Biological Control of Mile-a-Minute Weed

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2012 CT MAM Biological Control Team

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Mile-a-minute Weed, *Persicara perfoliatum* (Polygonaceae):

an invasive vining plant from Eastern Asia: an annual in North America, killed by frost

Mile-a-Minute Weed

- Initial introduction in PA in the 1930s which established; now infests 13 eastern states from NC to NH
- Colonizes ecosystems disturbed by human activity e.g., deforestation, cultivation, erosion
- Also invades undisturbed wetlands, fields, natural openings in forests
- Poses a serious threat to forest regeneration
- Out competes other vegetation for nutrients, water and sunlight, reducing native plant diversity

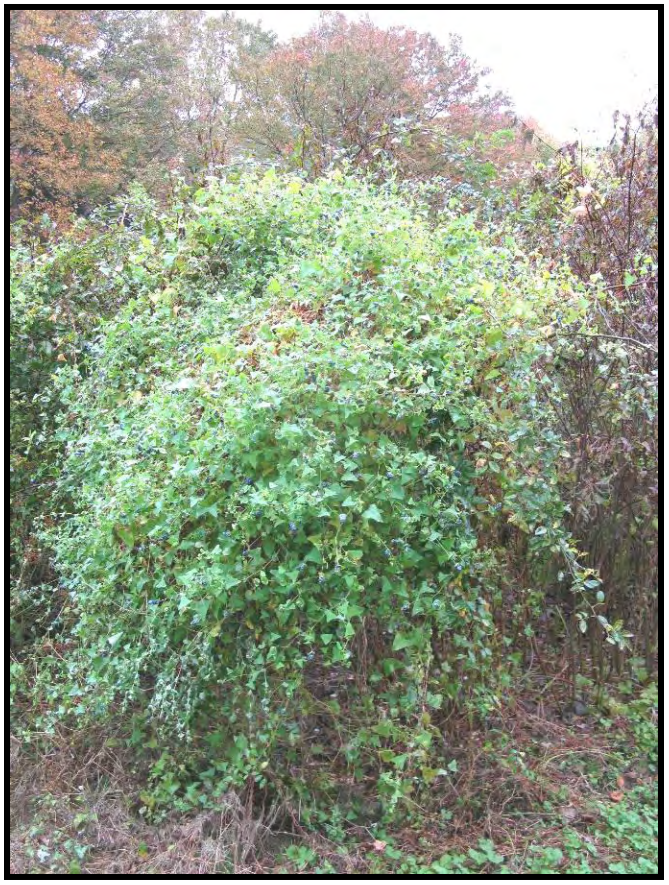
Identifying Characters for MAM

- Triangulate leaves
- Recurving barbs
- Blue fruit when ripe
- Saucer-shaped leaves (ocrea) encircling stem


