Vermont 2007 CAPS Final Report

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CAPS - Accomplishment Report

State: Vermont Year: 2007

Agency: Agriculture, Food and Markets

I. Core level funding activities

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B. Member name , if applicable, of National CAPS Committee:

C. *Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful.*
D. *If appropriate, explain why objectives were not met:* All objectives were met.
E. *Where appropriate, explain any cost overruns:* No cost overruns.
F. *State CAPS Committee narrative* – The Vermont CAPS Committee met on 16 April 2007 at the Vermont Agency of Agriculture, Food and Markets lab building in Waterbury, VT. Agenda items included an overview of 2007 survey activities and workplan overviews for 2008. Attendees included the following: Mark Michaelis, Andrea Rosin, Ann Hazelrigg, Scott Pfister, Trish Hanson, Ron Kelley, Timothy Schmalz, Ben Machin and Emilie Inoue.
G. *NAPIS database submissions:* Data has been submitted to NAPIS.

II. CAPS SURVEY ACTIVITY -PART I CORE SURVEYS

1) Nursery, Greenhouse and Garden Center Inspections

Priority Pests of the Nursery, Greenhouse and Garden Center:

- British yellowhead, *Inula Britannica*
- Southern Bacterial wilt, *Ralstonia solanacearum*
- Viburnum leaf beetle, *Pyrrhalta viburnum*
- Hemlock woolly adelgid, *Adelges tsugae*
- Asian long horn beetle, *Anoplophora glabripennis*
- Emerald ash borer, *Agrilus planipennis*
- Lily Leaf Beetle, *Lilioceris lilii*

A. Survey/Inspection Methodology (trapping protocol):

In 2007, there were 668 licensed nurseries, greenhouses and garden centers in the State of Vermont. Core survey activities focused on the presence/absence, biology, distribution and education of priority pests identified as having National, regional and state level significance. Nursery inspections included visual surveys for signs and symptoms associated with the following core survey pests:

Scientific Name	Common Name	Taxonomic Group	Major Hosts
Inula Britannica	British yellowhead	Plant	Hosta plants
Ralstonia solanacearum	Bacterial Wilt	Bacterium	Geranium, Tomato, potato, *Phaseolus* beans
Pyrrhalta viburni	Viburnum leaf beetle	Arthropod	Viburnum shrubs
Lilioceris lilii	Lily leaf beetle	Arthropod	Asiatic and oriental lilies
Adelges tsugae	Hemlock woolly adelgid	Arthropod	Hemlock trees
Anoplophora glabripennis	Asian long horn beetle	Arthropod	Hardwood trees
Agrilus planipennis	Emerald ash borer	Arthropod	Ash trees

A total of 422 nurseries, greenhouses and garden centers were inspected in 2007 (63% of the total number of licensed nurseries). These sites were selected based on data collected as part of the Vermont Agency of Agriculture, Food and Markets (VAAFM) annual nursery licensing program. Nurseries that are known to deal with large volumes of plant material each year were identified and listed as 'top priority' sites to inspect while nurseries dealing with much lower volumes of plant stock were included into the inspection schedule at random.

B. Rationale underlying survey methodology:

Nurseries have been identified as a significant pathway for the introduction of invasive species and can facilitate the artificial spread of many invasive species of concern. It is, therefore, critical to establish regular inspections and focus outreach activities within these environments. In addition to nursery inspections which focus on specific species of concern, the CAPS program publishes and distributes an annual

pest alert which identifies Vermont's top invasive species of concern and provides a brief description of each pest. In addition to the pest alert, the CAPS program also publishes pest specific brochures for species that have generated public concern (giant hogweed, viburnum leaf beetle and lily leaf beetle).

C. **Survey dates:**

The State plant pathologist, CAPS coordinator and one seasonal technician inspected nurseries, greenhouses and garden centers from March through October 2007.

D. **Taxonomic services:**

Suspect samples collected in the field during nursery inspections were initially screened by Agency of Agriculture staff (state entomologist, state plant pathologist, SSC), state Forest Protection staff (entomologist, plant pathologist) and/or by the pest and plant diagnostic labs at the University of Vermont. Additional identification and taxonomic services were provided by USDA APHIS PPQ identifiers.

E. **Benefits and results of survey:**

Three inspectors were able to visit four hundred and twenty two (422) nurseries, greenhouses and garden centers distributed throughout all 14 of Vermont's counties (Table 1, Figure 1).

Field inspectors visiting nurseries, greenhouses and garden centers identified host species of target pests at each of the 422 nurseries inspected. Data specific to each nursery were collected in the field and were later inputted into the state nursery database. Inspectors were able to conduct outreach regarding pests of significance by distributing pest alerts and brochures. One-on-one discussions with nursery owners, nursery managers and staff enabled inspectors to accurately disseminate information regarding pests of concern.

- British yellowhead, *Inula britannica*: British yellowhead is native to Europe and Asia. This aggressive weed was first noticed in several nurseries in Michigan around 1990. It has been found primarily with hostas imported from the Netherlands.

  In 2007, data collected during the nursery inspection season indicated that approximately 26% (110) of nurseries inspected sold hosta plants (Table 2). No signs or symptoms suggesting the presence of British yellowhead were detected during inspections conducted in 2007. All data has been entered into NAPIS.

- Southern bacterial wilt, *Ralstonia solanacearum* race 3 biovar 2: A bacterial pathogen that causes a wilt disease in several important ornamental and agricultural crops. *Ralstonia* is present in Europe, Asia, South and Central America and Australia. This pathogen was detected in a neighboring state (NH) in early 2003 in greenhouses that received imported geranium plants, and was subsequently eradicated.

In 2007, data collected during the nursery inspection season indicated that approximately 38% (160) of nurseries inspected sold geraniums (Table 2). No signs or symptoms suggesting the presence of Southern bacterial wilt were detected during inspections conducted in 2007. All data has been entered into NAPIS.

- Viburnum leaf beetle, *Pyrrhalta viburni*: Viburnum leaf beetle is an invasive, non-native beetle that first appeared in Vermont in 2000 and has steadily spread throughout the state. The beetle, first found in North America in 1947 in the Niagara Peninsula of Ontario, Canada, was discovered in New York State in northern Cayuga County in July 1996. The native range of this pest includes most of Europe. It is a voracious eater that can defoliate viburnum shrubs entirely. Plants may die after two or three years of heavy infestation. This insect is considered to be distributed throughout Vermont. Continued surveys for this pest over the years have determined that nurseries throughout Vermont are being affected by this pest each year. Despite the fact that viburnums have traditionally been considered a 'bread and butter' stock in Vermont nurseries the continued spread of VLB has forced many nurseries to turn away from growing/selling viburnum shrubs.

  Nursery inspections conducted in 2007 documented the presence of this insect at 23 different nurseries in 11 counties (Table 3). It was determined from data collected that approximately 43% of the 53 nurseries selling viburnum stock experienced defoliation caused by VLB (Table 2). Outreach activity included the publication of a brochure specific to the viburnum leaf beetle. Brochures were distributed to nurseries as well as to members of the public who requested material on this insect. All data has been entered into NAPIS

- Lily leaf beetle, *Lilioceris lilii*: The lily leaf beetle is an invasive, non-native beetle that first appeared in Vermont sometime in early 2000. This beetle attacks true lilies and *Fritillaria* species but has also been reported feeding on Solomon's seal, bittersweet, potato hollyhock and various Hosta species. Adult beetles are strong fliers which may facilitate their distribution statewide. Beetles and larvae are also dispersed on host plants. This insect is considered to be distributed throughout Vermont.

  Nursery inspections conducted in 2007 documented the presence of this insect in 24 nurseries located in 9 different counties (Table 4). It was determined from data collected that approximately 20% of the 123 nurseries selling Asiatic/oriental lilies experienced damage caused by LLB. This pest, like the viburnum leaf beetle, has steadily spread throughout Vermont. Brochures were distributed to nurseries as well as to members of the public who requested material on this pest. All data has been entered into NAPIS.

- Hemlock woolly adelgid, *Adelges tsugae*: The hemlock woolly adelgid (HWA) is native to Asia. It is a serious pest of eastern hemlock and Carolina hemlock. In the eastern US, it is present from the Smoky Mountains, north to the mid-Hudson

River Valley and southern New England. The pest sucks sap from the young twigs, depriving the needles and causing them to turn a grayish green.

Following the detection of a low level infestation of hemlock woolly adelgid at a wholesale nursery in central Vermont in 2004, the Agency of Agriculture and the Vermont Department of Forests, Parks and Recreation amended the joint state quarantine rules for hemlock woolly adelgid. The emergency rule became effective on February 18th, 2005 and was subsequently passed by state congress to law on June 30th, 2005. Pursuant to the amendment, importation of hemlocks seedlings and nursery stock into Vermont from areas of the United States that are infested with hemlock woolly adelgid is prohibited. Hemlock seedlings and nursery stock that are imported from non-infested areas of the United States are required to be accompanied by a copy of the State Phytosanitary Certificate of Origin (within 3 days of issuance) signed by a plant regulatory official. Hemlock seedlings and nursery stock may not be sold or further distributed unless a written release is issued by the Vermont Agency of Agriculture.

In 2007 hemlock woolly adelgid was detected on hemlock trees located in Windham County. One private property which was found to have several mature hemlocks infested with HWA was located in Rockingham and four infested properties were also identified in Brattleboro. The Agency of Agriculture in cooperation with the Agency of Natural Resources implemented an eradication strategy in all 5 locations. Currently, hemlock woolly adelgid is considered to be eradicated in Windham county.

- Asian long horn beetle, *Anoplophora glabripennis*: The Asian long horn beetle (ALB) is native to China and Korea. The beetle was introduced into New York City (1996), Chicago (1998) and New Jersey (2002 and 2004) and is a serious pest of many hardwood trees, such as maple, elm and ash. The beetle has the potential to damage such industries as lumber, maple syrup, nursery, and tourism accumulating over $41 billion in losses.

  In 2007, data collected during the nursery inspection season indicated that approximately 24% of nurseries inspected sold host material for this pest (Table 2). No signs or symptoms suggesting the presence of ALB were detected during inspections conducted in 2007. All data has been entered into NAPIS

- Emerald ash borer, *Agrilus planipennis*: The emerald ash borer (EAB) is native to China, Korea, Japan and other Asian countries. In the summer of 2002, this insect was discovered in Detroit, MI. More recent infestations have been detected in Indiana, Illinois, Maryland, Ohio and Pennsylvania and Ontario, Canada. The larvae can be found beneath the bark of ash trees, in tunnels, from June though the fall. All species of ash appear to be susceptible.

  In 2007, data collected during the nursery inspection season indicated that approximately 5% of nurseries inspected sold ash trees (Table 2). No signs or symptoms suggesting the presence of EAB were detected during inspections conducted in 2007. Outreach materials were distributed upon request from the general public, at trade shows, through environmental groups and handed out during inspections. All data has been entered into NAPIS.

F. **Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful**: Nursery inspections are a significant component of Vermont's core CAPS survey activities. In 2007, 422 nurseries (66% of all licensed Vermont nurseries) were inspected for CAPS target pests. The number of actual nurseries inspected during the 2007 field season exceeded the required number of inspected nurseries outlined in the CAPS work plan.

G. **If appropriate, explain why objectives were not met***: All objectives were met.

H. **Where appropriate, explain any cost overruns***: N/A

I. **NAPIS database submissions**: All NAPIS data entries were submitted by December 31st, 2007.

*indicates information required per 7 CFR 3016.40 and 7 CFR 3019.51

2) Hotzone/Exotic Bark Beetle Survey (Pathway Analysis)

A. **Survey/Inspection Methodology (trapping protocol):**

The 2007 Hotzone survey was the 3rd consecutive year that the project has taken place in Vermont. Having identified 18 'high risk' pathways for 2007 trapping efforts, state and federal agents deployed traps at these sites in April, 2007.

Lindgren funnel traps were used at all locations and several different pheromone lures were used as 'bait' for target insects. The lures utilized in this survey included Ultra High Release ethanol, Alpha-Pinene and a triple bait specifically targeting exotic bark beetles (Table 5). Traps were placed in close proximity of target businesses and trap contents were serviced and screened once every two weeks.

B. **Rationale underlying survey methodology:**

The Hot Zone Program was developed by USDA APHIS PPQ, to provide a national focus on early detection and eradication of exotic pests through targeting of the introduction pathways and potential pest establishment zones. This concept draws from a number of recommendations in the Safeguarding Review and combines them into a risk-based program that crosses the whole safeguarding continuum. Using this concept allows state and federal agencies to integrate risk information from various databases and other sources (e.g., emergency action notifications, Global Pest and Disease Database) to target areas that might be susceptible to pest introductions. This can help us evaluate domestic program activities and implement sound pest detection strategies. It can also help focus our efforts for rapid response by identifying locations where risk material might be entering the state.

This was our third year incorporating these concepts into our pest detection and pathway analysis efforts. The mission is to enhance the ability of state CAPS programs to identify and set up survey traps at target high risk areas and sentinel sites

within the U.S. that have the highest potential for exotic pest introduction and to develop appropriate pest detection protocols. These efforts were done in collaboration with USDA APHIS PPQ- State Plant Health Director, Domestic Program Coordinator and Plant Health Safeguarding Specialist.

This survey was conducted (1) to determine the presence and distribution of the target species, (2) to monitor the advent of new exotic species over time, (3) to track patterns of infestation throughout the U.S. and possible pathways for introduction, (4) to identify the characteristics of high risk habitats or sites, and (5) to identify the presence of other potential forest pests in survey areas.

C. **Survey dates:**

Traps were deployed in April, 2007 and the survey period extended through mid-October, 2007.

D. **Taxonomic services:**

Trap contents were pre-screened by Agency of Agriculture and USDA APHIS PPQ staff. Sorted and screened material was sent to John Crowe of USDA APHIS PPQ in Maine for further screening and identification.

E. **Benefits and results of survey:**

The VAAFM and USDA APHIS PPQ set traps at 18 locations throughout Vermont (Figure 2, Figure 3). All target areas were in close proximity to businesses that are known to import foreign products. Foreign commodities originated from the following countries: China, Canada, Germany, Italy, India, Japan, Taiwan, Mexico, the European Union, Australia, Peru, Spain and Brazil. The frequency of imports ranged from once or twice a year to weekly.

The Hotzone Program continues to help us to forge relationships with businesses in Vermont that deal with importing foreign commodities. Business owners and staff continued to be supportive and intrigued with the Hotzone survey as in the last two years. We have enhanced our outreach efforts by educating these businesses about exotic species that are of great to concern to Vermont and increased our 'eyes' on the ground. We know that the target insects we were surveying for currently are not known to occur in Vermont and therefore we have baseline data that we can build upon in future years. The results of this project will help protect the export markets and safeguard agricultural production.

In 2007, with the taxonomic support provided by Plant Survey Specialist, John Crowe, a list of identified bark beetles and other specimens trapped during the Hotzone survey was generated (Table 6). The continued identification of specimens caught in hotzone traps provides us with current data regarding the occurrence of different species of bark beetles and other insects in the state.

F. **Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful**: N/A

G. **If appropriate, explain why objectives were not met*:** All objectives were met.

H. **Where appropriate, explain any cost overruns***: There were no cost overruns

I. **NAPIS database submissions**: All NAPIS data entries were submitted by December 31st, 2007.

*indicates information required per 7 CFR 3016.40 and 7 CFR 3019.51

3.) Swede Midge Survey

A. **Survey/Inspection Methodology (trapping protocol):**

Survey for Swede Midge occured in 5 counties; Chittenden, Grand Isle, Franklin, Addison, and Washington (Figure 4). 10 delta, sticky traps distributed across 5 sites were baited with lures developed by Dr. Robert Baur of the Swiss Federal Research Station for Horticulture, Wädenswil, Switzerland and provided to us through the CAPS regional office. Traps were placed along rows of Cruciferus crops, primarily broccoli. Trap cards were changed every 2 weeks and lures were changed according to protocol. Trap contents were screened using a microscope back at the Agency of Agriculture laboratory. Suspect specimens were sent to Leon Praetorius in Puerto Rico for further identification.

B. **Rationale underlying survey methodology:**

Swede midge has been a pest throughout Europe for decades. SM appears to feed only on plants in the family Cruciferae such as broccoli, cauliflower, cabbage, brussels sprouts, etc. It has also been reported on ornamentals and common weed species such as pennycress and shepherd's purse. Wild crucifers provide a possible reservoir of the pest and bridge across uncropped areas, but their role in the spread and dynamics of swede midge populations has not been established. Recent detections of Swede Midge in New York state indicates that the pest is spreading eastwards towards Vermont and the continued survey of Swede Midge ensures that accurate pest distribution is established.

Swede midge injury is difficult to diagnose because similar symptoms can be caused by several other factors such as mechanical injury from cultivation, insect (i.e. flea beetles, aphids) and animal feeding, nutrient deficiency, hormonal herbicide injury, genetic variation of the plant, and heat or cold stress. During feeding, larvae produce a secretion that breaks down the plant surface and liquefies the contents of the cell. Their feeding results in changes in the physiology of the plant resulting in: swollen petioles and flower buds; blind heads (the head does not form); brown corky scaring at the growing point, leaf petioles, and flower stalks; crinkled, puckered, crumpled and distorted leaves; multiple heads and/or stems, and secondary soft rot. Damage is more severe in plants that are infested at an early growth stage by many larvae. There are differences in plant susceptibility to swede midge infestation among plant types within the Cruciferae family. Broccoli and cauliflower are among the most susceptible followed by Chinese cabbage, brussels sprouts, and others. Early in the season, damage symptoms first appear along field edges, especially near sheltered areas such as tree lines and hedgerows.

Vermont has a diverse agricultural history. Fifteen percent of the total land area is devoted to agricultural use. In 2002, agricultural products accounted for a total of $556 million dollars to the cash economy; this includes a variety of fruits, vegetables and berries which accounts for $23 million dollars annually. Much of this produce is sold directly to the general public, stores and restaurants.

C. **Survey dates:**

Traps were deployed in mid July, 2007 and the survey period extended through August, 2007.

D. **Taxonomic services:**

The CAPS Coordinator pre-screened traps using a dissecting microscope. Samples were processed using morphological keys provided by Dr. Tony Shelton with the NYS Agriculture Experiment Station at Cornell University. Several trap contents that looked suspicious were forwarded to Leon Praetorius in Puerto Rico for more expert identification.

E. **Benefits and results of survey:**

Sufficient data on species and their distribution is extremely important. It is essential to the survey and detection activities of the CAPS program in Vermont to monitor the presence and/or absence of recognized target pests statewide. Data collected in these efforts will provide USDA APHIS PPQ with accurate records relating to the distribution of non-native species in the state as well as support the infrastructure established to protect agricultural resources critical to the state and national food supply.

A total of 30 trap bottoms were screened for swede midge. Swede midge was detected during the screening process in one Vermont county, and data was entered into NAPIS indicating that the positive sample was the first state record of the pest. The detection was found in Chittenden County and the pest was not detected in any of the other four surrounding counties. Managers of the farm operation were alerted to the find and information regarding management was provided. The fact that Swede Midge had been detected in Vermont was printed in the local agricultural newspaper and in a press release distributed by the Vermont Agency of Agriculture, Food and Markets.

F. **Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful**: N/A

G. **If appropriate, explain why objectives were not met*:** All objectives were met.

H. **Where appropriate, explain any cost overruns***: There were no cost overruns

I. **NAPIS database submissions**: All NAPIS data entries were submitted by December 31st, 2007.

*indicates information required per 7 CFR 3016.40 and 7 CFR 3019.51

4.) Leek Moth Survey

A. **Survey/Inspection Methodology (trapping protocol):**

Survey for Swede Midge occured in 5 counties; Chittenden, Grand Isle, Franklin, Addison, and Washington (Figure 4). 10 delta sticky traps distributed across 5 sites were baited with lures specifically designed to attract leek moths. The lures were provided to us through the CAPS regional office. Traps were placed along rows of leeks or onions (known hosts). Trap cards were changed every 2 weeks and lures were changed according to protocol. Trap contents were screened using a microscope back at the Agency of Agriculture laboratory.

B. **Rationale underlying survey methodology:**

The leek moth (*Acrolepiopsis assectella*) larva is specialized to feed on the leaves of various plants belonging to the genus Allium. In Asia and the U.K the Leek Moth is considered a minor pest. However, in continental Europe it has caused considerable damage, particularly to leeks. It was first detected in Canada in 1993 in the National Capital Region (Ottawa-Hull) where a local population is now established. Given the fact that detections of leek moth have occurred within North America the survey of this pest in Vermont and other states ensures that accurate pest distribution is established.

Leek is the preferred host of the pest, though other *Allium* crops can be attacked. The larvae will tunnel mines in the leaf tissue, sometimes causing distortion, and are reported to occasionally attack the bulb and stems. In garlic, the larvae will also attack the scape. Damage to the leaves of leek can make them unmarketable and damage to garlic cloves may predispose them to secondary bacterial or fungal diseases. Symptoms include mining and perforations. On leek, larvae prefer to feed on the youngest leaves, but can consume leaves more than two months old. They bore through the folded leaves towards the centre of the plant, causing a series of pinholes on the inner leaves. Larval mines in the central leaves become longitudinal grooves in the mature plant. On onion, they feed inside the hollow leaves, forming "windows" on the plant surface. Occasionally, larvae attack reproductive parts of the host plant but usually avoid the flowers, which contain a saponin compound that inhibits the growth of the insect. Feeding at the base of the flower stalk may cause it to break off. Damage is reported as being more prevalent near field perimeters. In eastern Ontario, there have been reports of damage from a limited number of organic producers.

Vermont has a diverse agricultural history. Fifteen percent of the total land area is devoted to agricultural use. In 2002, agricultural products accounted for a total of $556 million dollars to the cash economy; this includes a variety of fruits, vegetables and berries which accounts for $23 million dollars annually. Much of this produce is sold directly to the general public, stores and restaurants.

C. **Survey dates:**

Traps were deployed in mid July, 2007 and the survey period extended through August, 2007.

D. **Taxonomic services:**

The traps were screened by the SSC and the State Entomologist using a dissecting microscope. No suspect specimens were found.

E. **Benefits and results of survey:**

Sufficient data on species and their distribution is extremely important. It is essential to the survey and detection activities of the CAPS program in Vermont to monitor the presence and/or absence of recognized target pests statewide. Data collected in these efforts will provide USDA APHIS PPQ with accurate records relating to the distribution of non-native species in the state as well as support the infrastructure established to protect agricultural resources critical to the state and national food supply.

