2013 Annual Summer Meeting of the American Cranberry Growers Association

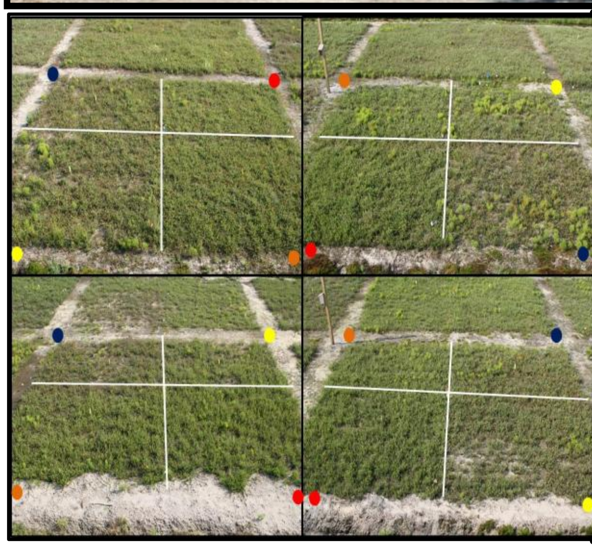
AMERICAN CRANBERRY GROWERS association

Rutgers University
Marucci Center

Chatsworth, NJ

Thursday
August 15, 2013

RUTGERS
New Jersey Agricultural Experiment Station



American Cranberry Growers Association
2013 Summer Field Day
Thursday August 15, 2013
Rutgers University

P.E. Marucci Center for Blueberry & Cranberry Research & Extension,
Chatsworth, NJ

Parking will be available at the Center's shop (across cranberry bogs).
Transportation for tours will be provided at the Center.
Restrooms located at the Center, adjacent to Conference Room.

CRANBERRY BOGS:

8:00–8:30 **Continental Breakfast**

8:30–8:45 **Opening Remarks**
Shawn Cutts, President, American Cranberry Growers Association
Bradley Hillman, Senior Associate Director, NJAES, Rutgers University

8:45–9:10 **Pre-inoculation with Mycorrhizae to Enhance Early Bed Establishment (Bog 8)**
James Polashock, Research Plant Pathologist, USDA-ARS

9:10-9:35 **Fruit Rot Resistance Breeding and Potential New Varieties (Bogs 8 and 10)**
Jennifer Johnson-Cicalese, Nicholi Vorsa, Karen Destefano, and Susan Vancho, P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ

9:35–10:00 **Disease Control in Bed Establishment (Bog 13)**
Peter Oudemans, Department of Plant Biology and Pathology, Rutgers University, *Chris Constantelos, Jessica Torres and Dyshay Smagacz*, P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University

10:00–10:25 **Recent Research in Cranberry Entomology (Bogs 19 and 20)**
Cesar Rodriguez-Saona, Department of Entomology, Rutgers University; *Vera Kyryczenko-Roth*, P.E. Marucci Center; and *Robert Holdcraft*, P.E. Marucci Center

10:25-10:50 **Show and Tell**
Shawn Cutts, Cranberry growers

CONFERENCE ROOM:

11:00–11:20 **Red Root Control in Cranberries**
Brad Majek, Department of Plant Biology and Pathology, Rutgers University

11:20-11:40 **Impacts of Fire and Insect Disturbance on Forests and Water Resources in the New Jersey Pinelands**
Michael Gallagher, Department of Ecology and Evolution, Rutgers University; USDA Forest Service Northern Research Station

11:40–12:`0 **Understanding the New Fuel Tank Requirements on the Farm**
Ray Samulis, Cooperative Extension Agent, Burlington County Extension, Rutgers University

12:10–1:10 **LUNCH** (Pole Barn)

Pre-inoculation with Mycorrhizae to Enhance Early Bed Establishment

James Polashock

Introduction

Mycorrhizae are fungi that form mutualistic associations with many plant species. The roots of American cranberry (*Vaccinium macrocarpon*) are naturally colonized specific type called ericoid mycorrhizae. Mycorrhizal colonization is reported to promote increased nitrogen uptake and utilization of forms of nitrogen in the soils that are not normally taken up by the plants. Other potential benefits include increased tolerance to drought and certain diseases.