Ripening fruit

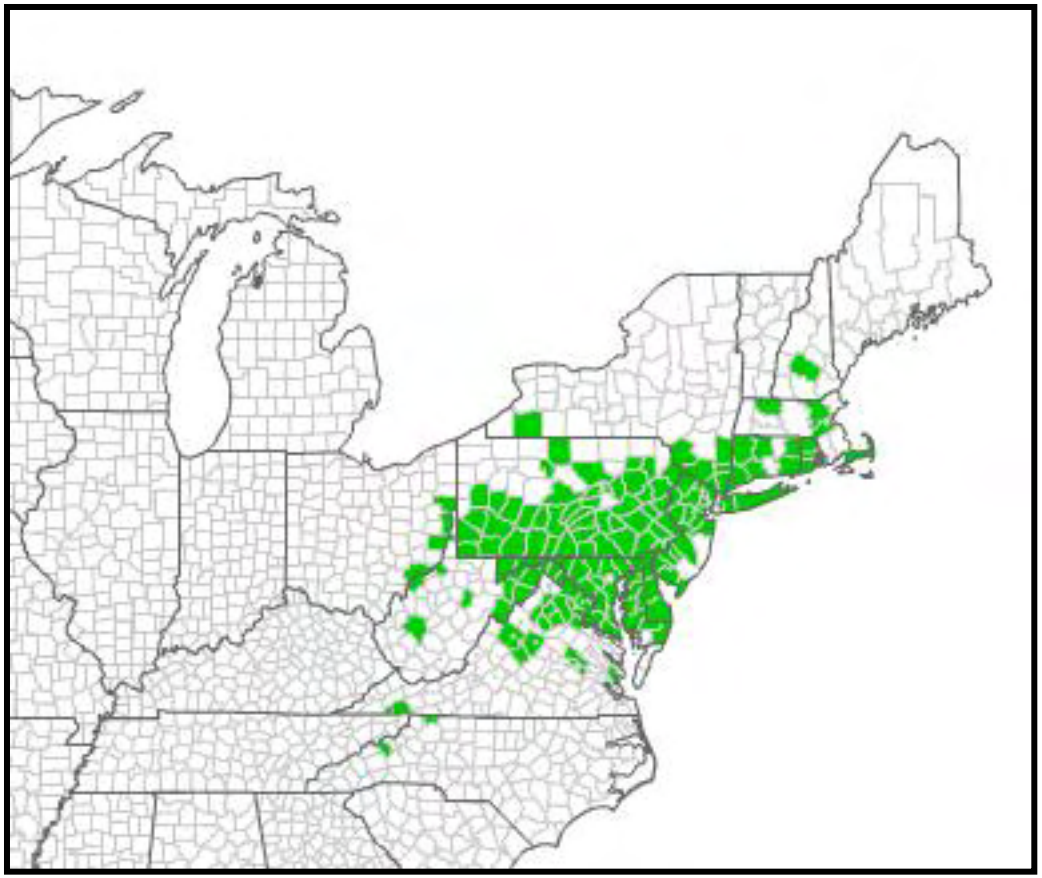

Shoot tips

Annual Growth Potential of MAM

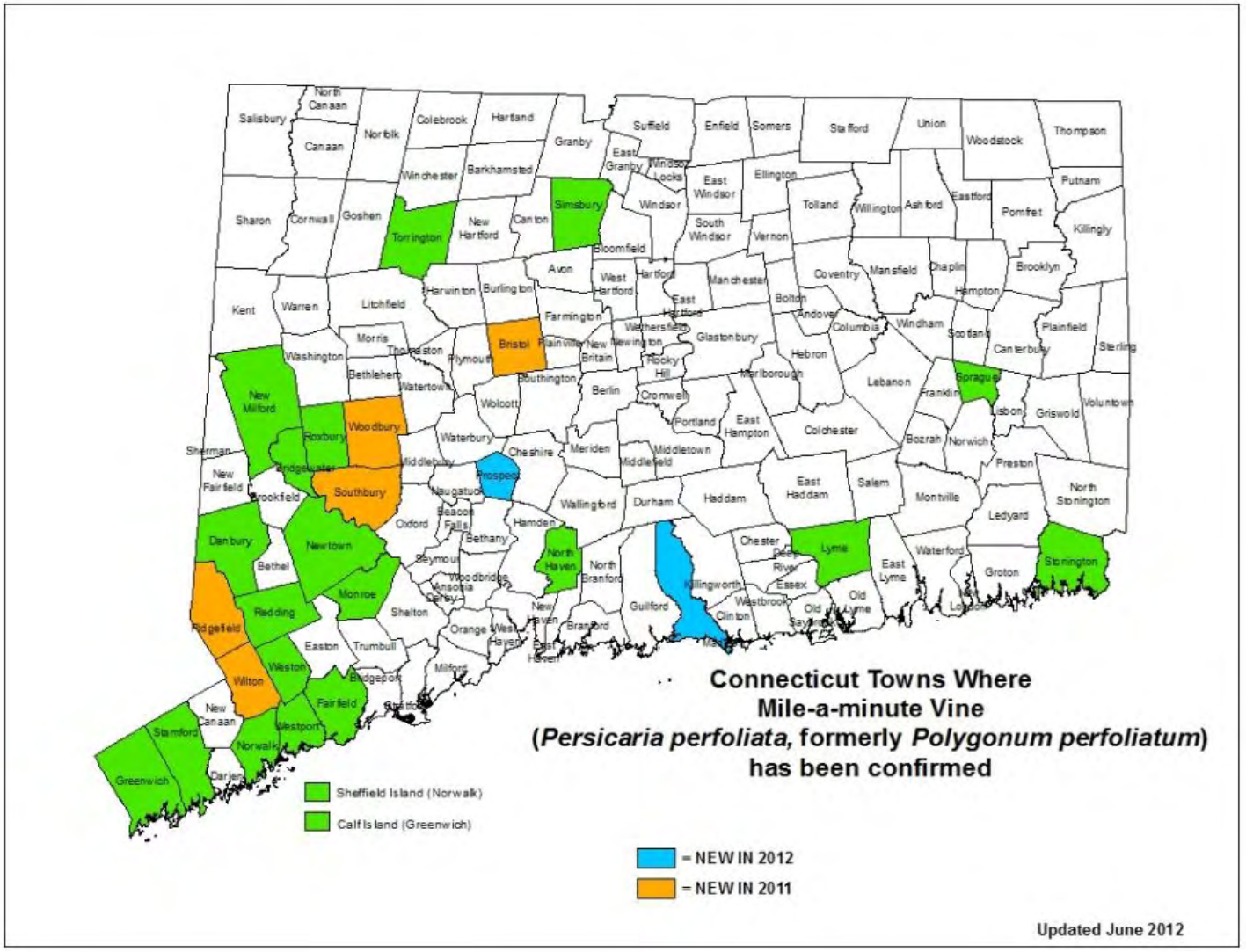


MAM has a huge seed bank that can persist for at least 6 years

Distribution of MAM



EDDMapS. 2012. Early Detection & Distribution Mapping System. The University of Georgia - Center for Invasive Species and Ecosystem Health. Available online at http://www.eddmaps.org/ Accessed July 19, 2012.