F. **Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful**: N/A

G. **If appropriate, explain why objectives were not met*:** All objectives were met.

H. **Where appropriate, explain any cost overruns***: There were no cost overruns

I. **NAPIS database submissions**: All NAPIS data entries were submitted by December 31st, 2007.

*indicates information required per 7 CFR 3016.40 and 7 CFR 3019.51

5.) Silver Y Moth Survey

A. **Survey/Inspection Methodology (trapping protocol):**

Survey for the silver Y moth occurred in 5 counties; Chittenden, Grand Isle, Franklin, Addison, and Washington (Figure 4). 10 delta sticky traps distributed across 5 sites were baited with lures specifically designed to attract silver Y moth. Traps were strategically placed along rows of known host species (lettuce, Cruciferae crops). The lures were provided to us through the CAPS regional office. Trap cards were changed every 2 weeks and lures were changed according to protocol. Trap contents were screened using a microscope back at the Agency of Agriculture laboratory.

B. **Rationale underlying survey methodology:**

The silver Y moth (*Autographa gamma)* is a polyphagous pest in much of Europe, Asia, and northern Africa. The likelihood and consequences of establishment by *A. gamma* have been evaluated in a pathway-initiated risk assessment conducted by the department of entomology from the University of Minnesota, published 2003. *Autographa gamma* was considered highly likely of becoming established in the US if introduced; the consequences of its establishment for US agricultural and natural ecosystems were also rated high (i.e., severe). This pest feeds on more than 200 plant species.

Autographa gamma is a pest of economic importance whose outbreaks damage many vegetable, flower, and greenhouse crops in Europe. On all hosts, mature larvae cause the most damage. Feeding damage includes skeletonizing, or feeding on the leaf epidermis, as well as on the petiole (leaf stalk), leaving a cut leaf appearance. First and second instar larvae feed on the leaf surface while third instar larvae will eat through the entire leaf.

Vermont has a diverse agricultural history. Fifteen percent of the total land area is devoted to agricultural use. In 2002, agricultural products accounted for a total of $556 million dollars to the cash economy; this includes a variety of fruits, vegetables and berries which accounts for $23 million dollars annually. Much of this produce is sold directly to the general public, stores and restaurants.

C. **Survey dates:**

Traps were deployed in mid July, 2007 and the survey period extended through August, 2007.

D. **Taxonomic services:**

The traps were screened by the SSC and the State Entomologist using a dissecting microscope. No suspect specimens were found.

E. **Benefits and results of survey:**

Sufficient data on species and their distribution is extremely important. It is essential to the survey and detection activities of the CAPS program in Vermont to monitor the presence and/or absence of recognized target pests statewide. Data collected in these efforts will provide USDA APHIS PPQ with accurate records relating to the distribution of non-native species in the state as well as support the infrastructure established to protect agricultural resources critical to the state and national food supply.

F. **Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful**: N/A

G. **If appropriate, explain why objectives were not met*:** All objectives were met.

H. **Where appropriate, explain any cost overruns***: There were no cost overruns

I. **NAPIS database submissions**: All NAPIS data entries were submitted by December 31st, 2007.

*indicates information required per 7 CFR 3016.40 and 7 CFR 3019.51

6.) Soybean Commodity Survey

A. **Survey/Inspection Methodology (trapping protocol):**

Two soybean pests were surveyed for in Vermont during the 2007 survey season. Visual inspection of 8 soybean fields in four western Vermont counties took place in late July and early August. Visual inspections were conducted by walking in a soybean field in a systematic manner which maximized the number of inspected plants and provided a good representation of the entire field. Suspect specimens were collected in vials filled with ethanol and identified back in the lab.

B. **Rationale underlying survey methodology:**

The soybean aphid (*Aphis glycines*) is a native pest of soybean in eastern Asia. The pest was first detected in the United States in July, 2000. The origin of soybean aphids invading the U.S. has not been conclusively determined. Suspected to have been introduced into North America from Asia as early as 1995, these small sap-sucking insects have caused significant yield loss in soybean crops in the United States and in Canada. Aphids have a tube-like mouthpart that sucks juices and nutrients from the plant. Plants may yellow and become stunted, reducing pod and seed production if aphid populations become extremely high. Aphids secrete large amounts of honeydew. This sticky honeydew, in the absence of rain, collects on the surface of the leaves and acts as a substrate for sooty mold to develop on the plant.

The soybean pod borer, Maruca vitrata, is found over much of the tropics, including: Africa, Hawaii, India and Taiwan. The moth is also present in Australia. The caterpillars of this species are a considerable agricultural pest in infested areas, feeding inside the developing seedpods of various members of the Fabaceae family. Unlike the soybean aphid, the soybean pod borer has not been detected in the United States.

Vermont has a diverse agricultural history. Fifteen percent of the total land area is devoted to agricultural use. In 2002, agricultural products accounted for a total of $556 million dollars to the cash economy; this includes a variety of fruits, vegetables and berries which accounts for $23 million dollars annually. Much of this produce is sold directly to the general public, stores and restaurants.

C. **Survey dates:**

Visual surveys were conducted in late July-August.

D. **Taxonomic services:**

The CAPS Coordinator collected samples of any suspicious looking insects during the visual inspection. Specimens were collected and placed in ethanol and brought

back to the lab where the collected insects were studied under a light microscope and identified by the State entomologist..

E. **Benefits and results of survey:**

Sufficient data on species and their distribution is extremely important. It is essential to the survey and detection activities of the CAPS program in Vermont to monitor the presence and/or absence of recognized target pests statewide. Data collected in these efforts will provide USDA APHIS PPQ with accurate records relating to the distribution of non-native species in the state as well as support the infrastructure established to protect agricultural resources critical to the state and national food supply.

Soybean aphid has been detected in the past several years in Vermont. In 2007, the pest was detected once again in the northwest counties of the state. 100% of the organic soybean fields that were inspected were positive for the pest. Farmers were alerted and they were able to contact UVM extension for assistance in managing the pest.

The soybean pod borer has not been detected in the United States to date. Although the visual inspection was early in the soybean season, at the time of inspection there were no signs or symptoms indicating that the soybean pod borer was present in the inspected fields.

F. **Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful**: N/A

G. **If appropriate, explain why objectives were not met*:** All objectives were met.

H. **Where appropriate, explain any cost overruns***: There were no cost overruns

I. **NAPIS database submissions**: All NAPIS data entries were submitted by December 31st, 2007.

*indicates information required per 7 CFR 3016.40 and 7 CFR 3019.51

4.) Outreach Activities

Education and communication are an integral part of Vermont's pest detection program. Our principal goal is to enhance our communication network to garner support for our survey and detection programs. Through presentations, workshops, trade shows and pest specific literature the CAPS program works to communicate risks associated with invasive and exotic species to a statewide audience.

Presentations

- Vermont Farm Show, January 23-25, 2007

Exhibited CAPS information and distributed informational pest alerts to the general public. Answered questions regarding exotic species.

- Vermont Flower Show, March 9-11, 2007

  Exhibited CAPS information and distributed informational pest alerts to the general public. Answered questions regarding exotic species.

- Shelburne Farms Harvest Festival, September 15, 2007

  Exhibited CAPS information and distributed informational pest alerts to the general public. Answered questions regarding exotic species.

- Vermont Student Assistance Corporation, November 14, 2007

  Exhibited CAPS information and distributed informational pest alerts to the general public. Answered questions regarding exotic species.

Training and Professional Development

- Northern New England Joint CAPS and Forestry Pest Survey Meeting, Portsmouth, NH March 11, 2007.
- Eastern Plant Board Annual Meeting, Jackson, NH, April 2-5, 2007

- **Pest Alerts and Publications**
- Brochures and Posters on Identification and Management
  - Emerald ash borer (poster)
  - Lily leaf beetle
  - Viburnum leaf beetle
- Pest Alerts
  - Nursery pest alerts
  - Fruit and Vegetable pest alerts
  - Forest and Urban Community pest alerts

5.) State Pest List

The SSC in cooperation with Vermont's CAPS committee selected from the Homeland Security, National, and Regional pest lists the exotic plant pests that are most appropriate to Vermont's agricultural landscape and their environmental conditions. Vermont's pest survey list is coordinated and prioritized with other neighboring states in the region and across the nation. Survey plans are developed, and surveys conducted, based upon this pest list. The priority pest list evolves in relation to pest risk and pathway analysis (Table 7).

Table 1-The total number of nursery's inspected in each Vermont County, 2007

County Name	Number of Nurseries Inspected
Addison	35
Bennington	26
Caledonia	25
Chittenden	69
Essex	1
Franklin	23
Grand Isle	8
Lamoille	31
Orange	23
Orleans	25
Rutland	44
Washington	51
Windham	33
Windsor	28
Total	**422**

Table 2-Number of nurseries inspected selling target pest hosts and number of nurseries with positive ID of specified surveyed pest, 2007

Type of Host Sold	Affiliated Pest/Disease of Concern	Number of Sites Inspected Selling Host	Number of Nurseries with Positive Sample
Ash	Emerald ash borer	19	0
Hardwood Trees	Asian long horn beetle	100	0
Geraniums	Bacterial wilt	160	0
Asiatic/Oriental lilies	Lily leaf beetle	123	24
Viburnums	Viburnum leaf beetle	53	23
Hostas	British yellowhead	110	0

Table 3- Nurseries inspected in 2007 found to have viburnum leaf beetle

Nurseries inspected in 2007 that have Viburnum leaf beetle	
Nursery ID #	**County**
1213	Addison
713	Caledonia
1183	Chittenden
778	Chittenden
837	Chittenden
459	Franklin
388	Grand Isle
294	Lamoille
546	Lamoille
437	Lamoille
1366	Lamoille
527	Orange
658	Orleans
651	Rutland
1386	Rutland
1436	Rutland
Unregistered	Rutland
1005	Rutland
723	Rutland
704	Rutland
1177	Washington
184	Washington
1004	Windham
Total # Nurseries	**23**
Total # Counties	**11**

Table 4- Nurseries inspected in 2007 found to have lily leaf beetle

Nurseries inspected in 2007 that have Lily leaf beetle	
Nursery ID #	**County**
Nursery #	**County**
240	Addison
713	Caledonia
574	Caledonia
1183	Chittenden
797	Chittenden
1300	Franklin
1088	Lamoille
352	Lamoille
936	Lamoille
1211	Lamoille
1346	Lamoille
1102	Lamoille
203	Orange
363	Orange
527	Orange
842	Orleans
1322	Windham
330	Windham
665	Windham
963	Windham
770	Windsor
777	Windsor
1394	Windsor
1004	Windsor
Total # Nurseries	**24**
Total # Counties	**9**

Table 5- List of exotic woodboring insect target species surveyed for in 2007.

SCIENTIFIC NAME	COMMON NAME
Agrilus planipennis (Fairmaire)	Emerald ash borer
Anoplophora chinensis (Forster) (= *Anoplophora malasiaca* Thompson)	Rough shouldered longhorned beetle, Citrus longhorned beetle
Anoplophora glabripennis (Motchulsky)	Asian longhorned beetle
Callidiellum rufipenne (Motchulsky)	Lesser Japanese cedar longhorned beetle
Chlorophorous annularis (Fabricius)	Bamboo longhorned beetle/tiger bamboo longhorned beetle
Hesperophanes (Trichoferus) campestris (Faldermann)	Chinese longhorned beetle
Hylurgops (Hylurgus) palliatus (Gyllenhal)	No common English name; (German common name, "Bastkaefer")
Hylurgus ligniperda (Fabricius)	Red-haired bark beetle, golden-haired beetle
Ips sexdentatus (Boerner)	Six-toothed bark beetle
Ips typographus (Linneaus)	European spruce bark beetle
Monochamus alternatus (Hope)	Japanese pine sawyer
Orthotomicus erosus	Mediterranean Pine Engraver Beetle
Pityogenes chalcographus (Linnaeus)	Spruce engraver
Tetropium castaneum (Linnaeus)	No common English name
Tetropium fuscum (Fabricius)	Brown spruce longhorned beetle
Tomicus minor (Hartig)	Lesser pine shoot beetle
Trypodendron domesticus (Linnaeus)	No common English name, (German common name, "Borkenkaefer")
Xyloborus spp.	
Xylotrechus spp.	

Table 6: 2007 Hotzone Trap Specimen Identification

Site Number	State	Family	Genus	Species	Collection Date	Count	Processing Date	Screener
VT101	VT	Scolytidae	Dryocoetes	sp.	07-Jun-07	1	03-Jul-07	John Crowe
VT101	VT	Scolytidae	Hylastes	sp.	07-Jun-07	1	03-Jul-07	John Crowe
VT105	VT	Scolytidae	Carphoborus	sp.	07-Jun-07	1	03-Jul-07	John Crowe
VT105	VT	Scolytidae	Dryocoetes	sp.	07-Jun-07	1	03-Jul-07	John Crowe
VT105	VT	Scolytidae	Xyleborus	sayi	07-Jun-07	1	03-Jul-07	John Crowe
VT106	VT	Scolytidae	Gnathotrichus	materiarius	07-Jun-07	2	29-Jun-07	John Crowe
VT106	VT	Scolytidae	Ips	grandicollis	07-Jun-07	1	29-Jun-07	John Crowe
VT106	VT	Scolytidae	Orthotomicus	caelatus	07-Jun-07	8	29-Jun-07	John Crowe
VT108	VT	Curcu.	Unknown	sp.	07-Jun-07	1	03-Jul-07	John Crowe
VT108	VT	Scolytidae	Carphoborus	sp.	07-Jun-07	2	03-Jul-07	John Crowe
VT108	VT	Scolytidae	Dendroctonus	sp.	07-Jun-07	3	03-Jul-07	John Crowe
VT108	VT	Scolytidae	Gnathotrichus	materiarius	07-Jun-07	2	03-Jul-07	John Crowe
VT108	VT	Scolytidae	Hylastes	sp.	07-Jun-07	3	03-Jul-07	John Crowe
VT108	VT	Scolytidae	Hylurgops	rufipennis	07-Jun-07	2	03-Jul-07	John Crowe
VT108	VT	Scolytidae	Ips	grandicollis	07-Jun-07	1	03-Jul-07	John Crowe
VT108	VT	Scolytidae	Xyleborinus	alni	07-Jun-07	3	03-Jul-07	John Crowe
VT108	VT	Scolytidae	Xyleborus	obesus	07-Jun-07	2	03-Jul-07	John Crowe
VT109	VT	Scolytidae	Dryocoetes	sp.	07-Jun-07	1	03-Jul-07	John Crowe
VT109	VT	Scolytidae	Gnathotrichus	materiarius	07-Jun-07	7	03-Jul-07	John Crowe
VT109	VT	Scolytidae	Orthotomicus	caelatus	07-Jun-07	2	10-Jul-07	Bob Brown
VT109	VT	Scolytidae	Orthotomicus	caelatus	07-Jun-07	185	03-Jul-07	John Crowe
VT109	VT	Scolytidae	Pityogenes	hopkinsi	07-Jun-07	2	10-Jul-07	Bob Brown
VT110	VT	Scolytidae	Ips	grandicollis	07-Jun-07	3	03-Jul-07	John Crowe
VT110	VT	Scolytidae	Xyleborus	dispar	07-Jun-07	5	03-Jul-07	John Crowe
VT110	VT	Scolytidae	Xyleborus	sayi	07-Jun-07	6	03-Jul-07	John Crowe
VT111	VT	Scolytidae	Xyleborinus	alni	07-Jun-07	1	03-Jul-07	John Crowe
VT111	VT	Scolytidae	Xyleborus	dispar	07-Jun-07	3	03-Jul-07	John Crowe
VT111	VT	Scolytidae	Xyleborus	obesus	07-Jun-07	2	03-Jul-07	John Crowe
VT111	VT	Scolytidae	Xyleborus	sayi	07-Jun-07	1	03-Jul-07	John Crowe
VTBER0107	VT	Annabidae	Unknown	saxeseni	14-Jun-07	1	26-Jul-07	John Crowe
VTBER0107	VT	Cerymbicidae	Clytus	ruricola	14-Jun-07	1	13-Jul-07	John Crowe
VTBER0107	VT	Claridae	Unknown	sp.	14-Jun-07	1	13-Jul-07	John Crowe
VTBER0107	VT	Claridae	Unknown	sp.	14-Jun-07	1	26-Jul-07	John Crowe
VTBER0107	VT	Curcu.	Unknown	sp.	14-Jun-07	1	13-Jul-07	John Crowe
VTBER0107	VT	Scolytidae	Dryocoetes	sp.	14-Jun-07	2	26-Jul-07	John Crowe
VTBER0107	VT	Scolytidae	Gnathotrichus	materiarius	14-Jun-07	1	26-Jul-07	John Crowe
VTBER0107	VT	Scolytidae	Orthotomicus	caelatus	14-Jun-07	3	26-Jul-07	John Crowe
VTBER0207	VT	Cerymbicidae	Phymatode	amoenus	14-Jun-07	1	13-Jul-07	John Crowe
VTBER0207	VT	Scolytidae	Hylastes	tenuis	14-Jun-07	1	16-Aug-07	Bob Brown
VTBER0207	VT	Scolytidae	Trypodendron	sp.	14-Jun-07	1	26-Jul-07	John Crowe
VTBER0307	VT	Annabidae	Unknown	sp.	14-Jun-07	1	26-Jul-07	John Crowe
VTBER0307	VT	Cerymbicidae	Acmaeops	sp.	14-Jun-07	1	13-Jul-07	John Crowe
VTBER0307	VT	Cerymbicidae	Monochamus	scutellatus	14-Jun-07	2	13-Jul-07	John Crowe
VTBER0307	VT	Cerymbicidae	Monochamus	scutellatus	14-Jun-07	4	13-Jul-07	John Crowe

VTBER0307	VT	Cerymbicidae	Phymatode	amoenus	14-Jun-07	1	13-Jul-07	John Crowe
VTBER0307	VT	Curcu.	Unknown	sp.	14-Jun-07	1	13-Jul-07	John Crowe
VTBER0307	VT	Curcu.	Unknown	sp.	14-Jun-07	1	26-Jul-07	John Crowe
VTBER0307	VT	Scolytidae	Carphoborus	sp.	14-Jun-07	1	26-Jul-07	John Crowe
VTBER0307	VT	Scolytidae	Hylastes	sp.	14-Jun-07	1	26-Jul-07	John Crowe
VTBER0307	VT	Scolytidae	Ips	pini	14-Jun-07	1	26-Jul-07	John Crowe
VTBER0307	VT	Scolytidae	Lymantor	decipiens	14-Jun-07	2	15-Aug-07	Bob Brown
VTBER0307	VT	Scolytidae	Orthotomicus	caelatus	14-Jun-07	5	26-Jul-07	John Crowe
VTBER0307	VT	Scolytidae	Polygraphus	ruficollis	14-Jun-07	1	26-Jul-07	John Crowe
VT101	VT	Curcu.	Unknown	sp.	21-Jun-07	1	03-Jul-07	John Crowe
VT101	VT	Scolytidae	Dendroctonus	rufipennis	21-Jun-07	1	03-Jul-07	John Crowe
VT101	VT	Scolytidae	Dryocoetes	sp.	21-Jun-07	2	03-Jul-07	John Crowe
VT102	VT	Scolytidae	Ips	pini	21-Jun-07	4	03-Jul-07	John Crowe
VT103	VT	Annabidae	Unknown	sp.	21-Jun-07	1	03-Jul-07	John Crowe
VT104	VT	Scolytidae	Xyleborinus	saxeseni	21-Jun-07	1	29-Jun-07	
VT108	VT	Curcu.			21-Jun-07	0	29-Jun-07	John Crowe
VT108	VT	Scolytidae	Gnathotrichus	materiarius	21-Jun-07	1	29-Jun-07	John Crowe
VT108	VT	Scolytidae	Orthotomicus	caelatus	21-Jun-07	1	29-Jun-07	John Crowe
VT108	VT	Scolytidae	Unknown	sp.	21-Jun-07	1	29-Jun-07	John Crowe
VT109	VT	Curcu.	Unknown	sp.	21-Jun-07	3	03-Jul-07	John Crowe
VT109	VT	Scolytidae	Gnathotrichus	materiarius	21-Jun-07	2	03-Jul-07	John Crowe
VT109	VT	Scolytidae	Hylastes	sp.	21-Jun-07	1	03-Jul-07	John Crowe
VT109	VT	Scolytidae	Ips	grandicollis	21-Jun-07	1	03-Jul-07	John Crowe
VT109	VT	Scolytidae	Ips	pini	21-Jun-07	7	03-Jul-07	John Crowe
VT109	VT	Scolytidae	Orthotomicus	caelatus	21-Jun-07	117	03-Jul-07	John Crowe
VT111	VT	Cerymbicidae	Unknown	sp.	21-Jun-07	1	03-Jul-07	John Crowe
VT111	VT	Scolytidae	Ips	grandicollis	21-Jun-07	1	03-Jul-07	John Crowe
VT111	VT	Scolytidae	Polygraphus	sp.	21-Jun-07	1	03-Jul-07	John Crowe
VT111	VT	Scolytidae	Xyleborus	obesus	21-Jun-07	4	03-Jul-07	John Crowe
VT111	VT	Scolytidae	Xyleborus	sayi	21-Jun-07	3	03-Jul-07	John Crowe
VT112	VT	Scolytidae	Xyleborus	dispar	21-Jun-07	1	29-Jun-07	John Crowe
VT201	VT	Scolytidae	Cryphalus	ruficollis	21-Jun-07	1	03-Jul-07	John Crowe
VT201	VT	Scolytidae	Ips	grandicollis	21-Jun-07	1	03-Jul-07	John Crowe
VT201	VT	Scolytidae	Xyleborus	obesus	21-Jun-07	2	03-Jul-07	
VTBER0207	VT	Scolytidae	Hylastes	porculus	26-Jun-07	10	26-Jul-07	John Crowe
VTBER0207	VT	Scolytidae	Unknown	sp.	26-Jun-07	1	26-Jul-07	John Crowe
VTBER0107	VT	Annabidae	Unknown	sp.	27-Jun-07	1	13-Jul-07	John Crowe
VTBER0107	VT	Cerymbicidae	Phymatode	amoenus	27-Jun-07	1	25-Jul-07	John Crowe
VTBER0107	VT	Claridae	Unknown	sp.	27-Jun-07	1	25-Jul-07	John Crowe
VTBER0107	VT	Curcu.	Unknown	sp.	27-Jun-07	1	13-Jul-07	John Crowe
VTBER0107	VT	Scolytidae	Trypodendron	sp.	27-Jun-07	1	13-Jul-07	John Crowe
VTBER0107	VT	Scolytidae	Trypodendron	sp.	27-Jun-07	3	25-Jul-07	John Crowe
VTBER0107 SX	VT	Cerymbicidae	Arhopalus	sp.	27-Jun-07	4	25-Jul-07	John Crowe
VTBER0107 SX	VT	Cerymbicidae	Grammoptera	exigua	27-Jun-07	1	25-Jul-07	John Crowe
VTBER0207	VT	Curcu.	Unknown	sp.	27-Jun-07	1	25-Jul-07	John Crowe
VTBER0207	VT	Scolytidae	Dryocoetes	autographus	27-Jun-07	1	25-Jul-07	Bob Brown

