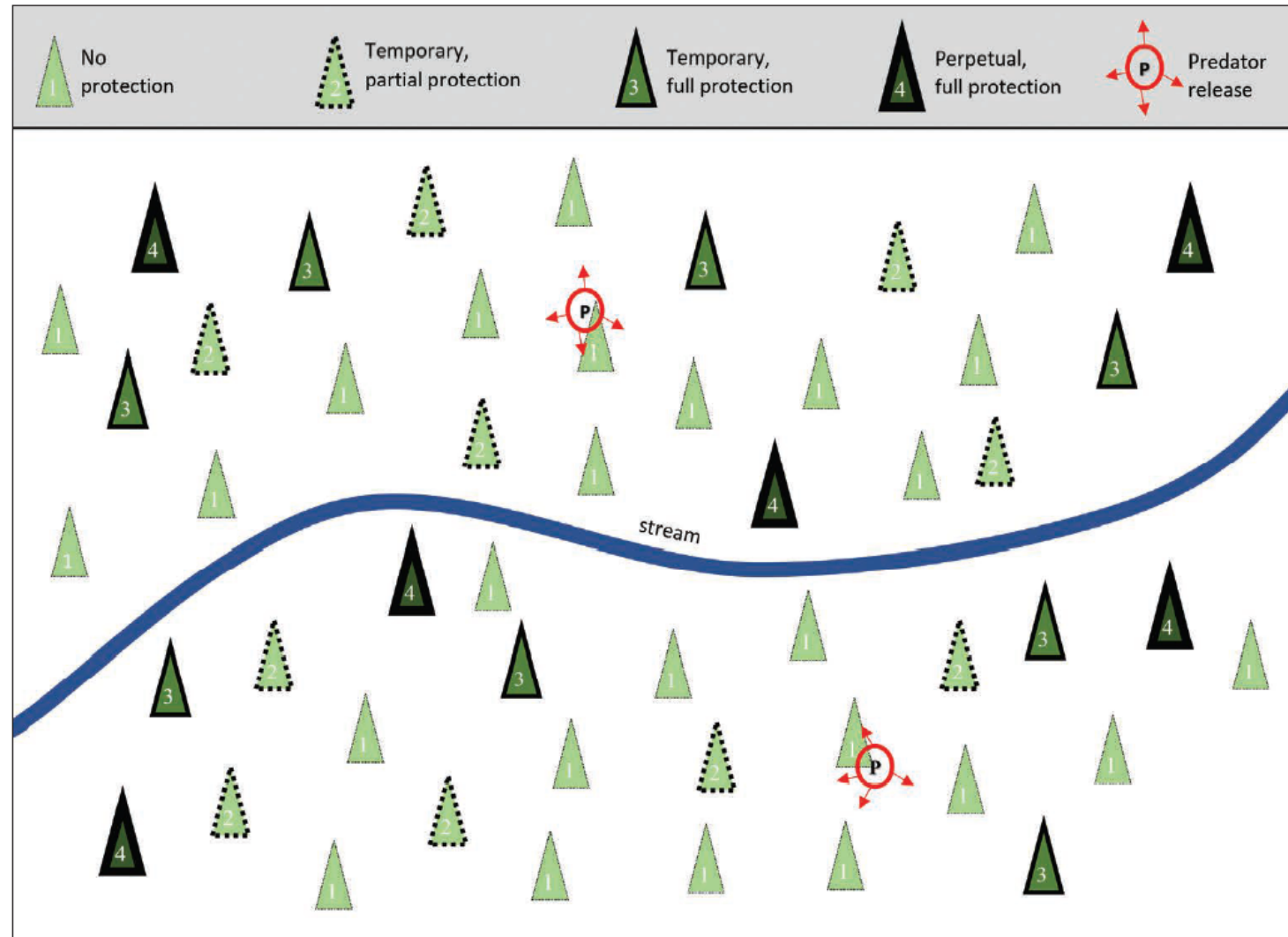
Integration with chemical control:

- simultaneous protection of high-value trees with insecticides;
- establishing predator populations within same stand

INTEGRATING CHEMICAL AND BIOLOGICAL CONTROL OF THE HEMLOCK WOOLLY ADELGID:

A RESOURCE MANAGER'S GUIDE

ALBERT E. MAYFIELD III, SCOTT M. SALOM, KENTON SUMPTER, TOM MCAVOY, NOEL F. SCHNEEBERGER, AND RUSTY RHEA



Project Goal

- ▶ Initiate and optimize biological control protocol
- ▶ Integrate with additional tactics (e.g. insecticides)
- ▶ Assist in post-release monitoring
- ▶ Provide expertise for clients

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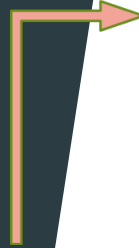
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POST-RELEASE MONITORING

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Canada

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