

*Mission Statement*

The mission of the North Carolina Department of Agriculture and Consumer Services is to improve the state of agriculture in North Carolina by providing services to farmers and agribusiness, and to serve the citizens of North Carolina by providing services and enforcing laws to protect consumers.

*Goals*

- Educate North Carolina's citizens on agriculture's many contributions to the state's economy, history, and future to build awareness of available services and to expand market opportunities through agricultural fairs, news releases, promotional campaigns, public exhibitions, and publication of agricultural statistics.
- Protect citizens from consuming unsafe food products and from experiencing economic loss due to unlawful business practices through programs of inspections and enforcement of laws and regulations to build consumer confidence with agricultural and consumer products.
- Prevent the spread and effects of agricultural-related diseases and pests, implement eradication steps, and assist farmers in preparing for and responding to catastrophic events through education, site inspections, testing, and emergency planning to maintain a safe environment.
- Work to continuously improve the quality and cost-effectiveness of departmental programs and related services provided to North Carolina citizens through performance management and constant monitoring to efficiently manage public resources and maintain high customer satisfaction.



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**Commissioner of Agriculture**  
**Chairman, Board of Agriculture**

**North Carolina Board of Agriculture**



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**General Farming**

**William Johnston**  
**General Farming**

**C. Osmond Kearney**  
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**Marketing-Green Industry**

**Jeffrey Turner**  
**Tobacco**

**Casey Armstrong**  
**General Farming-Equine**

**Jean Boseman**  
**Peanuts**

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**Cotton**

# North Carolina Department of Agriculture and Consumer Services

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## N.C. Department of Agriculture and Consumer Services-Plant Industry Division

Plant Industry Division Web Site: <http://www.ncagr.gov/plantindustry/>

### Facilities:

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#### Support Operations

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#### Witchweed Program Facilities:

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**Physical Address:** O. P. Owens Agriculture Center, 405 Country Club Drive, Lumberton, NC 28358

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#### Crossnore Plant Inspection Station:

**Physical Address:** 6111 Linville Falls Hwy., Crossnore, NC 28616

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# Above

From state budget issues to new pest, industry consolidations and seed compliance issues, each NCDA&CS-Plant Industry Division staff member has been challenged to rise above to meet those extraordinary challenges that have faced us. At this point, it does not appear the challenges have or will disappear. Rather, the proverbial bar continues to be raised. In these times, it is easy to lose focus and take our sight off the primary goal---serving the producers and citizens of the state.

During fiscal year 2010-11, Raleigh-based staff have been challenged with surviving an extensive renovation of the OHB, including the full replacement of an inefficient HVAC system, renovation of the NC Seed Lab, and painting and carpet throughout the entire building. To facilitate this work, NC Seed Lab staff re-located to the Beneficial Insect Lab for nearly a year and both first and second floor staff experienced temporary moves between the first and second floors. However, the result will truly be a more comfortable and professional work environment needed to support the laboratory and administrative functions of the Plant Industry Division and to effectively serve the citizens of the state. Each of these changes was long overdue.

While state and federal governmental agencies continue to experience crisis situations, the industries we support also suffer. Throughout the fertilizer and seed industries, we continue to monitor major consolidations and re-organizations. These consolidations continue to impact the ways we carry out our regulatory roles. Likewise, the nursery industry has suffered as housing starts have dramatically declined and the general public spends less of their disposable income on plant material. During this fiscal year, we have seen a decline of approximately 100 nurseries as part of our nursery registration process. Several of these reductions included larger nursery establishments employing numerous workers.

As we turn our sights to the future, our work must continue to focus on service and responsiveness to each of our clients. This is the type of organization that I continue to proud to be a part of. I hope together we will continue to rise above to meet all the challenges placed before us.

*Gene B. Cross*  
Director  
NCDA&CS-Plant Industry Division

**Dedication of the 2010-11 North Carolina Department of Agriculture and Consumer Services-Plant Industry Division-Annual Report to Marlene J. Ikerd**

Our 2010-11 NCDA&CS-Plant Industry Division-Annual Report is being dedicated to Marlene Joan Ikerd—a dedicated and loyal NCDA&CS staff member.

Prior to her retirement, Marlene served as an Administrative Secretary II in the Plant Industry Division, along with other roles during her 22 year tenure. Even with her cancer diagnosis, Marlene remained committed to her position responsibilities within the Division. During her radiation and chemotherapy, she routinely returned to work despite our pleas to stay home and rest. During her latter treatments, several PID staff members would volunteer to drive her to her treatments; however, she always responded with—"I can do it myself!" This positive attitude permeated her work on a daily basis and she always wanted to try a task herself before tapping into other's expertise.

Marlene was a native of Independence, Kansas where she attended Zion Lutheran School and was a 1956 graduate of Independence High School. Marlene had retired at the end of 2010 from her position as Administrative Secretary II. Family was clearly important to Marlene. She is survived by sons Frank and his wife Valarie, and Scott and his wife Amy. Grandchildren included Brittney, Alec, Maxson, Kendall and Caden.

***The strength of a family, like the strength of an army, is in its loyalty to each other.***

***MARIO PUZO, The Family***

## Accomplishments: Plant Protection Section

The Plant Protection Section is responsible for implementing laws enacted by the North Carolina General Assembly to protect North Carolina agriculture and its citizens from the entry, establishment, release, and spread of injurious organisms into or within North Carolina.

The mission of the Plant Protection Section is to enhance the quality of life in North Carolina by protecting agriculture and the environment from injurious plant pests, by promoting beneficial organisms, and by protecting rare native plants of the state.

We serve the people of North Carolina by:

- Protecting agricultural crops, horticultural crops and native flora, by preventing or controlling the invasion and spread of injurious insects, plant pathogens, weeds, and other pests of regulatory concern.
- Protecting honey bees by combating the spread of bee pathogens.
- Responding to constantly changing threats to crops, rare native plants, and honey bees by drafting effective and reasonable regulations and by achieving public compliance.
- Supporting agriculture, horticulture and related industries by providing inspection and export services to facilitate the movement of regulated commodities.
- Protecting rare native plants by restoring their habitats, and by propagating and restoring them to the wild.
- Promoting beneficial organisms that serve as biological controls of pest species.
- Providing outstanding service and satisfaction to all our clients.

North Carolina has an extremely wide range of climate, from near tropical along the southeast coast to winter conditions similar to southern Canada in our higher mountains in the west. Such diversity provides suitable environments for an extremely diverse flora and fauna. Extensive international air and sea transportation, both military and commercial, and an extensive Interstate Highway System increase the potential for the accidental introduction of pest organisms into North Carolina. Therefore, North Carolina's Plant Protection Section programs must deal with a wide range of organisms and host-pest interactions.

Major program activities for the period July 1, 2010 through June 30, 2011 included the following:

### **Apiary Inspection Program**



The NC beekeeping industry remains viable and strong. Our inspectors help beekeepers through field inspections, educational meetings, and field days and attempt to be available to assist the beekeepers in any way necessary. Our goal is to continue to improve our overall inspections and in particular our documentation of them. Our ultimate objective is to reduce the rate of honey bee disease and pest problems. The numbers of colonies the office has documented for inspection for fiscal year 2010-11 was 7,694 with 33 hives documented to have American Foulbrood. This compared to a total of eight the previous fiscal year.

In 2010, there was a favorable honey flow which allowed our beekeepers to recover from several years of difficulty. Unfortunately, 2011 has demonstrated that many of these problems still exist and the honey flow has not been particularly strong. There have been several interesting occurrences this year with regard to bee and brood viability that appear to be associated with poor nutrition. Among these are European Foulbrood, blue brood, and probable toxic nectar and pollen sources. We are working with the federal bee lab in Beltsville to determine the extent of these issues.

The *Varroa* mite persists as a major threat to the beekeeping industry in NC and is likely a contributing factor to some of the circumstances already described. Several new products have been registered for use in controlling this pest; however, the mites have developed resistance to some of these materials in short order and rendered these products ineffective. Although chemical treatment of mites may be necessary, some miticides have been demonstrated to have adverse effects on bees. Another perplexing factor is the growing use of unregistered materials that may also have adverse effects on honey bee health and may not be efficacious in controlling mites. In some cases, the improper use of antibiotics to control diseases can further complicate useful treatment regimes.

Colony Collapse Disorder (CCD) continues to be a major topic of discussion by the popular media regarding honey bees and their plight this year. The press coverage has highlighted the value of honey bees to a broader audience and raised awareness of their importance. Due to the restricted parameters described as symptoms of CCD, this disorder has not yet been documented in NC. This is not to say that it has not occurred here, but we have not seen evidence specifically attributable to this condition.

Another threat facing the beekeeping industry of North Carolina is the establishment of Africanized honey bees (AHB) (*Apis mellifera scutellata*) in southern Florida, along with detections in Georgia). In North Carolina, we are engaged in an outreach program to emergency response personnel to familiarize them to the potential threat of AHB. We are also reaching out to the structural pest industry and its membership. We are collecting samples of bees (particularly those from colonies with overly defensive behavior) in order to determine their geographic origin and their propensity for this behavior. The NCDA&CS and NCSU are collaborating in conducting this survey. At this time, none of the samples collected was determined to be of the AHB type. We are striving to have our inspectors and our lab prepared to deal with any AHB incursion or incident.

We encourage beekeepers to please let us know of any colonies that seem to be displaying any unusual or inexplicable defensive behavior so that we can maintain a beekeeping industry in North Carolina that is not threatened by the reputation of this more defensive type of bee.

We continue to enjoy a good working relationship with our friends in the NC State University Apiculture Research and Extension Program. We have had the opportunity to assist them in some of their projects and would like to express our gratitude for their assistance in many of our projects.

## Biological Control Programs



*CERCERIS FUMIPENNIS* AND  
PREY



HEMLOCK WOOLLY ADELGID



IMPORTED FIRE ANT AND  
PHORID FLY



KUDZU BUGS



MILE-A-MINUTE VINE WEEVIL

The mission of the biological control program is to manage exotic pests using ecologically-based methods. We focus on “classical” biocontrol that is, reuniting exotic pests with the natural enemies that keep them below damaging levels in their home ranges. Although we are primarily an implementation program, conducting these projects requires research to ascertain the appropriateness of releasing biological control agents or to follow up on agents released. The biological control program of the NCDA&CS was founded in the 1970s to investigate and establish natural controls for the gypsy moth, a visionary undertaking in advance of the invasion of that pest. Today, our projects focus on a variety of exotic pests, and involve laboratory rearing of insects, field releases of natural enemies, surveying, and the operation of a USDA-inspected containment (quarantine) facility. Rooms in the containment facility are available to industry and university researchers for short-term use. Such cooperation allows projects to be completed in a secure environment, and provides the opportunity to work on potential pests before they are established in North Carolina. Six shipments of exotic material were received by the NCDA &CS Insect Quarantine Facility during 2010/2011.

**Summary of Quarantine Activities 2010 - 2011**

ID #	SPECIES	FAMILY	STAGE	#	ORIGIN	STATUS
Q08-3	<i>Striacosta albicosta</i> <sup>1</sup>	Noctuidae	Egg/larvae	6,663	IA	Insects maintained on artificial diet until pupal stage.
Q08/09-4	<i>Cactoblastis cactorum</i> <sup>1</sup>	Pyralidae	Egg/larvae	15,000	FL	Insects maintained on artificial diet until pupal stage.
Q10-1	<i>Megacopta cribraria</i> <sup>2</sup>	Plataspidae	Adults/ Eggs/larvae	1000	GA	Insects maintained on kudzu for host preference test.
Q11-9	<i>Sirex noctilio</i> <sup>3</sup>	Siricidae	Adults/ Eggs/larvae	30 logs	NY	Logs maintained in quarantine awaiting wasp emergence.

<sup>1</sup>Dr. Allen Cohen, Insect Diet & Rearing Research, LLC, is utilizing the NCDA&CS Beneficial Insects Quarantine Lab to develop artificial diets and rearing systems for *Cactoblastis cactorum* (prickly pear cactus moth) and *Striacosta albicosta* (western bean cutworm).

<sup>2</sup>Determine host preference of the recently found kudzu bug, *Megacopta cribraria*.

<sup>3</sup>Dr. Coby Schal, NCSU Entomology Dept., NCSU will utilize *Sirex* to develop semiochemical tools to facilitate early detection, population monitoring, and ultimate control of *Sirex noctilio*.

## Development of the Wasp *Cerceris fumipennis* as a Biosurveillance Tool for Pest Buprestidae in North Carolina: 2010 Report of Activities

Christine A. Nalepa and Whitney Swink

The solitary ground nesting wasp *Cerceris fumipennis* is currently being utilized as a biosurveillance tool for the efficient collection of pest buprestid beetles in Canada and in several locations in the eastern United States. In 2010 we continued our studies of the wasp in North Carolina (NC), with the following goals, in order of priority:

- 1) To continue locating sites with high nesting activity throughout the state
- 2) To determine the timing of wasp activity in NC
- 3) To continue adding to the database of buprestid prey utilized by the wasp in NC
- 4) To continued our investigation of the regional biology and life history of the wasp
- 5) To conduct training and information sessions for potential cooperators and volunteers

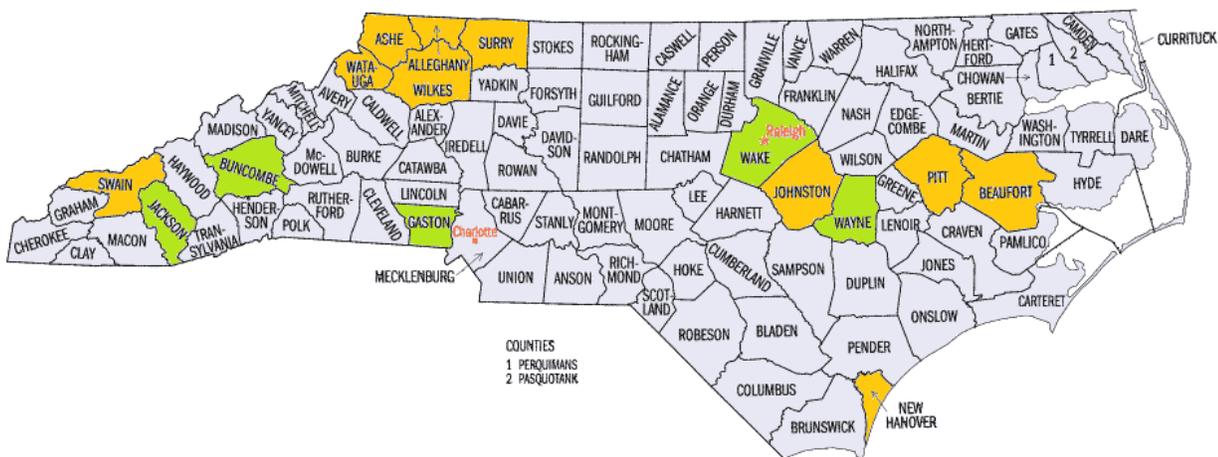
### A. NEST SURVEY

The wasp prefers to nest in hard-packed sandy soil in areas with direct sunlight and high human activity, features that are characteristic of baseball and softball diamonds. We were successful in locating nests during an initial survey of ball diamonds in 2009, and continued using them as survey units during 2010. Ball fields were located using Google Earth 5, and permission to survey specific fields was obtained from relevant schools or directors of Parks and Recreation.

To determine dates of first activity of *C. fumipennis* in Wake Co., on 16 May we began regularly surveying three local sites that were positive for nests in 2009. Active nests (n = 3) were first noted on 26 May at one site, and the statewide survey was then initiated. In general, the survey was conducted geographically from east to west.

Eastern counties were surveyed in June and included Johnston (initial visit on 7 June), Wayne (8 June), New Hanover (9-10 June), Pitt (17 June), and Beaufort (21 June). During the fourth week of June and throughout July, we surveyed counties in western NC, including Gaston (23 June), Surry (24 June), Watauga (30 June), Alleghany (30 June), Ashe (30 June), Wilkes (1 July), Jackson (7 July), Swain (8 July), and Buncombe (14-15 July). The survey ended on 3 August with a return trip to two positive sites in Wayne County.

A total of 363 ball diamonds in 177 sites across 15 counties were visited between 20 May and 3 August 2010 (Fig. 1).



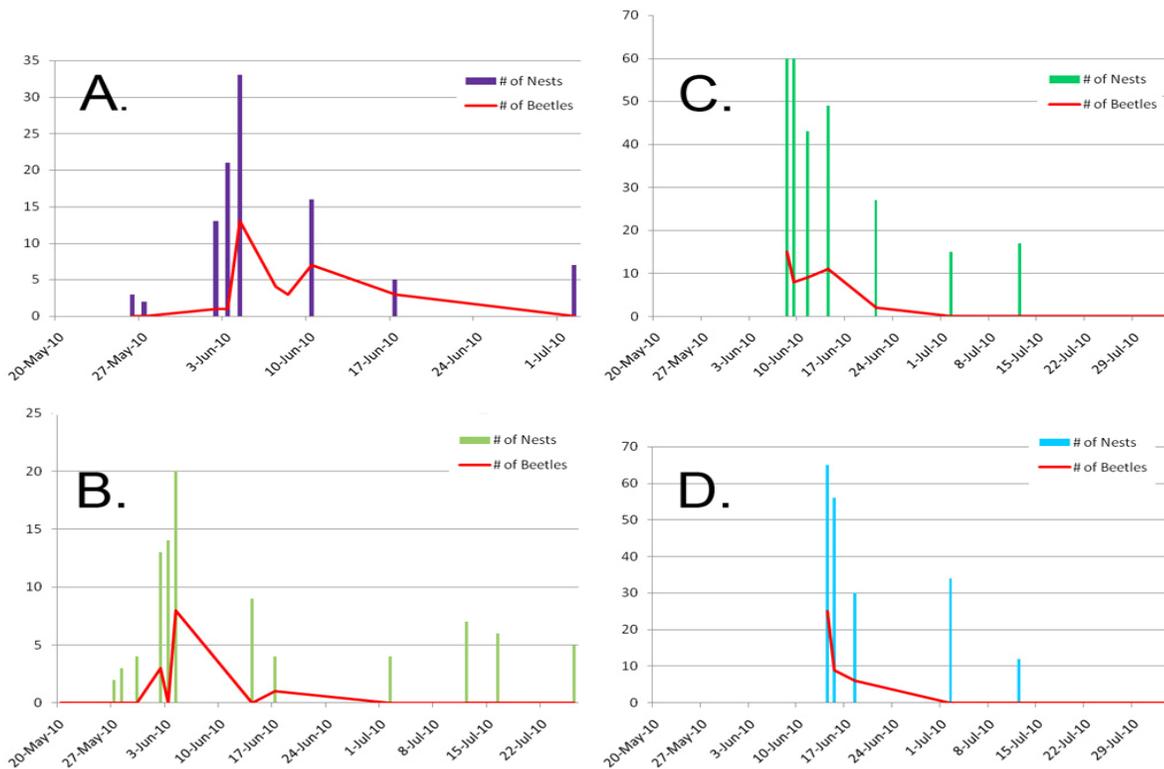
**Figure 1.** Map of *Cerceris fumipennis* survey in North Carolina in 2010; 15 counties were surveyed (highlighted). Gold = survey only; Green = survey and collection of buprestids from at least one site.

Of the 177 sites surveyed, 68 sites (38%) were positive for *C. fumipennis*, i.e., one or more of the characteristic nests were present. Of these 68 sites, 27 (35%) had just 1-2 nests, and 47 (69%) had fewer than 10 nests. A total of 633 nests were recorded during initial site visits; a total of 1,342 nests were observed if repeat visits to positive sites are included. The highest nest numbers found during a single visit were at an elementary school in Buncombe Co. (n = 74), a community college in Wayne Co. (n = 65), a Christian academy in Wayne Co. (n = 60), a middle school in Surry Co. (n = 41), and a city park in Wake Co. (n = 33).

Nests were rarely found on fields that were too manicured (e.g., most colleges, large high schools, or large athletic parks), overgrown with grass (e.g., small, rural elementary schools), or surfaced with Red Ball Diamond Aggregate (RBDA - crushed red dolomite limestone). Nests were most commonly found on ball diamonds that were not well maintained during the *C. fumipennis* flight season, but were generally kept in good condition throughout the rest of the year. Grade schools (primarily elementary and middle schools) yielded the most nests per site overall.

**Timing of nesting and foraging.** We made one or more return visits to sites where a high number of *C. fumipennis* nests (greater than 15) were found during the survey. Four sites in central NC were surveyed five or more times from May to August (Fig. 2). Plotting the number of nests at these sites over time gives a clear indication that the window of opportunity for working with the wasps in the piedmont of NC was a fairly narrow one in 2010. Activity peaked quickly in early June, then waned after mid-June.

The number of beetles collected from the wasps was generally correlated with the number of nests present at a site, but foraging activity was close to non-existent in July, even if nests were present. We collected no beetles from the Coastal Plains region; about 20 beetles were collected in the Mountains Region (late-June through July). Based on beetle data from 2010, we cautiously predict that the optimal time for collecting beetles in the Coastal Plain is mid-May and in the Mountains is late-June to early-July.



**Figure 2.** Timing of nesting and foraging of *Cerceris fumipennis* in four sites in the Piedmont of North Carolina. A) Wake Co. Jaycee Park; B) Wake Co. Lake Lynn; C) Wayne Co. Faith Christian Academy; D) Wayne Co. Wayne Community College. Note that the scale of the axes differ among graphs.

## B. BUPRESTID PREY

Work on the diversity of buprestid prey utilized by *C. fumipennis* in NC was continued during 2010. We collected beetles directly from wasps returning from foraging trips as well as paralyzed prey that the wasps left outside of nest entrances.

In 2010, 155 beetles were collected from eight sites in five counties across the state (Fig. 1); this was more than twice the number of beetles collected in 2009. Five genera (*Actenodes*, *Agrilus*, *Buprestis*, *Chrysobothris*, *Dicerca*) and 21 species (Table 1) were represented among the collected beetles. Thirteen species collected in 2010 were not collected in 2009; three species collected in 2009 were not collected in 2010. The highest number of species collected at a given site was 11. Overall a total of 24 species have been collected from *C. fumipennis* in NC to date. Three are new state records (*Buprestis consularis*, *Chrysobothris trinervia* and *Agrilus quadriimpressus*) and three had not been previously recorded as prey of *C. fumipennis* (*Agrilus acutipennis*, *A. difficilis*, *A. quadriimpressus*). Of particular note is that we collected **seven species of *Agrilus*** in 2010, for a total of 8 *Agrilus* species taken from *C. fumipennis* in NC to date.

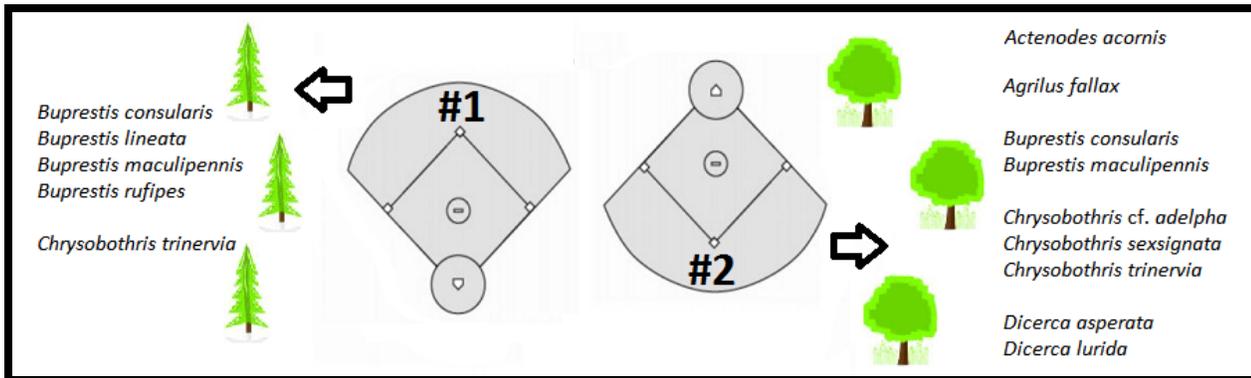
**Table 1.** Buprestid beetles identified as prey of *Cerceris fumipennis* during the 2010 North Carolina survey. ^ = new state record, \* = new to *C. fumipennis*. Identifications by Steven Paiero (University of Guelph), and Whitney Swink (NCDA &CS).