VTBER0207	VT	Scolytidae	Dryocoetes	sp.	27-Jun-07	1	25-Jul-07	John Crowe
VTBER0207	VT	Scolytidae	Hylastes	porculus	27-Jun-07	5	25-Jul-07	John Crowe
VTBER0207	VT	Scolytidae	Hylastes	tenuis	27-Jun-07	1	15-Aug-07	Bob Brown
VTBER0207	VT	Scolytidae	Trypodendron	sp.	27-Jun-07	2	01-Jul-58	John Crowe
VTBER0307	VT	Curcu.	Unknown	sp.	27-Jun-07	4	13-Jul-07	John Crowe
VTBER0307	VT	Scolytidae	Dendroctonus	sp.	27-Jun-07	5	25-Jul-07	John Crowe
VTBER0307	VT	Scolytidae	Ips	grandicollis	27-Jun-07	1	13-Jul-07	John Crowe
VTBER0307	VT	Scolytidae	Ips	pini	27-Jun-07	1	13-Jul-07	John Crowe
VTBER0407 SX	VT	Cerymbicidae	Monochamus	scutellatus	27-Jun-07	1	13-Jul-07	John Crowe
VTBER0407 SX	VT	Scolytidae	Polygraphus	ruficollis	27-Jun-07	1	25-Jul-07	John Crowe
VTBER0407 SX	VT	Scolytidae	Trypodendron	lineatum	27-Jun-07	1	25-Jul-07	John Crowe
VT102	VT	Scolytidae	Ips	pini	05-Jul-07	12	26-Jul-07	John Crowe
VT108	VT	Scolytidae	Ips	grandicollis	05-Jul-07	1	25-Jul-07	John Crowe
VT108	VT	Scolytidae	Ips	pini	05-Jul-07	2	25-Jul-07	John Crowe
VT108	VT	Scolytidae	Orthotomicus	caelatus	05-Jul-07	1	25-Jul-07	John Crowe
VT109	VT	Scolytidae	Gnathotrichus	materiarius	05-Jul-07	1	25-Jul-07	John Crowe
VT109	VT	Scolytidae	Ips	pini	05-Jul-07	14	25-Jul-07	John Crowe
VT109	VT	Scolytidae	Orthotomicus	caelatus	05-Jul-07	62	25-Jul-07	John Crowe
VT111	VT	Scolytidae	Ips	grandicollis	05-Jul-07	2	25-Jul-07	John Crowe
VT111	VT	Scolytidae	Orthotomicus	caelatus	05-Jul-07	1	25-Jul-07	John Crowe
VTBER0207	VT	Curcu.	Unknown	sp.	05-Jul-07	1	07-Aug-07	John Crowe
VTBER0807 SX	VT	Cerymbicidae	Monochamus	scutellatus	05-Jul-07	1	06-Aug-07	John Crowe
VTBER0807 SX	VT	Scolytidae	Hylastes	opacus	05-Jul-07	1	07-Aug-07	John Crowe
VTBER0807 SX	VT	Scolytidae	hypothenemus	sp.	05-Jul-07	1	07-Aug-07	John Crowe
VTBER0907 SX	VT	Scolytidae	Tomicus	pipiniperda	05-Jul-07	1	18-Sep-07	Bob Brown
VTEBB104	VT	Annabidae	Unknown	sp.	05-Jul-07	1	25-Jul-07	John Crowe
VTEBB104	VT	Scolytidae	Xyleborinus	sp.	05-Jul-07	1	25-Jul-07	John Crowe
VTBER0307	VT	Annabidae	Unknown	sp.	10-Jul-07	1	06-Aug-07	John Crowe
VTBER0307	VT	Curcu.	Unknown	sp.	10-Jul-07	1	06-Aug-07	John Crowe
VTBER0307	VT	Scolytidae	Trypodendron	sp.	10-Jul-07	1	06-Aug-07	John Crowe
VTBER0107	VT	Curcu.	Unknown	sp.	11-Jul-07	2	07-Aug-07	John Crowe
VTBER0107 SX	VT	Scolytidae	Trypodendron	sp.	11-Jul-07	6	06-Aug-07	John Crowe
VTBER0207	VT	Curcu.	Unknown	sp.	11-Jul-07	2	07-Aug-07	John Crowe
VTBER0207	VT	Scolytidae	Pityophthorus	sp.	11-Jul-07	1	06-Aug-07	John Crowe
VTBER0207	VT	Scolytidae	Pseudopityophthorus	sp.	11-Jul-07	1	06-Aug-07	John Crowe
VTBER0307	VT	Cerymbicidae	Asemum	sp.	11-Jul-07	2	06-Aug-07	John Crowe
VTBER0307	VT	Cerymbicidae	Monarthrum	scutellatus	11-Jul-07	3	06-Aug-07	John Crowe
VTBER0307	VT	Scolytidae	Dendroctonus	simplex	11-Jul-07	1	06-Aug-07	John Crowe
VTBER0307	VT	Scolytidae	Dendroctonus	simplex	11-Jul-07	5	06-Aug-07	John Crowe
VTBER0307	VT	Scolytidae	Monochamus	scutellatus	11-Jul-07	1	06-Aug-07	John Crowe
VTBER0307	VT	Scolytidae	Orthotomicus	caelatus	11-Jul-07	1	06-Aug-07	John Crowe

VTBER0307 SX	VT	Curcu.	Unknown	sp.	11-Jul-07	3	06-Aug-07	John Crowe
VTBER0407 SX	VT	Carabidae	Unknown	sp.	11-Jul-07	1	06-Aug-07	John Crowe
VTBER0407 SX	VT	Scolytidae	Dendroctonus	simplex	11-Jul-07	3	06-Aug-07	John Crowe
VTBER0507	VT	Cerymbicidae	Acmaeops	sp.	11-Jul-07	1	06-Aug-07	John Crowe
VT102	VT	Scolytidae	Ips	pini	19-Jul-07	8	06-Aug-07	John Crowe
VT102	VT	Scolytidae	Xyleborinus	sp.	19-Jul-07	1	06-Aug-07	John Crowe
VT106	VT	Scolytidae	Ips	pini	19-Jul-07	1	06-Aug-07	John Crowe
VT108	VT	Annabidae	Unknown	sp.	19-Jul-07	2	06-Aug-07	John Crowe
VT108	VT	Scolytidae	Dryocoetes	sp.	19-Jul-07	1	06-Aug-07	John Crowe
VT108	VT	Scolytidae	Gnathotrichus	sp.	19-Jul-07	5	06-Aug-07	John Crowe
VT108	VT	Scolytidae	Polygraphus	rufipennis	19-Jul-07	2	06-Aug-07	John Crowe
VT108	VT	Scolytidae	Unknown	sp.	19-Jul-07	7		
VT109	VT	Curcu.	Unknown	sp.	19-Jul-07	1	07-Aug-07	John Crowe
VT109	VT	Scolytidae	Dryocoetes	sp.	19-Jul-07	1	07-Aug-07	John Crowe
VT109	VT	Scolytidae	Gnathotrichus	materiarius	19-Jul-07	1	07-Aug-07	John Crowe
VT109	VT	Scolytidae	Ips	pini	19-Jul-07	10	07-Aug-07	John Crowe
VT109	VT	Scolytidae	Ips	sp.	19-Jul-07	3		
VT109	VT	Scolytidae	Orthotomicus	caelatus	19-Jul-07	13	07-Aug-07	John Crowe
VT109	VT	Scolytidae	Orthotomicus	sp.	19-Jul-07	2		
VTBER0907 SX	VT	Scolytidae	Tomicus	pipiniperda	19-Jul-07	1		
VTEBB104	VT	Scolytidae	Ips	chalcograph us	19-Jul-07	2	18-Sep-07	Bob Brown
VTEBB104	VT	Scolytidae	Ips	pini	19-Jul-07	1	18-Sep-07	Bob Brown
VTEBB104	VT	Scolytidae	Orthotomicus	caelatus	19-Jul-07	2	18-Sep-07	Bob Brown
VTBER0607 SX	VT	Cerymbicidae	Stictoleptera	Canadensi s	25-Jul-07	1	06-Aug-07	John Crowe
VTBER0607 SX	VT	Scolytidae	Polygraphus	rufipennis	25-Jul-07	1	07-Aug-07	John Crowe
VTBER0907 SX	VT	Scolytidae	Dendroctonus	simplex	25-Jul-07	1	06-Aug-07	John Crowe
VTBER0207	VT	Annabidae	Unknown	sp.	26-Jul-07	1	26-Jul-07	John Crowe
VTBER0307	VT	Scolytidae	Pityophthorus	sp.	27-Jul-07	1	25-Jul-07	John Crowe
VTBER0107	VT	Annabidae	Unknown	sp.	01-Aug-07	1	23-Aug-07	John Crowe
VTBER0107	VT	Curcu.	Unknown	sp.	01-Aug-07	1	23-Aug-07	John Crowe
VTBER0107 SX	VT	Scolytidae	Dryocoetes	sp.	01-Aug-07	1	26-Sep-07	John Crowe
VTBER0107 SX	VT	Scolytidae	Dryocoetes	sp.	01-Aug-07	2	29-Aug-07	John Crowe
VTBER0107 SX	VT	Scolytidae	Polygraphus	rufipennis	01-Aug-07	2	29-Aug-07	John Crowe
VTBER0207	VT	Scolytidae	Dryocoetes	sp.	01-Aug-07	1	28-Aug-07	John Crowe
VTBER0307	VT	Cerymbicidae	Monochamus	scutellatus	01-Aug-07	1	28-Aug-07	John Crowe
VTBER0307	VT	Curcu.	Unknown	sp.	01-Aug-07	2	29-Aug-07	John Crowe
VTBER0307	VT	Scolytidae	Ips	pini	01-Aug-07	3	23-Aug-07	John Crowe
VTBER0307	VT	Scolytidae	Orthotomicus	caelatus	01-Aug-07	2	29-Aug-07	John Crowe
VTBER0407 SX	VT	Scolytidae	Dendroctonus	valens	01-Aug-07	1	28-Aug-07	John Crowe

VTBER0407 SX	VT	Scolytidae	Dryocoetes	sp.	01-Aug-07	0	28-Aug-07	John Crowe
VTBER0407 SX	VT	Scolytidae	Polygraphus	rufipennis	01-Aug-07	1	28-Aug-07	John Crowe
VTBER0407 SX	VT	Scolytidae	Polygraphus	rufipennis	01-Aug-07	1	26-Sep-07	John Crowe
VTBER0407 SX	VT	Scolytidae	Trypodendron	sp.	01-Aug-07	1	28-Aug-07	John Crowe
VT107	VT	Scolytidae	Gnathotrichus	materiarius	02-Aug-07	1	02-Oct-07	John Crowe
VT107	VT	Scolytidae	Ips	grandicollis	02-Aug-07	1	02-Oct-07	John Crowe
VT107	VT	Scolytidae	Ips	pini	02-Aug-07	6	02-Oct-07	John Crowe
VT107	VT	Scolytidae	Orthotomicus	caelatus	02-Aug-07	1	02-Oct-07	John Crowe
VT107	VT	Scolytidae	Xyleborinus	saxeseni	02-Aug-07	1	02-Oct-07	John Crowe
VT107	VT	Scolytidae	Xyleborus	sayi	02-Aug-07	1	02-Oct-07	John Crowe
VTBER1007 SX	VT	Cerymbicidae	Monochamus	scutellatus	08-Aug-07	1	28-Aug-07	John Crowe
VTBER1007 SX	VT	Scolytidae	Polygraphus	rufipennis	08-Aug-07	1	23-Aug-07	John Crowe
VTBER1007 SX	VT	Scolytidae	Trypodendron	sp.	08-Aug-07	1	28-Aug-07	John Crowe
VT106	VT	Scolytidae	Gnathotrichus	materiarius	15-Aug-07	1	26-Sep-07	John Crowe
VT106	VT	Scolytidae	Ips	grandicollis	15-Aug-07	4	26-Sep-07	John Crowe
VT106	VT	Scolytidae	Ips	pini	15-Aug-07	26	26-Sep-07	John Crowe
VT106	VT	Scolytidae	Orthotomicus	caelatus	15-Aug-07	37	26-Sep-07	John Crowe
VT108	VT	Scolytidae	Dryocoetes	sp.	15-Aug-07	2	26-Sep-07	John Crowe
VT108	VT	Scolytidae	Gnathotrichus	materiarius	15-Aug-07	6	26-Sep-07	John Crowe
VT108	VT	Scolytidae	Ips	pini	15-Aug-07	3	26-Sep-07	John Crowe
VT108	VT	Scolytidae	Ips	sp.	15-Aug-07	3		
VT108	VT	Scolytidae	Lymantor	sp.	15-Aug-07	1	26-Sep-07	John Crowe
VT108	VT	Scolytidae	Pityogenes	sp.	15-Aug-07	1		
VT108	VT	Scolytidae	Unknown	sp.	15-Aug-07	0		
VT109	VT	Scolytidae	Gnathotrichus	materiarius	15-Aug-07	3	02-Oct-07	John Crowe
VT109	VT	Scolytidae	Ips	grandicollis	15-Aug-07	2	02-Oct-07	John Crowe
VT109	VT	Scolytidae	Ips	pini	15-Aug-07	19	02-Oct-07	John Crowe
VT109	VT	Scolytidae	Ips	sexdentatus	15-Aug-07	2	02-Oct-07	John Crowe
VT109	VT	Scolytidae	Orthotomicus	caelatus	15-Aug-07	51	02-Oct-07	John Crowe
VT111	VT	Scolytidae	Xyleborus	sayi	15-Aug-07	2	02-Oct-07	John Crowe
VTBER0107 SX	VT	Scolytidae	Trypodendron	sp.	15-Aug-07	3	26-Sep-07	John Crowe
VTBER0307	VT	Scolytidae	Ips	pini	15-Aug-07	1	11-Oct-07	John Crowe
VTBER0307 SX	VT	Scolytidae	Dendroctonus	rufipennis	15-Aug-07	1	11-Oct-07	John Crowe
VTBER0407 SX	VT	Scolytidae	Dendroctonus	punctatus	15-Aug-07	1	11-Oct-07	John Crowe
VTBER0407 SX	VT	Scolytidae	Dendroctonus	simplex	15-Aug-07	1	11-Oct-07	John Crowe
VTBER0407 SX	VT	Scolytidae	Pityophthorus	sp.	15-Aug-07	1	11-Oct-07	John Crowe
VTBER0307	VT	Scolytidae	Ips	pini	29-Aug-07	15	11-Oct-07	John Crowe
VTBER0307 SX	VT	Scolytidae	Dendroctonus	rufipennis	29-Aug-07	1	11-Oct-07	John Crowe

VTBER0407 SX	VT	Scolytidae	Dendroctonus	punctatus	29-Aug-07	2	11-Oct-07	John Crowe
VTBER0107 SX	VT	Scolytidae	Dryocoetes	sp.	12-Sep-07	5	11-Oct-07	John Crowe
VTBER0307	VT	Scolytidae	Ips	pini	12-Sep-07	1	11-Oct-07	John Crowe
VTBER0307 SX	VT	Scolytidae	Ips	pini	12-Sep-07	1	11-Oct-07	John Crowe
VTBER0607 SX	VT	Scolytidae	Monarthrum	sp.	19-Sep-07	2	11-Oct-07	John Crowe
VTBER0307	VT	Scolytidae	Ips	pini	26-Sep-07	1	11-Oct-07	John Crowe

Table 7: Vermont State Pest List of Exotic and Invasive Species of Concern to Agriculture and the Environment**.**

Common Name of Target Pest	Scientific Name	Taxonomic Group	Major Hosts	Rank**
Forest				
European Wood Wasp	*Sirex noctilio*	arthropod	Pine, spruce, fir and larch	NTP
Oak Splendor Beetle	*Agrilus biguttaus*	arthropod	Oak (*Quercus* spp.)	NTP
Siberian Silk Moth	*Dendrolimus superans sibiricus*	arthropod	Conifers (*Pinus* spp., *Picea* spp., *Abies* spp.)	NTP
Pine Shoot Beetle	*Tomicus destruens*	arthropod	Pine (*Pinus* spp.)	NTP
Asian Longhorn Beetle	*Anoplophora glabripennis*	arthropod	Hardwoods	ERTP
Emerald Ash Borer	*Agrilus planipennis*	arthropod	Ash (*Fraxinus* spp.)	ERTP
Citrus Longhorn Beetle	*Anoplophora chinensis*	arthropod	Hardwoods	ERTP
Longhorn Beetle	*Anoplophora malasiaca*	arthropod	Hardwoods	ERTP
Lesser Japanese Cedar Longhorn Beetle	*Callidiellum rufipenne*	arthropod	Eastern red cedar, arborvitae, juniper	ERTP
Bamboo Longhorn Beetle	*Chlorophorus annularis*	arthropod	Bamboo spp.	ERTP
Longhorned Wood Borer	*Hesperophanes campestris*	arthropod	Hardwoods	ERTP
Red Haired Pine Bark Beetle	*Hylurgops ligniperda*	arthropod	Pine (*Pinus* spp.)	ERTP
Pine Bark Beetle	*Hylurgops palliatus*	arthropod	Pine (*Pinus* spp.)	ERTP
Six-Spined Engraver Beetle	*Ips sexdentatus*	arthropod	Pine (*Pinus* spp.)	ERTP
Spruce Bark Beetle	*Ips typographus*	arthropod	Pine (*Pinus* spp.)	ERTP
Japanese Pine Sawyer	*Monochamus alternatus*	arthropod	Pine (*Pinus* spp.)	ERTP
Mediterranian Pine Engraver Beetle	*Orthotomicus erosus*	arthropod	Pine (*Pinus* spp.)	ERTP
Six-Spined Spruce Bark Beetle	*Pityogenes chalcographus*	arthropod	Spruce (Picea spp.)	ERTP
Black Spruce Beetle	*Tetropium castaneum*	arthropod	Norway spruce and Scots pine	ERTP
Brown Spruce Longhorn Beetle	*Tetropium fuscum*	arthropod	Norway spruce and Scots pine	ERTP
Lesser Pine Shoot Beetle	*Tomicus minor*	arthropod	Pine (*Pinus* spp.)	ERTP
European Hardwood Ambrosia Beetle	*Trypodendron domesticus*	arthropod	Hardwoods	ERTP

Common Name of Target Pest	Scientific Name	Taxonomic Group	Major Hosts	Rank**
Ambrosia Beetle	*Xyleborus* spp.	arthropod	Hardwoods	ERTP
Longhorn Beetle (no common name)	*Xylotrechus* spp.	arthropod	Hardwoods or Softwoods (depends on species)	ERTP
Sudden Oak Death	*Phytophthora ramorum*	fungus	Oaks and variety of alternate hosts	ERTP
Hemlock Woolly Adelgid	*Adelges tsugae*	arthropod	Hemlock (*Tsuga canadensis)*	STP
Blue Stain	*Leptographium wingfieldii*	fungus	Pine (*Pinus* spp.)	STP
Oak Wilt Disease	*Ceratocystis fagacearum*	fungus	Oak (*Quercus* spp.)	STP
Snail and Slug				
Giant African Land Snail	*Achatina fulica*	mollusk	Over 500 plants including agricultural crops	NTP
No common name (snail)	*Monacha cartusiana*	mollusk		ERTP
No common name (slug)	*Tandonia budapestensis*	mollusk	Potatoes and Cereals	ERTP
No common name (snail)	*Xerolenta obvia*	mollusk	Flowers and Vegetables	ERTP
Fruit and Vegetable				
Summer Fruit Tortrix Moth	*Adoxophyes orana*	arthropod	Apple, pear, peach, plum, apricot, currant, raspberry, quince, gooseberry, cherry, cotton	NTP
Fruit Piercing Moth	*Eudocima fullonia*	arthropod	Over 100 plant species in 34 families, includes Apple (*Malus* spp.)	NTP
Pink Gypsy Moth/ Rosy Moth	*Lymantria mathura*	arthropod	Oak (*Quercus* spp.), apple (*Malus* spp.) pear (*Pyrus* spp.) cherry, (*Prunus* spp.), beech (*Fagus* spp.)	NTP
Pear Leaf Blister Moth	*Leucoptera malifoliella*	arthropod	Hawthorne (*Crateagus* spp.), apple (*Malus* spp.), Pear (*Pyrus* spp.)	NTP
False Coddling Moth	*Thaumatotibia leucotreta*	arthropod	Fruit trees (including *Malus* spp.)	NTP