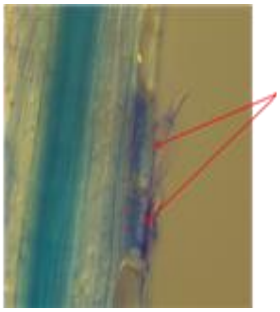
New or renovated cranberry beds are usually topped with a layer of sand. The sand used can be devoid of mycorrhizae and it may take years for vines planted into new beds to become colonized. In addition, there are at least two major species of ericoid mycorrhizae that colonize cranberry in New Jersey (*Rhizoscyphus ericae* and *Oidiodendron maius*) and there are many strains (genetically different types) of these fungi in the wild. It is likely that not all strains are beneficial to the plants and among those that are beneficial, some may be more effective than others. Thus, new bed establishment may be improved by pre-colonization of the plants with selected mycorrhizae.

Objectives

1. Select the species and isolates of mycorrhizae most likely to benefit cranberry.
2. Colonize cuttings of cranberry with selected isolates.
3. Test isolates in the field to determine effects on early establishment.

Approach and Preliminary Data

Two species of ericoid mycorrhizae (*R. ericae* and *O. maius*) were routinely isolated from commercial beds and wild stands of cranberry. *R. ericae* is reported in the literature to benefit cranberry, but little data are available on the effects of *O. maius*. More than 40 isolates of these and other species were tested in vitro to determine colonization ability. Three of those that colonized effectively (one *R. ericae* and two *O. maius*) were used in N15 nitrogen uptake experiments. Five isolates (three *R. ericae* and two *O. maius*) were used to colonize cranberry cuttings in the greenhouse. These cuttings were then transplanted to the field for evaluation. It is likely that a combination of isolates will be more beneficial than colonization with one isolate. To begin addressing this possibility, three isolates were used in combination to colonize cranberry cuttings in the greenhouse and these too are being further tested in the field.



Mycorrhizae colonized

Fruit Rot Resistance Breeding and Potential New Cranberry Varieties

Nicholi Vorsa, Jennifer Johnson-Cicalese, Karen Destefano, and Susan Vancho
P.E. Marucci Center for Blueberry & Cranberry Research & Extension,
Rutgers University, Chatsworth, NJ

Fruit Rot Resistance – A major objective of our cranberry breeding program is to develop varieties with improved resistance to the fruit rot disease complex. Fruit rot pathogens frequently causes significant crop loss even with multiple fungicide applications. Four sources of field fruit rot resistance have been identified in our germplasm collection, 'Budd's Blues', 'Cumberland', 'Holliston', and 'US89-3'. These resistant accessions have been used in crosses, with each other and with elite high-yielding selections. In 2009, a field trial of 1624 progeny from 50 crosses was planted in 5' x 5' plots. Fungicides were withheld from these plots in 2011, 2012 and again in 2013. Significant differences for fruit rot resistance, based on fruit rot ratings and rotten fruit counts, as well as yield, were found between families and within families. Moderately high heritability estimates were obtained using offspring-midparent regression (R^2=0.52), indicating there is a significant genetic component to resistance, and potential for improvement through breeding. Most encouraging was the observation that some highly resistant progeny also had very good yields; with some better than 'Stevens'. The best progeny from this trial have been planted in replicated plots and used in the next generation of crosses. These results are very promising, suggesting that a commercially viable variety, with higher fruit rot resistance than current varieties, may not be that far off.

In order to better understand the genetics of resistance, resistant accessions were crossed with inbred lines of cranberry. The progeny from these crosses were planted in Bog 8 and Bog 18 in May 2011. Next year fungicides will be withheld and these progeny will be evaluated for fruit rot resistance. Because the one 'non-resistant' parent of each cross is highly inbred (homozygous for most genes), the variation found in the resulting progeny will be arising solely from the resistant parent. Populations of this type are very useful for genetic mapping of traits such as fruit rot resistance, as well as other traits. Identifying genomic regions (QTLs) associated with resistance will greatly facilitate future progeny screening.