http://www.hort.uconn.edu/mam/index.html

Mile-A-Minute in CT

Contamination of mulch piles, hay, container plantings can lead to inadvertent MAM spread

Typical MAM Sites

Development of the Biological Control Program for MAM

- Initiated by Dr. Richard Reardon, USDA Forest Service, with the Chinese Academy of Sciences and the University of Delaware in 1996
- Out of 17 potential candidate species from China & Japan, *Rhinoncomimus latipes* emerged as the safest and best candidate for introductions in eastern USA
- Weevils were collected from Hunan, south central China and mass-reared in NJ

- Careful non-target assessments eg. native *Persicaria* spp and other related species were performed in USA and China

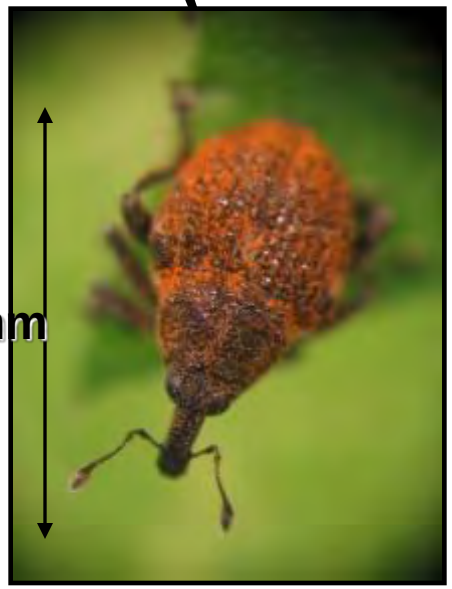
- Final Environmental Assessment permitting first field releases of *R. latipes* in 2004 in DE and NJ
- *R. latipes* has been released in 11 states

Host Specificity

Host specificity is critical to avoid non-target impacts to native *Persicaria* spp. and other spp.

Adult weevils will not lay eggs on other species and larvae can only survive on MAM.

Rhinoncomimus latipes (Coleoptera:Curculionidae)



Biology & life cycle of *R. latipes*

- Adults feed on youngest leaves, flowers and buds of MAM and are very host specific
- Eggs are laid on undersides of leaves and on the stem and plant capitula of MAM
- Larvae hatch, bore into first node in stem and enter stem to feed

- When mature, they leave the stem and drop to soil to pupate
- New adults emerge from the soil: generation time is approx. 26 days; >2 generations in China
- Adults overwinter and can live about a year

Weevil Impacts on MAM

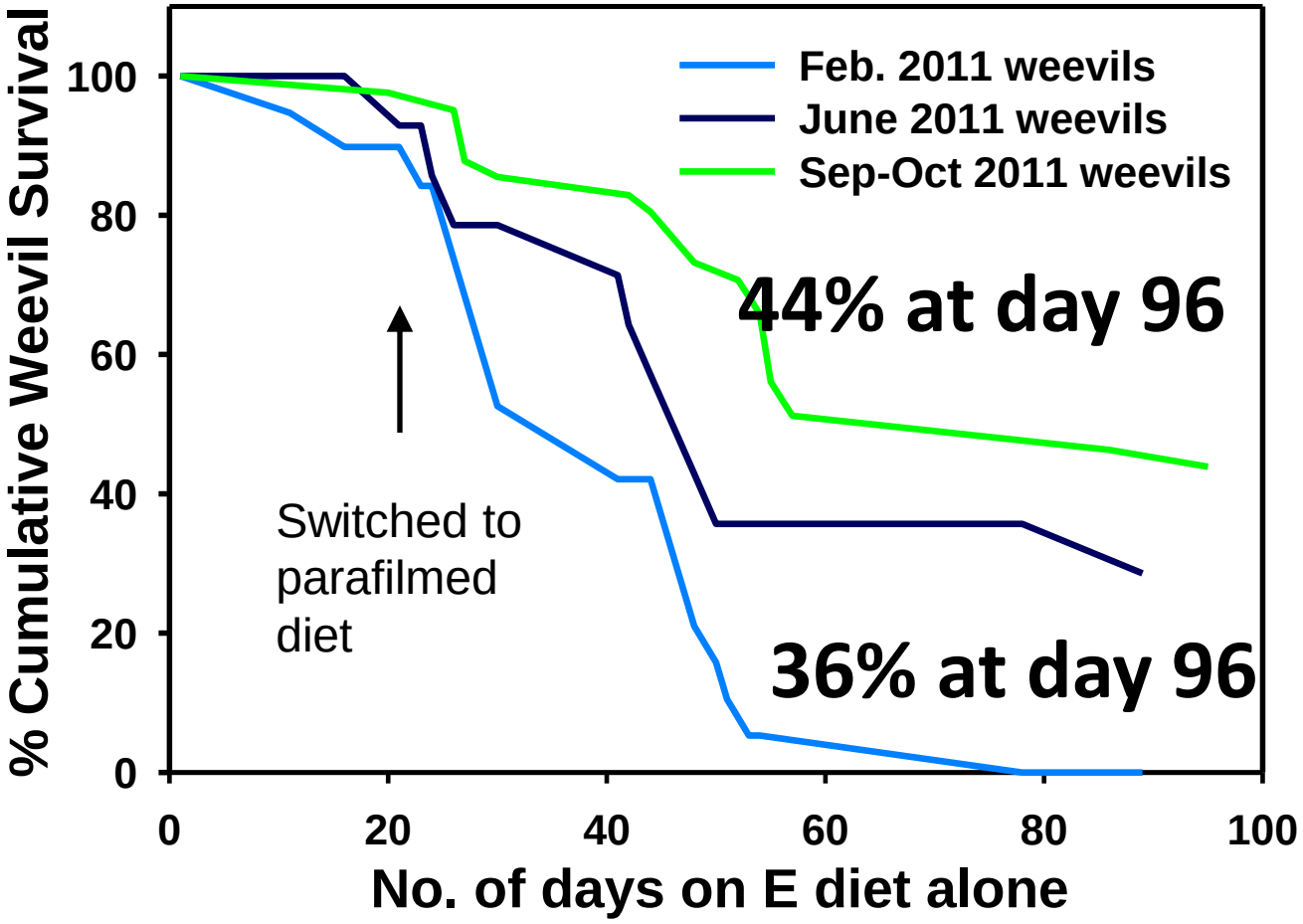
- Preferential feeding by adult weevils on new growing tips impacts fruit and seed production
- Larvae are stem feeders weakening the plant and stunting growth;
- Stacked nodes often indicate impact
- In PA, weevils dispersed 7-18 miles from nearest releases in 3 years, increased populations by 2-5x, significantly decreased MAM seed clusters, apical growth and seedling densities in 3 years (Lake 2011)