Buprestid species collected 2010	# of specimens collected	# of Sites at which a given species was collected
<i>Actenodes acornis</i>	9	4
<i>Agrilus acutipennis</i> *	1	1
<i>Agrilus carpini</i>	1	1
<i>Agrilus cephalicus</i>	1	1
<i>Agrilus difficilis</i> *	2	1
<i>Agrilus fallax</i>	1	1
<i>Agrilus fulgens</i>	1	1
<i>Agrilus quadriimpressus</i> *^	1	1
<i>Buprestis consularis</i>	5	3
<i>Buprestis lineata</i>	11	4
<i>Buprestis maculipennis</i>	59	5
<i>Buprestis rufipes</i>	27	5
<i>Buprestis striata</i>	3	3
<i>Chrysobothris cf. adelpha</i>	1	1
<i>Chrysobothris femorata</i>	1	1
<i>Chrysobothris sexsignata</i>	2	2
<i>Chrysobothris</i> sp.	1	1
<i>Chrysobothris trinervia</i>	13	4
<i>Dicerca asperata</i>	1	1
<i>Dicerca lurida</i>	11	4
<i>Dicerca obscura</i>	2	1
<i>Dicerca punctulata</i>	1	1

## C. BIOLOGY OF *CERCERIS FUMIPENNIS* IN NORTH CAROLINA

**Foraging behavior.** Multiple visits were made to a Wayne county site that had two adjacent ball diamonds. Bordering the outer edge of the first ball diamond (#1) was a stand of trees dominated by pines, and a stand of mostly hardwoods was

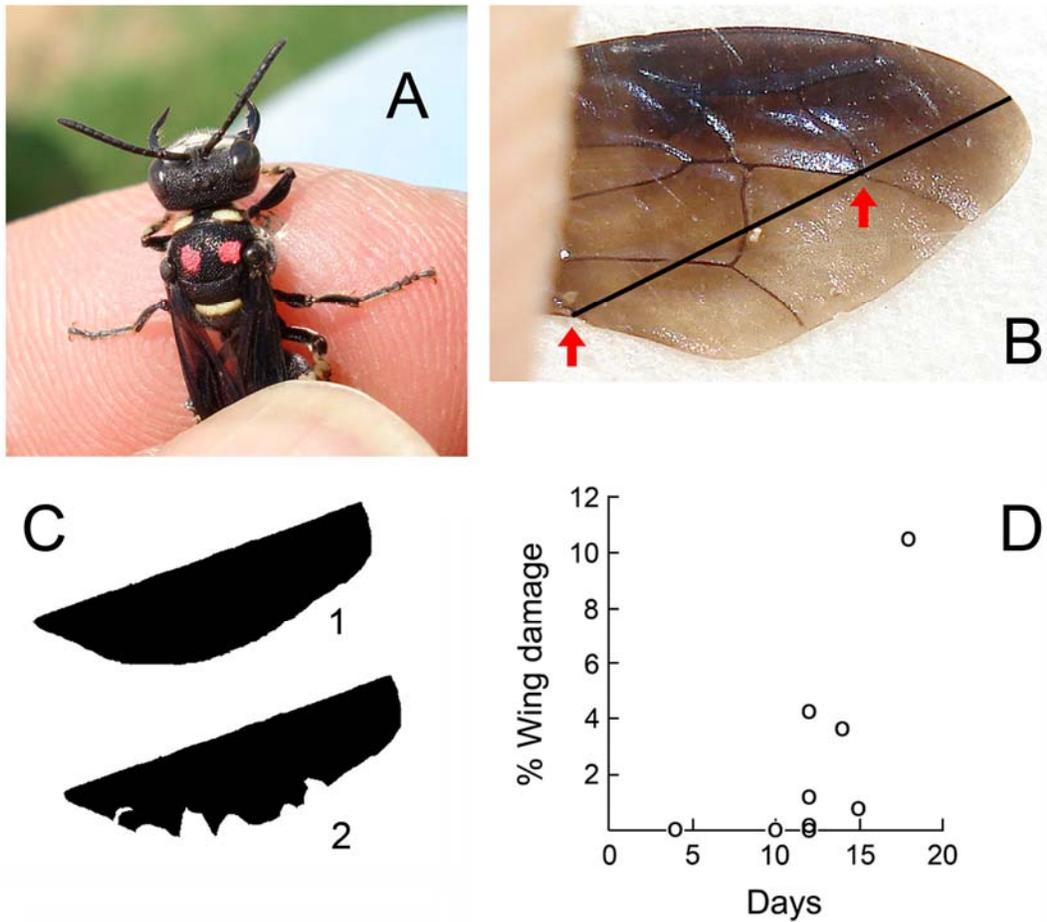
adjacent to diamond #2. Despite the proximity of the two fields, the wasps travelled to the nearest treeline when foraging, a behavior that is reflected in the species diversity of their buprestid prey (Figure 3).



**Figure 3.** Schematic of two adjacent ball fields at a school in Goldsboro. Arrows indicate foraging direction of the wasps. Buprestid species collected from each field are listed (n = 20 and 25 beetles collected from field #1 and #2, respectively). Edges of the infields are approximately 100 feet apart.

**Number of generations.** Observations of wing wear of *C. fumipennis* females during 2009 suggested that there may be more than one generation per year in NC. During 2010 we followed up on the problem by conducting a more focused study in one Raleigh location. Beginning shortly after nests began appearing at the site (30 May), females were captured and given a unique mark on the thorax using DecoColor opaque paint markers (Fig. 4a). A picture of each marked female’s right wing taken with a Sony Cybershot camera, and she was then released. A total of 11 visits were made to the site over the active season, and during each, an attempt was made to capture and examine all active wasps. If a female hadn’t been previously captured, she was marked and her wing condition recorded. In all recaptured females, wing condition was documented if it had been more than 5 days since she was last seen. Four site visits were made during the first week of wasp activity; subsequently, visits were made at least every 2 weeks until the end of the active season (26 July).

A total of 32 females were marked between 30 May and 12 July, and in 23 (72%) the wing was completely undamaged when the female was first captured. Nearly half (47%) of marked females were never recovered. Eight females were recaptured between 10 and 18 days later. One was found dead on the field 4 days after marking, apparently stomped by a young ball player. Wing damage in these nine wasps was analyzed using the before and after photographs, based on the technique of Lehnert (2010).



**Figure 4.** Attempt to determine number of *Cerceris fumipennis* generations per year based on wing wear. A) Marked female; B) Field photograph of right wing, showing reference points for analysis; C<sub>1</sub>) Undamaged wing of Female #2 (30 May); C<sub>2</sub>) Damaged wing 18 days later. D) Plot of percent wing damage over time in 9 females, based on pixel counts of damaged vs. undamaged wings.

**Wing analysis.** In Adobe Photoshop, a standard portion of the wing was delineated by drawing a line through two reference points: where vein  $Cu_{1b}$  meets the wing margin, and at the junction of  $M$  and  $3r-m$  (Fig. 4b). That portion of the image was excised, converted to black and white, and the contrast adjusted so that it appeared black on a white background (Fig. 4c). ImageJ software (National Institute of Health, public domain) was then used to compare pixel counts in the ‘before’ and ‘after’ wing tips and obtain estimated percent wing damage. Percent damage was plotted against the number of days elapsed between the two photographs to determine if wing damage is a reasonable estimate of a given female’s age.

**Results:** The relationship between days elapsed and percent wing damage was not consistent (Fig. 4d). A few females contributed to a nice trend of increased damage with time, but in others, the wings remain intact or nearly so over the same time frame. The wings of two females were completely unchanged over a 10-12 day interval.

**Conclusions:** The technique of assessing wing damage worked beautifully, but the results indicate that it is of little using in assessing *C. fumipennis* age and consequently the number of generations of the wasp in central NC. It is assumed that wing damage results from digging and maintaining a nest or perhaps intraspecific aggression; it is therefore likely to be correlated with variation in behavior of the wasps. Females obtain nests by reusing their natal nest, digging a new one, or usurping one from another female (Mueller et al. 1992). They would therefore be subjected to different levels of wing wear depending on their strategy. We also had some evidence of aggression. The thorax and head of one marked female was found buried in the

turret of a nest across the field from the nest where she was originally collected. We currently have no further plans for trying to assess the number of generations of *C. fumipennis* that occur in the state.

#### **D. TRAINING AND OUTREACH**

We (WGS and CAN) attended a *Cerceris* training session conducted by Philip Careless at Archbold Biological Station (Florida) in May, and in turn conducted two training sessions in NC: one in Wake Co. (for APHIS/NCSU) and one in Johnston Co. (for NC Division of Forest Resources). Talks on the *Cerceris* biosurveillance program were given at the SAFEPS meeting (Crossnore, NC), the SFIWC meeting (Wilmington, NC), to Forestry Continuing Education (Marion, NC and Asheboro, NC) and to the Forestry class at Wayne Community College.

#### **Acknowledgments**

We thank Philip Careless and Steve Paiero for advice, Steve Paiero for identifying/confirming the insects, Lynn Warren and the Raleigh Parks and Recreation Department for permission to work on local baseball diamonds, and Rebecca Norris, Jason Moan, and Steve Bambara for help with survey and monitoring. Walter Sloan of Faith Christian Academy, Edward Farris of Wayne Community College, James Hayes of Meadowview Middle School, and Cynthia Sellinger of Vance Elementary School were particularly generous in allowing us to work on their property. This work is supported by a grant from The United States Forest Service, Forest Health Protection Program.

#### **References**

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Mueller UG, Warneke AF, Grafe TU, Ode PR. 1992. Female size and nest defense in the digger wasp *Cerceris fumipennis* (Hymenoptera: Sphecidae: Philanthinae). *Journal of the Kansas Entomological Society* 65(1): 44-52.

#### **Update: *Cerceris fumipennis* in North Carolina**

The native ground-dwelling wasp, *Cerceris fumipennis*, provisions its nest with buprestids, including the invasive forest pest Emerald Ash Borer (EAB) (*Agrilus planipennis*) when present. The wasp is much more efficient than humans at finding EAB, and is proving to be a reliable way to monitor for this pest. It is a solitary, ground-nesting wasp that lives in diffuse colonies in sparsely vegetated, open spaces with hard-packed, sandy soil. Colonies are almost always found in full sunshine near wooded areas in places of human activity. In 2008, the Beneficial Insects Laboratory (BIL) of the NCDA initiated a project to locate nests of *C. fumipennis* for use in surveying for EAB and other pest buprestids; this program has continued until the present. The program is funded by Forest Health Protection, USDA Forest Service.

A full report of the 2010 season was distributed in February 2011. In late May 2011 we began monitoring sites known to be positive for *C. fumipennis* in the piedmont of the state, to determine first emergence of the wasp and to begin collecting their beetle prey. We concentrated on two sites in Wayne County and two sites in Wake County. Currently (9 June 2011) we have collected more than 200 beetle prey; these are being pinned and identified. We plan to concentrate our continued survey for new nest sites of the wasp in the western part of the state, as EAB is currently in Tennessee.

We have begun attempting to establish nests of *C. fumipennis* in an abandoned cold frame on the grounds of the NCDA Beneficial insects Laboratory (Fig. 1).

**Fig. 1. Attempting to artificially establish nests of *Cerceris fumipennis*, Wake Co., NC 2011.**



### **Hemlock Woolly Adelgid Predator Rearing**

The hemlock woolly adelgid (HWA) occurs over multiple states, and is now distributed throughout the native range of the eastern and Carolina hemlock species. Hemlock is widespread in western North Carolina, and the loss of the hemlock will bring about major changes to those ecosystems. In addition to the loss of unique habitats, dead and dying trees are a safety hazard in recreation areas, as well as aesthetically unattractive. Chemical control is effective for managing HWA, but is impractical for widespread use in stands that are large, remote or located where streams may be damaged by insecticides. Therefore, a biological control program has been developed to release predators in state and national forests and parks to slow the progress of this devastating insect.



**Fig. 1 Hemlock woolly adelgid and *Sasajiscymnus tsugae* larva (arrow)**

The primary objective for this project was for NCDA&CS to operate a large-scale central rearing facility to provide biological control agents for the management of hemlock woolly adelgid (HWA). *Sasajiscymnus tsugae* (*St*), native to Japan, has been in mass production at the lab since December 2002. In May and July of 2008, newly collected *S. tsugae* from Japan were received in our quarantine facility to broaden the gene pool in the colony. Rearing this season concentrated on the new Japanese strain and a colony of hybrids between new and old beetles. Beetles produced are turned over to USDA-Forest Service personnel for release at selected field sites within North Carolina as well as other states.

The predator beetles are well synchronized with the lifecycle of the adelgid. After a summer of aestivation, the adelgid begins to mature and prepare for oviposition. Once this maturation begins in the field, adelgids on hemlock boughs which are cut and stored in spring-like

conditions begin laying eggs. This stimulates reproduction in the beetles, and the mass rearing can proceed. Rearing continues until the adelgid completes two generations, usually by June. The adelgid aestivates as nymphs on new hemlock growth, and *St* feeds on these supplemented with honey in the lab.

For mass production of the colony, mating groups of beetles were placed in 3.8 l jars supplied with a bouquet of hemlock twigs (Fig. 1). Eggs (on the twigs) were removed weekly and put in rearing cages supplied with infested hemlock and water, and after 4 weeks, adult beetles collected and moved into storage cages (Fig. 3). Oviposition jars for the 2010-11 season were set up October 14, and significant oviposition began November 15. Egg production was halted 21 June 2011.

During the rearing season, several measures of beetle health were recorded and compared to HWA: egg production, beetle weights, and percent completing development. These data are part of a cooperative study with Allen Cohen (Insect Diet and Rearing Research) and Carole Cheah (CT Ag. Exper. Station).

Results of the season's production are shown in Figure 4. A total of 98,533 beetles were reared (68,406 of the 2008 Japanese strain). Approximately 66,600 were transferred to the USDA-FS and 10,000 beetles were sent to the Maine Department of Forestry for release. The remaining beetles are being maintained at the lab. Egg production and larval development is directly correlated with the quality of HWA and hemlock that is used in the rearing process. During the 2009-10 rearing season, HWA quality was poor, and production was very low. Combined with high mortality during the summer months, our colony was very small at the start of the rearing season. Peak adult production occurred during the oviposition period of the sistens<sup>1</sup> generation. In the field this occurs in the spring, but in the warmer lab conditions, HWA oviposition begins in January. A second peak of production occurred during the progrediens<sup>2</sup> generation oviposition period, but the return of adult beetles was much lower. These results are consistent with past rearing seasons. All of our rearing material is provided by USDA- FS personnel, and we are grateful to Virginia Gibbs for the excellent material she sent us. As HWA has spread throughout the natural range of hemlocks, adequate material has become harder to find. This underscores the need for a supplemental diet on which immature stages can develop.

Personnel assigned to the project include Anitha Boniface, Research Specialist, full time, Rebecca Fergus, Research Specialist ¾ time, and Whitney Swink and Jesse Anderson, Research Specialists, temporary employees.



**Fig. 3. Pupa (left) and adult (right) *S. tsugae* on hemlock**

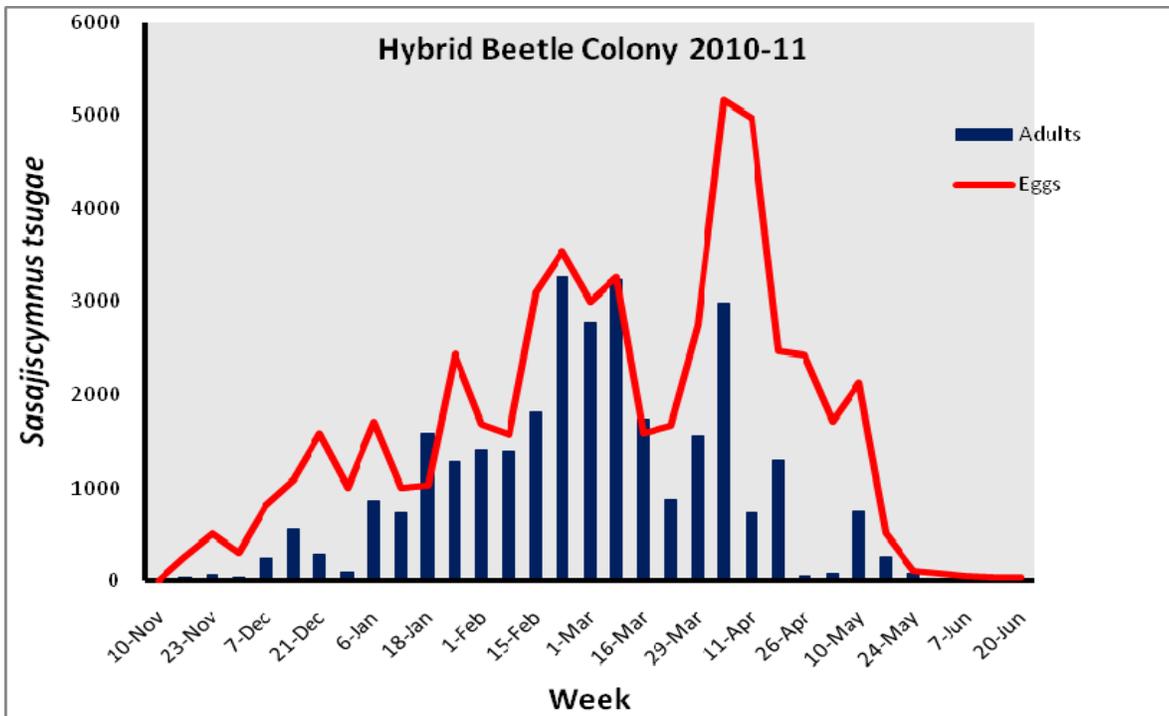
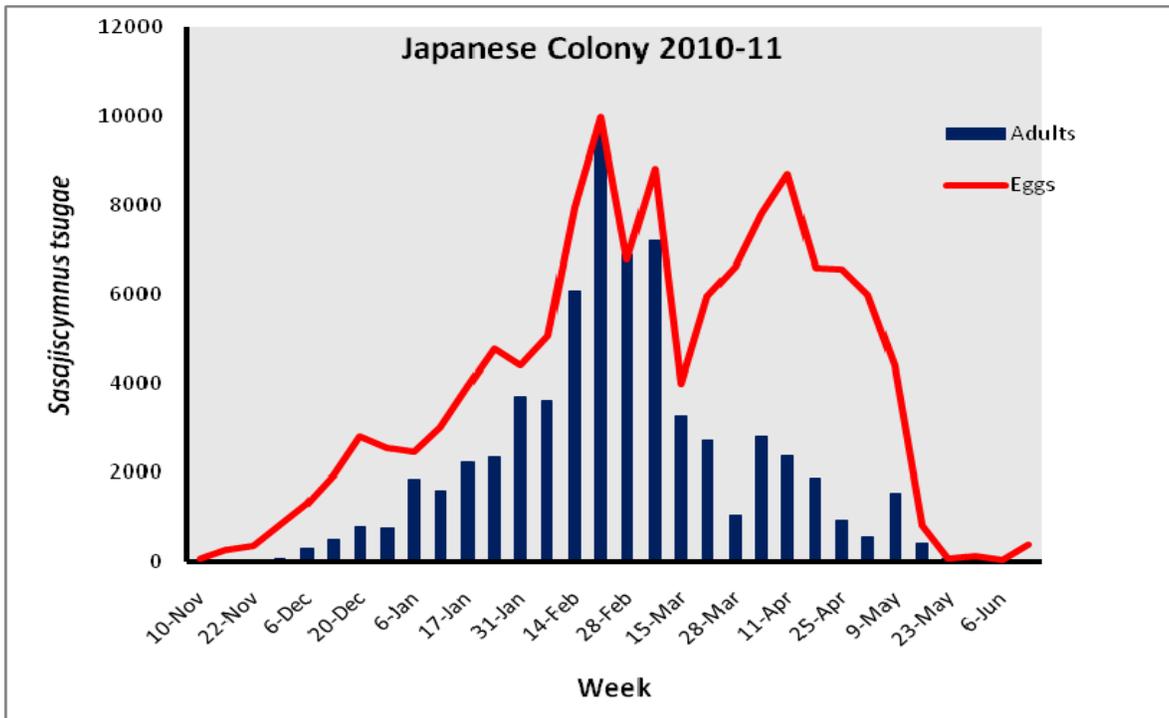


**Fig. 2. Oviposition jar**

<sup>1</sup> Terminology used to describe adelgids. The sistens generation aestivates during the summer, completes its development in the fall and winter, and oviposits in the early spring.

<sup>2</sup> The progrediens generation begins in the late spring or early summer and completes its life cycle within the same season. Adults lay eggs, and the resulting nymphs settle onto new hemlock growth to become the sistens generation.

**Figure 4. Production of *Sasajiscymnus tsugae* 2010-2011. Data shown represent production between November 10, 2010 and June 20, 2011.**



**Field Release and Monitoring Phorid Flies for Management of Imported Fire Ant  
 Rebecca Norris**

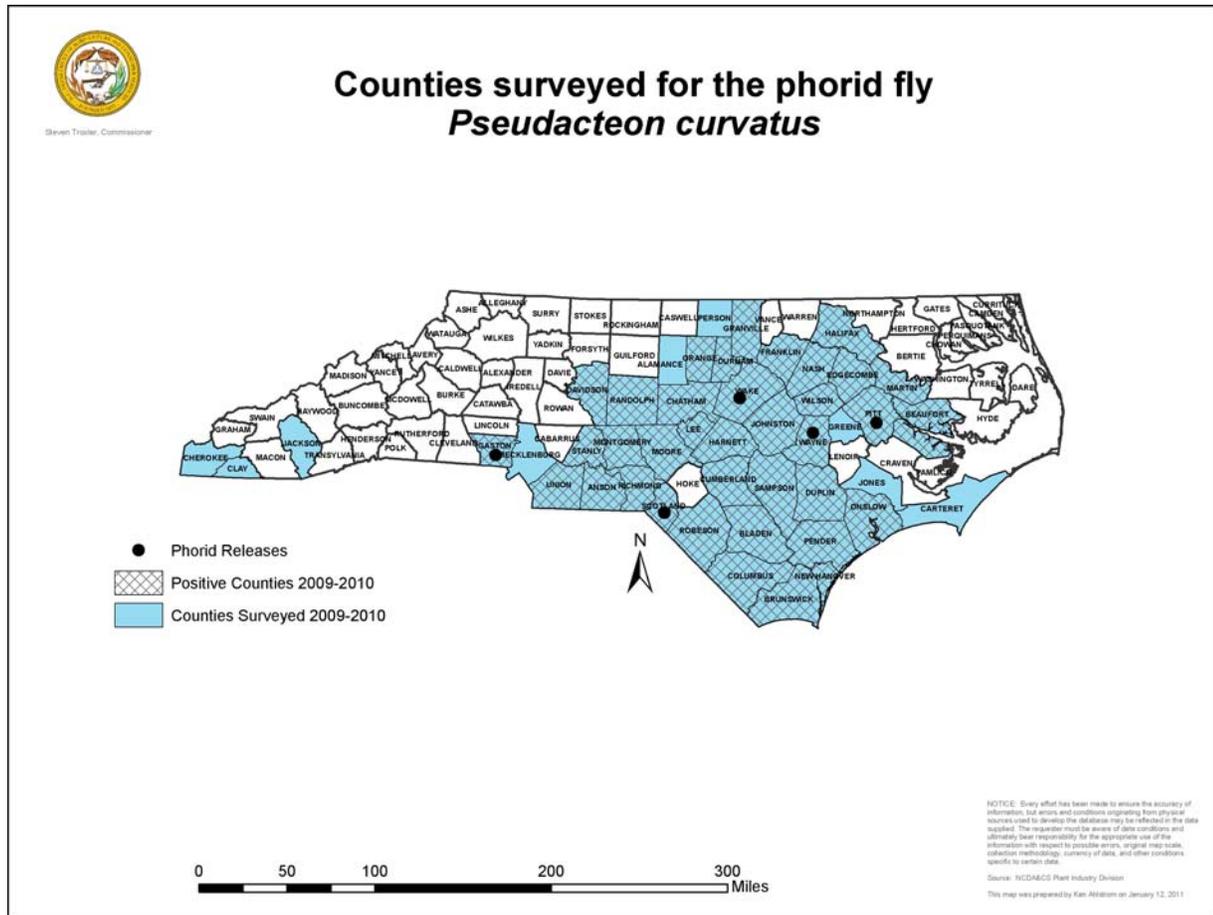
Since the discovery of the Imported Fire (IFA) in NC in 1953 it has spread to 71 of 100 counties. In an effort to slow the spread and decrease population size, phorid flies, *Pseudacteon* spp (Diptera: Phoridae), natural enemies of the IFA were released in NC beginning in 2000 through cooperative efforts between NCDA&CS and USDA-ARS. The phorid fly, also known as the decapitating fly, lays its eggs in foraging ants. After hatching, the larva move into the IFA's head where it secretes an enzyme that causes its head to fall off. Three species of phorids, *Pseudacteon tricuspis*, *P. curvatus*, and *P. obtusus* have been released in the state. The species of phorid flies selected for release at each locality was based on the most prevalent IFA type present: monogyne colonies with a single queen or polygyne colonies with multiple queens. *P. tricuspis* and *P. obtusus* typically attack larger workers found in the monogyne colonies whereas *P. curvatus* shows a preference for smaller workers common to polygyne colonies. Locations and species released are shown in Table 1.

**Table 1. Releases of phorid flies in North Carolina, 2000-2010.**

Species	County	Year	Site
<i>Pseudacteon tricuspis</i>	Beaufort	2000	Fallow land
	Duplin	2002	Rest area
	Robeson	2003	Fallow land
	Wayne	2004	Pasture
	Pitt	2006	Pasture
	Scotland	2007	Pasture
<i>P. curvatus</i>	Wake	2006	Naturalized area
	Scotland	2007	Pasture
	Wayne	2008	Pasture
	Gaston	2009	Pasture
	Pitt	2010	Fairgrounds
<i>P. obtusus</i>	Pitt	2010	Fairgrounds

Delimiting surveys to monitor establishment and spread of phorid fly species started July 28 and ended on October 18, 2010. Surveys are conducted in the fall when populations had time to increase. Since 2009 phorid flies have been found in thirty seven out of the forty-six counties surveyed. All of the counties surveyed were positive for *P. curvatus* (See Map). Only one sustained *P. tricuspis* population was found, in Pitt County.

A new species of phorid fly, *P. obtusus* was introduced into Pitt County in the fall of 2010. This species is more likely to attack the foraging ants instead of being attracted to mound disturbance like the other two species released. Approximately 1,100 *P. obtusus* and 12,000 *P. curvatus* were released in Pitt County over a three week period starting September 8. Monitoring confirmed the presence of *P. curvatus* in Pitt county in the Fall of 2010. Monitoring for *P. obtusus* will commence next fall after populations have had time to increase.



***Megacopta cribaria*, the Bean Plataspid or Kudzu Bug**

An exotic hemipteran, *Megacopta cribaria*, was found feeding on Georgia kudzu (*Pueraria montana* var. *lobata*) and aggregating on buildings in the fall of 2009. In the summer of 2010, the insect was found feeding on soybean (*Glycine max*) in Georgia and South Carolina. Reports from Asian literature indicate that it may feed on soybean and other related legumes, but this host association is unclear. We proposed testing the insect in the NCDA&CS Quarantine Facility to determine host preferences.