Potential New Varieties – We also continue to make advances in our cranberry breeding project in yield, TAcy, plant vigor and fruit quality. Four particularly promising selections are two progeny from a Crimson Queen x #35 cross, and two from a #35 x NJS98-34 cross. Because of exceptional yields in the initial progeny evaluation trial in Chatsworth, NJ, these selections were included in trials in Wisconsin, Washington and Oregon where they continued to perform well. In June 2013, these selections were planted in 2000 ft^2 plots in Bog 10 for further evaluation under NJ conditions and for fungicide trials.

Also included in this trial are 27 advanced selections planted in100 ft^2 plots, replicated two times. Many of these selections are 3rd generation hybrids of diverse parentage and represent many years of cranberry breeding effort. Parents include native accessions such as Ben Lear and Lemunyon; 1st and 2nd generation varieties such as #35, Stevens, Pilgrim, Mullica Queen, Crimson Queen, Demoranville and Scarlet Knight; and other advanced selections. In 2011, several of these selections had 1 ft^2 yield samples of over 1000 g (approximately equivalent to 1000 barrels/acre), with a 3-year average yield of over 600 barrels/acre. One Mullica Queen x Scarlet Knight progeny had a TAcy of 49 on a sample taken Sept. 19, 2011, and 93 on Oct 7, 2010. After replicated testing in larger plots in this trial, we will be able to better assess the true potential of these selections.

Disease control in bed establishment

Peter Oudemans, Chris Constantelos, Jessica Torres and Dyshay Smagacz

Objective: To examine establishment of 10 cultivars using different fungicide regimes
Rationale: Distinct differences in growth rate using the new generation of fungicides has been noticed. There is no data on resistance to Phyllosticta leaf drop.
Approach: Beds were planted using rooted cuttings in the fall of 2010. All plots were fertilized equally. Fungicide treatments were applied on June 25 and July 25 in 2013.

In 2013 a group from Princeton University utilized a UAV to fly over and collect vine coverage data from bogs 13 and 20.

Cult.	% Cover 2011		% Cover 2012		% Cover 2012	
GH	34.0	A	52.2	A	71.9	AB
DM	32.2	AB	39.1	AB	61.3	BCD
ST	31.8	AB	41.3	A	75.0	A
EB	31.2	AB	46.5	A	66.3	ABC
MQ	28.7	AB	38.1	AB	60.6	BCD
HO	27.3	B	34.7	C	56.3	CD
CQ	26.3	B	36.9	BC	66.9	ABC
#35	26.2	B	39.7	AB	63.1	ABC
BL	25.9	B	35.9	C	48.8	D

2011

Treatment	% Cover 2011		% Cover 2012		% Cover 2013	
Indar/Abound	30.9	A	48.5	A	73.3	A
Indar/Abound/Ph	30.5	AB	52.9	A	71.3	A
Untreated control	26.9	B	29.5	B	60.0	B
Bravo/Dithane	26.9	B	30.5	B	46.8	B

2013

In 2011 only small differences in the growth of cultivars and treatments were recorded. In 2013 the plots had become better established and leaf drop has had a pronounced effect on certain varieties such as Ben Lear and Howes. The results clearly demonstrate the impact of the newer chemistries on leaf drop control. This project will continue for three more seasons. We will investigate the impact of different fungicide regimes and cultivars on the establishment of canopy and the onset and development of yield.