Mass rearing at Phillip Alampi Beneficial Insect Laboratory, NJDA

Artificial diets for weevils developed in collaboration with **Dr. Allen Cohen of North Carolina State University** induced robust adult *R. latipes* feeding and high survival on diet only for many weeks in CT

Diets allowed weevil adults to survive without MAM foliage with no negative effects on subsequent feeding or reproduction

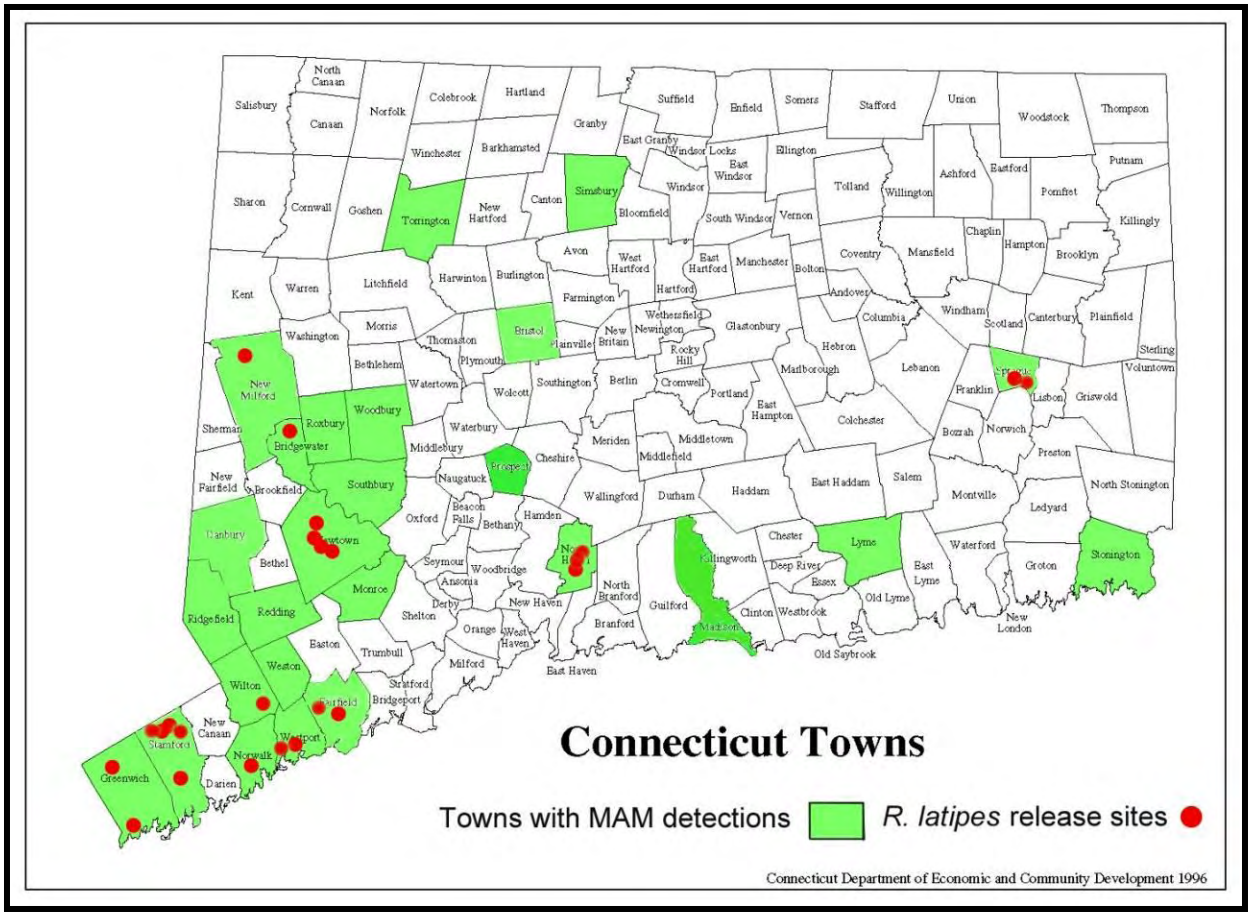
2011-2012 Adult Survival on Diet



Diet sustained weevils prior to releases in the field

This diet may promote laboratory storage survival of mass-reared weevils over the winter

Releases of *R. latipes* in CT: 2009-2012

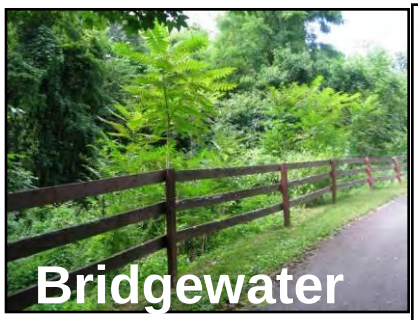


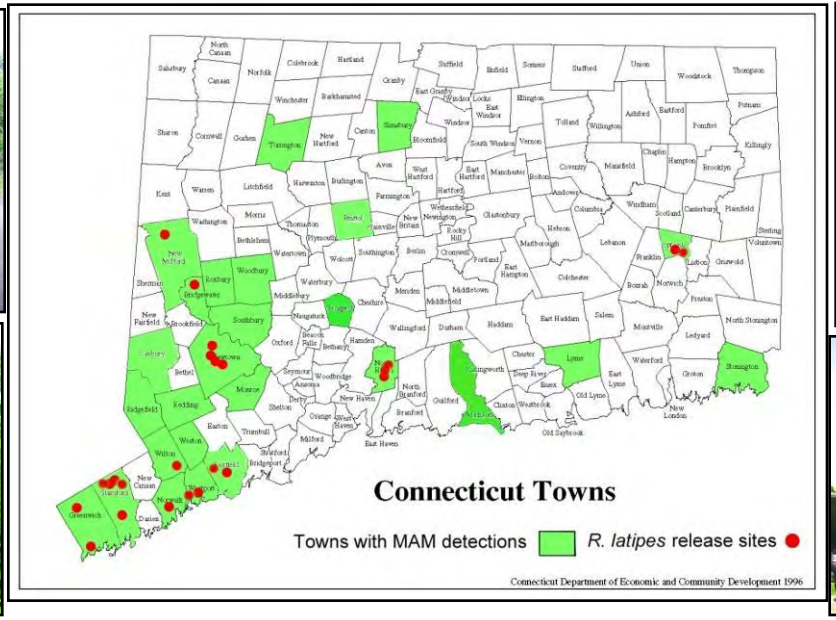
Over 23,000 weevils have been released in 11 towns at 24 locations


New Milford


Newtown


Sprague


Bridgewater


Connecticut Towns
Towns with MAM detections
R. latipes release sites
Connecticut Department of Economic and Community Development 1996