Work began after funding was approved on June 17, 2010. The initial goal was to establish two separate colonies, based on host plant, allow the bugs to reproduce, and conduct feeding tests with individuals of approximately the same age. The first shipment of insects arrived July 29, 2010, and was placed in the Quarantine Facility. Insects were collected from soybean (370 bugs) and kudzu (486) in Georgia, and placed in separate cages with pots of lablab (*Lablab purpureus* (L.) Sweet) seedlings and a pot of their plant of origin (soybean or kudzu). Lablab was selected because it is reported to be a preferred host, and for its ease of propagation. A second shipment of bugs was received on September 8 (350 from soybean and ca. 1300 from kudzu) (Fig. 1). The majority of those in the kudzu group died within a few days, but better survivorship was seen in the soy group. A third shipment was received into quarantine on September 28. Plants were checked daily for egg masses, and foliage with eggs was removed and placed in individual petri dishes with moist filter paper and a new leaf. Hatching was monitored then nymphs transferred to new plants.

*Megacopta* on soybean laid 16 egg masses (191 eggs), with a hatching rate of 70.7%. Those on kudzu laid 3 egg masses (10 eggs) with a hatch rate of 50%. To improve oviposition and survival rates we are trying different methods of transferring eggs and different sizes of plants.

**Choice Tests.** A choice test was established September 23, using adults of unknown ages from both kudzu and soybean groups. Adults were held without food in small petri dishes for 24 hours prior to starting the test. Small plants of cotton, kudzu or soybean were offered in pairs to bugs originating from kudzu or soybean. Each treatment (kudzu vs. cotton and soybean vs. cotton) was repeated with the plants in opposite positions (front and back of cage) Controls of two kudzu or two soybean plants were included. Plants were positioned in the cages, and a dish containing 3 females and one male bug was placed on the floor of the cage between plants. The test was repeated with bugs from the third shipment beginning October 1, using 2 females and 2 males for each cage. Results were inconclusive. Plataspids fed readily on soybean, but the majority of the kudzu group died leaving little evidence of feeding on the plants. One plataspid was observed on cotton during one observation period, but no feeding damage was found. The cotton was paired with kudzu, which did show evidence of feeding with a maximum of 2 (of 4) bugs on the plant at one time. This was the only kudzu cage that showed feeding damage.

A no-choice test with nymphs was conducted by placing 2 nymphs each on five different plants, lablab, soybean, kudzu, cowpea, and lima bean. All nymphs died before the trial was complete.

All individuals had died by December 10. Several difficulties were experienced during the course of this study; they included obtaining same age individuals, propagating kudzu from cuttings, spider mite infestations of plants, and overwintering the plataspids.

In the spring of 2011 reports of bugs present in the southern border counties of NC were received. Surveys by Erica Scocco of Wingate University and Jack Bachelor and Dan Mott of NCSU along with individual reports confirmed 35 of 100 counties as infested by June 30. Personnel from the BIL collected bugs from Richmond and Anson Counties on June 9 to begin a colony in quarantine, and Katharine Ellison of USDA in Georgia sent bugs from kudzu on June 21. Egg laying began within a few days and egg masses were monitored for hatching. One replication of a choice test using adults has been run to date; results will be reported when more replications are complete.

This exotic insect has been found feeding on kudzu, wisteria, and soybean in North Carolina. Although it may reduce growth of wild kudzu to some extent, its feeding on soybean is of particular concern to producers of organic soybeans for consumption as edamame. Also of concern is its habit of flying to and entering buildings to overwinter. When this occurs, the bug does not cause economic damage due to feeding, but becomes a nuisance pest, disturbing residents with its presence and even more so with the odor it emits when disturbed.

**Table 1. Number of Egg Masses and Hatched Eggs, 2010.**

<u>Shipment</u>	<u>Host</u>	<u># Egg Masses</u>	<u># Eggs Hatched</u>
1	Kudzu	3	5/10
2	Kudzu	0	
3	Kudzu	0	
1	Soybean	16	135/191
2	Soybean	4	22/43
3	Soybean	0	

**Figure 1. Life stages of *Megacopta cribraria*, Adults, Eggs, and Nymphs.**



### Mile-A-Minute Vine Biological Control

In the fall of 2010, an infestation of mile-a-minute vine (MAM) was reported in Alleghany Co by a student from Appalachian State University (ASU). In cooperation with the NCDA & CS Weed Program, delimiting surveys were conducted by Plant Industry field specialists, and showed several concentrations of the weed, primarily along the drainage of Elk Creek. Although some roadside plantings were designated for herbicide treatment, other areas along the creek were selected for biological control using a host-specific weevil, *Rhinoncomimus latipes*. The extensive distribution, its growth in the midst of native plants, and its preference for riparian habitat made this weed an ideal target for biological control methods.

The MAM weevil is native to China, and was identified by entomologists from the USDA Forest Service and the University of Delaware. The weevil is host-specific and during extensive lab and field testing did not complete its development on other plants, even those closely related to MAM. The weevils are now being reared at the Philip Alampi lab of the New Jersey Department of Agriculture. Experimental plots were established May 11 in one area of Alleghany Co. by ASU ecologists, and a total of 1000 weevils released. These plots will be monitored to determine the biology and spread of weevils in western NC. An additional 200 weevils were released May 26 along Elk Creek approximately 4 miles to the northeast (as the crow flies) of the experimental plots. This release is being monitored for establishment and spread along the creek.. Additional infestations have been identified in other western counties. A site near Burnsville, Yancey Co., along Coxes Creek was also selected for biological control and is being monitored. More infestations of MAM will likely be identified, and we hope to obtain more weevils for release in 2012. We will track the spread of the weevil from the 2012 release sites and document the progress in managing this weed.



**Mile-a-minute vine (left) with other vegetation; MAM weevils (below left); MAM weevil feeding (below).**



## Cooperative Agriculture Pest Survey (CAPS) Program

The Cooperative Agricultural Pest Survey (CAPS) is a joint initiative between the USDA, APHIS, PPQ and the NCDA&CS to fund and implement domestic surveys of harmful or economically significant plant pests and weeds that have not been detected by front-line inspections at our ports of entry. These surveys are necessary to safeguard our nation's agricultural and natural resources by detecting early pest infestations or introductions which validates our trading partners concerns for pest status. Typical surveys target exotic pests, pests of export significance and pests that are not known to occur in the U.S., but can also include regionally established pests. A strong domestic pest detection infrastructure and headquarters/regional staff is vital to ensuring that scientifically valid, current, and reliable pest/disease survey data is available on a continuing basis. Additionally, staff support is also critical at the state level and federal funding provided for a State CAPS Survey Coordinator position housed within the NCDA&CS Plant Industry Plant Protection Section.

The State CAPS Committee met twice in the spring at the NCDA&CS Biolab in Cary to prepare for the 2011 survey season.

In December, the State Survey Coordinator attended the National CAPS Conference in Kansas City, MO. This was an opportunity for CAPS members across the United States and its territories to learn what was going on in other states, and to network together to enhance better cooperation between state programs.

An overview of survey activities for 2010 and 2011 follows.

### 2010-11

- Twenty-two traps set in seventeen counties for Emerald Ash Borer.
- Seventy-six traps in twenty-two counties set for exotic bark beetles and wood borers.
- Eighty-six sites in five counties surveyed for exotic fruit moths.
- A National Grape Commodity Survey was conducted at twenty-nine vineyards in sixteen counties
- Forty-seven nurseries were surveyed for Sudden Oak Death
- Visual surveys for noxious weeds accomplished in five counties
- Survey and treatment for Tropical Spiderwort in two counties
- No exotic pests detected in the surveys.
- All data entered into the NAPIS database

## DISCUSSION

### Emerald Ash Borer

Research has developed a trap that is attractive to beetles in the family Buprestidae including Emerald Ash Borer (EAB). The trap is a prism shape consisting of three 14" x 24" panes, with several holes for trap and lure attachment. The trap is constructed of a corrugated plastic in a stock purple color. The lure is an attractant compound called Manuka: Phoebe oil and is placed in pouch with a release rate of 50mg/day. The pouch has a 60-day life expectancy.

Emerald ash borers attack only ash trees and therefore traps are placed in ash trees when available, or as close as possible to a host ash. Ideally, trees 8 inches or greater in diameter should be selected. Traps are to be located along edges of woods, in open areas, or in open stands such as parks and should be placed on the sunny side of the tree. Traps should be hung as high as possible but no lower than 5' above the ground.

Research indicates that initial emergence of EAB occurs after the accumulation of 450 growing degree days (base 50°F). The same research indicates that peak emergence is reached in 900-1100 growing degree days. In North Carolina the trapping season would be the end of April until approximately July 1st.

Because ash is a minor plant in NC, traps were put out at one per site. For 2010, twenty-two sites were selected as trap sites. These included 19 nurseries, 2 State Parks, and 1 Research Farm. Counties where traps were placed are Beaufort, Buncombe, Burke, Caldwell, Camden, Cumberland, Davidson, Duplin, Durham, Gates, Guilford, Henderson, Jackson, Johnston, Randolph, Rockingham, and Wayne.

No emerald ash borer specimens were found in any trap.

### **Exotic Bark Beetles and Exotic Wood Wasps**

Surveys for these pests were conducted using Lindgren funnel traps. Traps were fitted with the "wet option" for collections. This option uses recreational grade antifreeze as a killing fluid. Traps are placed in locations where pines are found and were selected on their proximity to sites having public access, i. e. parks, campgrounds, race tracks, wood pulp processing plants, and in some cases, tree nurseries.

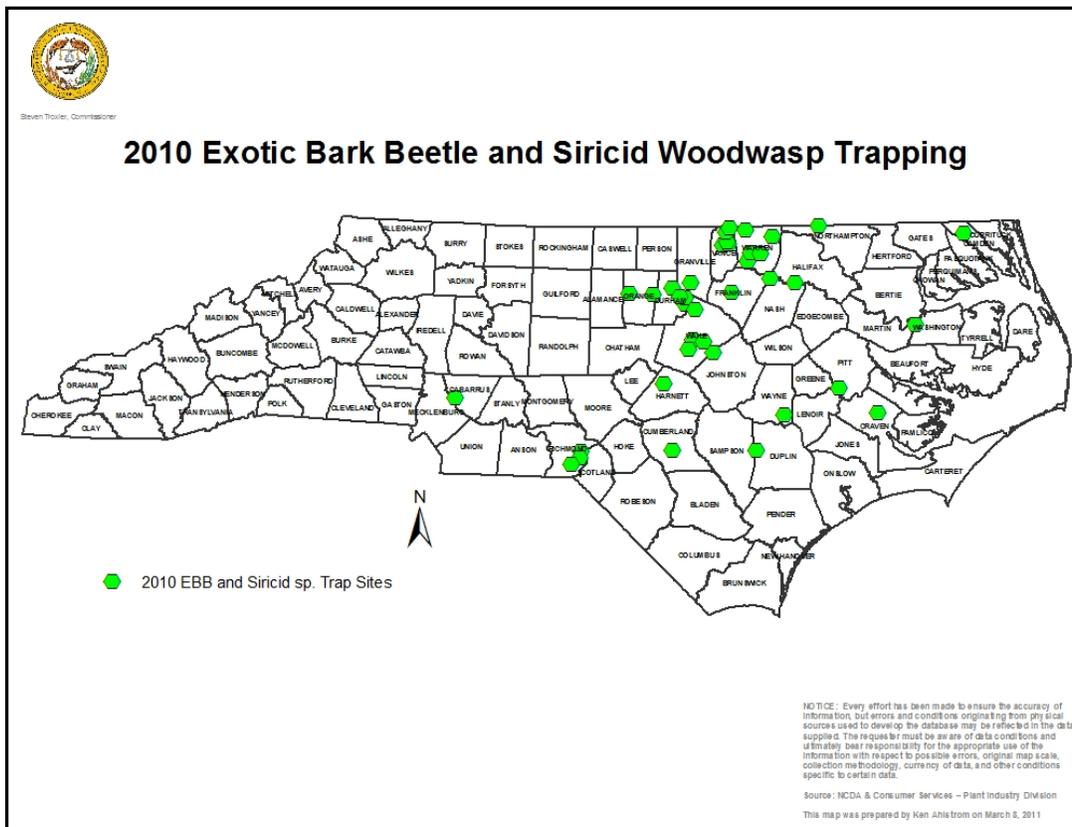
Wood wasps are pests of conifers and are native to Europe and Asia. Their predominant hosts are conifers. The European Wood Wasp, *Sirex noctilio*, is a native of Europe, Asia, and northern Africa and has successfully established in South Africa, South America, Australia and New Zealand. In 2004 it was detected in New York state in the vicinity of Lake Ontario, and has since spread to twenty-nine counties in NY, 11 counties in Pennsylvania, 5 in Michigan, 2 in Vermont and 1 each in Connecticut and Ohio. Most species of *Sirex* are attracted to stressed trees that are often used to make solid wood packing material (SWPM). Since the life cycle can take a year or more, the insect could be easily transported in pallets or other SWPM and not be detected at the port. Based on its native range in Europe and Asia, it could become established in any climate zone in North America where pine occurs. In South America and Australia where pine is cultivated in plantations, the wasp causes significant tree mortality and is considered a major pest. The wasp has a symbiotic relationship with a fungus that it injects into the trees to weaken them, and makes them more susceptible to larval feeding. Another siricid wood wasp to be surveyed for is the Yellow-horned horntail, *Urocerus gigas gigas* (Linnaeus). This wasp, attacks mainly Norway spruce, Scots pine, larches, and occasionally Sitka spruce and Douglas fir. While not considered to be a serious pest, it is attracted to dead and highly stressed trees.

In addition, there are several bark beetles which pose a threat to NC pine forests. Traps were set (Figure 1) at the same locations as those for the siricid species. Target beetles were *Hylurgus ligniperda*, *Ips sexdentatus*, *Ips typographus*, and *Orthotomicus erosus*. A combination of ethanol and  $\alpha$ -pinene is used to attract *H. ligniperda*; Ipslure is an attractant for the other three species.

Traps were serviced at approximately two week intervals because after this time the insects begin to disintegrate in the antifreeze and are more difficult to sort and identify.

In 2010, traps were placed at 38 sites in 21 counties (Cabarrus, Camden, Craven, Cumberland, Duplin, Durham, Franklin, Granville, Halifax, Harnett, Johnston, Nash, Northampton, Orange, Pitt, Richmond, Vance, Wake, Warren, Washington, and Wayne).

None of the targeted species was detected in North Carolina.



**Figure 1. 2010 Exotic Bark Beetle and Siricid Woodwasp Trap Sites**

**Oak Commodity Survey**  
**Subsection: Exotic Fruit Lepidoptera**

Pests surveyed were Light Brown Apple Moth (LBAM), Summer Fruit Tortrix Moth (SFTM), and Egyptian Cottonworm (ECW). Surveys were conducted using delta traps, wing traps, and pheromones. As much as possible, abandoned apple orchards were selected (Figure 2) and three traps placed in each orchard with one pheromone septa for each pest. LBAM, SFTM, and ECW have apple as one of their hosts. Additionally, LBAM traps were placed in working blueberry farms (Figure 3) in south-eastern North Carolina.

**1. Light Brown Apple Moth**

This moth is a highly polyphagous pest of over 120 plant genera in over 50 families with a preference for hosts in the Compositae, Leguminosae, Polygonaceae, and Rosaceae. Some host plants are: apple, blueberry, camellia, grape, oak, persimmon, pine, potato, strawberry, and viburnum. This pest has been found in California and is now under quarantine in that state. Due to the highly polyphagous nature of this pest, many of the plants that serve as primary and secondary hosts of these pests occur in North Carolina, especially apple, peach, and blueberry. LBAM would be a serious economic threat in fruit-growing areas of North Carolina should it become established. Because North Carolina has a thriving export program, any yield losses would have a deleterious effect on the livelihood of the growers. Traps were placed at 50 sites in 11 counties (Avery, Bladen, Cumberland, Duplin, Haywood, Henderson, Jackson, Mitchell, Pender, Sampson, and Wilkes).

2. Summer Fruit Tortrix Moth

This moth pest has two generations per year and is a serious pest of apples, pears, and peaches. The first generation larvae feed on the leaves and flowers of host plants with adult emergence occurring in June. Second generation larvae feed on the fruit. Adult emergence occurs in August. At the present time this pest does not occur in the US. Due to the highly polyphagous nature of this pest, many of the plants that serve as primary and secondary hosts of these pests occur in North Carolina. The establishment of this pest would pose a serious economic threat in fruit-growing areas of the state. Because North Carolina has a thriving export program, any yield losses would have a deleterious effect on the livelihood of the growers. Traps were placed at 24 sites in 6 counties (Avery, Haywood, Henderson, Jackson, Mitchell, and Wilkes).

3. Egyptian Cottonworm

ECW is native to the Mediterranean area, the Middle East, and much of Africa. It has a large host range and includes apples. At the present time this pest does not occur in the US. Due to the highly polyphagous nature of this pest, many of the plants that serve as primary and secondary hosts of these pests occur in North Carolina. The establishment of this pest would pose a serious economic threat in fruit-growing areas of the state. Because North Carolina has a thriving export program, any yield losses would have a deleterious effect on the livelihood of the growers. Traps were placed at 24 sites in 6 counties (Avery, Haywood, Henderson, Jackson, Mitchell, and Wilkes).

In 2010, blueberry exporters to Canada were again enlisted to participate in trapping for light brown apple moth. Eighty-six traps were set at twenty-six blueberry farms in Bladen, Cumberland, Duplin, Pender, and Sampson counties. The survey began in June and ended in September.

None of the target species were detected in North Carolina.



**2010 Oak Commodity Survey**  
**Exotic Fruit Lepidoptera**

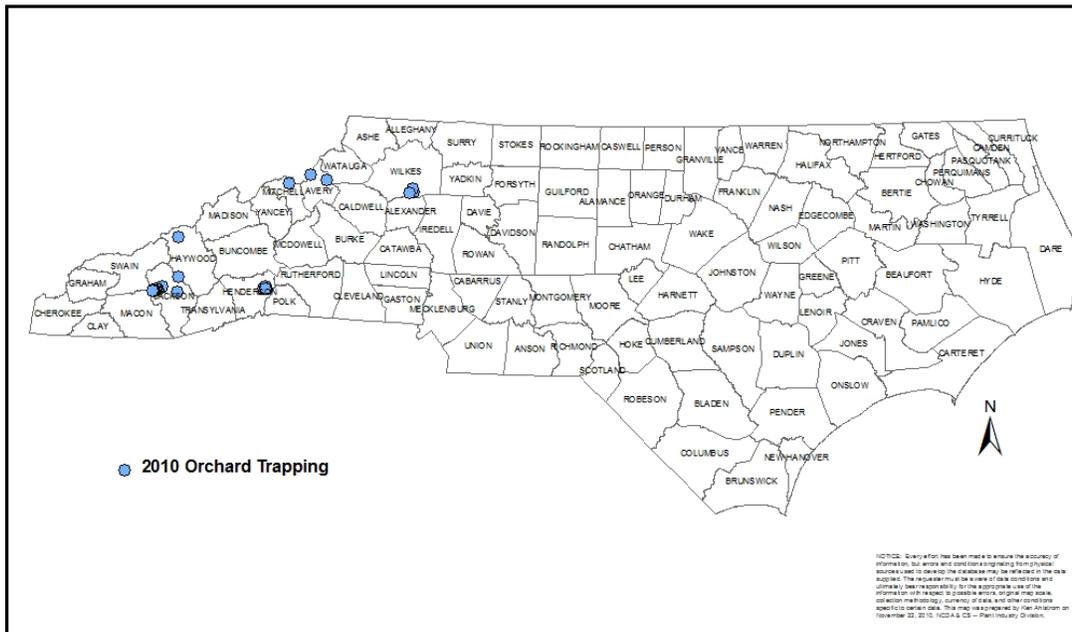


Figure 2. 2010 Exotic Fruit Lepidoptera Orchard Trap Sites

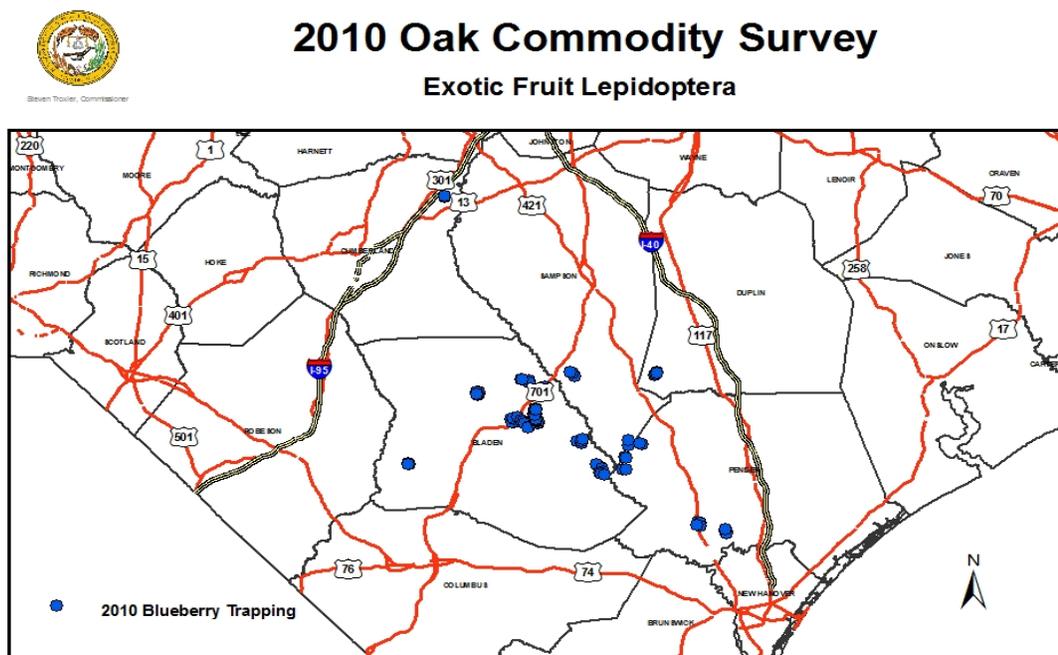


Figure 3. 2010 Exotic Fruit Lepidoptera Blueberry Trap Sites

### Light Brown Apple Moth National Survey

As in 2009, North Carolina participated in the National Light Brown Apple Moth (LBAM) Survey Program. North Carolina was given the task of placing 350 traps at 175 commercial nursery sites.

Traps were set and monitored according to the work plan (Figure 4). The state was divided into three regions: Mountains, Northern Coastal Plain and Piedmont, and Southern Coastal Plain and Piedmont. These areas were modified from the previous year to give better coverage of the state. Three people (Plant Pest Aides) were hired, one from each region, to install and monitor the traps during the trapping timeframe. Each trapper was given a comprehensive list of nurseries occurring in their area and were told select 60-65 locations from the list. The traps were distributed as follows:

**Mountains** - 60 nurseries in 20 counties (Alexander, Avery, Buncombe, Burke, Caldwell, Catawba, Cherokee, Cleveland, Gaston, Graham, Haywood, Henderson, Jackson, Lincoln, Macon, Madison, Mitchell, Transylvania, Watauga, and Yancey) are being surveyed.

**Northern Coastal Plain and Piedmont** - 78 nurseries in 22 counties (Alamance, Caswell, Chatham, Davidson, Davie, Durham, Edgecombe, Forsyth, Granville, Guilford, Halifax, Iredell, Nash, Orange, Person, Randolph, Rockingham, Rowan, Stokes, Surry, Wake, and Yadkin) are being surveyed.

**Southern Coastal Plain and Piedmont** - 60 nurseries in 20 counties (Anson, Bladen, Brunswick, Cabarrus, Columbus, Cumberland, Harnett, Johnston, Lee, Mecklenburg, Montgomery, Moore, New Hanover, Pender, Richmond, Robeson, Sampson, Scotland, Stanly, and Union) are being surveyed.

For adult male trapping, the Jackson fruit fly trap was used. Traps were hung on or near host plants in the nursery. The components of the female sex pheromone used are (E)-11-tetradecenyl acetate and (E,E)-9,11-tetradecadienyl acetate used in a 20:1 ratio at a 3 mg dose per septum. The pheromone is dispensed on rubber septa distributed by the USDA, APHIS, PPQ-CPHST Laboratory at Otis Air Force Base, MA. The septum is placed in a clip attached to the side of the trap. Due to the highly polyphagous nature of LBAM, many states in the United States contain at least one of the many primary or secondary hosts of LBAM. The host map for LBAM gives an overview of LBAM distribution in the United States based on six primary and thirteen secondary hosts. Based on the information available, there do not appear to be areas within the continental United States where LBAM is less likely to occur based on the prevalence of preferred hosts and temperature. In addition, information from regions where LBAM is established (England, New Zealand, Australia) was analyzed and LBAM has only been reported in USDA Plant Hardiness zones 7 and above. Therefore, regions of the United States in USDA Plant Hardiness zones 1-6 may have a less likely chance of LBAM establishment. These areas, however, are not to be considered excluded from possible establishment.

Traps were checked every two weeks and the lures changed every four weeks. Removable bottoms or inserts were changed as needed. Survey dates in North Carolina were June 1st - November 22nd 2010.

2376 traps bottoms were collected from traps and sent for identification to Dr. Ken Ahlstrom, SSC, NC who has over 30 years of taxonomic expertise with insects.

No Light Brown Apple Moths were found in North Carolina.