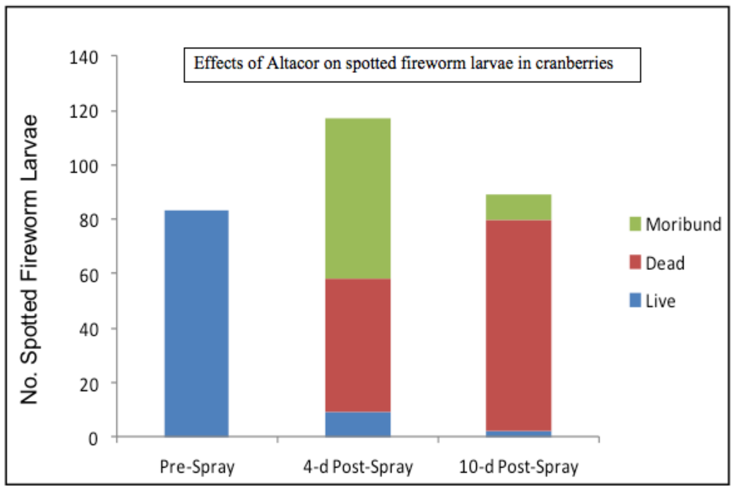
Funding for this study provided by the Cranberry Research Council.

Recent Research in Cranberry Entomology

Cesar Rodriguez-Saona, Department of Entomology, Rutgers University; *Vera Kyryczenko-Roth*, P.E. Marucci Center; and *Robert Holdcraft*, P.E. Marucci Center

On-Farm Research Results in Cranberry: Altacor

Altacor is a new insecticide registered in cranberries. A few weeks ago we conducted an experiment to test the efficacy of Altacor® (DuPont) at 4.5 oz/acre against spotted fireworm larvae. The experiment was conducted in a commercial cranberry bog in Chatsworth NJ. The application was done aerially on Monday May 27 following grower standard procedures. A pre-spray count of larvae was conducted on Thursday May 23. Post-spray counts were conducted on Friday May 31 (4 DAT) and on Thursday June 6 (10 DAT). Samples were taken using a sweep net (6 sets of 25 sweeps each) (see picture). We found very high numbers of spotted fireworm larvae in our pre-spray samples (average of 15 larvae per sweep set) (see graph). Four days after the Altacor treatment, most larvae were moribund. After 10 days, 88% of the larvae were dead (only 2% were alive and the rest were moribund) (see graph).



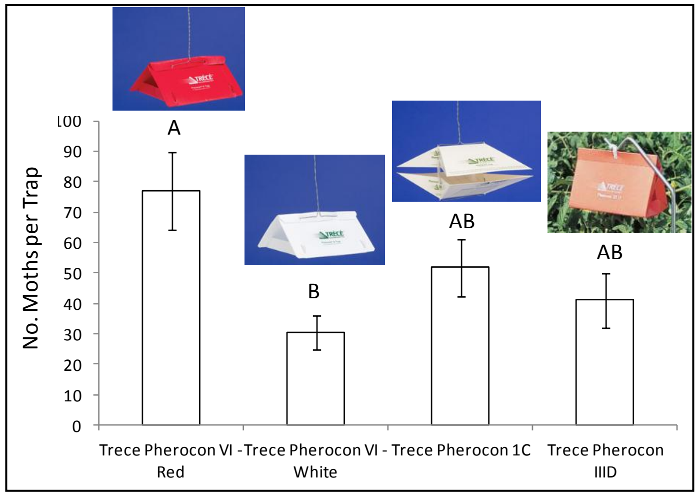
Effects of Altacor on Spotted Fireworm Larvae in Cranberries

Altacor is a new insecticide registered in cranberries. Its active ingredient, Rynaxypyr®, is from a whole new group of chemistry (Group 28) with no cross-resistance to other chemistries. Altacor is effective against lepidopteran pests including gypsy moth, leafrollers, spanworms, fireworms, and fruitworms. It controls hatching insects all the way through to adult stages of development and is easy on bees and beneficial insects. Unlike other insecticides, Altacor controls caterpillars by acting on their muscle fibers. It exhibits rapid cessation of feeding, lethargy, regurgitation and muscle paralysis, ultimately leading to death. In our study, we saw that 4 DAT most spotted fireworm larvae were not dead but looked lethargic (moribund); however, 10 DAT most of these larvae were dead. These results are in line with Altacor's mode of action.