North Haven


Stamford


Fairfield


Greenwich


Wilton


Norwalk


Westport

Releasing weevils in CT

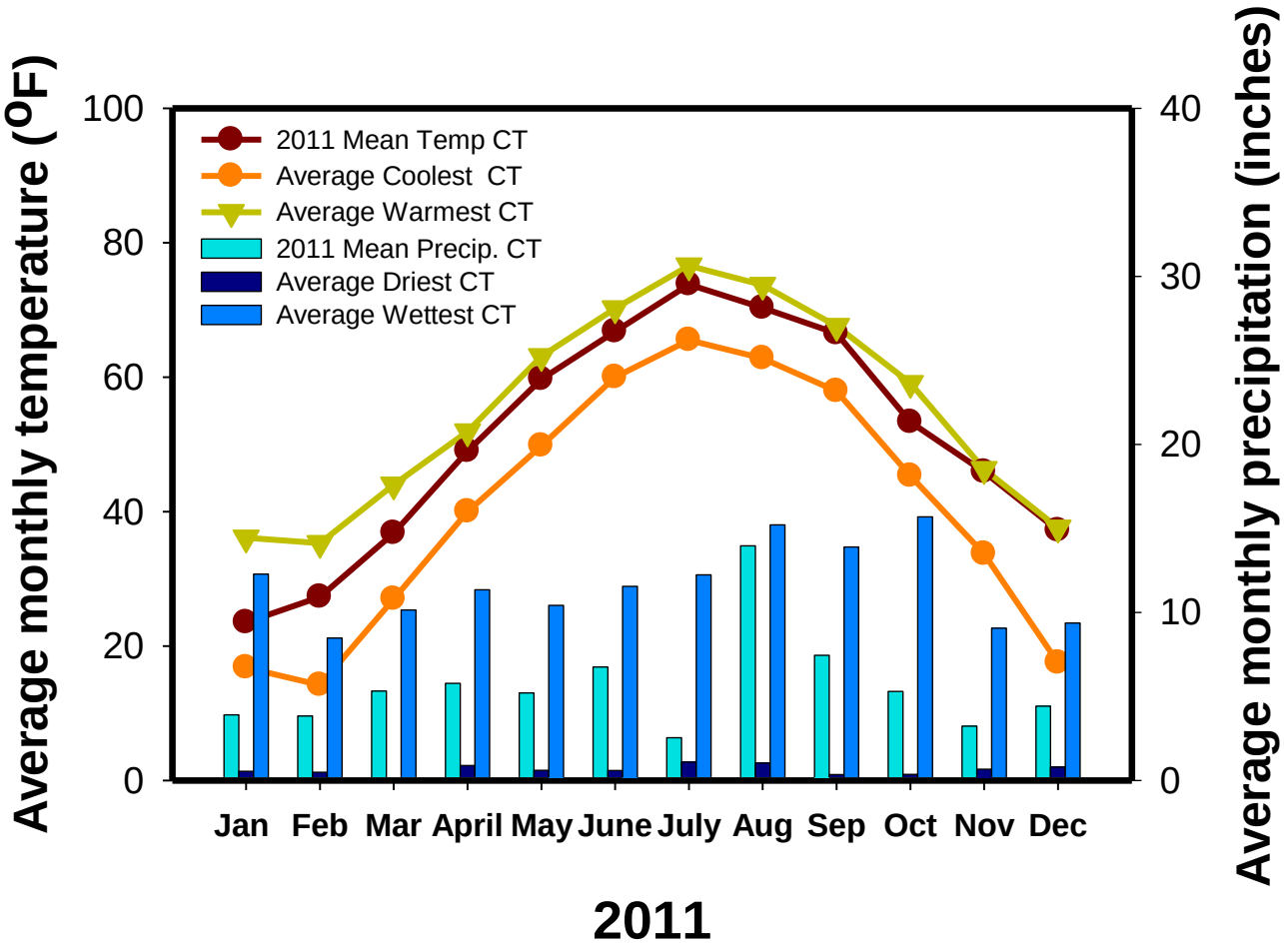





MAM suppression 2009-2011

Newtown

Weather in CT in 2011



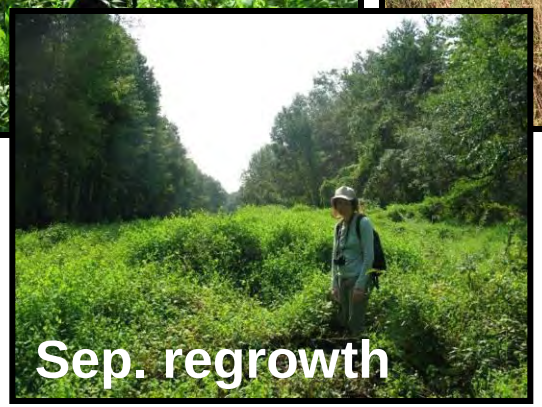
Data derived from Northeast Regional Climate Center, Cornell University

A year of weather extremes

- Heavy spring flooding from snow melt
- Above normal rainfall every month from Jan.-Nov: 2011 was the wettest year in CT on record with annual precipitation of 69.1”
- Above normal temperatures from April – Dec 2011; a very hot year (107/117 overall)
- Hot and dry July; overall very warm, wet conditions which accelerated MAM growth
- Tropical Storm Irene devastated riparian sites in late August; then remnants of Tropical Storm Lee in early September
- Early snowstorm in late October