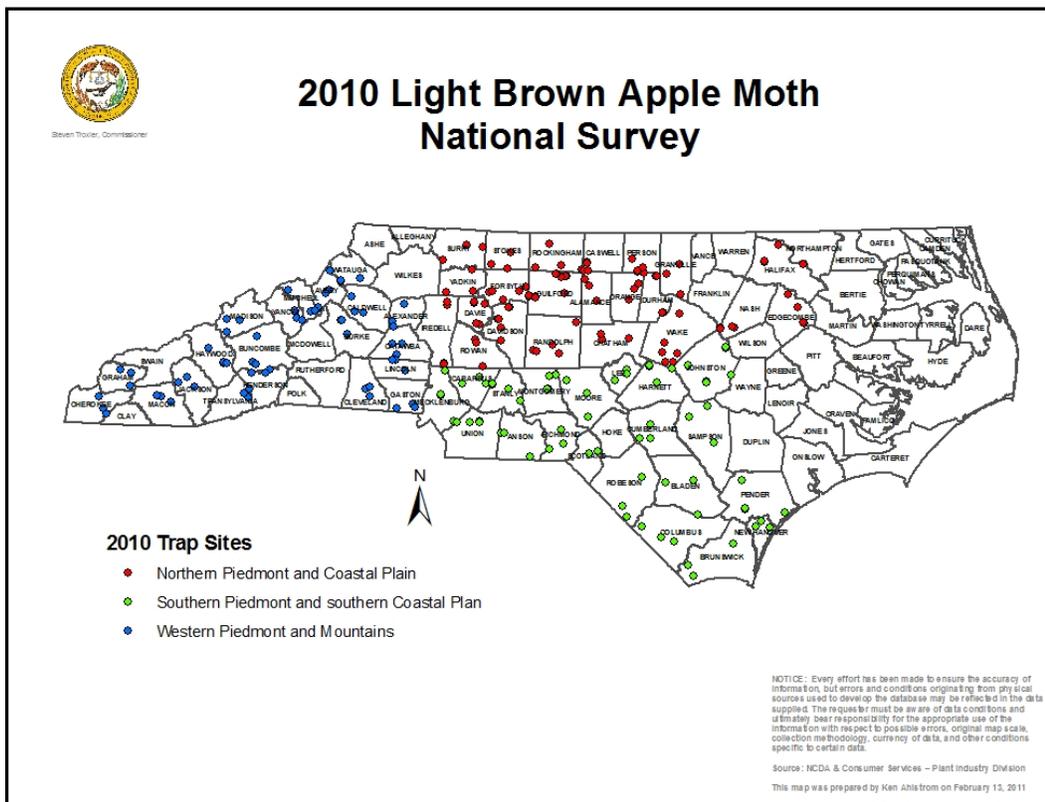


Figure 4. Light Brown apple Moth Trap Sites

## Grape Commodity Survey

Because of the tremendous growth of the wine and grape industry in North Carolina during the last few years, and coupled with the discovery of two serious pests of grapes in California last year, it was decided that, in 2010, a grape survey would be conducted which would be both beneficial and informative to winegrowers in the state. The survey was conducted partly under CAPS and partly under a cooperative Agreement with USDA,APHIS,PPQ

Pests surveyed were Light Brown Apple Moth (LBAM), European Grape BerryMoth (EGBM), European Grape Vine Moth (EGVM), False Codling Moth (FCM), Egyptian Cotton Leafworm (ECL), Rice Cutworm (RC), and Summer ruit Tortrix Moth (SFTM). Jackson, delta, and wing traps were utilized.

### Rationale underlying survey methodology

In March 2007, Light Brown Apple Moth (LBAM) was found for the first time in the United States mainland near Berkley, California by a private citizen who reported two suspect moths in a blacklight trap on his property. The identification was confirmed by the Systematic Entomological Laboratory in Washington, DC. LBAM is native to Australia and has been introduced into India, New Caledonia, New Zealand, and the United Kingdom. LBAM has a host range in excess of 150 plant genera in more than 70 families, including nursery stock, cut flowers, stone fruits (peaches, plums, cherries, etc.), pome fruits (apples and pears), grapes and citrus, and many others.

The European Grape Berry Moth (EGBM) has not yet been detected in the United States. It is widespread across the European part of Russia, eastward through southern Siberia to the Pacific Ocean. It is also known from Western Europe, Asia Minor, Iran, China, Korea, and Japan. Known hosts are grape, viburnum, ivy, honeysuckle, cherries, maples, and other trees and fruits. Females overwinter and egg-laying begins with the flowering stage of grapes.

The European Grape Vine Moth (EGVM) was detected in the Napa Valley of California in October of 2009 and has now been detected in an additional five counties in California. It is a significant pest of berries and berry-like fruit in Europe, the Mediterranean area, southern Russia, Japan, the Middle East, Near East, and northern and western Africa. Although the threat of introduction into the US was determined to be low, the consequences of establishment is considered to be severe because of the dramatic increase in vineyards and wine production across the US in recent years. In addition to grapes, other hosts of GBM are blackberry, cherry, dogwood, persimmon, and plums.

False Codling Moth (FCM) has not yet been detected in the United States. It is found in most of sub-Saharan Africa where it has caused significant damage to cotton. In addition, FCM has over 70 hosts including beans, castor bean, citrus, grapes, oaks, okra, and peppers.

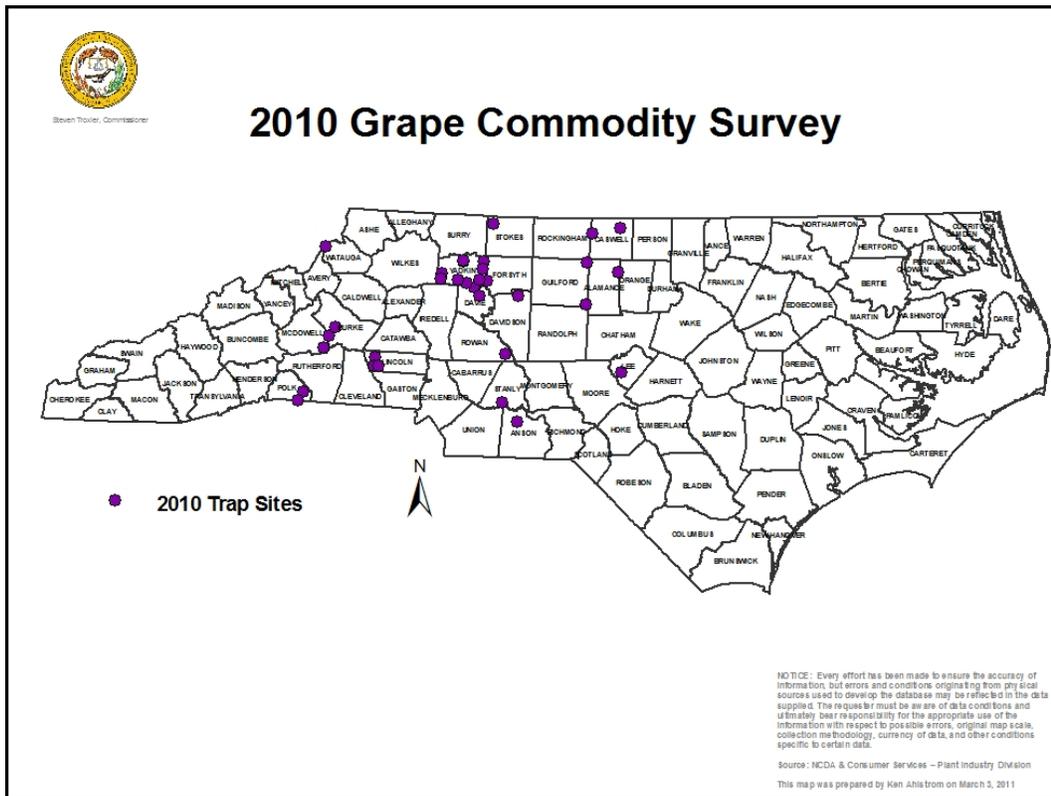
The Egyptian Cotton Leafworm (ECL) and Rice Cutworm (RC) have not yet been detected in the United States. Their ranges are Africa and Asia respectively. ECL and RC have host range of over 40 families, containing at least 87 species of economic importance including camellia, squash, soybeans, cotton, sweet potato, sunflowers, tobacco, corn, and grapes.

The Summer Fruit Tortrix Moth (SFTM) has not yet been detected in the United States. While it is not considered a primary pest of grapes, it is capable of causing damage to *Vitis* sp. Its host range consists of over 50 plants, most of which are of economic importance. Some of the hosts are: apple, ash, blackberry, cotton, honeysuckle, lilac, maple, oak, peach, roses, and strawberries.

The trapping season began in June and continued through November. Two hundred and three traps were placed (Figure 5) at twenty-nine vineyards in seventeen counties (Alamance, Burke, Caswell, Davidson, Davie, Forsyth, Guilford, Lee, Lincoln, McDowell, Polk, Rowan, Stanly, Stokes, Surry, Watauga, and Yadkin).

Traps were set up and monitored according to protocols established by USDA, APHIS,PPQ. Approximately 1000 traps and trap bottoms were examined at the end of the season.

None of the target organisms were detected in North Carolina.



**Figure 5. Grape Commodity Survey Trap Sites**

### Sudden Oak Death

The causal agent of sudden Oak death (SOD), *Phytophthora ramorum*, was first identified in 1993 in Germany and The Netherlands on ornamental rhododendrons. *P. ramorum* was isolated in June 2000 from dying trees in California. Since its discovery in North America, SOD has been confirmed in forests in California and Oregon and in nurseries in California, Oregon, Washington, and British Columbia. For several years now, North Carolina has been part of a National Survey Program to detect SOD in states other than those on the Pacific coast, concentrating on nurseries that receive nursery stock from the West Coast.

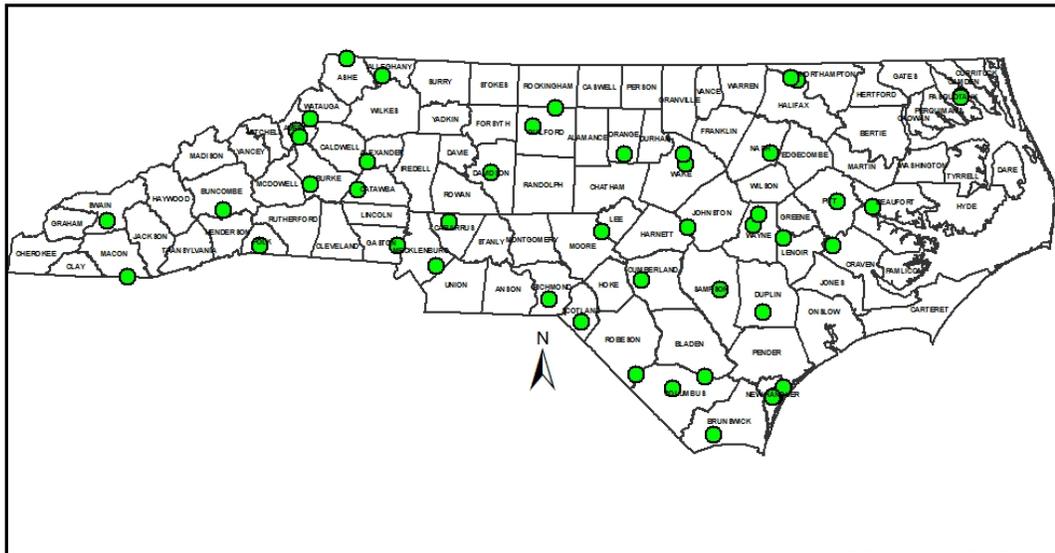
According to USDA guideline, North Carolina was to survey twenty nurseries for the presence of *Phytophthora ramorum* the causative agent for Sudden Oak Death (Figure 6). The survey was conducted at forty-six nurseries beginning on April 4<sup>th</sup> and ending on May 26<sup>th</sup> 2011.

*Phytophthora ramorum* was not detected in North Carolina at any of the survey locations.



## 2011 CAPS Sudden Oak Death Nursery Survey

46 Nurseries and Nursery Dealers were surveyed by  
NCDA&CS Plant Industry Division personnel.  
All sites were negative for *Phytophthora ramorum*



July 8, 2011

Map by Ken Ahlstrom NCDA&CS

Figure 6. Sudden Oak Death Nursery Survey Sites

### Thousand Cankers Disease

In the late 1990's foresters and others in several western states noticed an unusual increase in the death of black walnut trees. Initially it started as a yellowing and thinning of the upper crown followed by rapid dieback of larger and larger branches. The disease is caused by a fungus, *Geosmithia morbida*, which is vectored into the tree by the walnut twig borer, *Pityophthorus juglandis*. The fungus, that has been recently recognized, kills a localized area in the phloem layer just under the bark. The dead areas, cankers, eventually become so numerous that they come together causing nutrient to no longer flow to the foliage leading to death. Once the fungus has been introduced into the tree, it will usually die within three years after the first symptoms are noticed.

Known hosts are black walnut, *Juglans nigra* which occurs throughout the eastern United States and extends westward into Kansas, Nebraska, Oklahoma and Texas. It is also widely planted in the West. Other western walnuts such as Arizona walnut, *J. major*, California walnut, *J. californica*, and English walnut, *J. regia*) have varying degrees of susceptibility to the disease.

The disease is confirmed in 8 western states (AZ, CA, CO, ID, NM, OR, UT and WA) In August 2010, however, it was detected in Knox County, Tennessee. An additional 3 counties in TN have since detected the disease.

The walnut twig borer is not native to the eastern United States. So how did the disease make its way to TN? The most likely pathway for movement is untreated wood such as logs, stumps, firewood, or wood packing material. Other pathways may include nursery stock and natural spread. The latter can probably be eliminated because of distance between populations of walnut.

A visual survey was conducted in western North Carolina during early September 2010, by personnel from NCDA&CS, the North Carolina Forest Service, the National Park Service, and the Cherokee Indian Nation. Two person teams were used and the survey was conducted as a drive-by, counting the number of walnut trees observed and seeing if they displayed any symptoms of the disease. No beetles or disease were detected.

## Entomological Programs

### 2010-2011 Movement of Live Insects for Research, Commercial or Educational Purposes

The NCDA&CS evaluated and approved 33 federal applications, PPQ Permit 526, for the movement of live insects into North Carolina for a total of 37 different species. The large number of applications to move insects to North Carolina reflects the continued market in commercial production, sale, and movement of insects for education, entertainment, and scientific research conducted in North Carolina’s academic institutions and the private sector.

### 2010-2011 Boll Weevil Eradication Program

Cotton was grown in 56 counties in North Carolina by 2,224 growers for a total of 541,542 acres. Approximately 6,700 traps were placed in the field by eight contractors at a density of 1 trap per 51 acres. No boll weevil was captured during the 2010 cotton season.

### 2010-2011 Imported Fire Ant Survey and Monitoring Program

Four to seven temporary employees surveyed a total of 48,121 miles in 7576 acres along the existing quarantine line in 36 counties. As a result of these surveys, no new quarantines boundaries in relation to the 2009-2010 surveys were established. A summary of these surveys is presented in the table below.

Red Imported Fire Ant (*Solenopsis invicta*) survey results by county.

County	Miles Surveyed	Acres Surveyed	New Sites
Alamance	1,134	270	9
Alexander	535	161	9
Anson	90	16	1
Avery	20	2	
Buncombe	1,633	231	9
Burke	1,862	134	8
Caldwell	567	66	4
Catawba	2,756	215	17
Dare	204	6	1
Davidson	1,695	396	23
Davie	1,185	304	18
Forsyth	2,108	246	22
Graham	1,156	264	12
Granville	2,036	140	6
Guilford	1,144	387	18
Halifax	3,515	320	12
Harnett	133	10	1
Haywood	1,035	180	
Henderson	260	130	2
Iredell	2,468	393	35

Jackson	1,899	686	8
Lincoln	1,099	74	9
Macon	2,550	819	29
McDowell	1,808	172	11
North Hampton	2,338	157	6
Orange	2,172	240	26
Person	1,520	106	8
Polk	879	44	7
Rowan	1,055	217	17
Rutherford	1,068	108	9
Surry	62	97	3
Swain	1,500	528	14
Transylvania	724	198	1
Vance	1,593	102	4
Warren	2,318	157	10
<b>Totals</b>	<b>48,121</b>	<b>7576</b>	<b>371</b>

Thirty-two imported fire ant inspection blitzes were carried out at North Carolina weigh stations in Mount Airy (Surry Co.), Halifax (Halifax Co.) and Hendersonville (Henderson Co.) in support of the federal fire ant quarantine on movement of articles regulated by the quarantine policies. One hundred forty three trucks were inspected and soil samples from potted plants were collected for analysis from 23 trucks. No violations were found.

#### 2010-2011 Sweetpotato Weevil Trapping Program

NCDA&CS personnel continue the statewide comprehensive sweetpotato weevil trapping survey on all commercially grown sweet potato fields. Traps containing the female sweetpotato weevil pheromone are placed at a density of one trap per ten acres with a minimum of two traps per field. In 2010-2011, a total of 8133 traps were placed in 5761 fields, an increase of 68% on the number of fields compared to the 2009-2010 period.

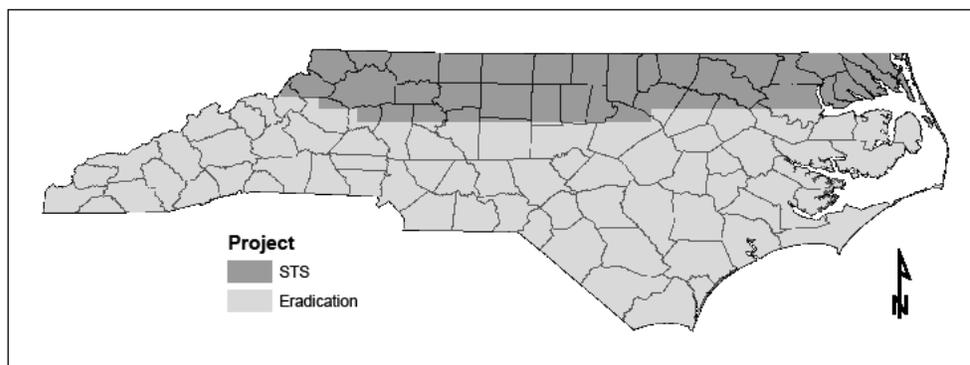
Surveys were also conducted in sixty four commercial sweetpotato storage and processing facilities and sweetpotato micro-propagation operations throughout the state. Surveys in these facilities were done on a year-round basis and traps were placed inside and outside the main entrances. No sweetpotato weevils were detected.

#### 2010-2011 Blueberry Export Certification Program

The Canadian Food Inspection Agency requires that all fresh blueberries shipped to Canada come from growers who participate in a Blueberry Certification Program. The program consists of monitoring and control procedures for the blueberry maggot, *Rhagoletis mendax*. Forty nine North Carolina production areas were monitored (5,500 acres total representing 96 fields) throughout the harvesting and shipping period and were issued certification documents. No blueberry maggots were detected in any of the fresh market blueberries being shipped to Canada in 2011.

#### 2010-2011 Gypsy Moth Slow the Spread (STS) and Eradication Program

In 2010-2011 the North Carolina Department of Agriculture and Consumer Services' Plant Industry Division carried out an extensive survey, treatment, and regulatory program for Gypsy Moth. The program was divided into two separate areas, Slow the Spread and Eradication. The 2010-2011 Project Boundaries are shown in the map below.



2010 Gypsy Moth Trapping Results

The presence and density of gypsy moth populations in North Carolina is determined by the placement of numerous relatively small traps. These traps are baited with the female sex pheromone, which is attractive to adult male gypsy moths. If a population is present, a portion of the adult males are attracted to and immobilized in NCDA&CS traps.

In the Slow the Spread area, traps were placed on a 2-kilometer base grid with 1-Kilometer and 500-meter delimit grids in areas that had high catches or treatments in 2009. The Slow the Spread area was divided into 32 separate trapping bid units. Nine private contractors placed and removed 9,462 traps at an average cost of \$15.32 per trap.

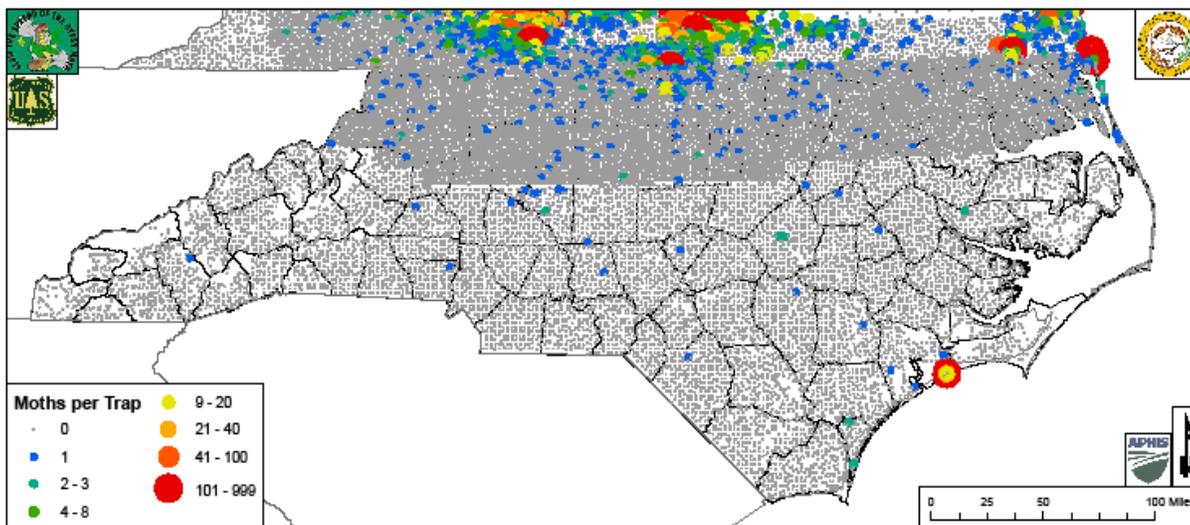
9,980 traps were placed and removed in the statewide eradication area. These traps were placed on a 3-kilometer base grid with 500-meter grids in areas of concern. Of these traps, the North Carolina Forest service placed 1,500 traps in eleven counties. Seventeen temporary employees and seventeen permanent NCDA&CS personnel set traps in the remaining counties. Between the STS and statewide programs, a total of 19,439 traps were deployed in 2010 with 806 moths caught in 266 positive traps.



*Gypsy moth trap.*



*Male gypsy moth.*



2010 Trapping Results

Twelve gypsy moths were captured in the Hampstead, NC area. Because of the proximity to ports and military bases, these specimens were sent to a USDA-APHIS laboratory. (European gypsy moths are the primary target of the program and are present in North America. Asian gypsy moths have the potential to be more damaging and spread more rapidly than their European relatives). Initial testing was inconclusive; the more elaborate microsatellite testing indicated that it is unlikely that these samples originated in Asia.

### Alternate Life Stage Surveys

NCDA&CS conducts ground surveys of locations with unexpectedly high moth captures in an attempt to locate life stages other than the male moths captured in the traps. Egg masses, buff-colored, hairy, and the size of a quarter, are the most common alternate life stage found, though spent pupae and larvae are occasionally located. If found, an alternate life stage confirms that there is a reproducing population at that location. Along with data from gypsy moth traps, this information helps determine whether control measures are necessary at a given location.

After reviewing the gypsy moth monitoring data, seven locations were identified for alternate life stage surveys. NCDA&CS personnel conducted these surveys during the fall of 2010, and successfully found alternate life stages in two of the seven locations.



*Helicopter ferrying to Hubert treatment block.*

### 2011 Gypsy Moth Treatments

In the fall of 2010, five locations were identified as needing intervention. Among these blocks, a total of 14,127 acres were treated in the spring of 2011. Five of the six locations were treated by only aircraft, while one was treated by both aircraft and ground equipment.

In preparation for the treatments, a detailed Environmental Assessment process was conducted.

The planning process revealed numerous challenges in implementing the gypsy moth treatment program this year. The treatment blocks were difficult to implement logistically, numerous landowner comments and concerns surfaced, numerous agencies were involved, and airspace issues required considerable attention.



*Gypsy moth egg mass found in Macon in 2009*

NCDA&CS collaborated closely with landowners to ensure that the impact of treatment was minimal.

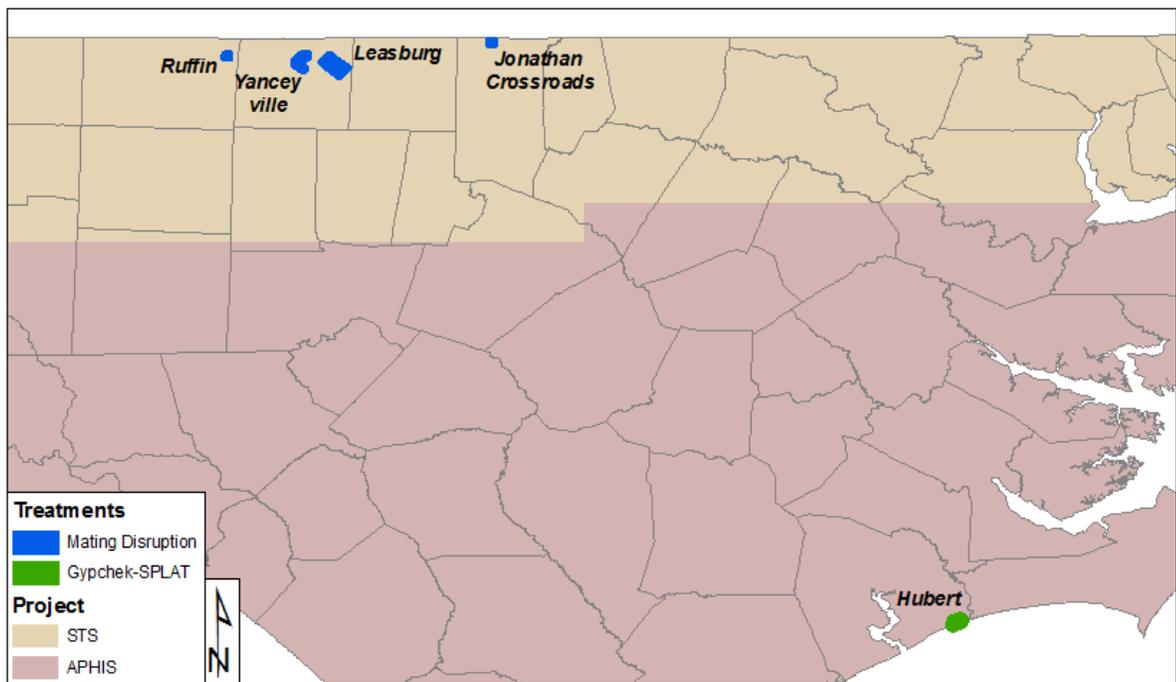
The program maintained a proactive stance on public notification so that all members of the public have the opportunity to remain informed of program activities before, during, and after treatments. Email listserves and Twitter were implemented, in addition to the more customary mailings, phone calls, and personal contact. As a result, the number of complaints received during the course of the project was maintained at a low level.