Testing Pheromone Traps for Sparganothis fruitworm

We have started to capture adults in our pheromone traps. In general, pheromone trap catches of this insect have declined over the last five years in New Jersey. This decline can be attributed to an increased use of effective, selective, and reduced-risk insecticides, such as IGRs, and a decreased use of broad-spectrum insecticides. Reduced-risk insecticides (IGRs, Delegate, Bts) are compatible with natural enemies (predators and parasitoids). The use of these selective insecticides, besides being effective against lepidopteran pests, has helped increase natural enemy populations.

In 2012 we started a study to compare the efficacy of different trap designs (delta versus wing traps) and colors (white versus red) on SPARG adult captures. We found that red delta traps (Trécé Pherocon VI) are more effective than white delta traps. White delta traps also catch greater number of honey bees, and it is possible that this saturates the sticky traps. We are continuing this work and testing this hypothesis in 2013. Results from these studies will be presented at future grower meetings.



Data show that red delta traps are more effective than white delta traps in catching adult Sparganothis fruitworm.

Current Research on Insecticide Trials against Blunt-nosed Leafhoppers

Recently we conducted an experiment to test the efficacy of a newly-registered insecticide (Closer SC) in cranberries against blunt-nosed leafhopper nymphs. Closer (Dow Agrosciences) is an insecticide for the control of sap-feeding insects, including leafhoppers, aphids, and whiteflies. It has both systemic and translaminar activity, belongs to a new class of insecticides (the sulfoximines), and has minimal impact on beneficial organisms. Insecticide control for leafhoppers is best achieved pre-bloom when targeting the nymphal stage, i.e., immatures. Broad-spectrum insecticides (e.g. Lorsban) are currently recommended for their control. Thus, Closer may provide an alternative to broad-spectrum insecticides and likely be more compatible with biological control because it has less of an impact on natural enemies.

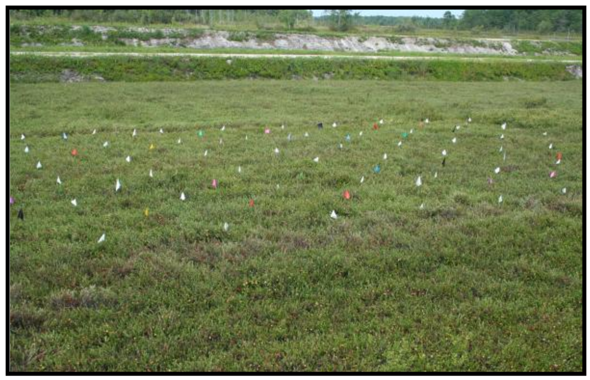
Blunt-nosed leafhopper nymphal mortality after 1 day exposure to treated foliage.

To test the efficacy of Closer against blunt-nosed leafhoppers, an experiment was conducted in an 'Early Black' bog located at the Rutgers P.E. Marucci Center. Closer and Lorsban were applied at 2 rates (full and half label rates) to 60 × 60 cm plots. Control plots received no insecticide. Insecticide applications were made with R&D CO_2 backpack sprayer, using a 1-liter plastic bottle. Four hours after treatment, 4–5 insecticide-treated uprights were inserted in florists' water picks, enclosed in a ventilated 40-dram plastic vial, and secured on Styrofoam trays (see picture). Each treatment was replicated ten times (i.e., total of 10 vials per treatment). Five blunt-nosed leafhopper nymphs were placed inside each vial. Plants and insects were placed on a light bench in the laboratory at approx. 25°C, on a 15:9 L:D cycle. Number of leafhoppers (alive or dead) was recorded 24 hours after transfer. Closer and Lorsban were highly effective against blunt-nosed leafhoppers-100% mortality at both rates (see figure).

Further studies will be conducted in 2014 in commercial bogs after receiving the state label.