Flooding and storm damage in several release sites in 2011

Quinnipiac River State Park

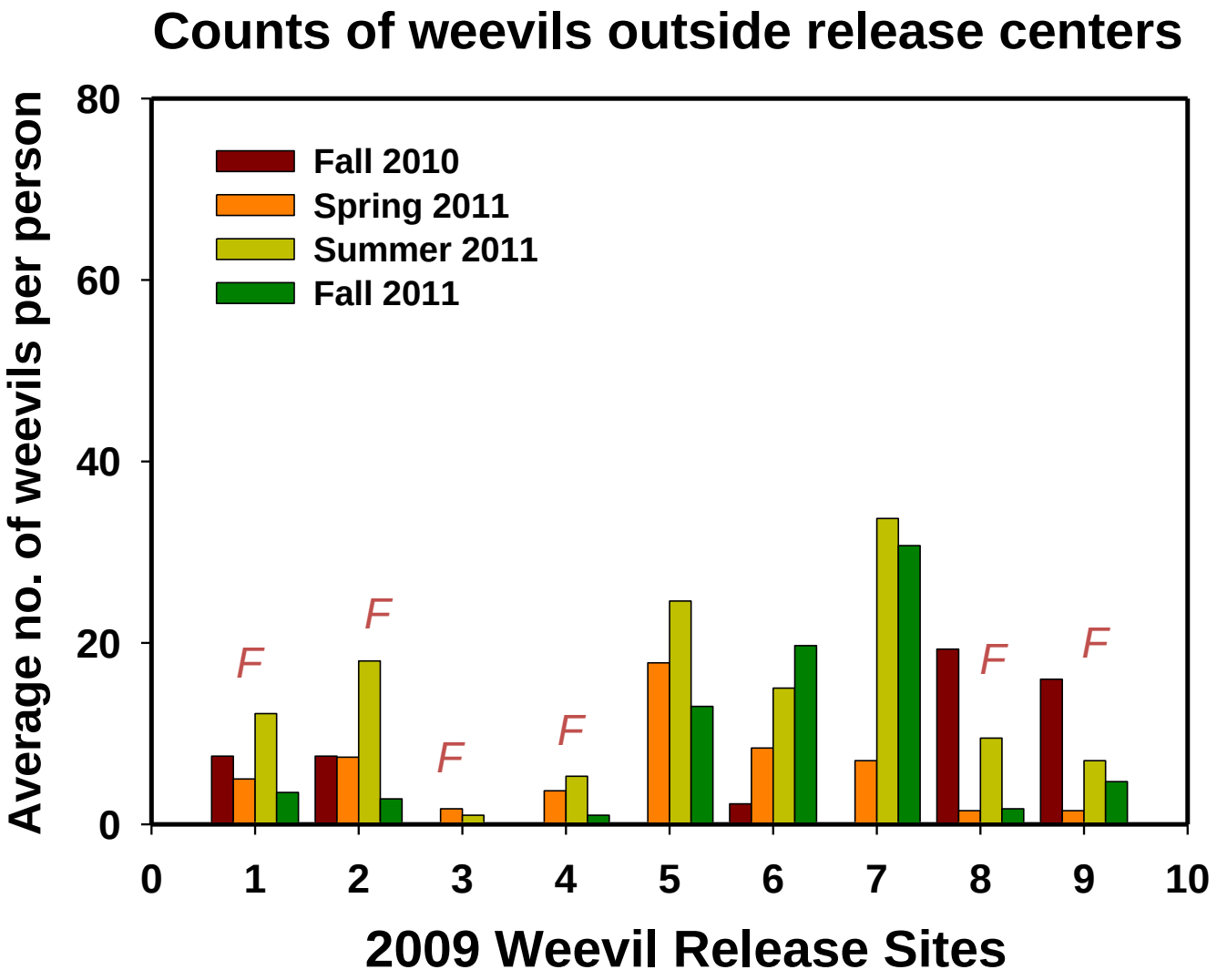


Flooding dispersed MAM seeds

…some weevils were recovered in flooded sites, but impact on populations is largely unknown