The program continued to utilize a new technology for intra-departmental communication during treatment. All members of the operational team were given VIPER radios (Voice Interoperability Plan for Emergency Responders). Relying on 800 MHz towers, VIPER radios allow for dependable, continuous, and instantaneous communication statewide. In the event of an incident, VIPER technologies would have allowed program personnel to seamlessly integrate emergency responders into the program's communication network, allowing for a more rapid response.

One treatment block was located within the range of a state rare moth which could have been adversely impacted by Bt, the product of choice for these treatment blocks. In lieu of the more effective and less costly Bt, NCDA&CS opted to use Gypchek, a product which only affects gypsy moth, to address these concerns. SPLAT-GM, a mating disruption product, was also applied by ground. The program is awaiting final removal of gypsy moth traps to determine if these treatments achieved their objective.

*VIPER radio.*





2011 Treatment Blocks

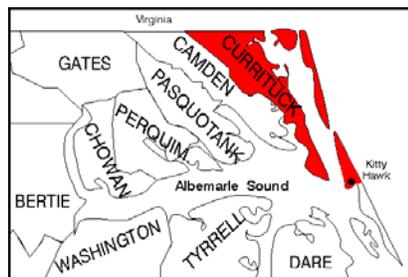
2011 Treatments: Aerial Blocks

Block	Acres	Product	Dosage	Applications	Treatment Date(s)	2010 Highest Catch	Alternate Life Stages
Hubert	400	Gypchek	1x10 <sup>12</sup>	3	4/13, 4/18, 4/20	103	6
Hubert Ground	20	SPLAT-GM	30g	1	5/23		
Yanceyville	3,070	Disrupt II	6g	1	6/10	17	0
Jonathan Crossroads	780	Disrupt II	6g	1	6/10	4	0
Ruffin	815	Disrupt II	6g	1	6/10	11	0
Leasburg N	2,235	Disrupt II	15g	1	6/10	13	10
Leasburg S	4,537	Disrupt II	6g	1	6/10	6	0

2010 Gypsy Moth Regulatory Program

The gypsy moth program also seeks to mitigate the risk of introduction through a comprehensive regulatory program. An area that is generally infested is quarantined such that the movement of certain high-risk articles is strategically restricted and regulated. In North Carolina, Currituck and a portion of Dare Counties were quarantined in 1988. A map of the US quarantine is below.

Regulated articles may be moved from quarantined to non-quarantined areas appropriate personnel undergo training and submit to the stipulations of a compliance agreement with NCDA&CS. These compliance agreements



North Carolina quarantine.

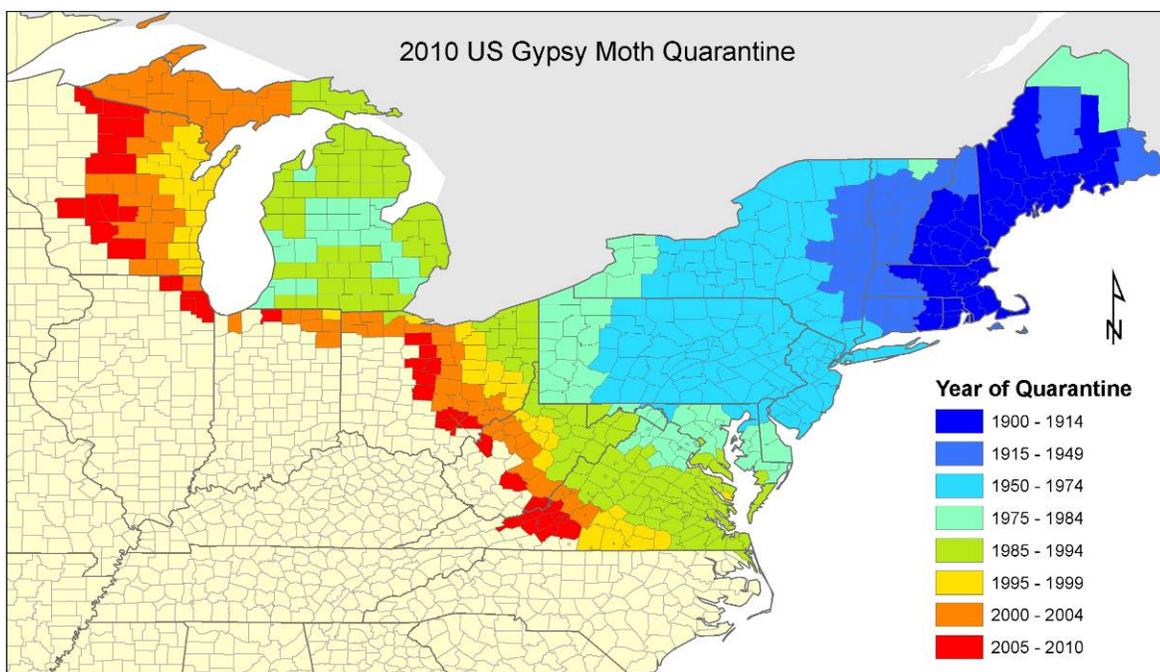
small  
if the

require inspection and/or treatment of articles to ensure that they are free of gypsy moth life stages.

Public education efforts are also an important part of the regulatory program. Regulatory personnel regularly visit NC Cooperative Extension and NC Forest Service offices to update county personnel. Also, program personnel monitor all high-risk locations in the STS program area by placing one or more gypsy moth traps.

With changing economic times, many businesses are undergoing operational and personnel changes. Multiple compliance agreements were altered to reflect these changes.

During 2010-2011, continued focus was placed on inspection of compliance agreement paperwork. Timber mills, firewood dealers, moving industry offices, and Christmas tree lots were visited to ensure that all parties were meeting their legal obligations. While the majority of companies were compliant, there were several incidences of non-compliance. Each incident of non-compliance was followed up, often in cooperation with the VDACS Gypsy Moth Program, with additional training and inspection to ensure future compliance.



## Nursery Certification Program

NCDA&CS' Plant Protection Specialists inspected 2,514 nursery dealers and 1,091 nurseries during the 2010-11 season. Four Stop Sale/Movement notices were issued to prevent the sale of infected or prohibited plants. These plants were either treated or destroyed.

The data shows a significant reduction in both the number of nurseries and the number of acres that were certified. This drop is believed to be a reflection of the economy and its impact on the nursery industry largely caused by the building industry. A similar reduction was also seen in the number of Nursery Dealer Certificates issued (a loss of 415). Several chain stores chose not to offer plants for sale at their locations and therefore did not renew their certificates. Most of these chains carried a very limited selection in past years. It is not believed this change had a large impact in the reduction of certified nurseries.

<b>Number of Nurseries by Category</b>	2008/09	2009/10	<b><u>2010/11</u></b>
• Retail	118	103	<b>58</b>
• Wholesale	239	224	<b>165</b>
• Retail and Wholesale	999	932	<b>567</b>
• Institutional	73	69	<b>72</b>
• Registered	332	554	<b>674</b>
Total Nurseries (All categories*) -	1,761	1,882	<b>1,536</b>

<b>Number of Acres by Category</b>	2008/09	2009/10	<b><u>2010/11</u></b>
• Retail	700.4	625.0	<b>570.2</b>
• Wholesale	6,482.0	5,856.5	<b>5,359.2</b>
• Retail and Wholesale	12,133.4	11,358.8	<b>9,346.4</b>
• Institutional	78.0	77.3	<b>71.9</b>
• Registered	167.4	338.4	<b>442.3</b>
Total Acreage (All categories*) -	19,561.2	18,256.0	<b>15,790.0</b>

**Total Collected Plant Certificates Issued - 49**

**Total Number of Nursery Dealers\*\* - 2,514**

**\*Categories**

A—Retail - Any nursery where 80% or more of the nursery stock sold is to the final consumer for their use.

B—Wholesale - Any nursery where 80% or more of the nursery stock sold is to other nurseries, dealers, or other persons for resale.

C--Retail and Wholesale - Any nursery where sales consist of nursery stock which is sold as follows: (1) Directly to the final consumer, and also (2) To other nurseries and/or dealers for resale with the percentage of total sales for each category being less than 80%.

I—Institutional - Any nursery owned or operated by any governmental agency.

R—Registered - Any nursery less than one acre in size that produces nursery stock, but does not sell, barter, or exchange such articles outside the state.

\*\*Nursery Dealer – Any person not a grower of nursery stock who obtains certified nursery stock and/or collected plants for the purpose of distribution or sale independent of the control of a nursery.

## **Phytosanitary Certification Program**

### **2010-11 Export Certification Program**

Within the Export Certification Program, Plant Protection Specialists issue phytosanitary certificates to growers and/or brokers to facilitate movement of agricultural commodities to other states and to other countries. Phytosanitary certificates indicate that inspections and other specific requirements of the importing states or countries have been met. State certificates are used for movement within the U.S., and federal certificates are required for movement to another country. Countries and states vary greatly in what they require for various types of commodities such that careful research and interpretation of requirements are needed for each request for phytosanitary certification. Primary use of the USDA PCIT (Phytosanitary Certificate Issuance and Tracking System) to issue federal certificates began in October 2009. Federal certificates were issued for the movement of commodities to 74 countries, while state certificates were issued for 21 states and Puerto Rico. The majority of phytosanitary certificates issued were for lumber, tobacco, cotton, cotton seed, Christmas trees, peanuts, nursery and greenhouse plants, sweetpotatoes, and sweetpotato cuttings.

<u>Summary of Certificates Issued</u>	<u>2009-2010</u>	<u>2010-2011</u>
Federal Certificates		
Phytosanitary Certificate	1,675	2,539
Re-Issue Certificates	194	242
Re-Export Certificate	27	21
Processed Product Certificate	68	29
Total Federal Certificates:	1,964	2,831
State Certificates		
Phytosanitary Certificates	267	361

## Plant Conservation Program

### NORTH CAROLINA PLANT CONSERVATION BOARD

The Program meets quarterly with members of the NC Plant Conservation Board whose 7 members are appointed by the Governor and the Commissioner of Agriculture. New regulations extensively reviewed and considered by this Board were approved and made effective December 1, 2010. These regulations included official adoption of 419 plant species as endangered, threatened, vulnerable, or historic in North Carolina, significant revisions to American Ginseng regulations and other important changes.

Recent legislative actions by the NC General Assembly also created and revised regulations under the purview of the Plant Conservation Program and Board. Some of these changes need further clarification from the Board and NCDA & CS legislative staff prior to final implementation.

### NORTH CAROLINA PLANT CONSERVATION SCIENTIFIC COMMITTEE

The Program continues to meet frequently and regularly with members of the NC Plant Conservation Scientific Committee. This 7 member committee consists, primarily, of positions designated to the committee by law. Members provide scientific guidance to the Program and Board and were instrumental in developing the comprehensive listing of plants that need immediate conservation attention. More recently, the Committee has begun to focus on commercially traded plants.

### PLANT CONSERVATION PRESERVE SYSTEM

The Plant Conservation Program and Board have the regulatory authority to establish Plant Conservation Preserves to protect imperiled plant species. **These Preserves are the only state-managed lands selected and designed specifically for plant conservation purposes. The Preserve system currently consisting of 19 Preserves distributed across North Carolina.**

Although Preserves are not generally open to the public, due to concerns about poaching, a number of field trips were lead by Plant Conservation Staff and partners to selected sites. Notable among these trips were visits to 2 Preserves by Commissioner Troxler.



Commissioner Troxler and former PCP Board chairman Hollis Wild viewing a Lily on the Tater Hill Preserve.

During the year, several Preserves were expanded with purchases of key tracts from neighboring landowners. Expansion occurred at the following Preserves:

- (1) Tater Hill Preserve – Watauga County
- (2) Eastwood Preserve – Moore County
- (3) Hebron Road Preserve – Durham County
- (4) Boiling Spring Lakes Preserve – Brunswick County
- (5) Ochlawaha Bog – Henderson County

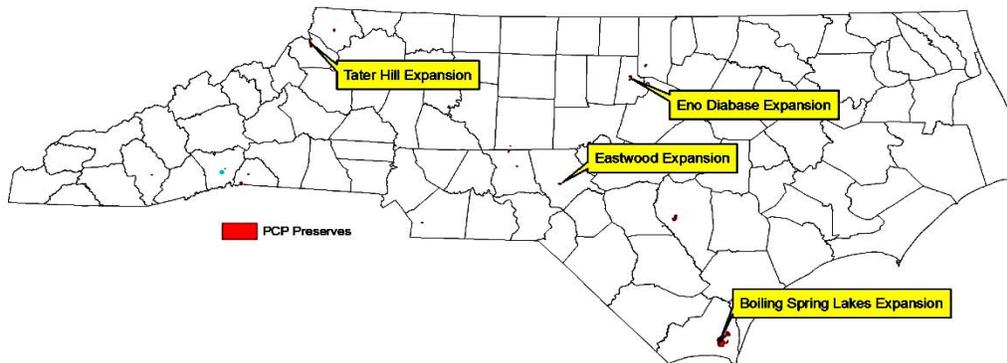
Expansions are pending in the following areas:

- (1) Rocky River
- (2) Melrose Mt.
- (3) Boiling Spring Lakes
- (4) Cedar Mountain

### NATURAL HERITAGE TRUST FUND GRANTS

Nearly all Plant Conservation Preserve acquisitions are funded by the NHTF. Additional grants were obtained to expand the Preserve system in the near future. Grants secured during this year included:

1. Tater Hill	\$1,895,000
2. Boiling Spring Lakes	\$220,000
3. Eastwood Preserve	\$449,000
4. Rocky River	\$128,500
5. Hebron Road	\$230,880
6. Melrose Mountain-Burdette	\$72,986.10



### ACQUISITION PLANNING

A systematic and comprehensive evaluation of site protection needs was updated this year. This “portfolio of Important Plant Conservation Areas” continues to guide our efforts in working with land owners and managers across the state to better protect these critical sites.

### UNITED STATES FISH & WILDLIFE SERVICE (USFWS) PARTNERSHIP

The Plant Conservation Program and USFWS continued a long-standing cooperative agreement related to the recovery of endangered and threatened species in North Carolina. Grant funds obtained under this cooperative agreement provide critical funds to North Carolina each year. This funding covers research specialist, Lesley Starke who joined the PCP Staff this year. The addition of her expertise has greatly increased the effectiveness of the program’s field work and data analysis. A portion of the remaining funds have funded temporary employees during the majority of this period.

### PROGRAM CAPACITY

The Plant Conservation Program operates with a full-time Program Coordinator/Plant Ecologist, and was joined for the first time ever with an administrative support position. The staff is greatly assisted by the positions funded by the USFWS. In addition, occasional support comes from other NCDA & CS personnel within the Plant Industry Division and from a host of external volunteers and a growing body of Preserve Stewards.

## **PARTNERSHIP PROJECTS**

The Plant Conservation Program is a member of several statewide or regional conservation partnerships and staff participates in these partnerships as time allows. In addition, staff regularly reaches out to the public with special presentations and by filling information requests.

## **REGULATORY PROGRAMS**

The Program is responsible for the protection and conservation of 419 plant species across NC, of which 27 are also federally protected. Program staff meets quarterly with an interagency panel to review permit requests for projects affecting these protected plant species. Over 21 permits were issued and several additional requests were evaluated

## **AMERICAN GINSENG**

American Ginseng harvest and exports from North Carolina continued under regulations adopted by the N.C Plant Conservation Board. Without monitoring by the Program harvest and export from North Carolina will not be allowed by federal authorities who have listed this plant under the Convention on International Trade in Endangered Species (CITES).



NCDA & CS certified 8,568.80 pounds of wild collected ginseng during 2010 and an additional 148 pounds of wild simulated ginseng. The amount of wild collected Ginseng has declined consistently since 2007. A total of 53 license permits were issued during the 2010 ginseng season.

## PLANT CONSERVATION PRESERVE MANAGEMENT & MONITORING ACTIVITIES

The Program continues striving to adequately manage Preserves for the benefit of the rare plant species and habitats present on these sites and to conduct sufficiently detailed monitoring to determine the status of rare species at these sites.

The four member staff conducted 11 different prescribed burns during the year. Each burn involved significant planning and preparation as well as mop-up after the burns were conducted. At least one new rare species was located as a result of these burns.

Staff completed a multi-week project to locate boundary lines and create fire lines around a previously unmanaged section of one of the Preserves to support future joint prescribed burning of the unit with NCDFR.

Significant restoration work was completed at the Ochlawaha Bog Preserve with the help of Carolina Mountain Land Conservancy, the USFWS, and the NRCS. The project involved plugging historic ditches, removing soil overburden, and recreating natural drainage channel patterns on a former agricultural field known to support one of the states rarest and most imperiled species.

On the nearby Bat Fork Preserve, staff has continued to combat an infestation of the highly invasive Canary Reed Grass. For the first time in many years, the Bunched Arrowhead population at the site has begun to flower again.

Staff initiated a monitoring study in conjunction with restoration activities designed to benefit the federally endangered Pondberry, a species found at only 3 sites in NC. Staff has conducted extensive removal of wood vegetation near this population in an attempt to restore more beneficial light and water levels.

Staff conducted monitoring of Venus Fly Trap populations at what are believed to be the most important remaining sites around North Carolina, including Camp Lejeune, Croatan National Forest, private lands, Plant Conservation Preserves, and TNC Preserves. With preliminary results in hand we have begun to develop a better understanding of how this locally endemic species responds to management as well as how critically vulnerable the species is.

Staff and volunteers planted hundreds of hardwood trees on a Preserve in Hendersonville as part of ongoing restoration activities. Huge piles of trees and brush were cleared from a Preserve in Durham, which was being hand thinned for the benefit of a rare plant found at only 1 site in the Piedmont..



Two volunteers from a local rugby club help clear debris from a Durham area Preserve.

## Plant Pathology Program

### **EXPORT: Disease certification requirements and distribution information**

Most agricultural commodities exported to foreign countries must be certified to meet certain plant-pest requirements. Countries differ as to what is important in regard to plant-pest risk. The Plant Pathologist received and handled requests from Field Specialists and NC USDA-APHIS-PPQ personnel for assistance with interpretation of plant disease and nematode certification requirements, development of specific certification procedures and protocols, and determination of disease organism distribution. Examples of specific issues during this reporting period include: inquiry about sampling for pinewood nematode prior to felling pine trees for export; clarification of new requirements for shipping white potatoes to Canada; review of new Canadian requirements for shipping root crops; fungicide treatment of corn seed as a basis for certification; and clarifying soybean cyst nematode requirements for shipping nursery stock to Canada. The Plant Pathologist also participated in quarterly Trade Support Team meetings, which involved representatives from NCDA&CS Marketing Division and USDA-APHIS-PPQ. In November, she received a Certificate of Appreciation from USDA-APHIS-PPQ for her scientific evaluation and documentation that the nematode *Ditylenchus destructor* has never been reported in NC. This resulted in the removal of North Carolina from the EPPO and Canadian list of infested States.

Similarly, some States have special export requirements. Examples of specific issues related to plant pathogens this year included: dogwood certification for shipping to Florida (dogwood anthracnose issue); grapevine certification for shipping to other States (inquiry from large nursery); peach propagation material for shipment to Oregon (peach yellows issue); roses stopped at the California border which were found to have originated in California initially; and tomato plants to New Jersey (special inspections required).

### **EXPORT: Tobacco blue mold oospore survey (for certification of tobacco to China)**

A field survey to detect special spore-forms (oospores) of the plant pathogen that causes tobacco blue mold must be completed annually in States where blue mold was reported in order to certify tobacco for export to China. This must be done according to procedures developed by USDA-APHIS-PPQ. The Plant Pathologist has been the state survey coordinator every year since the program began in 2001. She updates the NC survey procedures yearly and sends them to the NCSU Tobacco Pathology Specialist for distribution to NC Cooperative Extension Service personnel (county agents). The county agents conduct the survey by collecting samples from affected counties and submitting them to the approved lab (the NCSU Plant Disease and Insect Clinic). Industry groups pay for assaying the samples. Twelve counties (12) in NC reported blue mold during the 2010 season, according to the Blue Mold Forecasting System. No oospores were found in any samples collected in NC or in any other State. No blue mold was detected in NC during the 2011 season as of June 30, and so a survey was not initiated during this reporting period.

### **EXPORT: Nematode certification**

Before plants and certain other plant products are certified for export to Canada from NC, they must be certified free of soybean cyst nematode (SCN). California has a similar import requirement for reniform and burrowing nematodes. To assist nurseries that request certification, Field Specialists collect soil samples and submit them to the NCDA&CS Agronomic Division's Nematode Assay Section lab according to procedures developed by the Plant Pathologist, who also provides oversight for this program. A sampling table based on numbers of plants or area sampled was developed by the Plant Pathologist so that costs for assays can be predetermined prior to collection and submission. During this reporting period, twenty-five (25) NC nurseries were soil-surveyed for nematode certification. This involved the collection and submission of 166 field samples (332 lab assays). Targeted nematodes were not found in any of the samples. However, samples from one location had high numbers of endemic nematodes present which resulted in denial of certification. [Note: Reniform and burrowing nematodes have never been found in a nursery in North Carolina. Reniform nematode has been found in NC under agronomic field conditions in eight counties, but burrowing nematode has never been found at any location.]

The Nematology Assay Section (NAS) Chief cooperates with the Plant Pathologist to test routine samples for soybean cyst nematode in order to validate new-county detections. This is possible with the use of PCR testing. Otherwise, cyst nematodes detected in routine samples are not normally identified to species. Soybean cyst nematode was not detected in any new county in NC during this reporting period. The Plant Pathologist assisted the NAS Chief in preparing a paper for submission to the *Journal of Nematology* detailing this PCR procedure so that it could be shared with others. The idea for this work was initiated within the Plant Industry Division several years ago but was not previously sent out for peer review or published.

#### **IMPORT: Movement of plant pathogens for research and other purposes**

The Federal PPQ Form 526 (“Application and Permit to Move Live Plant Pests or Noxious Weeds”) permits the movement of plant pathogens and other pests into North Carolina from other states or countries for research, diagnostic identifications, or commercial uses. USDA-APHIS-PPQ receives the applications initially, evaluates them, adds conditions, and forwards the draft permits to the Plant Pathologist via the e-Permit system for final evaluation and approval. Because all plant pathogenic organisms are subject to this requirement, the pest-risk of each organism must be individually-evaluated to ensure that adequate safeguards are listed in the conditions of the permits. Sixty-three (63) permit applications were evaluated by the Plant Pathologist, with several requiring further clarification or documentation from PPQ before State approval could be given. Fifteen (15) permits were for receiving non-specified-species or unknown organisms. Specifically-requested organisms included 162 fungi, 57 bacteria, 13 viruses, and 17 nematodes.

#### **NURSERY: Submission and diagnosis of problem-plant samples**

The Plant Industry Division does not maintain a lab for general diagnostic purposes. Plant Protection Specialists collect problem-plant samples from nurseries during nursery inspections and submit them to the NCSU Plant Disease and Insect Clinic (Raleigh) for diagnosis and control recommendations. The Plant Pathologist serves as the liaison between the Specialists and the Clinic, assisting with interpretation of diagnoses and recommendations when necessary. Seventeen (17) problem-plant samples were submitted during this reporting period. No pests of regulatory-significance were detected.

#### **NURSERY: Strawberry Plant Nursery Certification**

Strawberries are defined as nursery stock in NC. The strawberry plant inspection program is outlined and guided by a Memorandum of Understanding (MOU) between the NCDA&CS and the NC Crop Improvement Association (NCCIA). The MOU clarifies roles and overlapping responsibilities for inspection of strawberry plant nurseries. The Plant Pathologist serves as the liaison with NCCIA. NCCIA no longer has a “certified” plant class and does not inspect that generation of plants produced from their “registered” plants. Inspection of these plants now defaults to NCDA&CS Plant Protection Specialists as is the case for all other plants defined as nursery stock. However, NCDA&CS defers inspection of NCCIA registered and foundation plants to NCCIA. The total strawberry plant acreage inspected by NCDA&CS is included in the totals of other nursery stock, as indicated under the nursery program section elsewhere in this report.