Insecticide Trials against Sparganothis Fruitworm and Spotted Fireworm

We are currently conducting experiments to compare the efficacy of various insecticides (Delegate, Altacor, Intrepid, Lorsban, Imidan, and 2 unregistered insecticides) against Sparganothis fruitworm and spotted fireworm larvae in cranberries. The experiment is being conducted in a cranberry bog cv. 'Early Black' located at the Rutgers PE Marucci Center for Blueberry and Cranberry Research and Extension in Chatsworth, New Jersey. Plots are 60 x 60 cm (2 x 2 feet) each, replicated 4 times (see picture). Each plot is separated by a 15 cm (0.5 foot) buffer zone. Treatment applications were made on Tuesday July 23 with a R&D CO_2 backpack sprayer, using a 1-liter plastic bottle. The sprayer was calibrated to deliver 50 gal of vol per acre at 30 psi, using a single T-jet VS 110015 nozzle, yielding 17.4 ml (0.6 oz) per plot. Three and 7 days after treatment, 3-4 insecticide-treated uprights were inserted in florists' water picks, enclosed in a ventilated 40-dram plastic vial, and secured on Styrofoam trays (as shown in picture). Three 1st instar larvae were placed in each of 8–10 vials for each treatment. Each vial was considered a replicate. Sparganothis fruitworm and spotted fireworm larvae used in assays were from a colony kept at the Rutgers PE Marucci Center. Plants and insects were then placed in the laboratory at ~25°C, on a 15:9 L:D cycle. Mortality was assessed at 7 days after setup. Results from these experiments will be presented in upcoming meetings.



Experiment for testing the efficacy of insecticides on Sparganothis fruitworm and spotted fireworm larvae.

Larval mortality is being assessed after 7 day exposure to treated foliage.

Redroot Control in Cranberries

Brad Majek

Studies were initiated to evaluate the crop safety of Casoron 4G, Casoron CS, and Alion at two sites in 2013. Redroot control was evaluated at one of the two sites. Both Casoron formulations were applied at 2.5 and 5 pounds of active ingredient per acre, equivalent to 62.5 and 125 pounds of Casoron 4G per acre, which has been the standard formulation used by cranberry growers. Alion was applied at 0.065 and 0.13 pounds of active ingredient per acre. These rates represent the 1X and 2X rates for these herbicides. Acceptable crop safety at the 2X rate is considered essential for the product to be recommended. Slight temporary crop injury that does not reduce yield, quality or earliness is acceptable at the 2X rate.

At the Cutt's Cranberry Farm, the bog was ninety percent purple-red and considered dormant when the herbicides were applied on May 9, 2013. Only ten percent had turned green and was considered to be breaking dormancy. Slight crop injury was observed in late June in the plots treated with the 2X rate of the liquid Casoron formulation, Casoron CS, and the 2X rate of Alion. Recovery appeared complete and no injury was observed a month later, in late July.

At Pine Island Cranberries, the bog was forty percent purple-red and considered dormant when the herbicides were applied on May 2, 2013. Sixty percent had turned green and was considered to be breaking dormancy. Slight to moderate injury was observed in early July in plots treated with the 2X rate of Casoron 4G and Casoron SC, but the injury symptoms were not the same. Casoron 4G treated plots exhibited "typical" Casoron injury, chlorosis on the margins and between the veins of the cranberry foliage. Recovery was rapid and no significant injury was observed in the plots treated with the 2X rate of Casoron 4G in late July. Plots treated with Casoron CS, the new liquid sprayable Casoron formulation exhibited injury symptoms earlier, and the injury was expressed differently. No chlorosis was observed. The treated cranberry foliage appeared to be darker green in color and stunting of new growth was observed. The injury from Casoron CS was observed in early June and early July, but recovery was complete by late July.

Redroot suppression or control was observed with both Casoron formulations evaluated, but Alion did not suppress or control redroot. Casoron 4G seemed slightly more effective than the Casoron CS formulation. The 1X rate provided early season redroot control, but some stunted redroot regrowth was observed by late July. The stunted redroot were reduced in numbers by almost half, were less than half the size of untreated redroot, and did not bloom. The 2X Casoron rate controlled redroot through the end of July. The redroot plant population was reduced from 78 per square meter in the untreated control to only 4 per square meter where Casoron 4G was applied at the 2X rate. The few escaped redroot plants were severely stunted and did not bloom.