Common Name of Target Pest	Scientific Name	Taxonomic Group	Major Hosts	Rank**
Silver Y Moth	*Autographa gamma*	arthropod	Over 200 different plant species including cruciferous crops and *Brassica* spp.	NTP
False Columbia Root-Knot Nematode	*Meloidogyne fallax*	nematode	Carrot, tomato, lettuce, beets, sugar beets, artichokes, daylily, bleeding heart	NTP
British Root-Knot Nematode	*Meloidogyne artiellia*	nematode	Barley, cabbage, cauliflower, beans, sorghum, wheat, peas, alfalfa, clover, radish, chickpea, turnip, broccoli, vetches	NTP
Leek Moth	*Acrolepiopsis assectella*	arthropod	Leek and Onion (*Allium* spp.)	ERTP
Fruit Tree Tortrix	*Archips podana*	arthropod	Fruit trees (including Malus spp.)	ERTP
Soybean Pod Borer	*Maruca vitrata*	arthropod	Soybean (*Glycine* spp.)	ERTP
Soybean Aphid	*Aphis glycines*	arthropod	Soybean (*Glycine* spp.)	STP
Swede Midge	*Contarinia nasturtii*	arthropod	Brassica crops (including broccoli, cauliflower, cabbage and radish)	ERTP
Light Brown Apple Moth	*Epiphyas postvittana*	arthropod	Apple (*Malus* spp.)	STP
Plum Fruit Moth	*Cydia funebrana*	arthropod	Cherry and plum (*Prunus* spp.) members of *Rosaceae* family	STP
Brown Marmorated Stinkbug	*Halyomorpha halys*	arthropod	Fruit trees and legumes	STP
Plant				
British Yellowhead	*Inula* spp.	plant	—	ERTP
Giant Hogweed	*Heracleum mantegazzianum*	plant	—	STP
Fanwort	*Cabomba caroliniana*	plant	—	STP
Brazilian Elodea	*Egeria densa*	plant	—	STP
Hydrilla	*Hydrilla verticillata*	plant	—	STP
E. Indian Hygrophilla	*Hygrophila polysperma*	plant	—	STP
Parrot Feather	*Myriophyllum aquaticum*	plant	—	STP

Variable-Leaved Milfoil	*Myriophyllum heterophyllum*	plant	—	STP
Common Name of Target Pest	**Scientific Name**	**Taxonomic Group**	**Major Hosts**	**Rank****
Giant Salvinia	*Salvinia auriculata*	plant	—	STP
Giant Salvinia	*Salvinia biloba*	plant	—	STP
Giant Salvinia	*Salvinia herzogii*	plant	—	STP
Pale Swallow-Wort	*Vincetoxicum hirundinaria*	plant	—	STP
Goutweed	*Aegopodium podagraria*	plant	—	STP
Tree-of-Heaven	*Ailanthus altissima*	plant	—	STP
Garlic Mustard	*Alliaria petiolata*	plant	—	STP
Flowering Rush	*Butomus umbellatus*	plant	—	STP
Oriental Bittersweet	*Celastrus orbiculatus*	plant	—	STP
Japanese Knotweed	*Fallopia japonica*	plant	—	STP
Frogbit	*Hydrocharis morsus-ranae*	plant	—	STP
Bell Honeysuckle	*Lonicera x bella*	plant	—	STP
Japanese Honeysuckle	*Lonicera japonica*	plant	—	STP
Amur Honeysuckle	*Lonicera maackii*	plant	—	STP
Morrow Honeysuckle	*Lonicera morrowii*	plant	—	STP
Tartarian Honeysuckle	*Lonicera tatarica*	plant	—	STP
Purple Loosestrife	*Lythrum salicaria*	plant	—	STP
Eurasian Watermilfoil	*Myriophyllum spicatum*	plant	—	STP
Yellow Floating Heart	*Nymphoides peltata*	plant	—	STP
Common Reed	*Phragmites australis*	plant	—	STP
Curly Leaf Pondweed	*Potamogeton crispus*	plant	—	STP
Common Buckthorn	*Rhamnus cathartica*	plant	—	STP
Glossy Buckthorn	*Rhamnus frangula*	plant	—	STP
Water Chestnut	*Trapa natans*	plant	—	STP
Black Swallow-Wort	*Vincetoxicum nigrum*	plant	—	STP
Ornamental/Nursery				
Geranium Wilt	*Ralstonia solanacearum*	bacteria	Geraniums, potatoes, tomatoes, peppers, eggplant	NTP
Chrysanthemum White Rust	*Puccinia horiana*	fungus	Chrysanthemums	STP
Daylily Rust	*Puccinia hemerocallidis*	fungus	Daylilies	STP
Lily Leaf Beetle	*Lilioceris lilii*	arthropod	*Lillium* spp., *Fritillaria* spp., *Polygonatum* spp., *Solanum* spp.	STP

Viburnum Leaf Beetle	*Pyrrhalta viburni*	arthropod	*Viburnum* spp.	STP
Apiary				
Small Hive Beetle	*Aethina tumida*	arthropod	beehives	STP

Ranking**

NTP=National Target Pest

ERTP=Eastern Region Target Pest

STP=State Target Pest

Figure 1: Vermont 2007 Nursery Inspection Locations

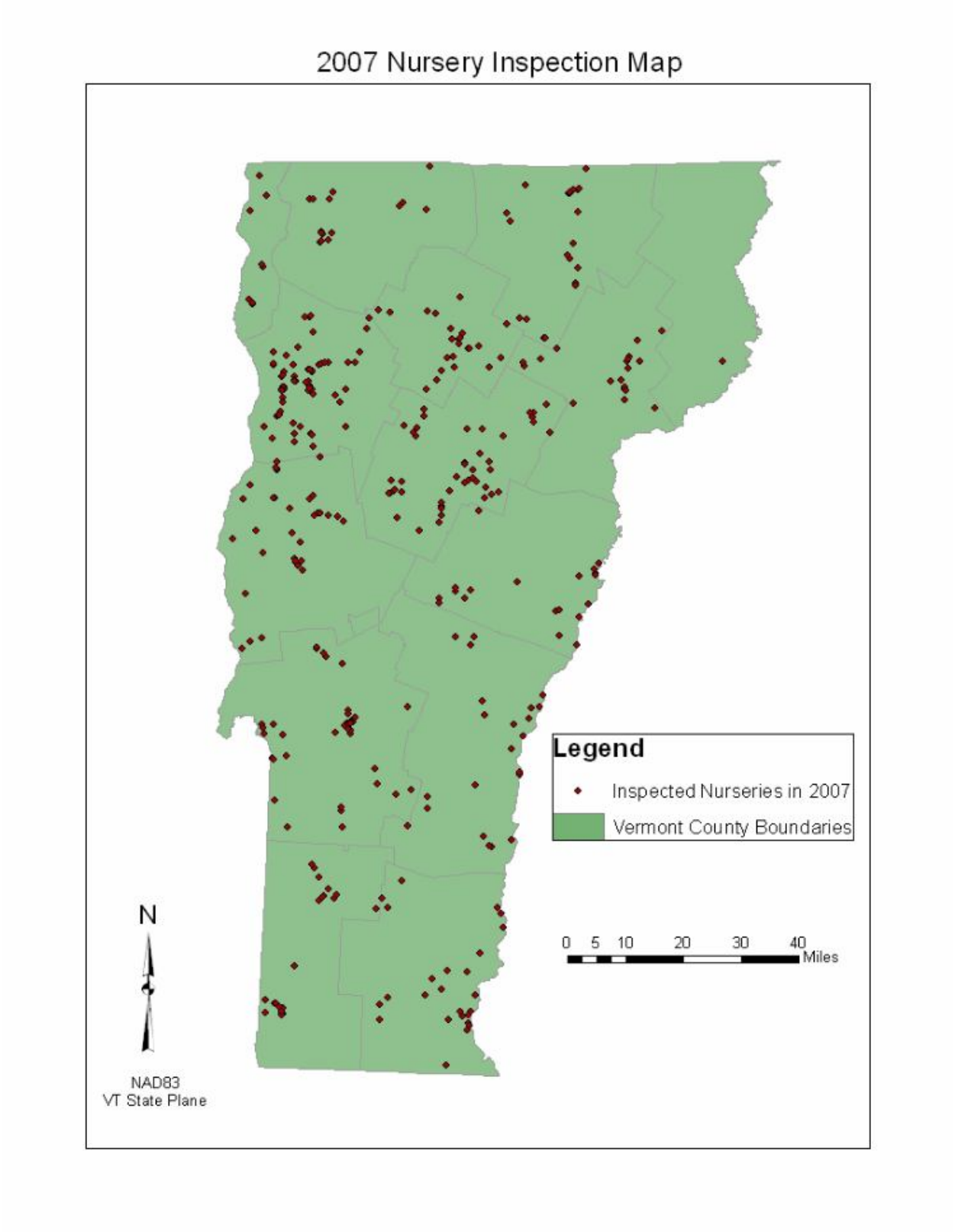


Figure 2: Vermont 2007 Hotzone Trap Locations

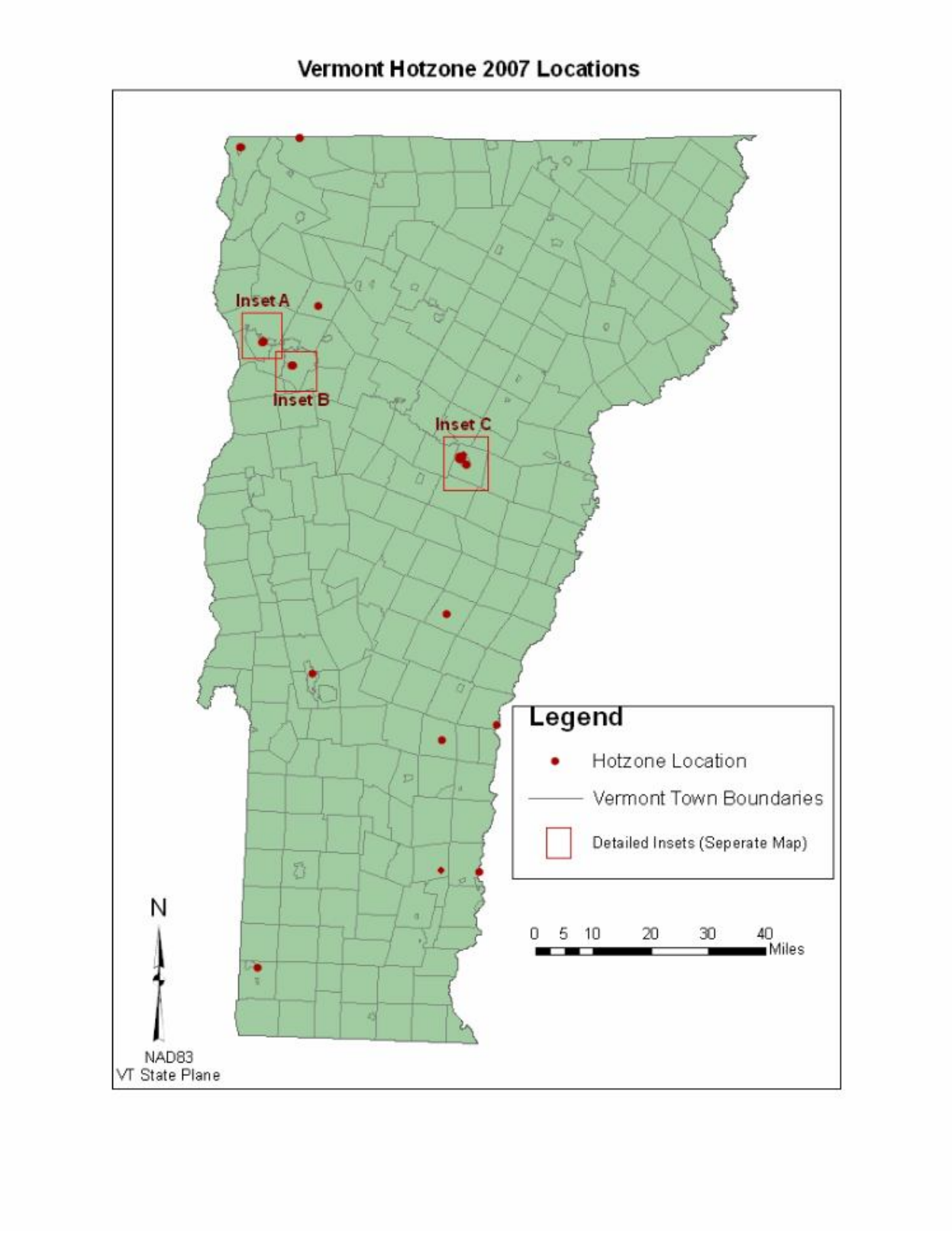


Figure 3: Vermont 2007 Burlington (A), Williston (B) and Barre (C) Hotzone Trap Location Insets

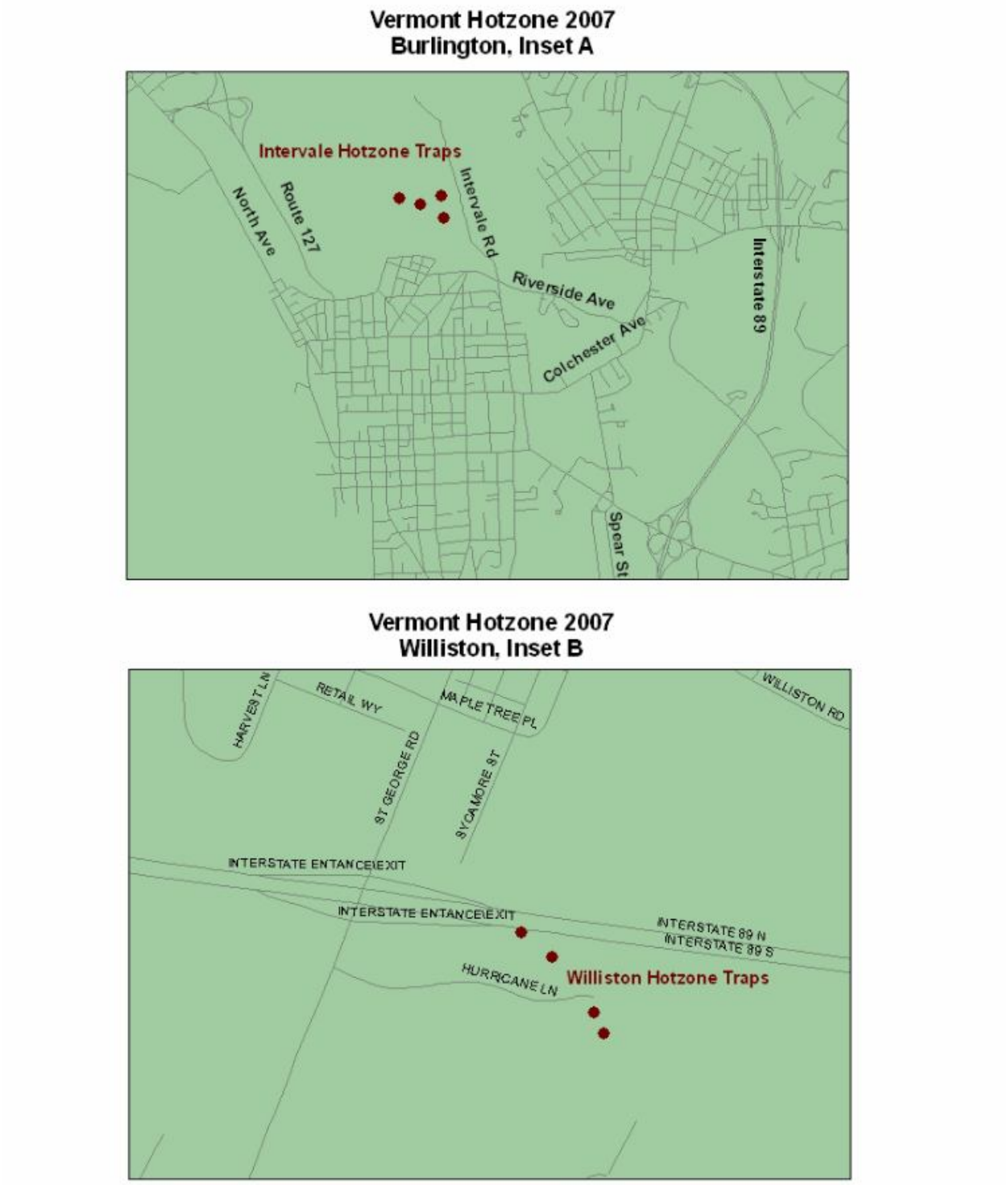


Figure 3-2007 Barre (Inset C) Hotzone Locations

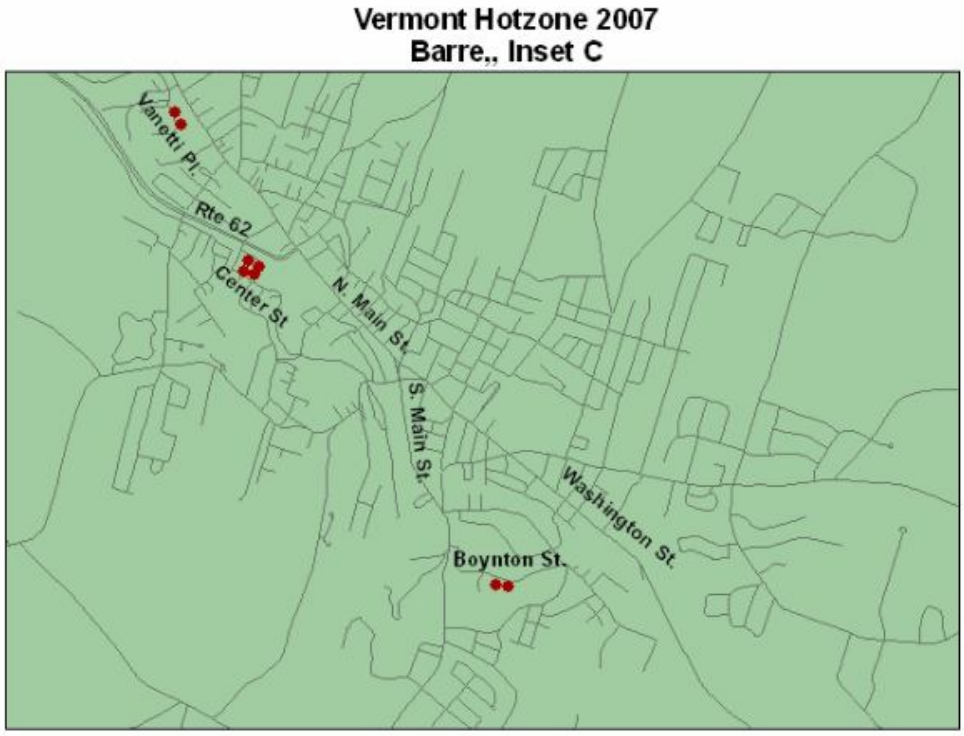


Figure 4: Vermont 2007 Swede Midge, Leek Moth and Silver Y Moth Trap locations

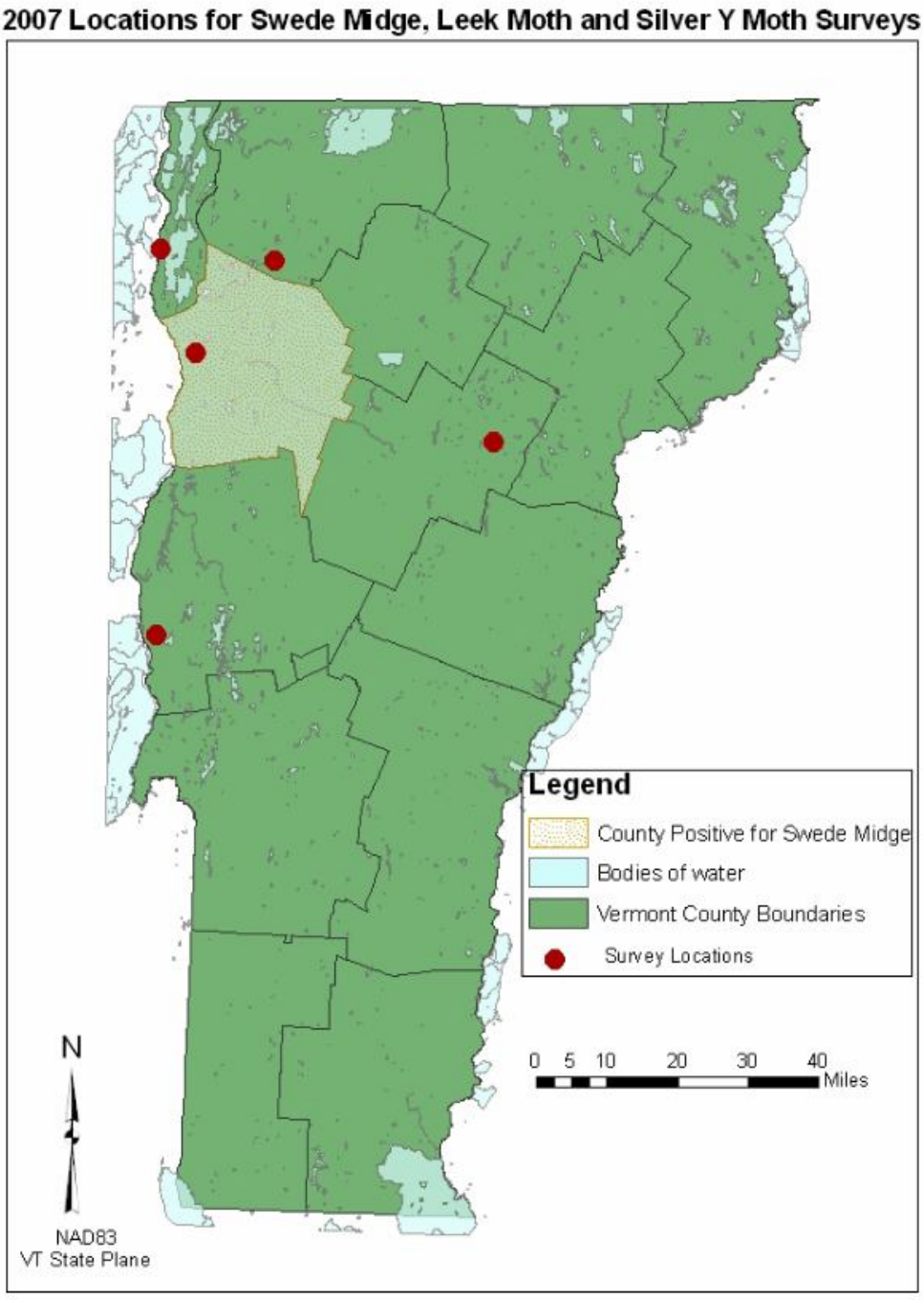
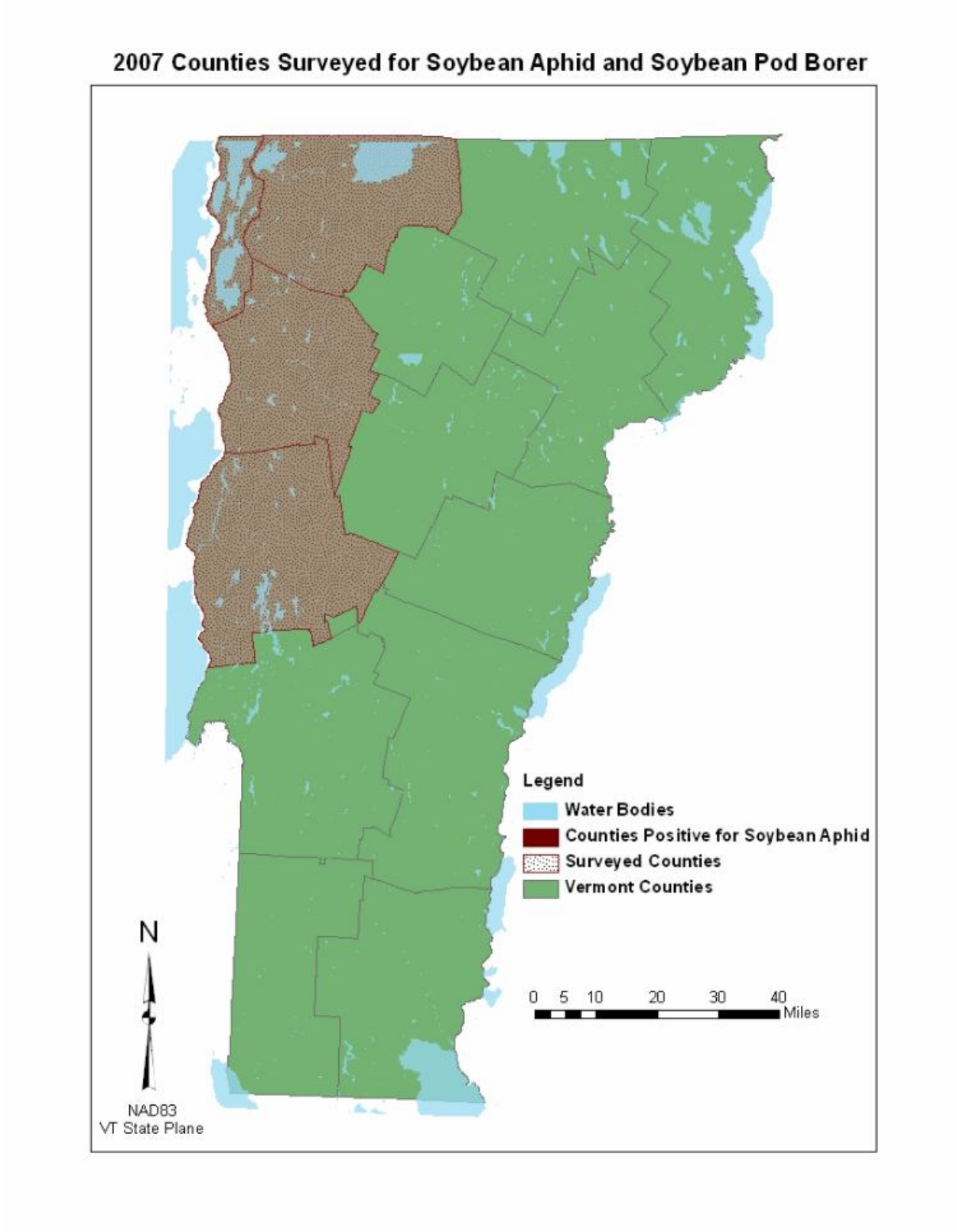