#### **SUDDEN OAK DEATH -- CAPS NURSERY SURVEY**

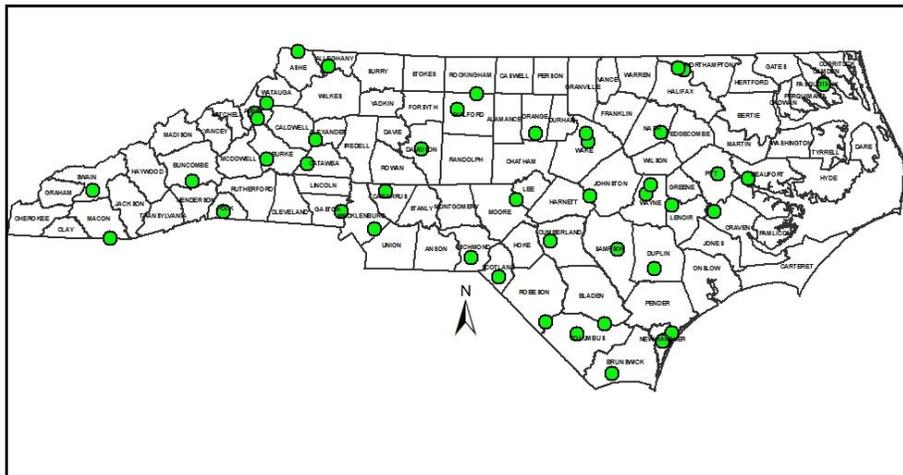
Sudden Oak Death disease caused by the plant pathogen *Phytophthora ramorum* is killing thousands of oak trees in California and Oregon. To prevent artificial movement out the known-infested areas, shipments of nursery host plants are regulated by federal (USDA-APHIS-PPQ) and state quarantines. The host list is broad and continues to expand. However, the highest-risk types of plants appear to be species of *Camellia*, *Kalmia*, *Pieris*, *Rhododendron*, and *Viburnum*. General background and actions taken in NC since 2003 can be found on the Plant Protection Section website. A survey of selected nurseries and nursery dealers was again conducted in April-June 2011 (8th year of survey). This survey was funded by the CAPS program. A total of forty-six (46) locations were inspected according to the

federal nursery survey manual. (see map below). Field Specialists collected and submitted samples from plants with suspicious symptoms. These samples were pre-screened by the Plant Pathologist using an ELISA test for *Phytophthora* species. DNA was extracted from ELISA-positive samples and sent to an approved PPQ lab for PCR confirmation. *Phytophthora ramorum* was not found in any of the samples. One nursery dealer in Mecklenburg County that was positive in 2008, 2009, and again in 2010 was also surveyed. This is discussed under the section titled “SUDDEN OAK DEATH -- REGULATORY ISSUE: Recurring-positive Nursery Dealer”.



### 2011 CAPS Sudden Oak Death Nursery Survey

46 Nurseries and Nursery Dealers were surveyed by  
 NCDA&CS Plant Industry Division personnel.  
 All sites were negative for *Phytophthora ramorum*



July 8, 2011

Map by Ken Ahlstrom NCDA&CS

### SUDDEN OAK DEATH -- REGULATORY ISSUE: Recurring-positive Nursery Dealer

A nursery dealer in Mecklenburg County has tested positive for the plant pathogen *Phytophthora ramorum* (Pram) repeatedly in 2008, 2009, and 2010. During this reporting period, surveys of plants, water, and soil continued at this location. A state compliance agreement established in fall 2010 formalized a formerly-verbal agreement that outlined requirements and best management practices thought to potentially reduce the risk of Pram development. This included prohibiting the sale of certain high-risk plants, keeping other high-risk host plants on a paved surface, cleaning up plant debris, and eliminating standing water. The following actions were taken during this reporting period (in chronological order):

- Final paving of a 2010 soil-positive area was completed in late summer. All follow-up surveys (at 45 days and 90 days after detections) related to the soil and plant detections in spring/summer of 2010 were also completed. Pram was not detected in any of these samples.
- Due to positive water detections in a drainage ditch downstream and off-site the previous spring, an environs survey of plants along the ditch bank was conducted in October by NC Forest Service, US Forest Service, Clemson University, and NCDA&CS personnel. Plant samples were collected and sent to USFS expert labs. Pram was not detected in any of these samples.
- Between March 16 and June 9, three whole-nursery plant surveys were completed. Plant samples were collected and assayed as described under the CAPS Nursery Survey. Pram was not detected in any of these samples.
- On March 16, a series of four soil samples were collected throughout the location in areas thought to be high-risk for Pram. The samples were assayed by an NCSU expert lab under contract. Pram was not detected in any of these samples neither initially nor after the required cold-storage period.

- In April, water in a ditch pool on-site was baited by NCFS and found to contain Pram (based on PCR testing). At this same time, Pram was found in water in the drainage ditch downstream from the location (off-site) by both PCR testing and recovery of a culture. Baiting halted when water heated up in May but will resume in the fall. USDA-APHIS-PPQ stated that it “does not have a policy or any regulatory authority in regard to detections in water outside a confirmed nursery”, thereby leaving it up to the State to handle. However, a detection on plants outside the boundary would trigger a serious regulatory action. NC is one of five States in the southeast where Pram has been found in the water downstream of a confirmed-positive nursery or nursery dealer, but, to date, no detections have been made in the natural vegetation around these waterways.
- Anecdotal information suggests that copper-based fungicides may be of value in controlling *Phytophthora* species. In June, the Plant Pathologist arranged to have a team of experts visit the location to determine if algacides might be applied safely and legally in the areas where Pram is continuing to be detected in water. The team consisted of experts from the NC Forest Service, NCSU (Departments Plant Pathology and Crop Science), Clemson University, and NCDA&CS. It was decided that, a determination had to be made as to whether or not the ditch was defined as a jurisdictional stream. [A representative from the NC Department of Environment and Natural Resources visited the site with her for this purpose on July 6 with a followup visit on July 15; results will be given in the report for the next reporting period.]
- Plant, soil, and water monitoring will continue at this location in the future.

#### **SUDDEN OAK DEATH -- REGULATORY ISSUE: Trace-forward notifications**

In June, NCDA&CS received a trace-forward (TF) notification for *Phytophthora ramorum* from USDA-APHIS- PPQ. This involved shipments of rhododendron plants from an infected Oregon Nursery to twelve homeowners in NC. USDA-APHIS-PPQ requested that NCDA&CS personnel visit four of these locations which had received a large number of plants (between seventeen (17) and eighty (80) plants each). The other locations had received less than five (5) plants each and were sent a letter and questionnaire by PPQ. The four locations assigned to NCDA&CS were contacted and the TF plants were inspected. Forty-one (41) plant samples were collected and assayed following the established procedure. *P. ramorum* was not detected in any of the samples.

#### **THOUSAND CANKERS DISEASE OF WALNUT**

Thousand cankers disease of walnut is considered to be an entomological program in NC because the disease cannot be spread without the presence of the insect vector. During most of this reporting period, however, the Section’s entomologist position was vacant, and therefore the plant pathologist was involved with this program. A state quarantine was established in NC against the disease and its insect vector in September 2010 as a result of a major detection in Tennessee. The Plant Pathologist participated in a meeting of personnel from NCDA&CS, the NC Forest Service, and N. C. State University to clarify responsibilities and outline reporting procedures in case of a detection by any of the three groups. The CAPS state survey coordinator participated in a preliminary survey of walnuts in western NC with NC Forest Service personnel. No evidence of TCW was found.

#### **TOBACCO PLANT INSPECTIONS**

The NC Tobacco Plant Certification Regulation requires that anyone who moves tobacco plants into NC from another state must do so under an import permit system. There were no import permit applications received in 2011. Another aspect of the regulation requires that plants grown in NC and sold for planting in a location more than seventy-five (75) miles away from the place of production must be inspected and certified. A major reason for this requirement is to prevent the artificial movement of blue-mold or virus-infected plants from one growing region into another, which could initiate a premature disease epidemic. There were no certified tobacco plant nurseries during this reporting period.

#### **VEGETABLE PLANT INSPECTIONS**

The Vegetable Plant Certification regulation requires weekly inspections and certification of vegetable plants grown in

NC if for sale to commercial growers. There were no vegetable plant nurseries certified under this regulation during this reporting period. However, special inspections were conducted at one large production greenhouse nursery to certify plants to meet the vegetable import requirements of New Jersey. The NC Crop Improvement Association (NCCIA) certifies a large number of sweetpotato cuttings and seed under its certification program. Because NCCIA certification requirements meet or exceed those of the vegetable plant regulation, NCDA&CS accepts inspections and certification tags of NCCIA in lieu of its own.

The regulation also requires that any vegetable plants or seed potatoes entering NC from another state be inspected and certified to meet certain disease standards. No problems were found during routine spot-inspections during this reporting period.

**\* MISCELLANEOUS ACTIVITIES related to Plant Pathology Issues:**

During this reporting period, the Plant Pathologist participated in on-line webinars on chrysanthemum white rust, Sudden Oak Death, and control of *Phytophthora* diseases. She attended the Ornamental Workshop held in Henderson, NC (Sept) and the American Phytopathological Society annual meeting in Charlotte, NC (July). After all these informational opportunities, she prepared information to share with others in the Section. She was also involved with other plant disease-related issues. Examples include:

- answered inquiries from the public as they relate to the White Pine Blister Rust Quarantine as well as any general plant problems;
- updated information pertaining to the federal Black Stem Rust Quarantine as it relates to certification of nursery stock;
- participated in conference calls pertaining to the Sudden Oak Death program and provides a summary to the Plant Pest Administrator;
- maintained a functioning lab to assay survey samples for Sudden Oak Death at all times;
- provided current operational procedures related to her programs to Plant Protection Specialists via a secure website designed as an electronic field manual;
- provided updates and training to the Plant Protection Specialists at their annual meeting;
- provided articles for industry newsletters as needed, e. g., an article for *Nursery Notes* to clarify PPQ's new "Advance Shipment Notification" for high-risk Sudden Oak Death nursery plants;
- served on the state CAPS committee for selecting pests for survey;
- handled import issues related to plant pathogens (for example, investigation of a report that cucumber plants infected with cucumber downy mildew were shipped from FL to Home Depots in NC, which turned out to be false);
- investigated complaints related to plant pathogens in nurseries (for example, complaint that African violets offered for sale were infected with a virus, which turned out to be false based on sampling and testing).

## **Regulatory Weed Program**

### **Program Objective**

The North Carolina Regulatory Weed Program protects North Carolina agriculture, public health, and native plant ecosystems from the harmful impacts of noxious weeds. The regulation of noxious weeds is authorized by the North Carolina Plant Pest Law and the Aquatic Weed Control Act of 1991. Program activities include inspections, issuance of Phytosanitary Certificates, issuance of Scientific Permits for movement of regulated articles and the survey, control and eradication of listed noxious weeds. The program manager is also accountable for management of the Witchweed Eradication Project funded by USDA, APHIS, PPQ.

### **Program Accomplishment Highlights**

#### **Witchweed Eradication**

- The witchweed program continues to make gains in released acres in spite of the discovery of new or re-infested fields. The total acreage of active fields (i.e. fields with fewer than 5 points) is now 1,867 acres.
- 4,166 acres were treated in NC as part of the witchweed eradication program

- A total of 80,045 acres were surveyed to evaluate status of witchweed infestation in Southeastern counties of NC
- Plans have been made with USDA, APHIS, PPQ to revise the witchweed eradication manual and to utilize GIS tools to track fields and generate maps.

### **Tropical Spiderwort**

- The only significant infestation of tropical spiderwort (*Commelina benghalensis*) is currently contained within the Cherry Research Farm. Most of the infested acreage is located within the Farming Systems Research Unit (FSRU) of the Cherry Farm.
- The Tidewater Research Station was released from quarantine in May, 2011.

### **Other Noxious Weeds**

- The NCDA&CS assisted with the treatment of a small infestation of bushkiller (*Cayratia japonica*) at a small nursery in Lexington in Davidson County. A small infestation of bushkiller was confirmed at a private residence in Durham County and at Old Salem in Forsyth County.
- Only one tropical soda apple plant (*Solanum viarum*) (a Federal Noxious Weed) was found during the 2010 survey at Martin Meats in Sampson county. The plant was bagged and destroyed.
- Small broomrape (*Orobanche minor*) (a Federal Noxious Weed) continues to be confined to only a few plants in several locations of Mitchell County. Annual surveys are necessary to find the plants and destroy them to prevent additional spread.
- Purple loosestrife (*Lythrum salicaria*) is still confined to only a few plants primarily in Forsyth county and at several other locations throughout the state. Annual surveys are necessary to find the plants and treat them with herbicide to prevent spread. A new location was confirmed near Sparta in Alleghany county.
- Approximately 3,600 acres were surveyed for the presence of Itchgrass (*Rottboellia cochinchinensis*) in Robeson county. Glyphosate was applied during summer/early fall 2010 to control emerged plants and pendimethalin herbicide was applied along affected roadsides in late March, 2011 to prevent germination.
- Additional mile-a-minute vine (*Persicaria perfoliata*) was documented in Rockingham and Yancey counties. Work is underway to evaluate efficacy of weevil releases as a biocontrol agent in both Alleghany and Yancey counties.

### **Regulatory**

- 100 phytosanitary certificates were issued to support the witchweed quarantine program
- Eleven new scientific permits were issued during 2010 to support the tropical spiderwort quarantines at the Cherry and Tidewater Research Stations
- Several changes to the Noxious Weed Regulations are awaiting approval by the NC Board of Agriculture. Changes will include the following:
  - Move mile-a-minute (*Persicaria perfoliata*) vine from the list as Class A Noxious Weed to the list as a Class B noxious weed and define a quarantine areas in Alleghany and Yancey counties,
  - Delete Florida betony (*Stachys floridana*) from the list of Class B Noxious Weeds,
  - Delete Durham county as a regulated county for puncturevine (*Tribulus terrestris*).
  - Add crested floating heart (*Nymphoides cristata*), yellow floating heart (*N. peltata*) and water snowflake (*N. indica*) to the list of Class A Noxious Weeds.

### **Public Relations and Outreach**

- The NCDA&CS Weed Specialist served as President of the NC Exotic Plant Pest Council (NC-EPPC) for a second year. The Weed Specialist is also a board member of the Aquatic Weed Control Council and is serving as editor of the NC Vegetation Management Association Newsletter.
- As President of NC EPPC, the weed specialist helped to organize events for the first official Invasive Plants Awareness Week in NC. As part of the week's events, the weed specialist did an interview for NBC 17 television to bolster awareness regarding the damaging impacts of invasiveness plants.
- The Weed Specialist helped to organize and participated as an instructor in an Early Detection and Rapid Response Workshop at the following events: volunteer training event for the Sandhills Weed Mgt Area; pesticide certification at a New Hanover County training session; and, to a meeting of the Sandhills Natural History Society.
- The Weed Specialist made a presentation that explained the Early Detection and Rapid Response program being coordinated by NC EPPC at the NCVMA annual meeting.

- The Weed Specialist provided updates on the new mile-a-minute vine infestation in NC at the annual NC Christmas Tree Growers Association Annual Meeting and at the NCVMA annual meeting.
- The Horticultural Inspection Society Southern Chapter invited the Weed Specialist to address the southern states horticultural inspectors on regulatory weed issues.



<http://hissc.web.officelive.com/default.aspx>

- The Weed Specialist presented an invited paper summarizing the status of the Carolinas Witchweed Eradication Program at a one day symposium as part of the Weed Science Society Annual Meeting.
- As part of pesticide certification training in Lumberton, NC, the Weed Specialist provided an update and review of the witchweed eradication program in the Carolinas.
- In cooperation with the Biofuels Center of NC, the Weed Specialist helped to organize a summit to discuss concerns associated with potentially invasive biofuel feedstocks and made a presentation at the meeting on and the Regulatory Considerations for Biofuel Feedstock Management in NC.
- On numerous occasions, assistance was provided to help identify weeds and provide weed control recommendations in crop, turf, aquatic and non-crop sites.
- Eastern NC Hydrilla Symposium:  
An addendum was added to the original plan to provide \$5k in funding to help sponsor a symposium on *Hydrilla verticillata*. The symposium was proposed to help build awareness regarding the alarming spread of Hydrilla in Eastern NC and the potential harm it could cause to pristine water resources in the region, such as Lake Phelps. Another symposium objective was to enable the exchange of information that would lead to actions by responsible agencies to help manage and prevent the spread of Hydrilla. The Hydrilla alert was prompted by the confirmation of a significant population of hydrilla in Albemarle Sound for the first time in 2010. The symposium was organized by North Carolina State University with input from the NCDA&CS and the NC Dept. of Natural Resources. The Weed Specialist served as moderator for the symposium. The agenda is detailed below:

**Eastern NC Hydrilla Symposium Agenda, Tidewater Research Station, Plymouth NC, December 16, 2010.**

- **8:00 - 8:30 Registration**
- **8:30 - 8:45 Welcome and Introductions**  
Jewell Tetterton: Tidewater Research Station, Research Operations Manager  
Rick Iverson: NCDA&CS, Weed Specialist
- **8:45 - 9:15 *Hydrilla verticillata* - Biology and History in North Carolina**  
Dr. Rob Richardson: NCSU Crop Science Department, Assistant Professor of Crop Science and Extension Specialist
- **9:15 - 9:45 Current Status of Hydrilla in Eastern NC and NCDENR Cost Share Program**  
Rob Emens: Division of Water Resources, Aquatic Weed Control Program,
- **9:45 - 10:15 Avian Vacuolar Myelinopathy: Updates on Field and Laboratory Investigations Linking *Hydrilla verticillata* and Associated Cyanobacteria to Eagle and Waterbird Deaths in the Southeastern United States.**  
Dr. Susan B. Wilde, *Rebecca Haynie, Faith Wiley, James Herrin, and Michael Hook*: University of Georgia, Assistant Professor Warnell School of Forestry and Natural Resources
- **10:15 - 10:30 Break**
- **10:30 - 10:50 The Spread and Management of Hydrilla in a North Carolina Piedmont River with Mosquito Control Implications**  
Ken Manuel: Duke Energy, Lake Services

- **10:50 - 11:20 Albemarle Sound Ecology, Importance of SAV (Submersed Aquatic Vegetation) and Potential Effect of Non-natives on the Ecosystem (Working Title)**  
Anne Deaton: NC Division of Marine Fisheries, Chief, Habitat Protection Section
- **11:20 - 11:50 Ecology of Eastern NC Lakes and Potential Impacts of Hydrilla (Working Title)**  
Jeremy McCargo: NC Wildlife Resources Commission, District 1 Fishery Biologist
- **12:00 - 1:00 Lunch (Provided by USDA, APHIS, PPQ Noxious Weed Program)**
- **1:00 - 1:30 Challenges Associated with Managing *Hydrilla verticillata***  
Dr. Mike Netherland: Center for Aquatic and Invasive Plants UFL, Courtesy Associate Professor, US Army Engineer Research and Development Center
- **1:30 - 2:00 Outreach Programs to Combat Invasive Aquatic Species**  
Barbara A Doll: NCSU Sea Grant Program, Water Quality Specialist
- **2:00 - 2:20 Break**
- **2:20 - until Open Discussion - Needs and Priorities**  
Moderator - Rebecca Liverman: Washington County, Extension Director
- **Wrap Up**  
Rick Iverson

Over 90 people, representing state agencies, both in NC and outside NC, USDA, APHIS, PPQ, Universities, Utilities, Counties, U.S. Fish and Wildlife Service, applicators and Agro-chemical suppliers, participated in the symposium. Needs and priorities that resulted from the Open Discussion part of the agenda have been summarized and are in the process of being finalized for distribution to Symposium participants upon approval by the NC Aquatic Weed Control Council in March, 2011.

## Weed Survey and Eradication Program Details

### Survey Methodology and Rationale

Surveys for all projects were done by visual reconnaissance. Survey objectives are: 1) identify new infestations of target noxious weed (i.e. detection surveys); and, 2) delimit the boundaries where the weeds were mapped in previous years (i.e. delimiting surveys). Detection survey location targets were selected based on probability that subject plant pest would be present. In some instances GPS coordinates were recorded to provide reference points for mapping and relocation, if needed.

Roadsides close to wet areas and home landscapes were targets for purple loosestrife detection surveys. Locations known to have been infested with *Orobanche minor* in the past were checked at least three times in spring or early summer for reoccurrence of the weed. A known infestation in a hay field was monitored to delimit the size of *Orobanche minor* infestation and prevent additional spread by hand pulling plants at time of survey. Also, past known locations for itchgrass (*Rottboellia cochinchinensis*) were surveyed in June through October to confirm results of 2009 treatments and delimit known past infestations. Cattle slaughter houses and holding farms in Sampson county are surveyed annually for infestations of tropical soda apple.

Since plant species must be identified during the growing season, all surveys are done during the period from full leaf (June) through the first hard freeze (usually mid November). No taxonomic services were budgeted or used in the projects.

The Survey Aide doing itchgrass surveys in Robeson County worked from the end of May through October, 2010.

## Results

### Mile-a-minute vine (*Persicaria perfoliata*) (Figure 1)

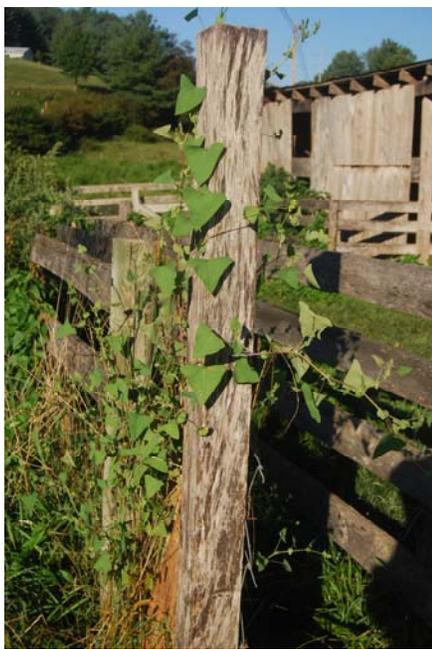


Figure 1. Mile-a-minute vine. Note the triangular-shaped leaves.

Mile-a-minute vine has now been documented in the following counties: Alleghany, Rockingham and Yancey. Changes to the Noxious Weed Regulations have been proposed to quarantine this pest in portions of Alleghany County and additional areas may be proposed as more is learned about the extent of infestation in other counties.

To help contain the infestation, the NC DOT is actively spraying for mile-a-minute vine along portions of Highway 221 and Irwin Grocery Road in Alleghany County. Also, a weevil that feeds exclusively on mile-a-minute vine (MAM) is being released in Alleghany and Yancey counties to help contain this serious invasive weed (Figure 2). Appalachian State University is monitoring the effectiveness of the weevil in containing the infestation and is also characterizing weevil reproduction, survival and spread in the NC area of the MAM infestation.



Figure 2. Release of mile-a-minute vine weevils (*Rhyncomimus latipes*) into MAM infestations in Alleghany County.

Bushkiller (*Cayratia japonica*) (Figure 3)



**Figure 3.** Bushkiller overtopping an ornamental cedar tree.

Bushkiller has now been confirmed on one additional site in Forsyth County and on one site at a private residence in the city of Durham in Durham County. Efforts are underway to eradicate the infestation at the Durham County site.

An operational application of a new herbicide, Streamline® (aminocyclopyrachlor + metsulfuron methyl), was made in October, 2010 at the Davidson County bushkiller site. Evaluation on June 10, 2011 indicated good control, but bushkiller is still present at the site and needs to be monitored and treated again to ensure it does not spread.

Broomrape (*Orobancha minor*)

Surveys were completed April 19 & 25, May 2, 19 and 23 and June 1, 7, and 13 at sites where plants were known to occur in the past. Approximately 30 plants were pulled at one of the sites along Highway 226 in Mitchell County.

Purple Loosestrife (*Lythrum salicaria*)

A location near the airport at Banner Elk, NC where a plant was discovered in 2008 was surveyed in June, 2011. No plants were found.

Sixteen sites near Winston/Salem were surveyed in September, 2010. Loosestrife was detected and treated at several of the sites. The plants were treated with a 2% solution of triclopyr (Table 1)

**Table 1.** Purple loosestrife sites and acreages treated near Winston/Salem.

Sites	June 2&3	August 3&4	October 6	Total Acres Treated
I-40 West	4.51	4.51	0	9.02
Rec Center	2.03	2.03	2.03	6.09
Substation	7.66	7.66	7.66	22.98
Farmingdale	1.71	1.71	1.71	5.13
Oak Grove Church Rd	0.22	0	0	0.22
Megahertz	1.97	1.97	1.97	5.91
Krispy Kreme	0.79	0.79	0	1.58
Corning Plant	2.05	2.05	0	4.1
Goose Pond	7.83	7.83	0	15.66
Chaucer Lane	3.82	0	0	3.82
Fox Meadow	1.75	1.75	0	3.5
Villas	0	0	0	0
I-40 East Pasture	1.46	1.46	0	2.92
Wallburg	2.23	2.23	2.23	6.69
White Church/Hwy 109	0.85	0	0	0.85
Willshire Golf Course	0	3.32	0	3.32
<b>Total Acres Treated by Date</b>	<b>38.88</b>	<b>37.31</b>	<b>15.6</b>	<b>91.79</b>
		<b>Grand Total</b>		<b>183.58</b>

Approximately 6 plants were discovered along Highway 21 near Sparta, NC. Plants were treated in August, 2010 by the NC DOT (Figure 4)



Figure 4. New purple loosestrife infestation discovered near Sparta, NC.

Tropical Soda Apple (*Solanum viarum*)

Survey was done in Sampson County in July and October and at Coharie Farms in Sampson County in October. Table 2 shows acreages and survey results.

Table 2. Acreages and survey results for Tropical Soda Apple during the 2010 season.

<u>County</u>	<u>Date</u>	<u>Location</u>	<u>Fields</u>	<u>Acres</u>	<u>Plants</u>	<u>Survey Crew</u>
<b>Sampson</b>	<b>7/27/10</b>	<b>Martin Meats</b>	26	260	1*	Herbie Ward Rondy Godwin Cleveland Chavis Ricky Gregory Earl Brewington Rick Iverson Jon Cole
<b>Sampson</b>	<b>10/05/10</b>	<b>Martin Meats</b>	27	290	0	
			7	65	0	Rick Iverson Herbie Ward Earl Brewington Richard Smith James Bullard Cleveland Chavis
<b>Sampson</b>	<b>10/05/10</b>	<b>Coharie Farms</b>	8	850	0	
<b>TOTALS</b>			<b>68</b>	<b>1465</b>	<b>1</b>	

\*Martin Meats: July 1-small plant (no fruit)

Itchgrass (*Rottboellia cochinchinensis*)

Roadside itchgrass sites were treated with pendimethalin on March 23 in cooperation with the NC DOT. In June, glyphosate was used to treat itchgrass plants on the edges of infested fields and along drainage ditches. Fields were mapped for presence of itchgrass (Figures 5,6,7 and 8).

