Assessment of the Psyllid, *Aphalara itadori*, for Knotweed Biocontrol in North Carolina

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Background

Knotweeds in the genus *Fallopia* (= *Reynoutria*) were popularized as ornamentals throughout Europe and North America in the 1800's. They have since escaped cultivation and have become invasive throughout their introduced range. Knotweeds outcompete native species and reduce biodiversity. They present significant challenges, particularly along rights of way and riparian corridors. Available control methods have proven costly, labor intensive, and ineffective. A host-specific herbivorous insect, the psyllid *Aphalara itadori*, is under investigation for sustainable and achievable biological control of knotweed. We are investigating one biotype that is adapted to Giant Knotweed and another that is adapted to Japanese and Hybrid (Bohemian) Knotweed.

Objectives

- Determine whether the psyllid can overwinter in NC
- Record evidence that the psyllid can establish in NC
- Compare knotweed phenological effects in the field with those observed in lab settings.

Approach

Psyllids are lab-reared on knotweeds propagated from field-collected rhizomes and released at each site via three established methods. Visual surveys are conducted two weeks post-release and periodically during the growing season.

Psyllids released per protocol (FHTET-2017-03, 2nd Ed.)

Field Cage Releases commenced inYear 3, in conjucnction with sleeve cages and free releases.

Field Surveys

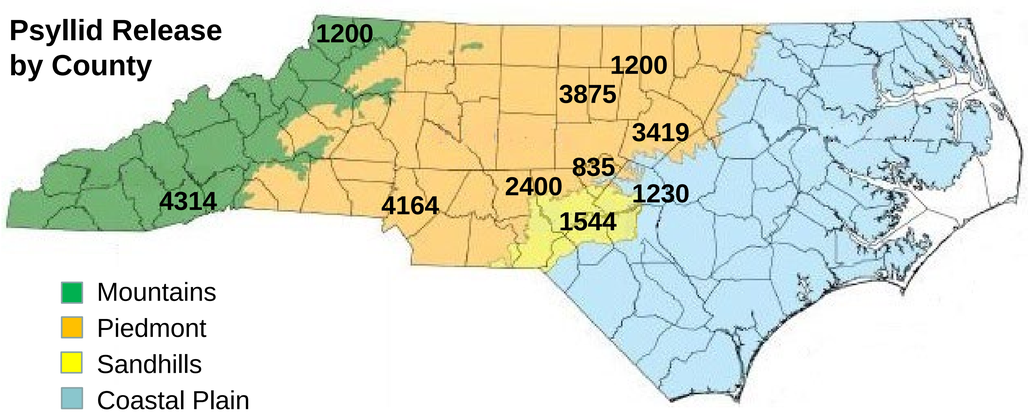
We conduct post-release surveys (minimum 30 min. per site, repeated through the growing season) for psyllids and for plant damage.

Overwintering Test

Psyllids are overwintered on knotweeds in tents within Field Cages to assess and retain overwintering capability and phenotypic plasticity.

Results to Date: Psyllids Released

County	Knotweed species	# Released 2020	# Released 2021	# Released 2022	# Released to Date
Ashe	Giant			1,200	1,200
Durham	Japanese			1,200	1,200
Harnett	Bohemian			1,230	1,230
Henderson	Giant		1,914	2,400	4,314
Hoke	Bohemian	780	764		1,544
Lee	Japanese	835			835
Mecklenburg 1	Bohemian	800	764		1,564
Mecklenburg 2	Bohemian			2,600	2,600
Moore	Japanese			2,400	2,400
Orange	Japanese		2,675	1,200	3,875
Wake 1	Japanese	500			500
Wake 2	Japanese	500	1,219	1,200	2,919
	Yearly Totals	**3,415**	**7,336**	**13,430**	
	Total To Date				**24,181**



Detection of Psyllids and Observed Effects

- Psyllids of both biotypes have overwintered successfully in Field Cages for two years
- Psyllids were detected through the second generation at most sites, and the following year at one site
- Stereotypical damaged plant phenology (leaf curl) was observed in the lab on GKW, but not at release sites.

Discussion

Psyllids persist within the season of release and can overwinter in NC, but consistent establishment has not been confirmed.

Challenges include climatic effects and increasingly erratic weather events. For example, models predict that psyllids should break winter diapause in this region in March, as host plants emerge. Our earliest psyllid releases followed this model. However, late Spring frosts may kill the tender new plant growth, which is where psyllids prefer to lay their eggs.

Thermal tolerances might limit development of the psyllid not only during late Spring cold snaps, but also in the heat of summer. Heat waves might afford healthy growth by the plant, just as psyllids are metabolically stunted.

Use of Field Cage might mitigate factors such as temperature and humidity extremes, while concentrating first-generation psyllids to prevent Allee effects. Surveys in the Spring of 2023 should elucidate their effectiveness in protection of an initial release population.

Future Directions

- Initiate cooperative releases at new sites that are less subject to disturbance
- Continue field cage studies
- Design paired treatments, caged and uncaged, with strips maintained by pruning to provide sections with consistent shade and higher humidity
- Expectations: Ability to more clearly address the potential for this biocontrol agent in this region and its inclusion within a developing management strategy

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