Figure 5: Vermont 2007 Soybean Aphid and Soybean Pod Borer Survey

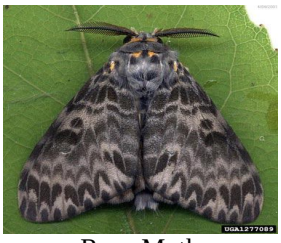


Part II) VERMONT TREE FRUIT EXOTIC PEST SURVEY


Summer Fruit Tortrix Moth


False Codling Moth


Pear Leaf Blister Moth


Rosy Moth

A. Survey Methodology (trapping protocol):

The tree fruit exotic pest survey for 2007 occurred at one abandoned apple orchard in Grand Isle county. Survey targets for 2007 included; summer fruit tortrix moth, *Adoxophyes orana,* false coddling moth, *Cryptophlebia leucotreta,* pear leaf blister moth, *Leucoptera malifoliella,* and pink gypsy moth, *Lymantria mathura.*. A control trap was also included at the site. Winged Sticky Traps with pest specific lures provided by OTIS Methods Development Lab were used following the general trapping guidelines from the Exotic Pest Detection Manual (USDA 2002). Winged sticky traps with appropriate lures were distributed at a density of 1 trap per target pest. Traps were suspended from limbs at approximately 1.5 meters off the ground. Traps were spaced at a minimum of 2 meters except for *A. orana* which was placed at least 30 meters away from any other traps. Trap bottoms were replaced every two weeks and lures were changed according to OTIS protocols.

B. Rationale underlying survey methodology:

The primary objective of this survey was to obtain current information on the occurrence and distribution of exotic apple pests. The New England states combined (CT, MA, ME, NH, RI and VT) rank 7th nationally in apple production and growing areas (Basic Commodity Information is from the USD, NASS, Agricultural Statistics Board Non-citrus Fruits and Nuts 2001 Summary, July 2002). There are approximately 90 commercial apple growers in Vermont which produce 900,000 bushels of apples on approximately, 4,800 acres (UVM Extension). The apple industry in Vermont alone is valued at over $9 million (USDA, NASS).

Selected target pests included in the 2007 tree fruit pest survey have been identified as exotic, some with limited distribution or as National Priority pests. Those pests which have been identified as having limited distribution in parts of the U.S. have unknown and undocumented distribution in Vermont. Trapping for target pests following guidelines set forth by the Exotic Pest Manual (USDA 2002) allowed the CAPS program to enhance early detection capabilities of pests threatening tree fruit crops that are economically and ecologically valuable at both the regional and national level.

C. Survey dates:

This survey occurred over a 16 week period. Traps were deployed on May 21st. Trap bottoms were replaced every two weeks and lures changed in accordance with OTIS protocols. All traps were collected and removed from the survey locations on September 10th.

D. Taxonomic services:

Trap contents were screened by staff at the University of Vermont, Plant Diagnostic Clinic.

E. Benefits and results of survey:

During the 17 week survey period a total number of 40 trap bottoms were collected and screened for target pests (Table 1). In addition to NAPIS data entry, detection results from the survey are being included as part of the UVM Extension-Apple Resources. This survey also provided support to the export (trade) of apple and tree fruit crops by obtaining current information on the occurrence and distribution of exotic apple pests.

- Summer fruit tortrix moth, *Adoxophyes orana:*

  The Summer Fruit Tortrix Moth is currently distributed throughout most countries in Europe. The damage caused by this pest to the fruit can be extensive and costly. The fruit attacked heals poorly and the lesions allow fungi to invade. The potential distribution of *A. orana* in the United States is anywhere host plants occur, including Vermont.

  In 2007, a total of 8 winged sticky trap bottoms from a trap baited with a lure specific to *A. orana* were screened by the University of Vermont, Plant Diagnostic Clinic for the target pest. *A. orana* was not detected in 2007. All data has been entered into NAPIS.

- False codling moth, *Cryptophlebia leucotreta:*

  The False codling moth is native to southern Africa, the Ethiopian regions and many islands off the African continent. The insect has a wide range of host plants but prefers citrus and tropical species. Plants infested with codling moth will drop their fruits early. Although not currently present in the US, this pest has been intercepted 122 times at 19 different US ports on 15 different host species. The establishment of false codling moth in the US could result in significant economic losses.

In 2007, a total of 8 winged sticky trap bottoms from a trap baited with a lure specific to *C. leucotreta* were screened by the University of Vermont, Plant Diagnostic Clinic for the target pest. *C. leucotreta* was not detected in 2007. All data has been entered into NAPIS.

- Pear leaf blister moth, *Leucoptera malifoliella:*

  The pear leaf blister moth occurs in middle and southern Europe, the Middle East, Russia, central Asia and mainland China. This species prefers hawthorn, apple and pear but will also feed on the leaves of other fruit trees and deciduous forest and shade trees. Heavy infestation of this pest causes severely damaged leaf surfaces and reduces photosynthesis capability.

  In 2007, a total of 8 winged sticky trap bottoms from a trap baited with a lure specific to *L. malifoliella* were screened by the University of Vermont, Plant Diagnostic Clinic for the target pest. *L. malifoliella* was not detected in 2007. All data has been entered into NAPIS.

- Pink Gypsy Moth, *Lymantria mathura:*

  The pink gypsy moth occurs in eastern Asia. This species will feed on the leaves of a wide range of deciduous forest and shade trees and conifers. Heavy infestation of this pest causes severely damaged leaf surfaces and reduces photosynthesis capability. Although not currently present in the US, this pest would likely find climates suitable for establishment within the continent. The establishment of rosy moth in the US could result in significant environmental and economic losses.

  In 2007, a total of 8 winged sticky trap bottoms from a trap baited with a lure specific to *L. mathura* were screened by the University of Vermont, Plant Diagnostic Clinic for the target pest. *L. mathura* was not detected in 2007. All data has been entered into NAPIS.

F. **Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful**.*: N/A

G. **If appropriate, explain why objectives were not met***:

All objectives were met except for the trapping of the fruit piercing moth, *Eudocima fullonia*. Lures for this pest were not received and as a result of not having the appropriate pheromone for this pest trapping for it did not occur.

H. **Where appropriate, explain any cost overruns***: There were no cost overruns.

I. **NAPIS database submissions**: All NAPIS data entries were submitted by December 31st, 2007.

*indicates information required per 7 CFR 3016.40 and 7 CFR 3019.51

Table 1: 2007 apple survey trap details and schedule

APPLE SURVEY TRAP DETAILS AND SCHEDULE 2007

Grand Isle County

	WEEK #:																	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	
Pest	**May 21st**		**June 4th**		**June 18th**		**July 2nd**		**July 16th**		**July 30th**		**Aug 13th**		**Aug 27th**		**Sept 10th**	**lures needed per site**
Adoxophyes orana*	x								x								o	2
Cryptophlebia leucotreta	x								x								o	2
Leucoptera mallifoliella	x								x								o	2
Lymantria mathura	x								x								o	2
control trap (no lure)	-								-								o	-
	x=set new lure, o=remove trap																	
																	# trap tops used:	5
																	Trap Bottoms changed every 2 weeks for 15 weeks:	40

**pheremone is a powerful inhibitor to many other species - trap placed away from others*

(http://www.ceris.purdue/caps/east/epdm/sftm.html)

Part II) VERMONT NEMATODE SURVEY

A. Survey Methodology (trapping protocol):

A detection survey for 2 species of nematodes, *Meloidigyne artiella* and *M. fallax*, was performed in September by collecting soil samples in 5 Vermont counties including Orleans, Lamoille, Caledonia, Bennington and Essex. This was the second year surveying for the nematodes and the 5 counties surveyed in 2007 were different counties than those surveyed in 2006. The 2007 and 2006 survey sites together represent most of Vermont and the survey results provide a baseline on the occurrence of the target pests in the state.

Two soil samples were collected per site and sub-sampling was drawn from this. Samples were collected at intervals of 180 feet when possible and a depth of 6 inches, or the root zone of the crop. Samples were collected from fields that include one or more hosts in the cropping rotation. Samples were sent by overnight mail to the University of Nebraska Nematode Diagnostic Lab for nematode identification. All of the five Vermont counties tested were negative for the two species of nematodes on the survey.

B. Rationale underlying survey methodology:

The primary objective of this survey was to obtain current information on the occurrence and distribution of exotic nematode pests. *Meloidogyne* species are among some of the most economically important plant parasitic nematodes found worldwide. Damage to host plants caused by root-knot nematodes involves impaired root growth and function which interferes with the plants ability to take up water. Crops damaged by nematodes can result in yield losses and affect the marketability of produce through visible external symptoms (e.g., discoloration, galls and stunted growth). The objective of this survey is to obtain current information of the occurrence and distribution of these economically significant plant parasitic nematodes.

The plant parasitic nematode *Meloidogyne artiellia* Franklin is a significant pest of several cereals, legumes, root and cruciferous crops and is adapted to survive cold and dry conditions. The British root-knot nematode (BRKN) occurs in northern Europe, the Mediterranean, North Africa, the Middle East, Russia and China. The currently reported distribution suggests that this pest may be most closely associated with the biomes characterized as: temperate broadleaf and mixed forests, temperate coniferous forests, etc. as found throughout New England. *M. artiellia* has more than 30 host plants many of which are grown and harvested in Vermont (e.g., beans, cabbage/kale, alfalfa, *Brassica* spp., etc.).

Meloidogyne fallax Karssen, the false Columbia root-knot nematode (FCRN) is a significant pest primarily of potato in Europe. This nematode occurs in the Netherlands, Belgium, Germany, Australasia and South Africa. Like BRKN, this pest is closely associated with biomes found in the New

England region. Primary host species include potato and carrot (25 host species have been reported).

C. Survey Dates:

The survey was done in September 2007 over the course of two weeks. All samples were held in the refrigerator until shipment.

D. Taxonomic services:

Soil samples were analyzed at the University of Nebraska Plant Diagnostic Nematode Laboratory.

E. Benefits and results of survey:

In addition to NAPIS data entry, detection results from the survey may be shared with Vermont vegetable and field crop growers. This information will help further our nematode database for the state. Figure 1 depicts a map of Vermont counties included in the 2007 nematode survey.

F. **Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful**.*: N/A

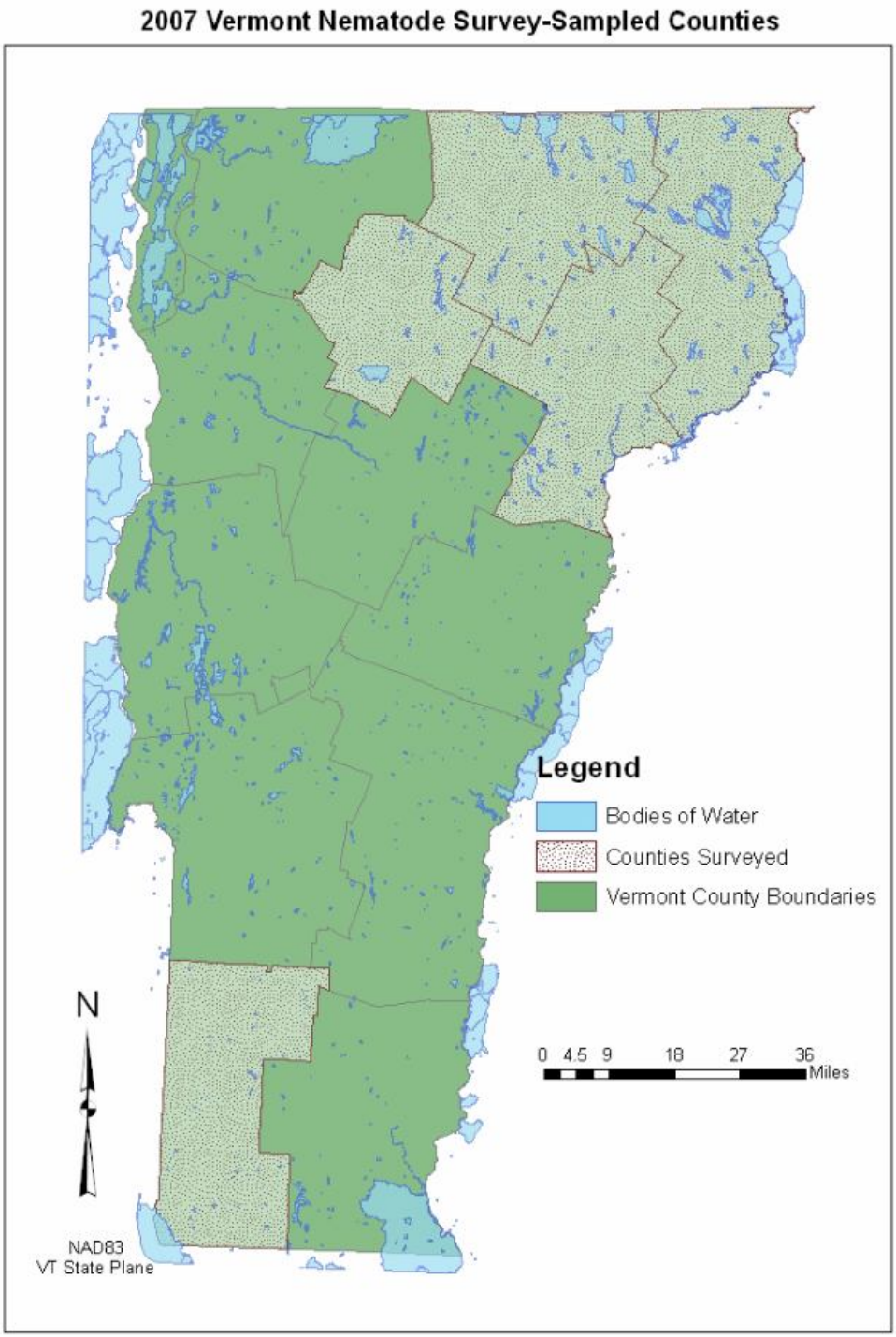
G. **If appropriate, explain why objectives were not met***:

H. **Where appropriate, explain any cost overruns***: There were no cost overruns

I. **NAPIS database submissions**: **All data has been submitted into NAPIS**

*indicates information required per 7 CFR 3016.40 and 7 CFR 3019.51

Figure 1. Vermont counties sampled for CAPS target nematodes in 2007



Part II) BROWN SPRUCE LONGHORN BEETLE TRAPPING SURVEY

 Photo: Natural Resources Canada	Brown Spruce Longhorn Beetle (*Tetropium fuscum*): Identified in Point Pleasant Park in Halifax, Nova Scotia, this beetle is not known to be established anywhere else in North America outside its native range. Trees that are stressed or dying are usual hosts, but healthy trees are attacked during population outbreaks. Excessive resin production and networks of sawdust-filled feeding tunnels are signs of attack.

A. Survey Methodology:

Large, cross-vane Colossus Panel Traps baited with BSLB lure (a host volatile) and UHR ethanol were used to survey four sites for the presence of the Brown Spruce Longhorn Beetle, *Tetropium fuscum*, in spruce stands in Caledonia, Franklin, and Orleans Counties in Vermont in 2007 (Figure 1). At survey sites, traps were placed in or within 1 meter of the nearest living spruce tree. A cup containing a preserving solution of propylene glycol, Kodak Photo-flo and bitrex was used to collect specimens. New solution was added to the collection cup during each site visit. All specimens were removed with forceps or by screening and placed in alcohol in labeled plastic vials, and transported to the Forests, Parks and Recreation Forest Biology Lab in Waterbury, VT. Beetles collected during the survey were screened to separate Cerambycids from other Coleoptera. Cerambycids, Scolytids and other selected beetles were labeled and maintained for our permanent collections.

B. Rationale underlying survey methodology:

This European beetle is attacking and killing apparently healthy red spruce trees in Nova Scotia. It has also been intercepted in solid wood packing material in Montreal, which is only about 40 miles from the Vermont border. Red spruce is preferred but white and black spruce are also attacked. These three species are present in Vermont, with white and red spruce the most common. They represent an important component of deer wintering yards in northern Vermont. This survey was conducted (1) to determine the presence and distribution of the target species, (2) to monitor the advent of new exotic species over time, (3) to aide in tracking patterns of infestation throughout the U.S. and possible pathways for introduction, and (4) to identify the characteristics of high risk habitats or sites.

C. Survey dates:

In Caledonia County, traps were deployed on 5 June and were retrieved on 20 August 2007. Trapping dates in Franklin and Orleans Counties were 30 May through 23 August 2007.

D. Taxonomic services:

Personnel at the Vermont Department of Forests, Parks and Recreation Forest Biology Laboratory in Waterbury screened trap catches. No suspects were collected.

E. Benefits and results of survey:

A summary of trap locations, trapping dates and number of site visits appears in Table 1. No *Tetropium fuscum* beetles were caught at the survey sites, though a single specimen of an indigenous *Picea*-feeding species of *Tetropium* was found in a trap in Sutton in Caledonia County. Non-target Cerambycidae and Siricidae collected during the surveys were maintained for our permanent collection. Siricids included *Urocerus cressoni* and *Xeris spectrum spectrum*.

F. Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful.*: We accomplished our survey objectives for the period.

G. If appropriate, explain why objectives were not met:

We met the objectives of this survey.