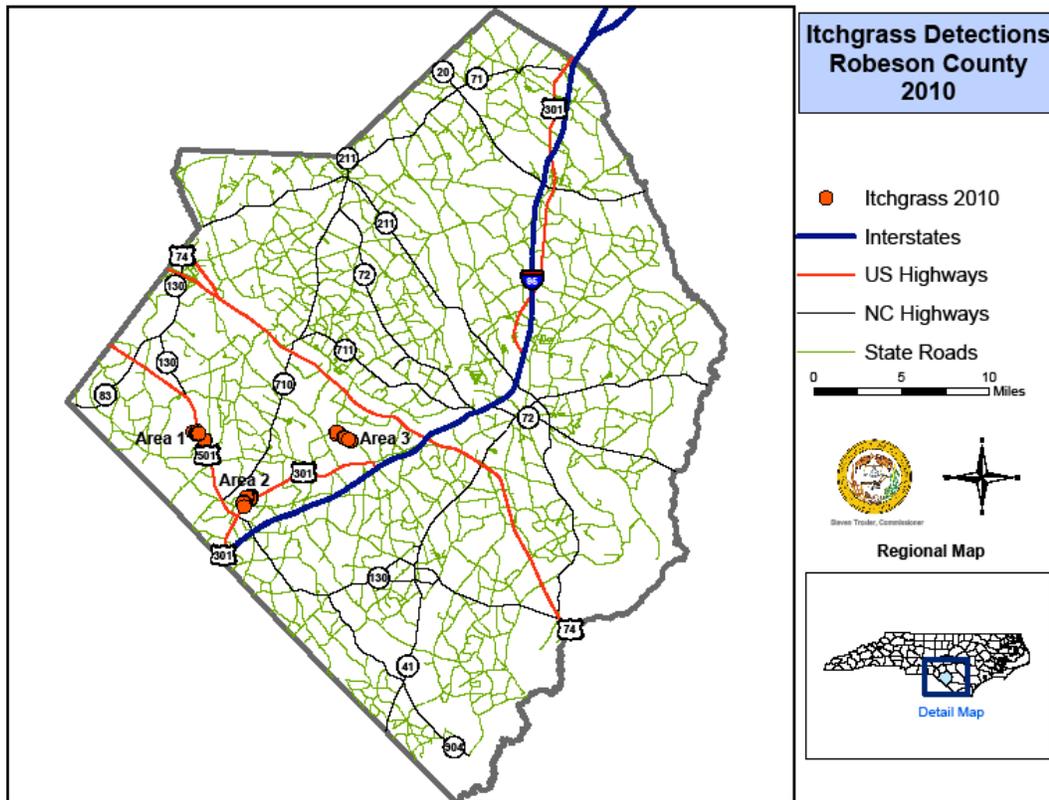


Figure 5. Map showing 3 general areas where itchgrass has been found in Robeson County.



Figure 6. Map of itchgrass locations in fields of area 1 in Robeson County.

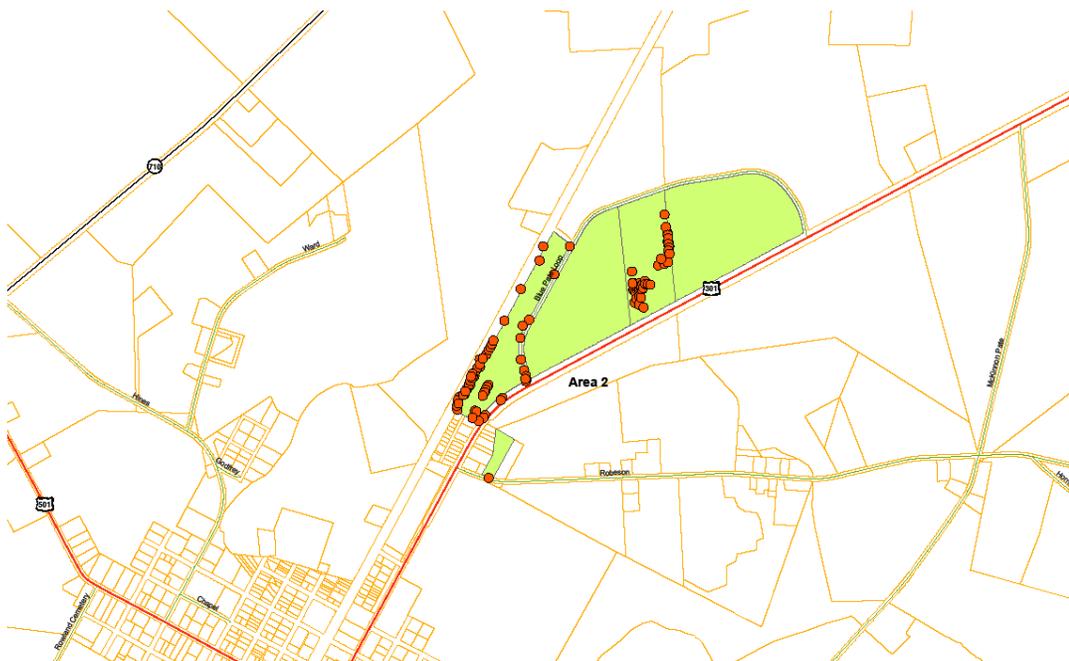


Figure 7. Map of itchgrass locations in fields of area 2 in Robeson County.

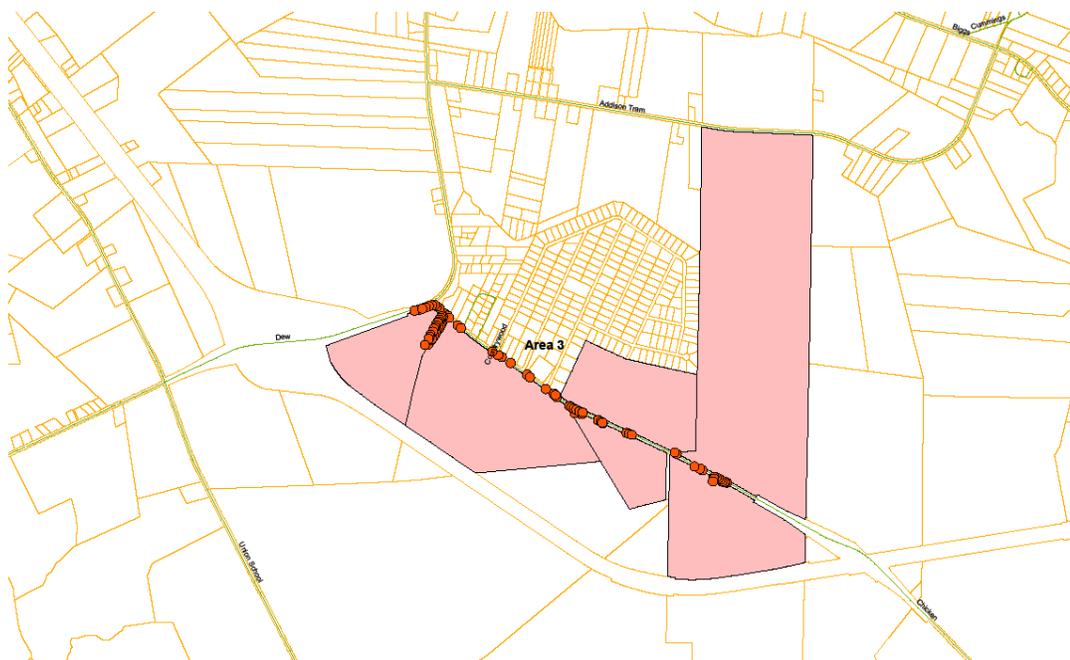


Figure 8. Map of itchgrass locations in fields of Area 3 in Robeson County.

A NC State summer intern, Jonathan Cole, was employed through the NC Youth Advocacy and Involvement Office to assist with survey and treatment during the 2010 growing season. The intern started on May 24 and ended his internship on July 30.

#### Oriental bittersweet (*Celastrus orbiculatus*)

Each year, Plant Pest Specialists, responsible for counties within the oriental bittersweet quarantine area, distribute colored warning tags that retail outlets are encouraged to provide with all purchases of oriental bittersweet. The tags warn purchasers that oriental bittersweet is an invasive plant that should be disposed of in plastic bags destined for landfills and that disposal in a natural setting or mulch piles could lead to establishment of this serious invasive plant.

A stop sale for oriental bittersweet was issued to a vendor at a Farm Fresh Market in Mecklenburg County on October 19, 2010. Twenty-five bundles of the plant were returned to Buncombe County.

#### Chinese Water Spinach (*Ipomoea aquatica*)

Compliance agreements permitting the culture of Chinese water spinach for human consumption were issued to one grower in Pasquotank County and to one grower in Wake County.

Giant Salvinia (*Salvinia molesta*) (Figure 9)



Figure 9. Giant salvinia. This plant can double in biomass every 10 days.

History of Giant Salvinia in NC:

Giant Salvinia (*Salvinia molesta*), a Federal Noxious Weed, was detected at an aquatic nursery's display at the North Carolina State Fair in 1998, and subsequent surveys by NCDA&CS, NCDENR, and NCSU personnel resulted in detections in 26 counties in North Carolina. All of these infestations have been eradicated. However, in September 2000, naturalized infestations of Giant Salvinia were detected in golf course ponds in New Hanover County and in a canal and wetland at the Riverbend Subdivision (Figure 10) near Burgaw in Pender County. Acting under the authority of the Aquatic Weed Control Act of 1991, NCDENR Water Resources personnel began eradication treatments at these sites in November, 2000. Survey of the Northeast Cape Fear River and adjacent wetlands at the Pender County site in 2005 and 2007 yielded no new finds of Giant Salvinia. Survey and monitoring of the River Bend site in Pender County has continued to the present.

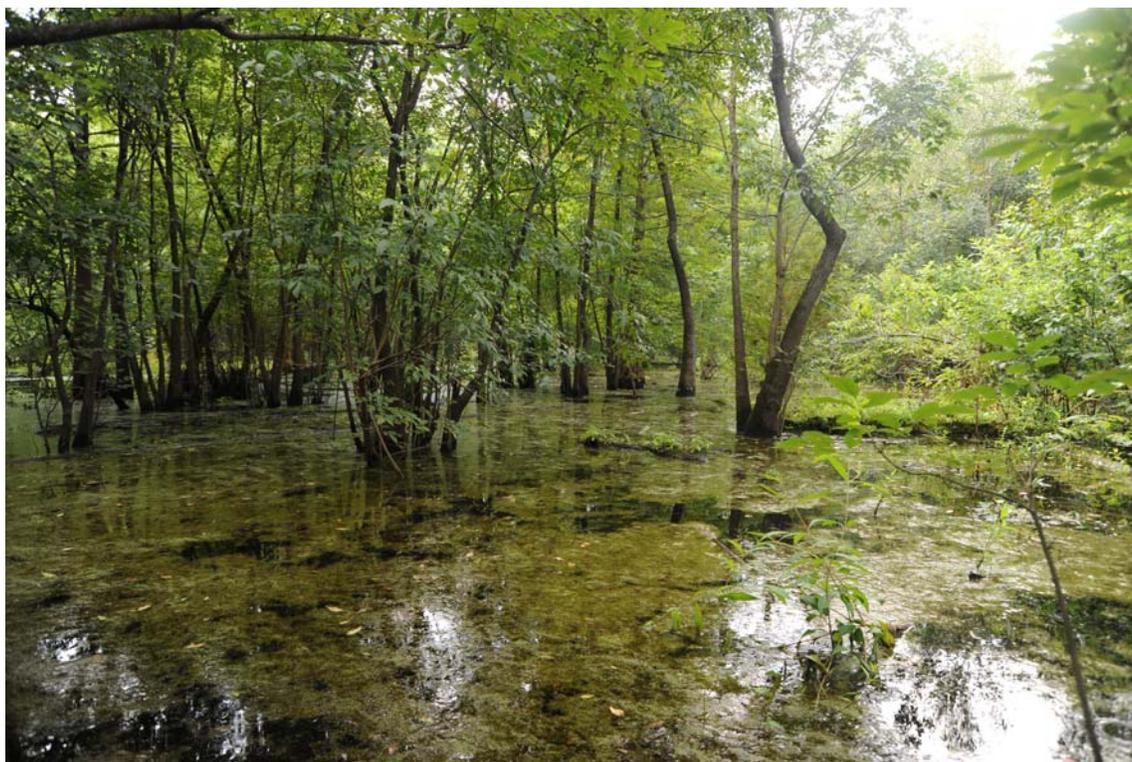


Figure 10. Riverbend Subdivision swamp in Pender County.

A biological control program for Giant Salvinia at the Pender County site was initiated in 2004 with two releases of the Salvinia Weevil (*Cyrtobagous salviniae*) in June and September. Observations throughout 2005 confirmed the successful overwintering and survival of the Salvinia Weevil in Pender County, but this biocontrol effort was not deemed appropriate as we approached eradication of this plant and the biocontrol program was discontinued in 2008.

Current status as of December, 2010:

A contract for survey and treatment of the River Bend Subdivision swamp was awarded during the 2010 growing season. During 2010, NO Giant Salvinia plants were discovered. Another contract was awarded to survey and treat the Riverbend Subdivision swamp for the 2011 growing season. The Giant Salvinia Task Force is still consulted for technical advice on program activities, but the NC Dept of Environment and Natural Resources and the NC Dept. of Agriculture and Consumer Services have partnered in specifying contract requirements and the subsequent awarding of the contract through the Pender County Extension office. Both agencies also assumed responsibility for contract supervision.

#### Witchweed (*Striga asiatica*)

#### **Witchweed Eradication Program Objectives, Methods and Rationale**

Witchweed (*Striga asiatica*) is a Federal Noxious Weed and a Class A State Noxious Weed in NC. It is an obligate parasite which attacks corn, sorghum, millet, and other warm season crops in the grass family. Heavy infestations of Witchweed can eliminate yield from these crops, resulting in devastating economic losses. The presence of this quarantined pest also imposes a regulatory burden on crop production and on the movement of farm commodities, equipment, and other regulated articles. The Witchweed eradication program includes an organized and effective set of survey, control and regulatory procedures developed through early USDA, APHIS research. Specific objectives of the program include: 1) characterization of the infestation through survey; 2) control of existing infestations; and, 3) containment by preventing the movement of potentially infested articles out of established quarantine boundaries.

1. **Survey** – Survey is necessary to detect and verify the extent of Witchweed (Detection and Delimiting surveys), evaluate the effectiveness of eradication treatments on infested properties (Appraisal surveys), and verify eradication of Witchweed on sites released from quarantine (Released surveys). Additional survey of terminated acreage is required in order to confirm the long-term effectiveness of the eradication program. Survey is done through the growing season after host plants have started to grow from about the middle of June through the end of October or until the first frost. (Figure 11)



Figure 11. Summer Intern, Jonathan Cole, showing witchweed detected in corn field, during survey in July, 2010.

2. **Control** – The objective of control treatments is to prevent Witchweed seed production and eliminate Witchweed seed from the soil. Herbicide treatments, hand pulling and disking help to control witchweed host plants and witchweed plants before they can flower and produce seed. Methyl bromide fumigation of additional infested acreage will destroy reserves of witchweed seed in the soil and accelerate completion of the eradication program. Ethylene applications also help to deplete soil reserves of witchweed seed by encouraging germination and subsequent control by exposure to treatments or a non-host crop. Control treatments can be completed during the growing season and into the winter months provided soil moisture and temperature are favorable for soil fumigation.
3. **Regulatory** – Regulatory activities aid in preventing the artificial spread of Witchweed from infested areas to non-infested sites. These regulatory functions facilitate the interstate and intrastate movement of agricultural commodities from Witchweed regulated areas.

### Witchweed Eradication Program Data Compilation Description

All control treatments and surveys are tracked in an ACCESS database that updates the status of infested fields and released fields. New or re-infested fields are added to the infested field list when Witchweed is confirmed in new fields or fields that have been previously released. A point system was developed for the program that provides a quantitative measure for moving fields from infested to a released status and from a released status to a terminated status. Infested fields are assigned points depending on the nature of the field and the control activities that were done on it during the season. Once a field accrues five points it is advanced to "Release" status which means it is surveyed on a schedule for a minimum of 10 years and assigned either 0.5 points for a spot survey or 1.0 points for a general survey. Once a field acquires 10 points it is terminated from the program.

The following summary tables show the status of acreage in NC and SC as of the end of survey and treatment for the current growing season which usually occurs by mid-November each year. *Note that this report summarizes witchweed acreage status and activities during the 2010 calendar year even though the report specifies a period that matches the fiscal year which covers the period Oct. 1, 2009 through September 30, 2010.* Since point values for a field are adjusted only once at the end of the growing season, it is not possible to obtain an accurate end of season account of field status until survey and treatment have ended for the year.

Following is a description of year end activities that are required to summarize year end data:

- A "switchboard" routine is executed in the ACCESS data base that automatically increments point values for released fields to account for surveys done on them during the season.
- Based on input from each inspector, infested field point values are manually adjusted to reflect current field conditions and treatments that were done during the year. In most instances fields will be advanced in point value. Some fields may qualify for release based on reaching a point value of 5. Infested field point value at the **end of the season** is a judgment based on knowledge of witchweed biology, field treatments and current field conditions and can be discussed with the program manager. The new field values are done at the **end of the growing season** after the first frost when it is assumed no more treatments for the year will be implemented and no new witchweed will be found.
- New fields are added to the data base and are assigned a new farm and/or field number. Re-infested field point values are changed to bring them back to values less than 5 so that they will be tallied as infested fields.
- **After end of growing season** adjustments, the data base is queried and standard reports are generated that provide status reports of acreages infested, released, surveyed, treated and so forth that can be compiled by county or other criteria.

### 2009 Witchweed Eradication Program Summary of Results

This report contains the following Witchweed Status Data Tables for 2010:

- ✓ 2010 North Carolina Acreage Status
- ✓ Infested Acres in NC Quarantined Counties by Point Value
- ✓ Other Statistics for NC
- ✓ 2010 South Carolina Acreage Status
- ✓ 2010 Summary of Survey Acreage
- ✓ Number of Farms and Fields with Fewer Than 5 Points (infested) by County
- ✓ Treatment Summary by Crop and Treatment Type

**2010 North Carolina Acreage Status**

Total Acres Infested	1867.34
Total Acres Released	306.2
New or Re-Infested Acres	157.86
Net Gain in Released Acres	148.34
Total Acres Treated	4,166.28
Total Acres Surveyed	80,044.70

**Infested Acres in NC Quarantined Counties by Point Value**

County	0-0.9	1-1.9	2-2.9	3-3.9	4-4.9	Total
Bladen	0	215.40	180.60	83.50	59.60	539.10
Cumberland	35.40	133.10	95.10	120.60	472.60	856.80
Pender	0	0	12.50	4.60	0	17.10
Robeson	0	0	0	230.40	177.60	408.00
Sampson	0	4.30	5.80	25.24	11.00	46.34
<b>Total</b>	<b>35.40</b>	<b>352.80</b>	<b>294.00</b>	<b>464.34</b>	<b>720.80</b>	<b>1867.34</b>

**Other Statistics for North Carolina**

Acres Treated by Contract-----52.30  
 Counties now Infested in NC-----5  
 Number of Witchweed Bounty Payments-----12  
 Associated Witchweed Bounty Acreage-----99.80  
 Number of Phytosanitary Certificates Issued -----100

**2010 South Carolina Acreage Status**

Total Acres Infested-----0  
 Total Acres Released-----60.3  
 New or Re-infested Acres-----0  
 Net Gain in Released Acres-----60.3  
 Total Acres Treated-----68.20  
 Total Acres Surveyed-----5817.20

**Infested Acres in South Carolina Quarantined Counties by Point Value**

County	0-0.9	1-1.9	2-2.9	3-3.9	4-4.9	Released
Marion	0	0	0	0	0	14.4
Horry	0	0	0	0	0	45.9
Total	0	0	0	0	0	60.3

Total = 0

**Other Statistics for South Carolina**

Acres Treated by Contract-----0  
 Counties now infested with Witchweed-----0  
 Number of New Witchweed Finds-----13

**2010 Summary of Survey Acreage**

State	Survey Category	Total Acres
North Carolina	Appraisal	13,776.50
	Release	20,864.50
	Delimiting	22,381.80
	Detection	23,003.80
	Regulatory	18.10
<b>Total Survey Acreage for NC</b>		<b>80,044.70</b>
South Carolina	Release	910.70
	Detection	4,906.50
	<b>Total Survey Acreage for SC</b>	<b>5,817.20</b>
<b>Grand Total Survey Acres</b>		<b>85,861.90</b>

**2010 Treatment Summary by Crop and Treatment Type**

Treatment Acreage by State and Crop

State	Crop Name	Number of Acres Treated	Number of Fields
<b>North Carolina</b>	Corn	1612.81	116
	Garden	136.99	25
	Idle (noncrop)	1257.48	273
	Other	205.04	37
	Soybeans	695.85	116
	Wildlife Planting	215.82	28
	Yard	5.89	5
	Horticultural Crops	35.16	4
	<b>Total</b>		<b>4165.08</b>
<b>South Carolina</b>	Corn	2.30	4
	Idle (noncrop)	50	19
	Soybeans	15.9	5
<b>Total</b>		<b>68.20</b>	<b>27</b>
<b>Grand Total for NC and SC</b>		<b>4233.28</b>	<b>626</b>

**Treatment Acreage by Treatment Type NC**

<b>Treatment Description</b>	<b>Treated Acres</b>	<b>Number of Fields</b>
<b>North Carolina</b>		
CURBIT 1.1-1.7 PES	4.50	2
2, 4-D 0.5 PD, OT	11.70	2
2, 4-D 0.75PD, OT	2.00	1
GRAMOXONE 0.50 PD, OT	39.10	8
GRAMOXONE 0.125 PD, OT	11.00	1
PROWL 07.5-1.5 PPI, PES	49.9	4
OUST 0.05-0.2 PD, OT	1.00	1
ATRAZINE 1.0-1.5 PPI, PES	72.40	5
DISKING-100% GRASS KILL	1550.57	190
DUAL 1.125-3.0 PES	280.90	8
ETHYLENE (HAND) 1.5	3.51	15
ETHYLENE (TRACTOR) 1.5 INJ	748.35	74
METHYL BROMIDE (CONTRACT) 436.0	3.80	1
METHYL BROMIDE (SPOT) 436.0	0.15	5
REFLEX 0.375 PD, OT	10.90	1
ROGUE- 100% WITHWEED REMOVAL	95.54	132
ROUNDUP 0.50-2.0 OT	1070.68	65
TREFLAN "G" 3.0-4.0 SA	0.51	3
TREFLAN-EC 0.5-1.0 PPI	86.20	7
ROUNDUP =2,4-D.5-2.0+1.0 OT, PD	12.13	4
VELPAR 1.0-2.0 PD, OT	11.00	1
PROWL 2.0-4.0 SA	30.10	2
REFLEX + FUSILADE .375+.06- .19PD. OT	11.70	2
CLARITY 0.25-0.5 OT, PD	5.20	2
PREFIX 1 QUART PER ACRE	45.90	3
ENVIVE 4.3 OUNCES PER ACRE	6.40	1
<b>TOTAL</b>	<b>4165.14</b>	<b>540</b>

**Treatment Acreage by Treatment Type SC**

<b>Treatment Description</b>	<b>Treated Acres</b>	<b>Number of Fields</b>
<b>South Carolina</b>		
GOAL 0.75 PD, OT	2.20	3
DISKING-100% GRASS KILL	18.3	2
ETHYLENE (TRACTOR) 1.5 INJ	37.60	7
ROUNDUP 0.50-2.0 OT	10.10	16
<b>TOTAL</b>	<b>68.20</b>	<b>28</b>

**Number of Farms and Fields by County with Fewer Than 5 Points**

County	Number of Farms	Number of Fields	Infested Acreage
Bladen	32	53	539.10
Cumberland	50	65	856.80
Pender	1	4	17.10
Robeson	26	35	408.00
Sampson	8	10	46.34
<b>Total</b>	<b>117</b>	<b>167</b>	<b>1867.34</b>

*2010 Program Discussion*

**Trends and Other Issues that Impact the Witchweed Eradication Program**

It is expected that more corn and wheat will be planted in 2011 than in 2010 potentially increasing opportunities to detect WW in fields which may not have been planted to corn for the past few years. However, cotton prices will encourage more planting of cotton which is good for the witchweed program since cotton is a false host crop that encourages WW germination but does not allow it to complete its life cycle to produce seed if other host plants such as crabgrass are not allowed to grow in the fields

More farmers in Robeson County are utilizing no-till practices, which makes it harder to apply ethylene effectively and it is becoming more difficult to use soil fumigants. BASAMID® is no longer an EPA-cleared pesticide for many of the crop sites where we would traditionally use it. Consequently, field borders will continue to be a challenge. Also, it is expected that new regulations which are supposed to be implemented in 2011 will make it impossible to use other soil fumigants, such as methyl bromide near roadsides, houses and other sensitive areas. Contract soil fumigation costs continue to rise with contract bids expected to come in again at \$2500/acre or more depending on when new regulations will be enforced. After 2011, it is expected that soil fumigation will no longer be a viable treatment for witchweed eradication, thereby extending the time for field release by at least 3 years.

Another challenge is the fact that more growers are utilizing 20 and 24 inch row spacings. This makes it more difficult to use equipment which is not configured for these row spacings.

In the quarantined county of Bladen, more new ground is being cleared for blueberries. This will necessitate the need for more delimiting surveys to confirm witchweed is not moving with equipment that may have worked in witchweed areas prior to working in other areas.

The program utilizing GIS tools to improve field location descriptions and provide retrievable electronic records for fields in the program. CPHST is also working on a project to update treatment recommendations since many new herbicides are not now included in the current manual and some products have been discontinued.

In the near future, more time and resources will be required to create witchweed awareness with newer farmers and to extend our reach and effectiveness for witchweed survey. Early Detection and Rapid Response is paramount in this program to ensure infestations which could potentially start outside of quarantine boundaries are quickly identified and managed.