Estimating weevil populations: 5 minute weevil counts outside release centers

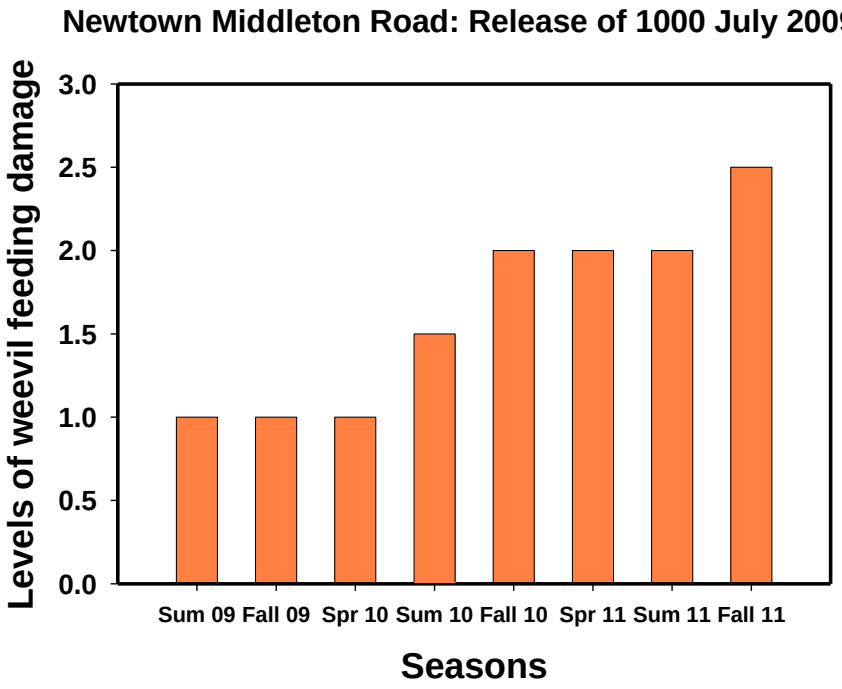
Site differences in weevil populations



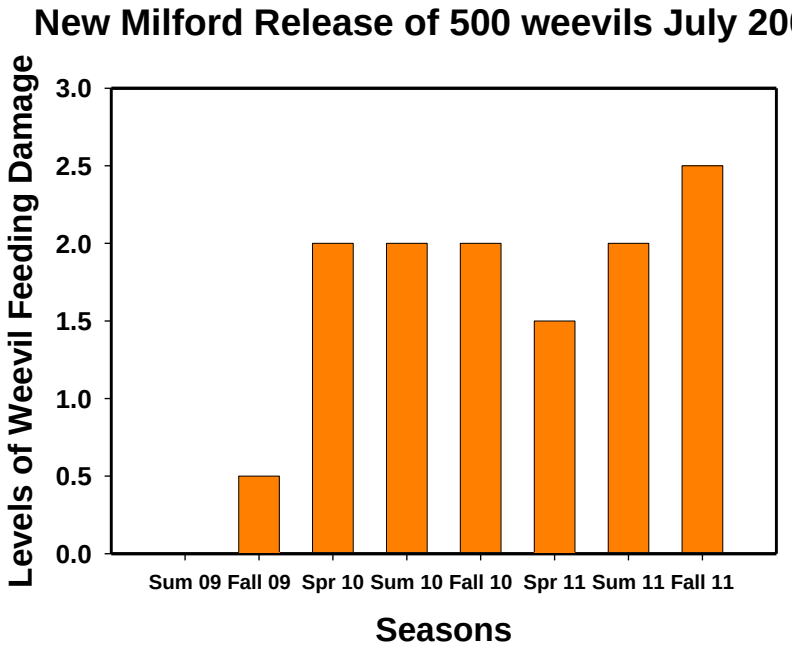
2009 Releases

F = Heavy Flooding in 2011

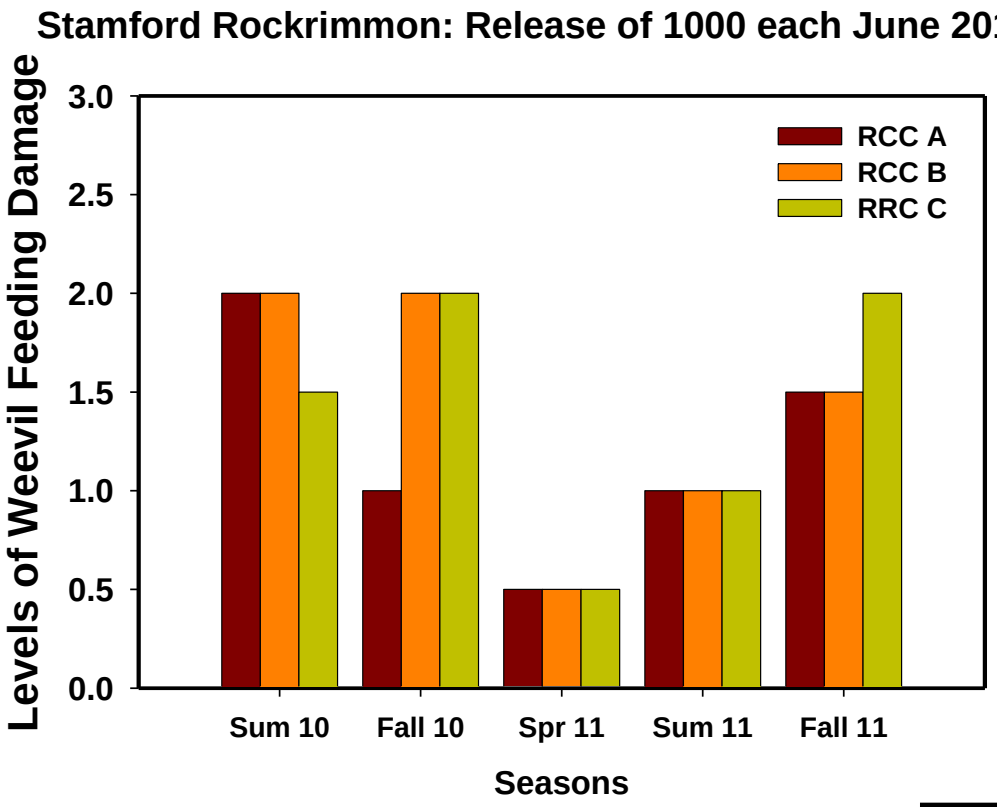
Newtown Damage Levels



New Milford Damage Levels



Stamford Damage Levels



Weevil activity continues into October until frost






Concluding remarks

- Weevils have adapted and survived 2 extreme winters in CT; a mild winter has increased overwintering survival in 2012
- Weevils are dispersing a minimum of 0.5-2 miles from nearest release sites
- Activity and damage appears highest in sunny drier sites. In spite of continual rain throughout 2011, weevils did well in such sites
- Flooding in 2011 had major diluting impacts on weevil populations; some adults survived but flooding may have affected survival of soil pupating larvae

Many thanks to MAM Cooperators

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Images by Carole Cheah

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