H. Where appropriate, explain any cost overruns. There was no cost overrun.

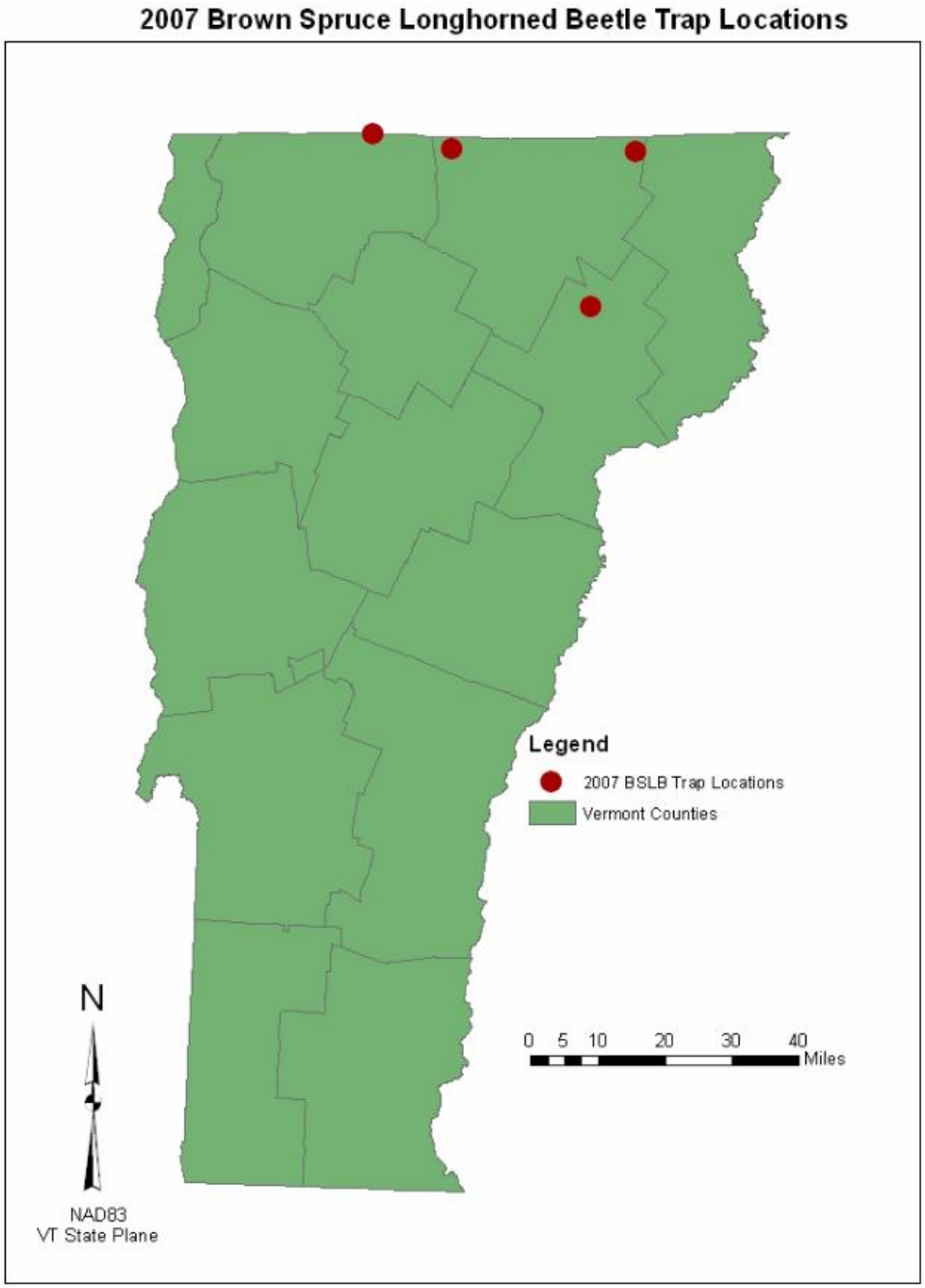
I. NAPIS database submissions: All data were entered into NAPIS in November, 2007. This information is available per state on the NAPIS web site.

*indicates information required per 7 CFR 3016.40 and 7 CFR 3019.51

Table 1. Summary of site and collection data for 2007 Vermont survey for *Tetropium fuscum*, the brown spruce longhorn beetle. Data include counties, towns, GPS coordinates, stand type, trapping dates, numbers of visits, and numbers of *T. fuscum* collected during the survey. Numbers of other Cerambycids and numbers and species of Siricid wasps collected in traps were also recorded.

County	Town	GPS Points (NAD83)	Stand Type	Trapping dates	# of visits	Non-targets		# of *Tetropium fuscum*
						Ceramby-cids	Siricids	
Caledonia	Sutton	N44.64016 W72.06731	*Picea rubens*	6/5/07-8/20/07	6	6	4 (*Urocerus cressoni*)	0
Franklin	Berkshire	N45.0156, W72,72873	*Picea abies* plantation. Trap was hung in *P. abies.*	5/30/07-8/23/07	7	2	1 (*Urocerus cressoni*)	0
Orleans	Holland	N44.97390 W71.92900	*Picea rubens* and *P.glauca* within 100 meters. Trap was hung in *P.rubens.*	5/30/07-8/23/07	7	21	1 (*Xeris spectrum spectrum*)	0
Orleans	Jay	N44.98231 W72.49067	*Picea rubens* and *Abies balsamea* Trap was hung in *P. rubens.*	5/30/07-8/23/07	7	8	0	0
Totals					27	37	6	0

Figure 1 Brown Spruce Longhorn Beetle Trap locations.



Project completed by ANR, Forests, Parks and Recreation

Part II) OAK SPLENDOR BEETLE SURVEY


Photo: Louis-Michel Nageleisen

Agrilus biguttatus (Fabr.) is a major pest of oaks in Europe, causing damage similar to that of the two-lined chestnut borer (*Agrilus bilineatus* (Weber)) in this country. It is also associated with the European version of oak decline and has become more common within its natural range in recent years. *A. biguttatus* is not known to occur in the United States but, if it were introduced, the insect would be a considerable threat in natural and urban settings.

A. Survey Methodology:

Log samples were collected from three sites, one each in Chittenden, Grand Isle and Windham Counties (Figure 1). White oak was sampled at two of the survey sites, and swamp white oak was taken at the third (Table 1). Six bolts were collected from each of the three sites. The oak bolts were transported to a rearing facility, where they were placed in individual rearing chambers constructed of builder's tubes 30 cm in diameter and 43 cm long. The back opening of the tube was covered with 5 mm luan mahogany, and the front opening was fitted with 1 mm screen that was secured with a metal band. A 4 cm hole was cut in the screen and the lid of a snap-on rearing cup was secured with silicon glue to the center of each screen.

B. Rationale underlying survey methodology:

It is not known whether *Agrilus biguttatus* is present in the United States. With increasing tree dieback in Vermont following recent droughts, this was a good opportunity to investigate declining white oak, the favorite host of this insect, and rear out the wood borers to determine if *A. biguttatus* is present. This survey was conducted (1) to determine the presence and distribution of the target species, (2) to monitor the advent of new exotic species over time, (3) to aide in tracking patterns of infestation throughout the U.S. and possible pathways for introduction, and (4) to identify the characteristics of high risk habitats or sites.

C. Survey dates:

Dates that trees were felled and log samples taken were 24 April 2007 for Windham County samples, and 2 May 2007 for Chittenden and Grand Isle Counties (Table 1). The rearing set up was in place by 30 April for Windham County logs, and by 3 May for log samples from Chittenden and Grand Isle Counties. Observations took place daily through 22 September 2007.

D. Taxonomic services:

Insects that emerged from the boles were identified by personnel at the Vermont Department of Forests, Parks and Recreation Forest Biology Laboratory in Waterbury. No *Agrilus biguttatus* were reared from the log samples. However,

members of three orders of insects were found in the collecting cups. These included Coleoptera (seven species in four families), Hymenoptera in four families, and one species of Psocoptera .

Numerous non-target insects were reared from the logs collected at North Hero. A total of 50 specimens of *Xylotrechus colonus*, a Cerambycid beetle, emerged from the six log sections from that site. In addition, there were 11 specimens of another Cerambycid, *Urographis fasciatus*, 15 specimens (three species) of parasitic wasps, six other Cerambycids in two families, and a single sawfly.

E. Benefits and results of survey:
No *Agrilus biguttatus* beetles were reared from the boles of sampled trees.

F. Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful.*: We accomplished our survey objectives for the period.

G. If appropriate, explain why objectives were not met:
We met the objectives of this study.

H. Where appropriate, explain any cost overruns. There was no cost overrun.

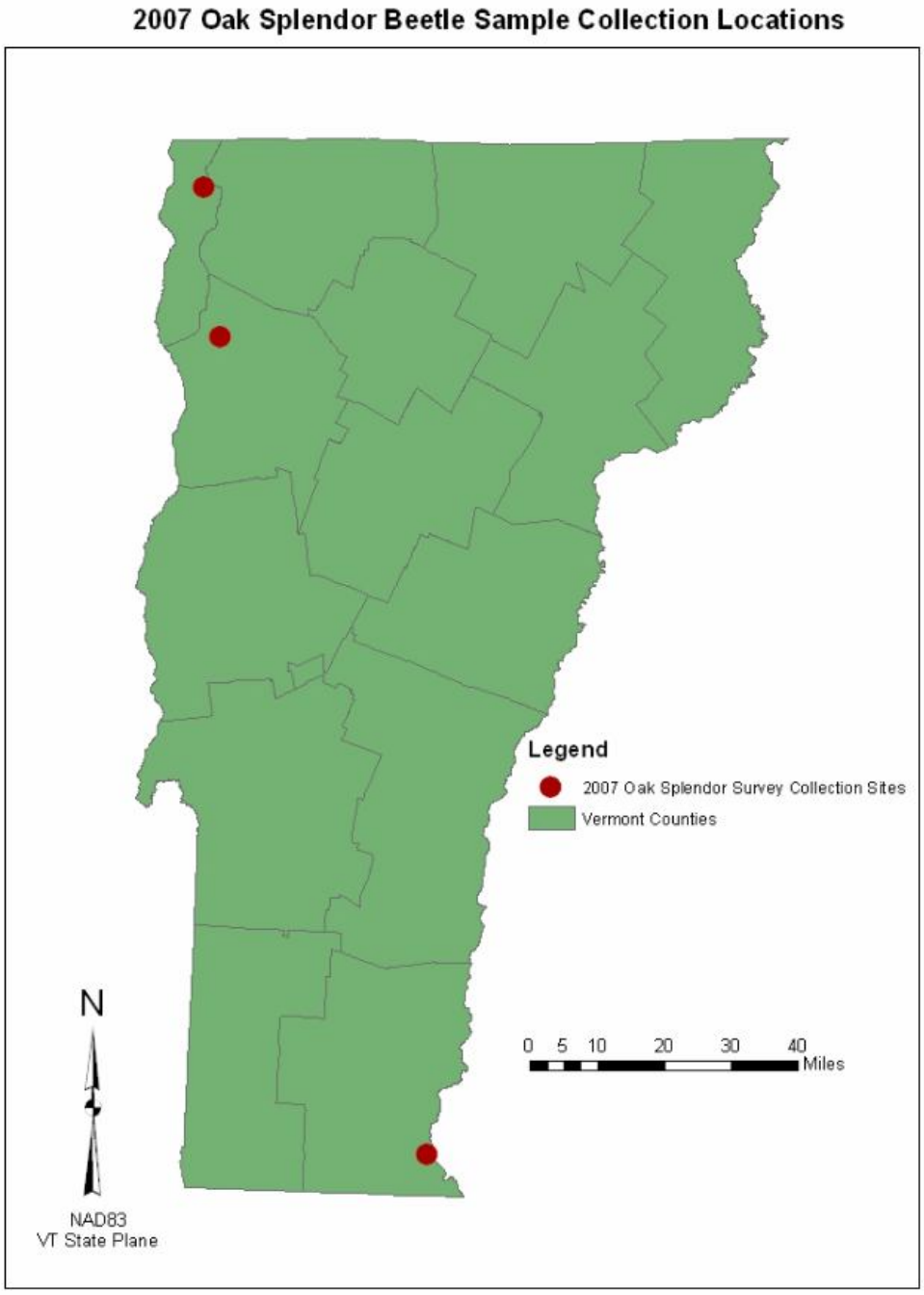
I. NAPIS database submissions: CAPS program pest and date of submission
NOTE: All data were entered into NAPIS in November, 2007. This information is available per state on the NAPIS web site.

*indicates information required per 7 CFR 3016.40 and 7 CFR 3019.51

Table 1. Summary of site and collection data for 2007 Vermont survey for *Agrilus biguttatus*, the oak splendor beetle. Data include counties, towns, sites, GPS coordinates, dates of survey, oak species, and numbers of *Agrilus biguttatus* found.

County	Town	Site	GPS Points (NAD83)	Dates of survey	Oak species	# of *Agrilus biguttatus*
Chittenden	Colchester	Niquette Bay State Park	N44.58565, W73.18850	5/2/07-9/22/07	*Quercus alba*	0
Grand Isle	North Hero	North Hero State Park	N44.90959, W73.24210	5/2/07-9/22/07	*Quercus bicolor*	0
Windham	Brattleboro	Fort Dummer State Park	N42.81891, W72.56071	4/24/07-9/22/07	*Quercus alba*	0

Figure 1. Oak Splendor Beetle Trap Locations.



Project completed by ANR, Forests, Parks and Recreation

Part II) 2007 Chittenden County pine plantations digital mapping for assistance in *Sirex noctilio* monitoring efforts

1.0 INTRODUCTION

During 2007, Redstart Forestry & Consulting worked in conjunction with the Vermont Agency of Agriculture, Food & Markets Cooperative Agricultural Pest Survey (CAPS) and several other cooperators[1] to digitize mapped pine stands in Chittenden County, Vermont. This work was designed to integrate with cooperative efforts to protect vital natural resources in Vermont in a manner that leverages information primarily directed at a particular pest or impact (in this instance, efforts directed at both *Sirex noctilio* and Scleroderris canker were involved) in such a way that the information can be used for protection efforts across a broader spectrum of interests and applications.

1.1 RATIONALE

The European wood wasp, *Sirex noctilio*, is considered a minor pest in its native range but has been a major pest in exotic pine plantations in the Southern Hemisphere, with periodic outbreaks contributing to significant economic losses**.** A single female was trapped near Oswego, NY in 2004 and positively identified in 2005 **(**http://www.aphis.usda.gov/plant_health/plant_pest_info/sirex/index.shtml **).** Since that time, delimiting surveys have yielded *Sirex noctilio* captures in 29 counties in New York State, 6 counties in Pennsylvania, and one county each in Michigan and Vermont (http://www.aphis.usda.gov/plant_health/plant_pest_info/sirex/downloads/postivecountiesbyyear.pdf). Due to widespread distribution of its preferred hosts and the potential for significant economic impacts if the wasp were to become well established**,** the pest has received high ratings in risk assessments performed by United State Department of Agriculture Animal and Plant Health Inspection Service (USDA\APHIS) personnel (Borchert 2007).

Much is still unknown about this wasp and its potential impacts in the United States and Canada, but it appears that climate will not limit its spread and that the distribution of its preferred hosts (primarily pines) will be a principal factor in the extent of its impacts in determining the amount of damage it will cause (Borchert 2007). Indications are that the wasp and an associated fungus have the potential to seriously affect even-aged stands with a high percentage of pines in the northeast U.S. in particular, but that focused monitoring efforts and silvicultural prescriptions to encourage vigorous growth can help reduce the damage (Dodds, Cooke, and Gilmore 2006). Although vegetation cover type maps have evolved considerably over time, forest cover type maps based on remotely sensed data still have trouble distinguishing coniferous stands to a species level (NEG/ECP 2003).

Vermont enables landowners to enroll in Use Value Appraisal (UVA) for acreages that are actively managed for forest or agricultural use, a program designed to maintain Vermont's working landscape by reducing tax burdens below the level of fair market value (often the value of "developed" land uses) to levels of assessment for working

[1] Cooperators included: Emilie Inoue (Pest Survey Coordinator) and Tim Schmalz (Plant Pathologist), VT Agency of Agriculture, Food and Markets Agricultural Resource Management and Environmental Stewardship Division Plant Industry Section; Mike Snyder, Chittenden County Forester; Dale Bergdahl, Professor Emeritus of Forest Patholgy, Univ. of Vermont; and Ron Kelley, Resource Protection Regional Supervisor, VT Agency of Natural Resources Dept. of Forests, Parks & Recreation.

values of enrolled lands. A landowner must enroll a minimum of 25 acres of contiguous forest land (excluding 2 acres for the homestead) to be eligible for the forestry component of the program. As part of this program, landowners with enrolled forest land are required to submit forest management plans, updated every ten years, including mapped acreages with stand-level forestry information, to the County Forester. These are generally submitted in the form of paper maps. Conversion of these maps to a digital format permits their integration into Geographic Information Systems (GIS) applications that can be used to create sophisticated levels of map overlays and analysis, using a wide range of information sources, including everything from a range of natural resource, environmental, and climate factors to road and transportation networks, pest introductions, and prioritized monitoring and trapping locations. Redstart has been working with numerous cooperators to pilot "ForAgProtect" in Vermont, a GIS-based system for forestry and agricultural protection designed to integrate these information sources in a centralized database that helps increase the efficiency and applicability of efforts to combat a variety of introduced pests.

The Vermont Agency of Natural Resources Department of Forests, Parks and Recreation (VT ANR-FPR) has a long-standing record of active monitoring and reporting geared to forest health protection. During the late 1970s and into the 1980s, Scleroderris canker (caused by the fungus *Gremmeniella abietina-Scleroderris lagerbergii* (Lagerb.) Morelet) was detected in portions of the northeast U.S. including Vermont (Skilling, O'Brien, and Bell 1979). Although the canker has not been detected in Vermont since 1986 (VTFPR 2004), periodic surveys are conducted to monitor for this organism as a means for early detection and rapid response. In 1994, a Scleroderris survey was conducted through much of Vermont that included many small pine and Christmas tree plantations, directed particularly toward hard pines (especially Scots and red pine). The host range for this organism overlaps closely with that of *Sirex noctilio*, and many of the plantations surveyed in 1994 fall below thresholds of the acreages needed for entry of a parcel into the UVA program.

2.0 BACKGROUND INFORMATION

2.1 GEOGRAPHIC SETTING

2.1.1 Location description

The mapped stands were all located in Chittenden County in the northwest corner of Vermont (Fig. 1). This county lies primarily within the Champlain Valley biophysical region, but the eastern portions of the county extend into the Northern Green Mountain biophysical region (Thompson and Sorenson 2000). This accounts for a wide range of climatic factors, geology, and soils. Growing seasons are commonly 30-40 days shorter in the Green Mountains than the 130- to 150-day seasons of the Champlain Valley, and the soils of the Green Mountains tend to be much more acidic than the rich lacustrine, deltaic, and alluvial-based soils common in the Champlain Valley. Similar disparities exist in human-related influences, with the rich farmlands and lake resources of the Champlain Valley hosting the longest continually human-inhabited portions of Vermont and currently some of the most densely populated municipalities within the state. The Northern Green Mountains, in contrast, have one of the lowest road densities in the state

and the second highest proportion of publically owned lands of Vermont's eight biophysical regions (exceeded only by the Southern Green Mountains; Fig. 1).

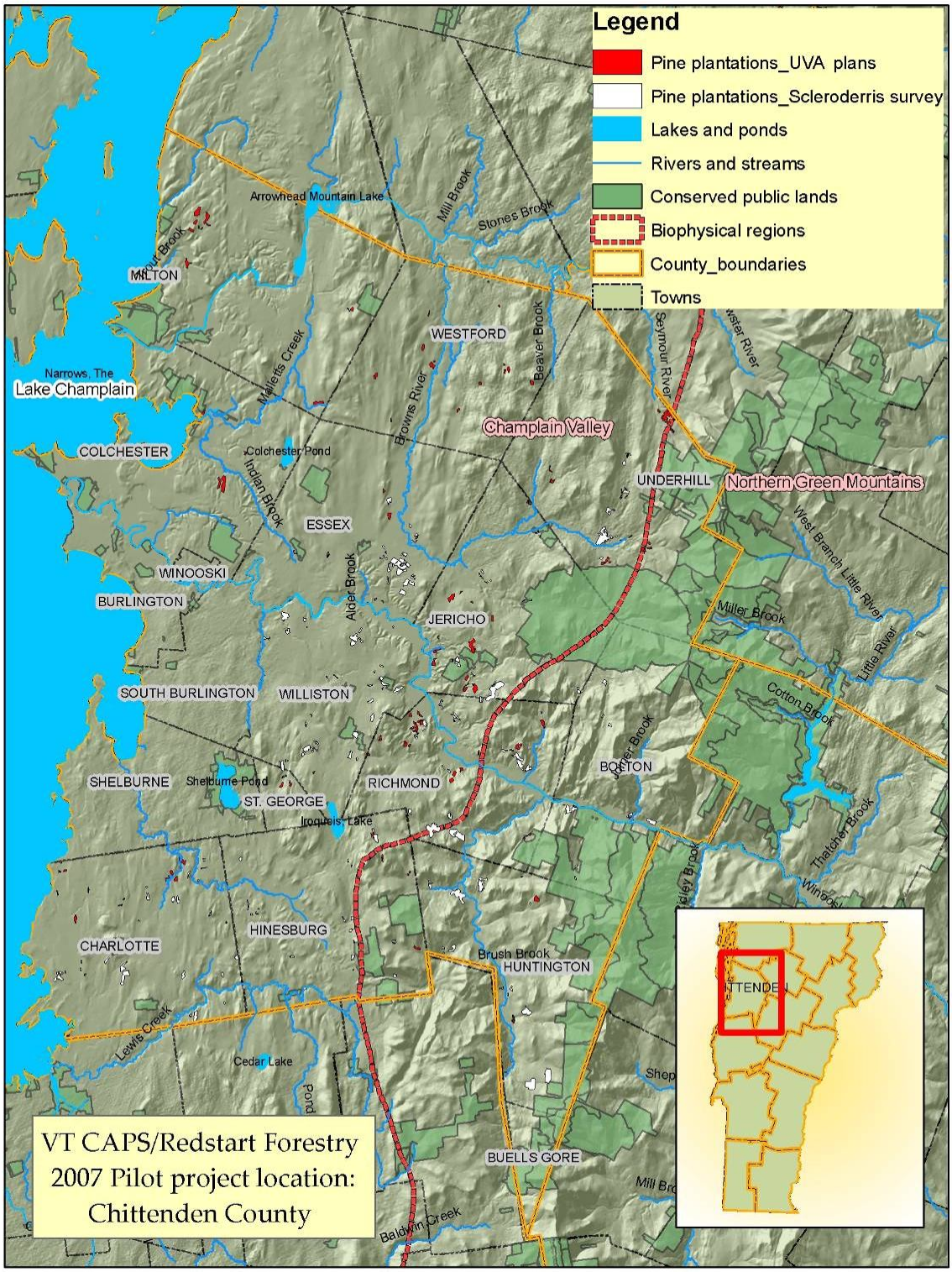


Figure 1. Locator map for VT CAPS/Redstart Forestry 2007 pilot project: digitizing of pine plantations in Chittenden County, VT.

2.1.2 Political jurisdictions

Chittenden County contains eighteen townships: Bolton, Buells Gore, Burlington, Charlotte, Colchester, Essex, Hinesburg, Huntington, Jericho, Milton, Richmond, Shelburne, South Burlington, St. George, Underhill, Westford, Williston, and Winooski. Forest management plans are created by consulting foresters or other individuals and submitted to the County Forester, who, at the time of this project, is Michael Snyder in Essex Junction. The county lies within VT Forest, Parks and Recreation District 3, which at the time of this project is covered by Regional Resource Protection Supervisor Ron Kelley in Morrisville.