Impacts of Fire and Insect Disturbance on Forests and Water Resources in the New Jersey Pinelands

By Michael Gallagher
USDA Forest Service Silas Little Experimental Forest, New Lisbon, NJ
Rutgers University Department of Ecology, Evolution, and Natural Resources

The Silas Little Experimental Forest, in New Lisbon, New Jersey, serves as part of the USDA Forest Services Northern Research Station. As part of the northern region's Climate, Fire, and Carbon Cycle Sciences group, federal researchers work at the station with state resource managers, Rutgers students and faculty, and numerous other academic institutions and agencies to study mechanisms and broader scale implications of ecosystem processes in the New Jersey Pinelands. Research at the station is mainly split between wildland fire and ecosystem fluxes, and is funded mainly by the National Fire Plan and Joint Fire Sciences. Ongoing projects include:

- quantifying smoke emissions and predicting smoke dispersal patterns
- estimating the accumulation and three dimensional distribution of forest fire fuels
- evaluating effectiveness of prescribe burning
- modeling forest floor microclimate and variability in probability of ignition
- long term measurements of forest productivity, ecosystem fluxes, and meteorological conditions
- evaluating the impacts of fire and insect disturbances on ecosystem cycles and fluxes

During the successive outbreaks of gypsy-moth caterpillars from 2006-2008, we began studying the effects of landscape scale defoliation events on ecosystem productivity. Upland forests, comprising 62% of the Pinelands forested area, were substantially defoliated (about 20%), during this period. This reduction in forest leaf area and mortality seen in overstory species resulted in substantial decreases in ecosystem evapotranspiration, available nitrogen, water use efficiency, and gross ecosystem productivity. Rapid growth of understory shrubs, epicormic sprouting of pitch pines, and the regrowth of surviving canopy oaks have since allowed most of ecosystem processes to mostly recover. In comparison to annual prescribe burning in the Pinelands, gypsy moth herbivory makes far more meaningful impacts with slower recovery rates to ecosystem fluxes and cycles.

Gypsy moth defoliation, in reducing forest evapotranspiration (Et), also has illustrated noteworthy impacts loss of forest leaf area can have on hydrology in the New Jersey Pinelands. In 2007, decreased Et in 12% of the Pinelands area resulted in an estimated 7% increase of hydrologic recharge for the area. Water movement by evapotranspiration is also an important mechanism for environmental heat exchange. This reduction in Et, combined with a lowering of albedo, also caused a 67% reduction in latent heat flux density, an increase in sensible heat flux, with the overall result of increased mean soil temperature in by 2.7 °C in affected areas. Pine stands were less affected than oak stands in this regard, and had largely recovered at the end of the second year following defoliation, while oak stands have taken longer.

Increased hydrologic recharge and heating due to lost forest canopy, despite a relatively quick recovery period when compared to other systems, demonstrates the importance of forests in regulating local climate and suggests that future disturbances resulting in lost forest function could have meaningful impacts in the New Jersey Pinelands. For example, if 50 or 80% of the pinelands leaf area was lost, a rough estimate of increased hydrologic recharge would be 17 or 28%. While these numbers may be unlikely, foresters and land managers should be aware of that larger forest disturbances could have a greater impacts on local climate and groundwater recharge than we have previously assessed, especially given future projected climate trends of hotter weather and extreme precipitation or lack thereof. Realistically, sizeable wildfires have had a far more severe defoliating effect on trees than gypsy moth, historically, and even gypsy moth outbreaks have been worse. Despite this recent opportunity to study the effects of gypsy moth defoliation, it remains unclear as to how an extensive outbreak of a pine pest, such as southern pine beetle *(Dendroctonus frontalis)*, would affect ecosystem fluxes or how recovery would play out.