Tropical Spiderwort (*Commelina benghalensis*) (Figure 12)



Figure 12. Tropical spiderwort a.k.a. Benghal dayflower (*Commelina benghalensis*) at the Cherry Research Station.

### **Survey Methodology and Rationale**

Tropical Spiderwort (TSW) survey in 2009 confirmed a continuing infestation at the Cherry Research Station near Goldsboro, NC. The objective of this project is to continue with intensive surveys at currently quarantined field stations (Cherry Research Farm and Tidewater Research Station) and treat plants before they flower. Fields with confirmed TSW outside of the Farming Systems Research Unit (FSRU) at the Cherry Farm and at the other Research Farms can be treated with herbicides and fumigants, unlike any of the infested fields in the FSRU, due to the sensitive nature of the research in the FSRU which excludes use of pesticides.

Survey outside of the Farming Systems Research Unit at the Cherry Research Farm is done on every field at least every 3 to 4 weeks and surveys on fields where infestations have been known to occur in the past are done more frequently. Areas are covered on a frequency that will hopefully catch TSW plants before they flower and produce seed. Survey in the Farming Systems Research Unit is done within a 15 by 15 meter grid. The survey schedule in the Farming Systems Research Unit is dependent on the history of past TSW occurrences. The survey of high priority fields (highest level of past infestation) is done four times per month, survey of mid-priority fields (fields with moderate infestation or fields next to high infestation fields) is done three times per month and survey of low-priority fields (fields with no known infestation in the past) is done two times per month. TSW plants that are discovered are bagged and destroyed. Glyphosate herbicide is used to “burndown” vegetation around all fields outside of the Farming Systems Research Unit to improve visibility for survey.

To prevent the spread of TSW within the quarantined areas, equipment is washed prior to movement from one field to another and all regulated articles are moved outside of the station by permit only.

One plant pest aide was re-hired in mid May for survey at the Cherry Research Farm and one plant pest aide with previous TSW survey experience was hired in July for part time survey at the Tidewater Research Station. No TSW has been discovered during this reporting period at the Tidewater Research Station. The first TSW plant appeared on May24 in the Farming Systems Research Unit (FSRU) at the Cherry Research Station.

### Regulatory Action

The Tidewater Research Station was officially released from quarantine for tropical spiderwort on April 27, 2011.

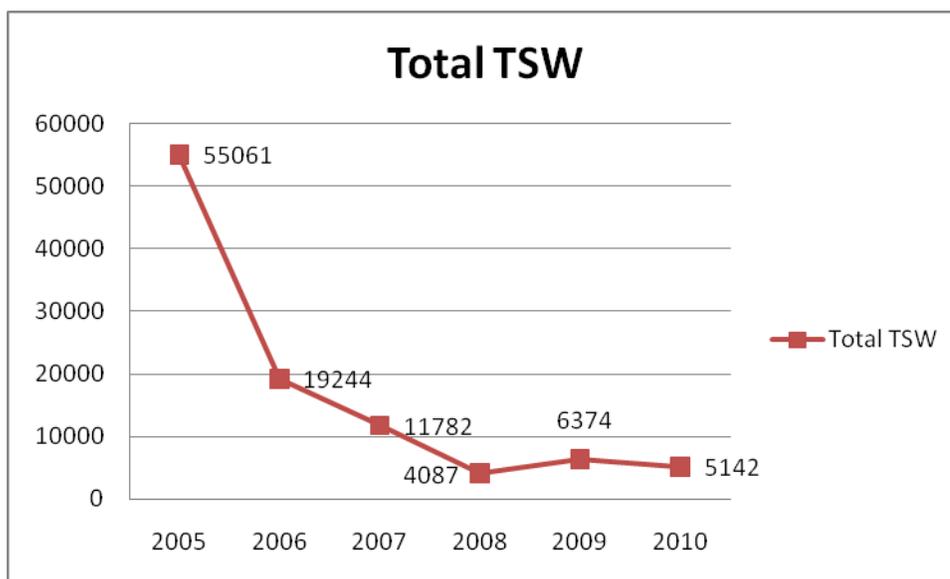
The following is a summary of treatment and survey done by NCSU personnel in the Farming Systems Research Unit of the Cherry Research Farm near Goldsboro, NC. The Final Report was written by Richard Banner, NCSU:

The only unexpected finds this year were in plots 4 and 7. In plot 4, next to the road, a total of fifty TSW were found, none larger than three leaves and most were single leaf sprouts. Once we dug up the plants and the surrounding soil only one more sprout was found in that location. The four single leaf TSW found in the alley behind plot 7 were the only plants found in that location. Occasional outbreaks are to be expected, the important thing is that we are catching them. Overall, fewer TSW were found this year than last year and, as of 2010, we have reduced the amount of TSW to less than ten percent of the original amount from 2005. I will try to keep the graphs and tables to a minimum but here is a table of our heaviest producing plots with totals over the years:

PLOT	2005	2006	2007	2008	2009	2010
6	317	94	125	15	83	23
12	9820	2467	5866	868	1833	1438
13	540	254	472	22	303	281
14	31	40	25	335	2476	1426
23	761	39	12	1	20	19
26	1745	3856	485	229	383	397
27	29197	8400	3056	1789	800	1351
28	937	552	295	89	21	32
47	9578	2970	456	522	269	116

Some of these areas yo-yo while others steadily decline, however, all plots except 26, 27 and 28 had less than last year. Plot 13's numbers are a bit misleading due to a find across the road by the water testing station. For the first time to my knowledge, that area was mowed and planted in crop. Possibly the offending plant from the crop area hitched a ride and fell off there. All the TSW found here were in a two by four foot area No more were seen after we had dug up that area. I have given the folks that do the testing a heads up so they are aware of, and can avoid that location. TSW is still concentrated in the center of plot 12. Tropical Spiderwort was consistent in plot 12 as in previous years. Numbers were way down in the crop area of 13, the relatively small amount we found were scattered randomly. Plants in plot 14 are still confined to the area designated in 2008. We have not found any escapees and continue to maintain control of this area. The areas in this section where TSW are found are shrinking as well. We keep a very close eye on this spot and nothing larger than a three leaf specimen was found here this year. It is a possibility this patch peaked last year and will continue to decline over time. All the TSW found in plot 6 were in the corner hot spot (next to plot 7) and continue to dwindle in numbers. Plot 23 had TSW in the field as opposed to just on the fence line as in previous years. This plot has been tall grass since I started and I look forward to seeing it mowed and tilled so we can catch anything else as it sprouts. Plots 26 and 27 continue to live up to their reputation. There are various hot spots in these fields where most of the TSW is found although the size of these areas is also shrinking. Very few were outside of these areas and none of them were even close to mature this year. Plot 28 was mostly quiet with the finds there in the expected areas and all were found in a couple of passes instead of the usual season-long steady supply. Plot 47 continues to dwindle in numbers and was relatively devoid of TSW this season.

Now for some good news. Except for plot 16, none of the plots that had new finds last year produced anything this year. Plot 16 had five TSW found in only one of the two spots as last year, all in the same pass. These were in exactly the same location and were caught before they could reproduce. Plots 9, 21, 24 and 38 were empty of TSW this year. Plots 17, 22, 25 and 37 also had zero found in them. Plot 15 has gone two years with no TSW at all and the only way I could scout that one any closer would be on hands and knees. Plots 1 through 3, 5, 8, 10 & 11, 18 through 20, 30 through 36 and the two sandlot tree plots 44 & 46 have never been infested and remain clean.



This graph shows the decline in total TSW found in the FSRU over time. We are now down to 9.33% of the amount we started with.

This year I made some minor changes in how we scout. We used the equipment more efficiently and added bicycles to the arsenal. I also utilized my experience with time and motion studies coupled with probability and statistics methods. This resulted in covering more fields and more of the fields with increased frequency. We stayed on schedule for the entire season. We also covered areas not routinely scouted such as the water testing areas, ditch lines, borders and deer trails.

I also continued the practice of removing the surrounding soil along with the plants in cases of mature TSW finds to further eliminate any seed in these areas. All this material is fumigated and disposed of in accordance with state regulations.

This year the TSW peaked as expected then noticeably declined in numbers as opposed to the usual peak followed by continued high numbers until fall. Relatively few plants found this year were even close to producing seed, above or below ground and almost all of the TSW found this year were in the early stages of growth. The aim is to eliminate any new seeds from forming, which leaves the FSRU with only the current seed bank. Our goal remains to contain and eradicate Tropical Spiderwort from the farming systems without the use of dangerous chemicals and without ruining decades of irreplaceable research. We are also examining possible methods to force the existing seed to germinate enabling us to remove the TSW even faster.

We were lucky with the equipment this year. Absolutely no GPS or data gathering problems were encountered. The mower, gator and 4-wheeler held up nicely, although the gator will need routine service before next spring. Naturally, as soon as I wrote this the tongue broke on the mower. I have been in the process of repairing this and as of this date, the mower is back in operation.

The following is a summary of survey, treatment outside of the FSRU fields at the Cherry Research Farm near Goldsboro, NC in 2010. It also includes a summary of the regulatory activities pertinent to management of the quarantine. The Final Report was written by Phil Wilson, NCDA&CS Plant Pest Specialist who is responsible for daily activities related to the quarantine, survey and treatment at the Cherry Research Farm:

NCDA&CS personnel provide occasional checks to the survey and treatment (hand pulling) work done by North Carolina State University and supplement NCSU's efforts when needed.

**Survey**

We were able to survey the farm overall every 3 to 4 weeks. This seemed to work well throughout the year. We located TSW in 2 locations outside of CEFS during our surveys. In July, we found 72 plants in field C4 next to the path. These plants were removed.

In September, we found about 30 plants in field C1. These plants were removed and the area was prepared for soil fumigation. Both of these locations appear to be reintroductions from equipment being used in the fields.

**Treatment**

In April, 2010, we fumigated approx. 0.5 acre in C4 where the seed test was conducted by NCSU.

The locations in C1 and C4 were fumigated in November, 2010. The C1 site was 1 acre and the C4 site was 2.1 acres. This completed all control that was needed outside the FSRU of CEFS.

**Quarantine Actions**

We fumigated various pieces of equipment in 2010. Those included peanut equipment going to another station, bushhogs, combines, planters, and cultivator equipment. Also approx. 250 soil samples, destined to the NCDA soil lab, were fumigated. During the year, we required more thorough inspection and cleaning of equipment after TSW detections were confirmed in fields C4 and C1.

During the year we continued to maintain sign in procedures for people entering the Cherry Research Farm and required washing of vehicles and other equipment also, with sign-in procedures, as vehicles and equipment were moved from field to field or off of the Research Farm.

A cattle enclosure was completed to house harvested forage that originated from previously infested fields. The enclosure has been used to quarantine livestock being fed by potentially contaminated feed with a 2 day holding period after cessation of feeding with potentially contaminated forage.

As required by the quarantine at both the Tidewater Research Station and the Cherry Research Farm, visitors were required to sign in before entering the stations to make sure they were aware of the quarantine and the need for precautions. Also, equipment operators were required to wash equipment after movement between fields and to sign in each time equipment was washed, including any vehicles which entered and subsequently exited the farm. Tables 3 and 4 summarize the number of registrations by month for entry to the stations and for washing.

**Table 3.** Summary of quarantine registrations at the Tidewater Research Station during 2010 by month.

<b>Month</b>	<b>Station Registrations</b>	<b>Central Wash</b>	<b>Portable Wash</b>	<b>Articles removed</b>
January	6	0	0	0
February	4	1	0	0
March	8	8	0	0
April	9	10	0	2
May	13	23	1	0
June	15	10	0	3
July	12	10	0	1
August	19	9	0	0
September	9	13	0	0
October	14	6	0	2
November	9	4	2	0
December	2	1	0	0
<b>Total</b>	<b>120</b>	<b>95</b>	<b>3</b>	<b>8</b>

**Table 4.** Summary of quarantine registrations at the Cherry Research Farm during 2010 by month.

<u>Month</u>	<u>Visitor Sign-Ins</u>	<u>Wash Stations Log</u>
January	34	26
February	143	28
March	338	114
April	236	273
May	392	306
June	357	419
July	515	270
August	214	288
September	204	252
October	447	245
November	223	92
December	23	15
Total Sign-Ins	3,126	2,328

Overall, 2010 was a successful year in survey and control work at Cherry Research Farm. We were able to keep Tropical Spiderwort confined to the Farm and no new TSW plants have been detected at the Tidewater Research Station.

#### **Aquatic Dealer Inspections**

Aquatic dealer inspections are completed each year by the Plant Protection Specialists. In 2010, 104 aquatic plant dealers were inspected in the following 24 counties. Fourteen of the aquatic dealers were now out of business in 2010, eleven were no longer selling aquatic plants, 52 showed no issues or concerns and 27 were recorded as having no change in status during 2010.

As part of the inspection process, the plant protection specialists also advised dealers to inform customers about the importance of not disposing of aquatic plants such as water hyacinth, parrot feather and water lettuce into outdoor water bodies.

## Accomplishments: Seed and Fertilizer Section

The mission of the Seed and Fertilizer Section is to improve the profitability and sustainability of agriculture in the state by ensuring the seed, fertilizer, lime, and other soil additives offered for sale in North Carolina meet prescribed standards and are properly labeled.

The mission of this section is accomplished by:

- Ensuring that all locations that offer seed, commercial fertilizers, agricultural liming materials, landplaster, and soil additives for sale in the state are registered.
- Implementing a sound regulatory compliance program by conducting inspections and sampling of seed and fertilizer offered for sale in the state.
- Implementing seed purity, germination, and other specialized laboratory tests in support of the seed regulatory and service programs.
- Implementing a joint federal/state administered biotechnology permitting and inspection program.
- Conducting the fertilizer bioassay and endophyte testing programs.
- Coordinating activities of the N.C. Seed Board such that complaints regarding the failure of agricultural or vegetable seed to produce or perform as labeled or warranted are heard and responses are provided.

The Seed and Fertilizer Section includes 25 staff members with responsibilities and accountability for administrative, field services and North Carolina Seed Lab functions of the unit. The total budget for the Seed and Fertilizer Program for 2010-11 was \$1,584,435 including a state appropriation of \$704,303 and receipts of \$880,132. Revenues included receipts from registrations fees and penalties issued for non-compliance. Each staff member is highly trained for the specialized work duties performed by this Section.

### Seed and Fertilizer Field Programs

For fiscal year 2010-11, Seed and Fertilizer Section staff provided a number of services critical to the producers and citizens of this state. Program staff were responsible for registering and issuing licenses for all locations that offered seed, commercial fertilizers, agricultural liming materials, landplaster, and soil additives for sale in the state. For this fiscal year, 4,500 Seed Dealer licenses were issued. Seed dealers include those locations that offer wholesale and retail seed for sale. For the period, 435 Fertilizer Licenses were issued. Fertilizer licenses must be obtained for those individuals or businesses manufacturing or distributing fertilizer in the state.

Seed and Fertilizer Field Staff are responsible for conducting inspections and sampling seed and fertilizer offered for sale in the state. The staff also implemented a regulatory program to ensure full compliance with laws and regulations. An overview of program accomplishments is provided to the right.

Seed and Fertilizer Field Staff also provided support to the N.C. Department of Transportation by sampling 289 seed lots to be utilized on highway projects. The lab tests performed on these seed lots detected several violations and as such remain a critical part of the program.

Commodity prices on all major crops were up in 2011 and this was reflected in additional tonnage being applied. Producers also took advantage of animal and poultry waste to provide nutrients to their crops rather than traditional fertilizers.

#### 2010-11 Seed and Fertilizer Program-Inspection and Regulatory Activities

**Number of Seed and Fertilizer Dealer Visits: 5,909**

#### Seed and Fertilizer Samples collected

**Official Seed Samples: 2,991 (44,394 lots)**

**Official Fertilizer/Lime Samples: 2,837 (30,757 lots)**

#### Regulatory Compliance Program

▫ **Seed Stop Sales Issued: 47**

▫ **Seed Stop Sales Issued and Resolved on Site: 794**

▫ **Seed Stop Sales (N.C. Seed Lab): 342**

▫ **Fertilizer Stop Sales Issued: 15**

▫ **Fertilizer Stop Sales Issued and Resolved on Site: 13**

North Carolina continues to experience consolidations with the fertilizer industry. Due to the late winter weather, spring shipments of fertilizer were slow. The late winter season was followed by dry weather permitting work to quickly proceed, providing for an abbreviated application season.

## **N.C. Seed Laboratory**

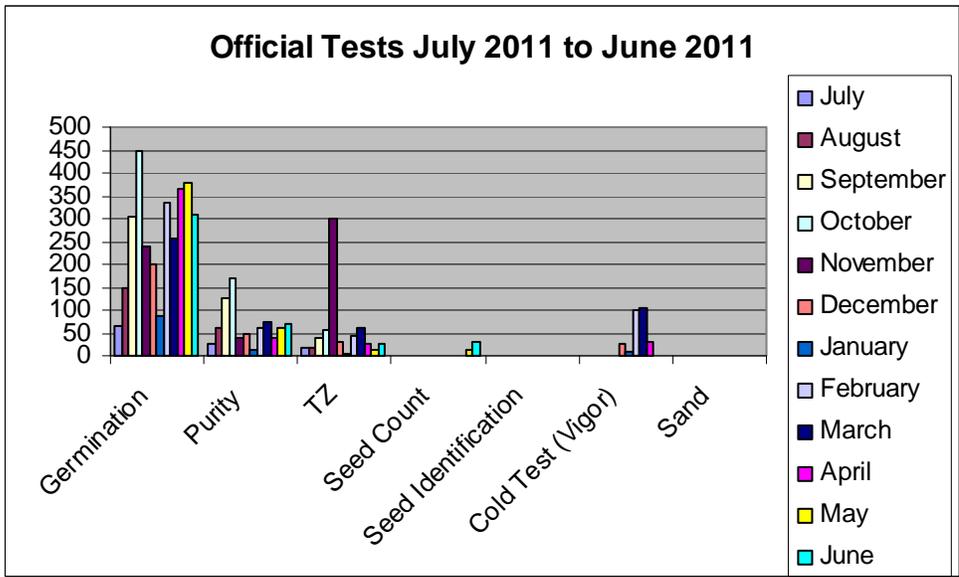
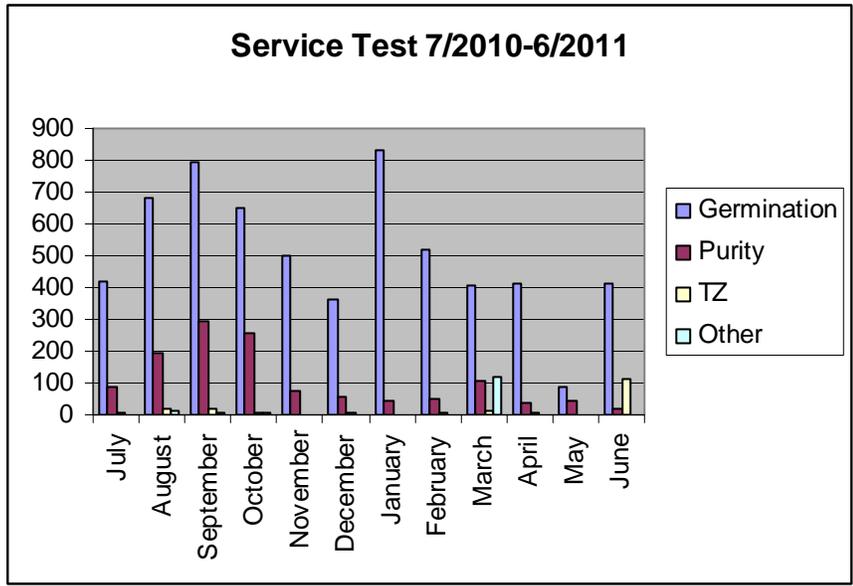
The North Carolina Seed Laboratory is responsible for providing laboratory support for both the regulatory and service areas including the state's seed dealers, producers, university researchers and consumers. The work of this laboratory provides critical seed testing data needed to make management decisions regarding seed stock and for labeling purposes. For 2010-11, the North Carolina Seed Laboratory conducted 4,287 regulatory seed tests and 7,140 service seed tests. These tests accounted for required testing involving purity and germination. Multiple tests are generally conducted on each of the samples submitted with 11,427 individual tests carried out. Additional special tests included tetrazolium, accelerated aging, cool test of cotton, cold test of hybrid corn, phenol, Round-up Ready™ tolerance, sand, and moisture testing. There were 1,315 special tests conducted during the fiscal year. The Seed and Fertilizer Section continued to implement the endophyte testing service. A number of grasses, including tall fescue and perennial ryegrass, contain a fungal endophyte which has a beneficial relationship with the grass host. The tall fescue endophyte, *Neotyphodium coenophialum* (previously *Acremonium coenophialum*), lives exclusively inside plants, and can only be detected through laboratory analysis. This endophyte has been proven to give the grass insect, disease and mammal resistance. Though very beneficial to tall fescue plants, this endophyte produces chemicals which are toxic to a variety of animals. In North Carolina, fescue toxicosis is especially a problem in horses and cattle. A total of 28 pasture samples were processed for producers.

Based on developing trends, seed dealers have shifted to labeling seed numbers per pound rather than pounds per bag. In response, the NC Seed Laboratory has conducted random seed count checks on soybeans. These random checks have noted the seed counts have only been out of tolerance in a few cases and these tolerances were to the favor of the producer. NCDA&CS is continuing to work with the National Institute of Standards and Technology to determine whether to accept the AOSA standards and tolerances.

The North Carolina Seed Laboratory and its staff remain active in the activities of the Association of Official Seed Analysts (AOSA) and the Association of American Seed Control Officials (AASCO). At the state level, program staff remain active in the N.C. Seedsmen's Association (NCSA) and the N.C. Crop Improvement Association (NCCIA). Staff attended the AOSA/SCST annual meeting in Williamsburg, VA. One of the outcomes from this meeting was the development of a collaborative effort between NCDA&CS and the VDACS' Seed Lab related to the peanut germination evaluation section of the *Seedling Evaluation Handbook*, a publication of the AOSA.

All Seed Analysts participated in a virtual germination referee exercise on soybean and corn seedlings. Additionally, the group was involved in a referee comparing the dormancy on cotton samples and another developing germination testing protocols for germination testing of partridge peas.

To accommodate the replacement of the Old Health Building HVAC system, the NC Seed Lab temporarily relocated to the NCDA&CS-Beneficial Insect Laboratory during the construction period.



### Joint Collaboration with USDA, Biotechnology Regulatory Services

Seed and Fertilizer Section Staff worked with USDA, Biotechnology and Regulatory Services (BRS) to jointly administer a federal/state biotechnology and permitting program. Primary responsibilities included reviewing permits and acknowledgements provided through USDA, Biotechnology and Regulatory Services (BRS) for laboratory, greenhouse, and field tests of genetically engineered crops. For this period, NCDA&CS' staff reviewed a total of 495 notifications and permits. A joint project with USDA-BRS continued during this period involving NCDA&CS staff with inspections of *Notification and Permit Release Sites*, including pharmaceutical/industrial trials. As a prerequisite for participation in the project, all field staff were required to participate in training focusing on work flow, confidential business information, and steps in effectively completing a field inspection.

### N.C. Seed Board

The scope of the N.C. Seed Board is to review complaints from individuals who may have suffered damage from the failure of agricultural or vegetable seed to perform as labeled or warranted, or as a result of negligence. Such performance issues related to seed purity, seed germination, varietal purity, lot number of other lot identification, percent weeds, inert material, other crop seed and test date. For this period, complaints raised were resolved prior to N.C. Seed Board consideration.

### N.C. Tobacco Variety Evaluation Program

The Tobacco Variety Evaluation Program continued in joint cooperation with N.C. State University. Samples from 41 flue-cured tobacco seed lots were obtained for planting grow-outs in the variety testing program. All seed lots tested were found truthfully labeled as to variety and recommended for sale by the committee.

### Fertilizer and Lime Sampling and Tonnage

Table2: Data of fertilizer samples analyzed for the current and previous fiscal years

<b>FERTILIZER SAMPLING AND TONNAGE</b>						
<u>Year</u>	<u>#Samples</u>	<u>#Compliant</u>	<u>%Compliant</u>	<u>Tonnage Reported</u>	<u>Tonnage Sampled</u>	<u>%Sampled</u>
2010-11	1,437	1,019	70.90	1,295,362	33,170	2.56
2009-10	1,651	1,141	69.11	1,251,026	26,539	2.12
2008-09	1,484	1,069	72.52	1,073,286	35,598	3.32
2007-08	2,507	2,186	87.20	1,477,235	70,326	4.76
2006-07	2,473	1,900	76.80	1,605,642	37,259	2.30
2005-06	2,448	1,816	74.10	1,511,419	37,253	2.46
2004-05	2,662	2,065	77.57	1,400,426	44,352	3.17
2003-04	2,773	2,019	72.81	1,591,225	50,458	3.17
2002-03	3,468	2,621	75.58	1,399,516	299,488	21.39

Table 2: Data of lime and landplaster samples analyzed for the current and previous fiscal years

<b>LIME SAMPLING AND TONNAGE</b>						
<u>Year</u>	<u>#Samples</u>	<u>#Compliant</u>	<u>%Compliant</u>	<u>Tonnage Reported</u>	<u>Tonnage Sampled</u>	<u>%Sampled</u>
2010-11	895	724	80.90	793,925	43,680	5.50
2009-10	729	611	83.81	640,106	35,793	5.59
2008-09	871	720	82.66	687,605	43,295	6.3
2007-08	439	268	61.04	620,469	84,124	13.56
2006-07	1,379	807	58.50	760,637	39,009	5.10
2005-06	1,021	805	78.80	914,990	48,200	5.27
2004-05	1,114	959	59.16	784,620	60,885	7.76
2003-04	719	613	85.26	787,186	31,793	4.04
2002-03	770	618	80.26	695,564	112,286	16.00