3.0 METHODS

Paper maps were obtained for any pine plantations enrolled in the UVA program within the Chittenden County forester's jurisdiction. White, red, or Scots pine plantations or mixed plantations with any of these species in the mix were included; natural white pine stands were not included in the scope of this project. These pine stands were on-screen digitized against a base of 1:5,000 scale orthophotography. The resulting "shapefiles" (geographically referenced polygons) of these stands were then associated with tables including pertinent information for each stand ("attribute tables"). Attribute table fields include identified species present within the plantation, the landowner, and the forester who prepared the plan, based on the information found on the management plan maps when available. The orthophotography, created and maintained by the Vermont Tax Mapping Program, is black and white (leaf-off) data, permitting relatively easy distinction of softwood stands in contrast to surrounding deciduous stands. The management plan maps filed with County Foresters in Vermont all include coordinate locations from a standard 500-m grid system that permits quick referencing of the maps to the orthophotography, and subsequent delineation was based on the plan maps and the leaf-on/leaf-off contrast for on-screen stand delineation. The imagery derived from year 2000 fly-overs, with the exception of the extreme southeast portion of the county in Huntington and Buells Gore, where the flights occurred in 1997.

A second level of data was derived from a Scleroderris canker survey conducted by VT ANR-FPR personnel in 1994. These were visual inspections looking for diseased trees in hard pine and Christmas tree plantations. Only hard pines (red or Scots) were included, unless the plantation was mixed and contained at least one of these species. Stand locations were generally marked as point locations in a paper road atlas at a scale of roughly 1inch: 1.1miles (1:69,168), so the existing data was of a coarse resolution. These locations were referenced to the same orthophotography base as the management plan maps, but many of these plantations were significantly smaller in size and lacked the coordinate grid locators. These data are likely of a lower precision and have not been ground-truthed, and are thus maintained in a separate shapefile. No data were available for landowners and were not well detailed for species breakout, so the attribute table for this shapefile is not populated beyond the location data. Although the survey extended further abroad in Vermont, only Chittenden County locations were included within the scope of this project.

4.0 RESULTS AND BENEFITS

In all, 132 pine plantations were digitally mapped, based on the maps obtained from Chittenden County forest management plans. An additional 219 hard pine plantations were digitally mapped based on the information available from the 1994 Scleroderris canker survey. Only 13 of the stands represented in these two sources overlapped, and the data from the UVA maps used for the additional attribute information it contained. The location and attribute data for these 351 stands have been integrated into the ForAgProtect GIS, which is maintained as a centralized database integrating a wide range of data sources for potential applicability to a broader range of invasive species. In addition, the pine plantations data have been incorporated into a "geodatabase" with trap location and monitoring results from CAPS surveys up to year 2006 (Fig. 2), providing a means for maintaining this project or pest-specific data in a coherent and portable format. Risk assessment of *Sirex noctilio* performed by USDA\APHIS personnel indicates that an unknown factor in the establishment of this wasp in U.S. forests is the degree to which it is able to displace native siricids and other organisms occupying similar ecological niches (Borchert 2007). In its home range, competition with similar organisms and predation by a parasitic nematode (which has been successfully deployed as a biocontrol agent in some areas of the southern hemisphere) has prevented the European wood wasp from having a serious impact on forest health or wood industries (Dodds, Cooke, and Gilmore 2006). As part of protection efforts, VT Plant Pathologist Tim Schmalz assembled the geodatabase of delimiting survey trap locations and 2005-2006 annual trapping records of siricids, including native species in addition to *Sirex noctilio* (*S. noctilio* did not appear in any of these traps until 2007, but native siricids had been trapped and identified previously). The loading of the digitized pine plantation maps produced in this project into this geodatabase provides just one example of how these data can be easily utilized in a GIS to increase the value and flexibility of their application.

4.1 QUANTIFICATION OF RESULTS

Bearing in mind the broader applicability of these results, the 351 pine stands mapped in this project were covered within a project budget of $3500, yielding a per-unit cost of $9.97/stand. Project funds were covered by $2700 of CAPS funding and $800 of Redstart Forestry funds provided as an in-kind contribution through the Northern States Research Cooperative (Table 1). No cost overruns were associated with the project.

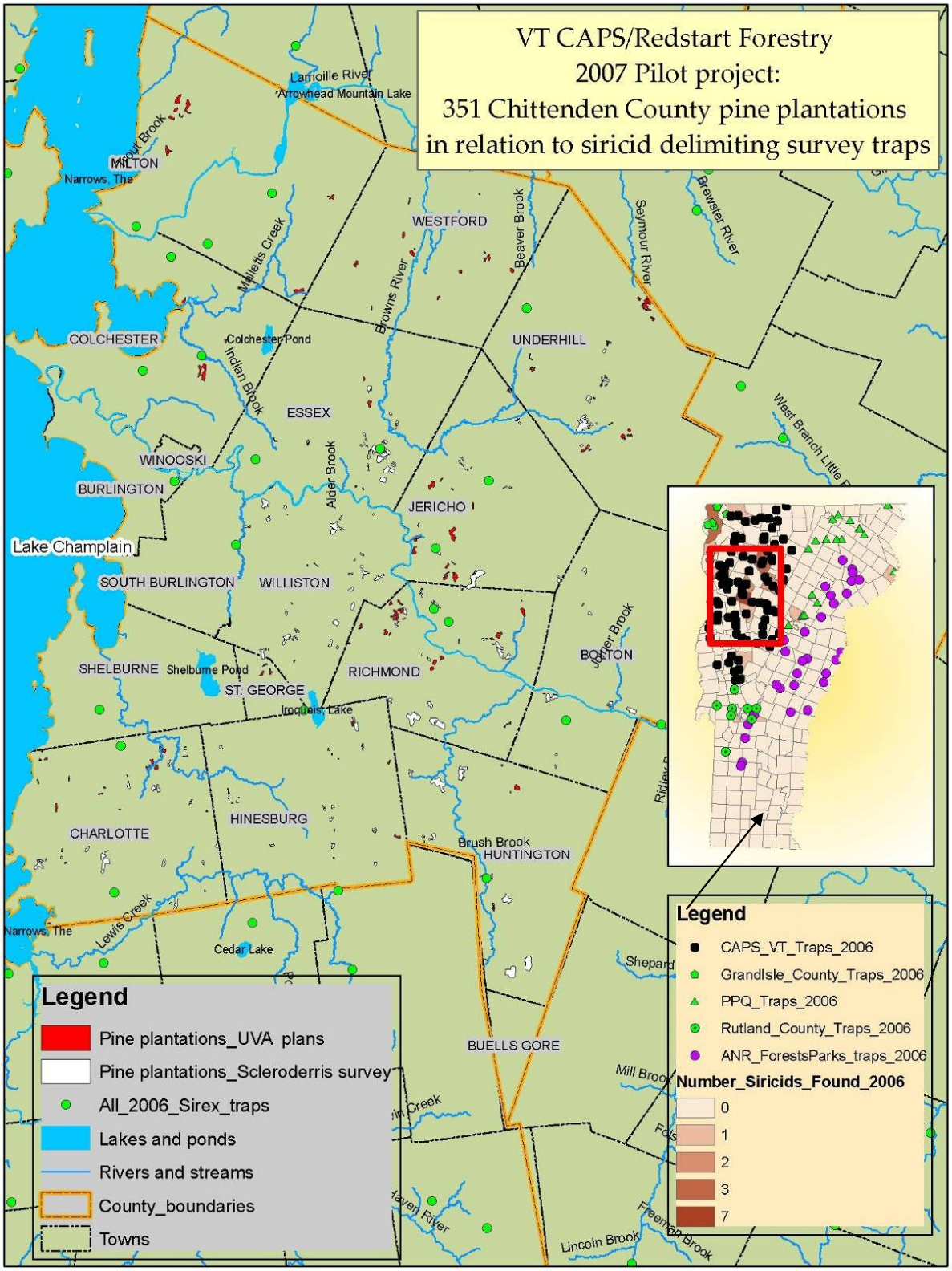


Figure 2. Results for CAPS 2007/Redstart Forestry pilot project digitizing 351 pine plantations in Chittenden County for host range mapping in *Sirex noctilio* and native siricid monitoring efforts.

Table 1. Budget detail for CAPS/Redstart Forestry 2007 pine plantations digitized mapping pilot project.

Item	Federal Funds	Cooperator Funds
a) Personnel (57 hrs x $40)	2,280.00	0
b) Fringe Benefits	0	0
c) Travel (133.8 mi x $.485)	67.61	0
d) Equipment	0	800.00*
e) Supplies (incl. w/ indirect costs)	0	0
f) Contractual	0	0
g) Construction	0	0
h) Other	0	0
i) Total Direct Costs (sum of a – h)	2347.61	800.00
j) Indirect Costs (15%)	352.14	0
k) TOTALS (sum of i + j)	2699.75	800.00

*In kind: ESRI software, PC, server space, scanner/copier use match from Northern States Research Cooperative.

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Part III) European Woodwasp Survey

Photo: Canadian Food Inspection Agency

European Woodwasp, *Sirex noctilio*. This pest native to Europe and Asia. Adults have four clear yellow membranous wings and have a stout cylindrical body, pointed at the terminal end. Size varies from 9 to 36mm long. In February 2005, a single wasp was positively identified in New York State. Host species include pine, spruce, fir and larch. *S. noctilio* is associated with the fungus *Amylostereum aerolatum* that, together with the wasp's mucus, results in the rapid weakening of host trees, thus rendering them susceptible to larval feeding.

A. **Survey Methodology (trapping protocol)**-

The objective of this survey was to determine the distribution of *S. noctilio* in the counties of western Vermont that lie within 150 miles of the 2005 detections in New York and Ontario, Canada.

One hundred traps were deployed: 65 Lingren funnel traps and 35 intercept panel traps. The Traps were placed in pine stands; one trap was placed approximately every 25 square miles, as the distribution of pine stands permitted (Map 1, Map 2). Given the partiality of *S. noctilio* to hard pine, however, traps were placed preferentially at hard pine sites. The traps were baited with α-β pinene 70/30 lures, and wet cups with a 50% solution of RV grade antifreeze were used for collection. The contents of the traps were collected and screened every two weeks. Lures were changed every month. Suspected *S. noctilio* specimens were sent to Cornell for identification.

B. **Rationale underlying survey methodology**-

Sirex noctilio is a wood-boring wasp native to Europe, Asia and Northern Africa. It prefers stressed pine trees, but will also bore in Spruce, Fir and Larch. Females deposit their eggs, along with a toxic mucus and *Amylostereum areolatum*, a cellulose digesting fungus, under the bark of pines (Haugen and Hoebeke 2005). In its larval stage, *S. noctilio* remains in the tree and receives nutrition from its symbiont, *A. areolatum*. The combination of *A. areolatum*'s digestive activities and the toxic mucus imparted by *S. noctilio* effects the damage to the trees (Smith and Schiff 2002). After 1-3 years of maturation, adult *S. noctilio* emerges. In its native range, *S. noctilio* is considered a secondary pest. As an exotic invader in New Zealand and Australia, however, *S. noctilio* has caused up to 80% mortality in pine plantations (Haugen and Hoebeke 2005). When introduced, robust populations of *S. noctilio* will attack healthy stands.

In 2004, one *S. noctilio* adult female was found in the by-catch of an exotic bark beetle survey in Fulton, NY. Follow-up surveys in 2005 found six infested trees and 83 adult females in New York, and five females in Ontario, Canada (*Sirex* Science Panel Report 2006). Surveys were continued in 2006 and found 58 positive *S. noctilio* specimens between New York, Pennsylvania, and Vermont (*Sirex* Science Panel Report 2006). All but three of the specimens were female (*Sirex* Science Panel Report 2006). These

findings resulted in twenty new county records in New York and two in Pennsylvania; no *S. noctilio* were found in Vermont, despite the survey effort. Thirty-eight trap sites returned a total of 74 specimens in Ontario, Canda, though no *S. noctilio* were identified in Quebec, New Brunswick or Nova Scotia (*Sirex* Science Panel Report 2006). The *Sirex* Science Panel reported that the delimiting survey met its objectives, but found the western edge of *Sirex* distribution remains unclear (*Sirex* Science Panel Report 2006).

Based on these findings, APHIS launched a 2007 delimiting/detection survey in those areas of New York, Pennsylvania and Vermont within a 150 miles radius of the 2005 *S. noctilio* detections. Within Vermont this includes Addison, Chittenden, Franklin, Grand Isle, Lamoille, Rutland and Washington counties. Preliminary results from the 2007 survey suggest an increase in *S. noctilio* range. Specimens were found in four counties in Pennsylvania, three counties in New York, and one county each in Michigan and Vermont. The 2007 survey results mark the first appearance of *S. noctilio* in Michigan and in Vermont.

C. **Survey Dates**-

Traps were deployed between May 29th and September 21st, 2007. They were removed between August 9th and November 1st, 2007.

D. **Taxonomic services**-

The state field technician pre-screened traps for suspected specimens of *S. noctilio*. Suspects were sent to Dr. Rick Hoebeke at Cornell University. Of the two suspects sent to Dr. Hoebeke, one was positively identified as *S. noctilio*.

E. **Benefits and results of survey**-

One specimen of *Sirex noctilio* was detected in Vermont during the 2007 survey. The specimen was collected on August 31, 2007 from a trap in Lamoille County. It was sent to Dr. Richard Hoebeke and confirmed as *S. noctilio* on September 5, 2007. Two specimens total were sent to Cornell for identification; the second siricid was collected on September 10, 2007 and identified as *Sirex cyaneus* by Dr. Hoebeke on September 15, 2007.

The fact that the target pest was detected in Vermont for the first time provides the U.S. Science Advisory Panel with important distribution data in the United States. The positive identification of *S. noctilio* in Vermont represents the easternmost finding in the U.S. to date. With all states' data compiled, it may be possible to understand the pattern of spread for this pest.

This survey enabled the Vermont Agency of Agriculture to go out and identify hard pine stands located in western Vermont. In addition to the CAPS "in-grid" survey for this pest, personnel at USDA APHIS PPQ placed *S. noctilio* traps outside of the grid area. The combination of both agencies setting traps ensured that the entire state of Vermont was heavily surveyed.

The trapping locations will not only be valuable for future *S. noctilio* surveys, but will also be useful in surveys dealing with pests that target similar hosts.

Although traps were in the field from May until November, the results indicated that all siricids were caught between the months of July and October (Figure 1). October yielded the highest number of captures, with twenty-eight, followed by thirteen each in September and August, and four in July. The total number of siricids caught was fifty-eight. Franklin, Addison and Lamoille counties had the highest number of siricids captured, with twenty-two, fourteen, and thirteen respectively (Figure 2). A complete list of in-grid trapping locations with survey results is provided in Table 1.

The widespread mortality of hard pine stock caused by *S. noctilio* invasion in the southern hemisphere suggests that *S. noctilio*'s presence poses a threat to hard pines in the northeastern United States. Learning the distribution of *S. noctilio* allows the Science Advisory Panel to make informed regulatory decisions and best allocate resources in order to minimize the number of trees damaged.

The North East State Forester's Association estimates Vermont's annual economic contribution of forest-based manufacturing and forest-related tourism and recreation at over $1.5 billion (2007). Vermont's land-area covers 5.92 million acres; 77% of which is forested (Miles 2007). Ninety-eight percent, or 4.49 million acres, of forested acres in Vermont is classified as timberland by the USDA Forest Service (Miles 2007). *Pinus strobus* (white pine) and *Pinus resinosa* (red pine) comprise a total of 5% of Vermont's forest type (North East State Forester's Association 2007). The North East State Forester's Association calculates that each 1,000 acres of forestland in Vermont supports 1.4 forest-related manufacturing jobs and 1.4 forest-based recreation and tourism jobs (2007). This means approximately 6,400 jobs each in forest-related manufacturing and in recreation and tourism. In short, the economic impact of a *S. noctilio* infestation in Vermont would be significant. It is therefore important for Vermont to determine the status of occurrence for *S. noctilio*. An accurate distribution map of *S. noctilio* is necessary not only for Vermont but also for other states in order to safeguard the U.S. pine industry.

F. **Compare actual accomplishments to objectives established for the period. When the output of the project can be quantified, a computation of cost per unit of output is required when useful.***

All of the objectives stated in the 2007 *Sirex noctilio* survey workplan were met.

G. **If appropriate, explain why objectives were not met**

All objectives were met.

H. **Where appropriate, explain any cost overruns-**

We had no cost overruns.

I. **NAPIS database submissions-**
All data was entered into NAPIS

*indicates information required per 7 CFR 3016.40 and 7 CFR 3019.51

References Cited:

Smith, David R. and Nathan M. Schiff. "A review of the Siricid woodwasps and their Ibalid parasitoids (Hymenoptera: Siricidae: Ibaliidae) in the eastern United States, with emphasis on the Mid-Atlantic region." *Proceedings of the Entomological Society of Washington*. 2002;104(1):174-194.

Haugen, Dennis A. and E. Richard Hoebeke. "Pest Alert: Sirex Woodwasp – *Sirex noctilio* F. (Hymenoptera: Siricidae)." USDA Forest Service Northeastern Area. 2005. Available at: http://na.fs.fed.us/spfo/pubs/pest_al/sirex_woodwasp/sirex_woodwasp.htm. Accessed on October 30, 2007.

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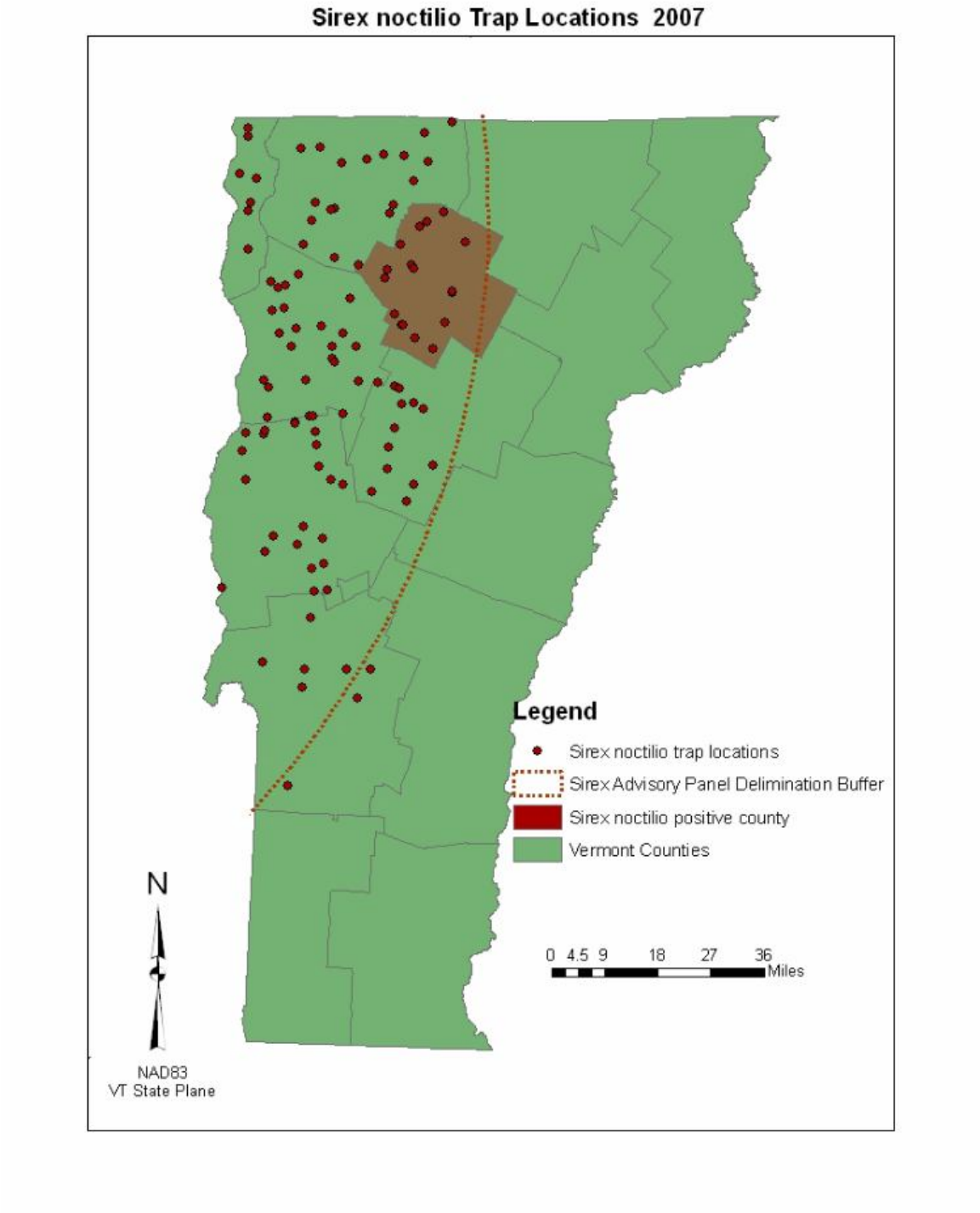
Miles, Patrick D. "Forest Inventory and Analysis Database version 2.1." St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 2007. Available at: www.ncrs2.fs.fed.us/4801/fiadb/available_data.html. Accessed on October 30, 2007.

Map 1: Vermont 2007 *Sirex noctilio* trap Locations



Map 2: Vermont 2007 *Sirex noctilio* trap locations by town

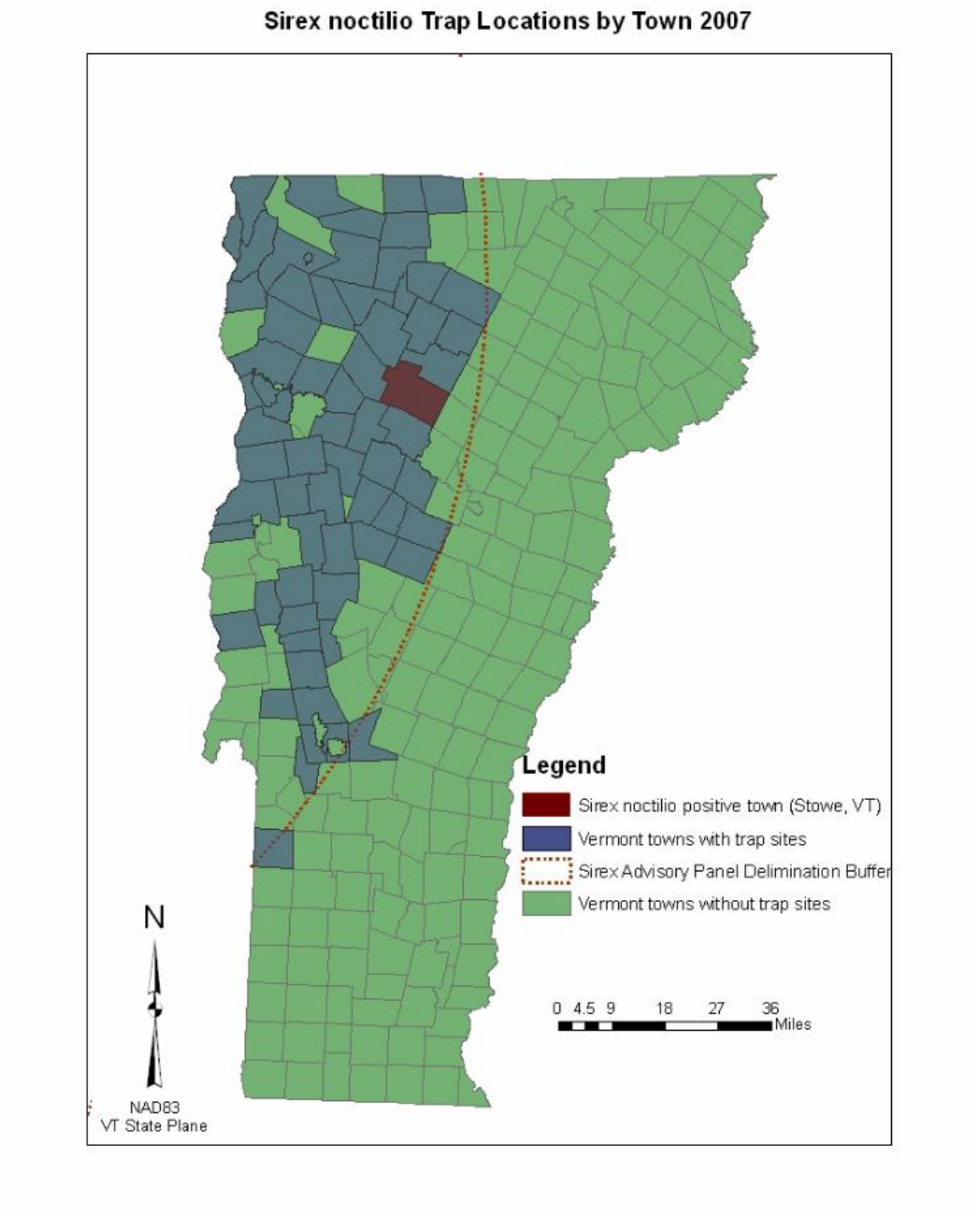


Figure 1. Number of siricids captured per month

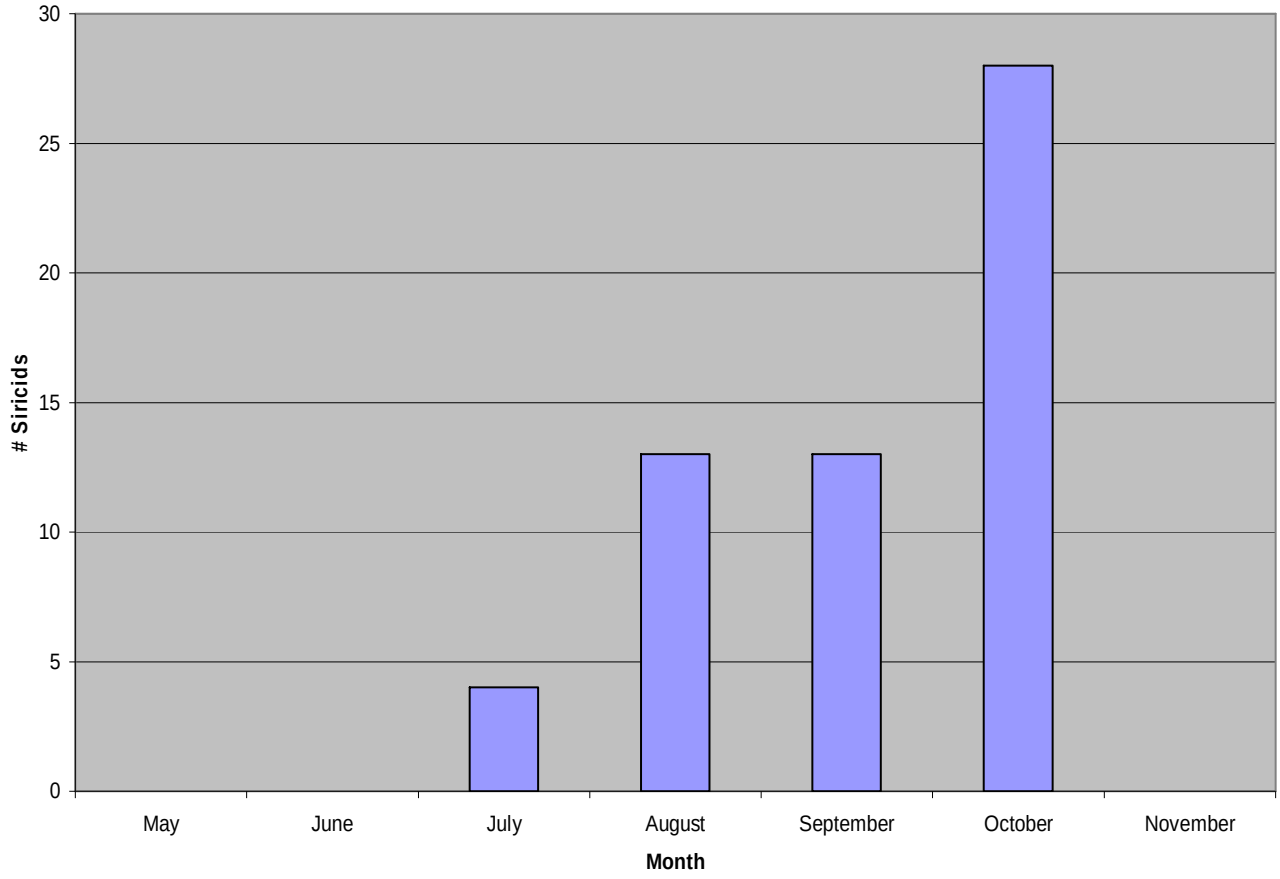


Figure 1 Data

Month	# Siricids
May	0
June	0
July	4
August	13
September	13
October	28
November	0
Total	**58**

Figure 2. Number of siricids by county

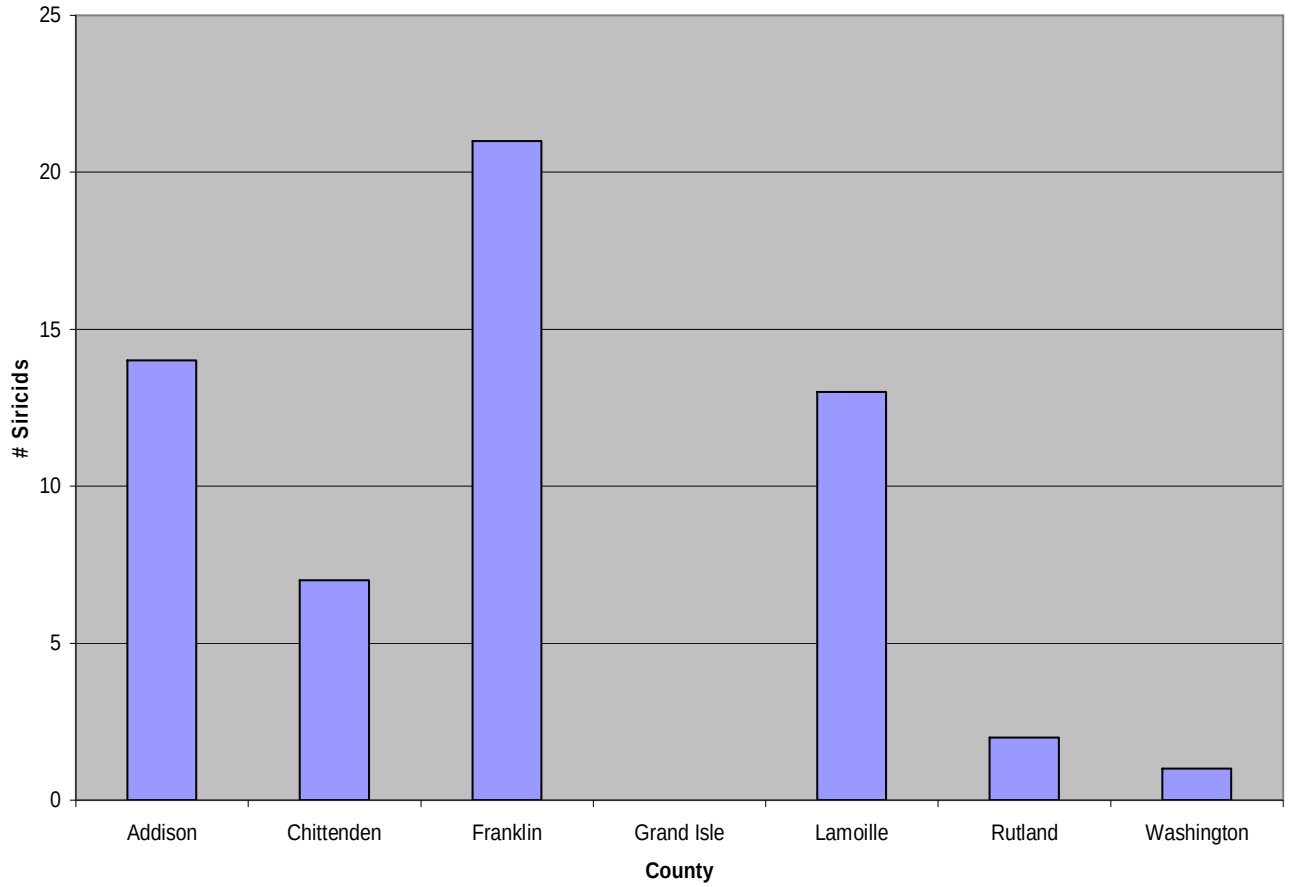


Figure 2 Data

County	# Siricids found by County
Addison	14
Chittenden	7
Franklin	21
Grand Isle	0
Lamoille	13
Rutland	2
Washington	1
Total	58

Table 1: In-grid trap details

Trap ID	Latitude	Longitude	State	County	Town	Species of Pine	Date Installed	Date Removed	# of Siricids	Month Found
VTAD1	44.28145	-73.07915929	VT	Addison	Starksboro	Red	6/29/2007	10/4/2007	0	N/A
VTAD10	43.91861	-73.02587545	VT	Addison	Goshen	Scotch	6/29/2007	10/4/2007	0	N/A
VTAD12	43.8499	-73.05816036	VT	Addison	Brandon	Red	6/29/2007	10/6/2007	3	September, October
VTAD13	43.90551	-73.06669548	VT	Addison	Salisbury	Red	6/29/2007	10/6/2007	1	July
VTAD14	43.94774	-73.22627443	VT	Addison	Middlebury	White	6/29/2007	10/6/2007	0	N/A
VTAD15	44.26375	-73.12759814	VT	Addison	Hinesburg	Scotch	6/29/2007	10/4/2007	0	N/A
VTAD16	44.24291	-73.23028685	VT	Addison	Ferrisburgh	Red	7/2/2007	10/8/2007	0	N/A
VTAD17	44.23729	-73.29635695	VT	Addison	Ferrisburgh	Red	7/2/2007	10/8/2007	0	N/A
VTAD18	44.19349	-73.30646686	VT	Addison	Ferrisburgh	Red	7/2/2007	10/8/2007	0	N/A
VTAD19	44.12346	-73.29262163	VT	Addison	Vergennes	Scotch	7/2/2007	10/8/2007	0	N/A
VTAD2	44.2408	-73.05784537	VT	Addison	Starksboro	Scotch	6/29/2007	10/4/2007	1	October
VTAD3	44.20955	-73.05420058	VT	Addison	Starksboro	Scotch	6/29/2007	10/4/2007	0	N/A
VTAD4	44.15555	-73.04669291	VT	Addison	Bristol	Red	6/29/2007	10/4/2007	0	N/A
VTAD5	44.12581	-73.00189826	VT	Addison	Bristol	Scotch	6/29/2007	10/4/2007	0	N/A
VTAD6	44.11236	-72.96371299	VT	Addison	Lincoln	Red	6/29/2007	10/4/2007	1	October
VTAD7	44.01046	-73.09502615	VT	Addison	Middlebury	Red	7/4/2007	10/6/2007	0	N/A
VTAD8	43.96402	-73.1155893	VT	Addison	Middlebury	White	6/29/2007	10/6/2007	0	N/A
VTAD9	43.9807	-73.0307077	VT	Addison	Ripton	Red	7/4/2007	10/6/2007	0	N/A
VTCH1	44.53828	-73.20678324	VT	Chittenden	Colchester	Red	6/26/2007	10/2/2007	1	September
VTCH10	44.4943	-73.12785069	VT	Chittenden	Essex Junction	Red	6/26/2007	10/1/2007	0	N/A
VTCH11	44.50004	-73.04100445	VT	Chittenden	Essex Junction	Red	6/27/2007	10/1/2007	0	N/A
VTCH12	44.57059	-72.93960077	VT	Chittenden	Underhill	Red	6/27/2007	10/1/2007	1	October
VTCH13	44.4844	-72.96544737	VT	Chittenden	Jericho	Red, Scotch	6/26/2007	10/2/2007	0	N/A
VTCH14	44.45059	-73.00197562	VT	Chittenden	Jericho	Red	6/27/2007	10/1/2007	1	October
VTCH15	44.42055	-73.00303233	VT	Chittenden	Richmond	Red	6/27/2007	10/4/2007	1	October
VTCH18	44.36988	-73.0929528	VT	Chittenden	Williston	Scotch	6/29/2007	10/4/2007	0	N/A

VTCH19	44.27792	-73.22346951	VT	Chittenden	Charlotte	Scotch	7/2/2007	10/8/2007	0	N/A
VTCH2	44.54588	-73.1658705	VT	Chittenden	Colchester	White	6/26/2007	10/2/2007	0	N/A
VTCH20	44.35147	-73.21989773	VT	Chittenden	Charlotte	Red	7/2/2007	10/8/2007	0	N/A
VTCH22	44.36922	-73.23470629	VT	Chittenden	Shelburne	Red, Austrian	7/2/2007	10/8/2007	0	N/A
VTCH23	44.28652	-72.96528619	VT	Chittenden	Huntington	Scotch	7/3/2007	10/10/2007	1	September
VTCH3	44.59495	-73.18769286	VT	Chittenden	Colchester	Scotch	6/26/2007	10/2/2007	0	N/A
VTCH4	44.60975	-73.21234387	VT	Chittenden	Milton	Red, White	6/26/2007	10/2/2007	0	N/A
VTCH5	44.60133	-73.16228229	VT	Chittenden	Milton	Austrian	6/26/2007	10/2/2007	0	N/A
VTCH6	44.62675	-73.1175816	VT	Chittenden	Milton	Austrian	6/26/2007	10/2/2007	0	N/A
VTCH7	44.45181	-73.14092763	VT	Chittenden	South Burlington	White, Austrian	6/27/2007	10/4/2007	0	N/A
VTCH8	44.41428	-72.99285402	VT	Chittenden	Richmond	Red	7/4/2007	10/11/2007	1	September
VTCH9	44.48299	-73.18411295	VT	Chittenden	Burlington	Scotch	6/26/2007	10/1/2007	0	N/A
VTFR10	44.91002	-72.88600177	VT	Franklin	Enosburg Falls	White	6/27/2007	10/1/2007	0	N/A
VTFR11	44.90409	-72.6747286	VT	Franklin	Enosburg Falls	Red, Scotch	6/27/2007	10/1/2007	0	N/A
VTFR13	44.79826	-72.79430802	VT	Franklin	Enosburg Falls	Scotch	7/6/2007	10/11/2007	2	October
VTFR15	44.66923	-72.99584644	VT	Franklin	Fairfax	Scotch	6/26/2007	10/1/2007	0	N/A
VTFR16	44.65097	-72.91289988	VT	Franklin	Cambridge	Red	27-Jun-07	1-Oct-07	4	September, October
VTFR17	44.78831	-72.99807871	VT	Franklin	Fairfield	Scotch	7/6/2007	10/11/2007	0	N/A
VTFR3	44.93624	-73.11308211	VT	Franklin	Swanton	Red	6/27/2007	10/1/2007	2	October
VTFR4	44.93824	-73.04679668	VT	Franklin	St. Albans	Red	6/27/2007	10/1/2007	0	N/A
VTFR6	44.92067	-72.7573709	VT	Franklin	Enosburg Falls	Red	6/27/2007	10/1/2007	1	October
VTFR7	44.97463	-72.68903685	VT	Franklin	Richford	Red	6/27/2007	10/1/2007	0	N/A
VTFR8	45.00262	-72.59217348	VT	Franklin	Richford	Red	6/27/2007	10/1/2007	0	N/A
VTFR9	44.90197	-72.97261993	VT	Franklin	Sheldon	Red	6/27/2007	10/1/2007	12	September, October
VTLA1	44.47421	-72.71727238	VT	Lamoille	Stowe	Red	7/6/2007	10/10/2007	3	August, September, October
VTLA10	44.51248	-72.61747451	VT	Lamoille	Morrisville	Scotch	7/5/2007	10/10/2007	1	August

VTLA11	44.58535	-72.59004137	VT	Lamoille	Hyde Park	Red	7/5/2007	10/10/2007	0	N/A
VTLA12	44.70717	-72.54495034	VT	Lamoille	Eden	Red, Scotch	7/5/2007	10/10/2007	2	September, October
VTLA13	44.7834	-72.61943445	VT	Lamoille	Belvidere Center	Red	7/5/2007	10/10/2007	0	N/A
VTLA14	44.75791	-72.67884135	VT	Lamoille	Eden	Scotch	7/5/2007	10/10/2007	2	August, September
VTLA2	44.50467	-72.76425806	VT	Lamoille	Stowe	Red	7/6/2007	10/10/2007	3	August
VTLA3	44.53229	-72.78994163	VT	Lamoille	Stowe	Red, Spruce	7/6/2007	10/10/2007	0	N/A
VTLA4	44.61944	-72.82142842	VT	Lamoille	Jeffersonville	Scotch	7/6/2007	10/10/2007	1	August
VTLA5	44.63963	-72.81309019	VT	Lamoille	Jeffersonville	Red	7/6/2007	10/10/2007	0	N/A
VTLA6	44.64274	-72.72407333	VT	Lamoille	Johnson	Red	7/6/2007	10/10/2007	0	N/A
VTLA9	44.44551	-72.65754847	VT	Lamoille	Stowe	Scotch	7/5/2007	10/10/2007	1	August
VTWA1	44.35556	-72.78732036	VT	Washington	Waterbury	Red	7/4/2007	10/11/2007	0	N/A
VTWA10	44.07397	-72.7447123	VT	Washington	Roxbury	White	7/3/2007	10/9/2007	1	October
VTWA11	44.11462	-72.72280737	VT	Washington	Northfield	Scotch	7/3/2007	10/9/2007	0	N/A
VTWA13	44.30063	-72.69049404	VT	Washington	Montpelier	Red	7/4/2007	10/9/2007	0	N/A
VTWA2	44.34897	-72.77258188	VT	Washington	Waterbury	Red	7/4/2007	10/9/2007	0	N/A
VTWA4	44.31377	-72.72383709	VT	Washington	Waterbury	Scotch	7/4/2007	10/9/2007	0	N/A
VTWA5	44.31185	-72.76450633	VT	Washington	Waterbury	White	7/4/2007	10/9/2007	0	N/A
VTWA6	44.2513	-72.7864147	VT	Washington	Moretown	White	7/4/2007	10/9/2007	0	N/A
VTWA7	44.20416	-72.80776676	VT	Washington	Waitsfield	Red	7/3/2007	10/9/2007	0	N/A
VTWA8	44.09499	-72.86341589	VT	Washington	Warren	Red	7/3/2007	10/9/2007	0	N/A
VTWA9	44.15225	-72.81160215	VT	Washington	Waitsfield	Austrian	7/3/2007	10/9/2007	0	N/A
SIREX1	43.78682	-73.06852609	VT	Rutland	Brandon	Red	6/18/2007	11/1/2007	0	N/A
SIREX2	43.66129	-72.94857913	VT	Rutland	Chittenden	Red	6/18/2007	11/1/2007	0	N/A
SIREX3	43.65899	-72.86619298	VT	Rutland	Mendon	Red	6/18/2007	11/1/2007	0	N/A
SIREX4	43.58985	-72.90975013	VT	Rutland	Mendon	Red	6/18/2007	11/1/2007	0	N/A
SIREX5	43.3739	-73.14414334	VT	Rutland	Pawlet	Red	6/18/2007	11/1/2007	2	August
SIREX6	43.67666	-73.22930801	VT	Rutland	Fair Haven	Red	6/18/2007	11/1/2007	0	N/A
SIREX7	43.65887	-73.08709276	VT	Rutland	West Rutland	Red	6/18/2007	11/1/2007	0	N/A

SIREX8	43.61406	-73.09765907	VT	Rutland	Ira	Red	6/18/2007	11/1/2007	0	N/A
VTGI1	44.68745	73.29438	VT	Grand Isle	Grand Isle	Red	6/29/2007	9/14/2007	0	N/A
VTGI2	44.87439	73.3265	VT	Grand Isle	Isle La Motte	Red	6/29/2007	9/14/2007	0	N/A
VTGI3	44.86181	73.26746	VT	Grand Isle	South Alburg	Red	6/29/2007	9/14/2007	0	N/A
VTGI4	44.80402	73.28773	VT	Grand Isle	North Hero	Scotch	6/29/2007	9/14/2007	0	N/A
VTGI5	44.78116	73.29504	VT	Grand Isle	North Hero	White	6/29/2007	9/14/2007	0	N/A
VTGI6	44.96404	73.29798	VT	Grand Isle	Alburg	Red	6/29/2007	9/14/2007	0	N/A
VTGI7	44.98597	73.29563	VT	Grand Isle	Alburg	White	6/29/2007	9/14/2007	0	N/A
FPR1A	44.45292	72.92146	VT	Chittenden	Jericho	Red	9/21/2007	10/5/2007	1	September
FPR1B	44.45292	72.92146	VT	Chittenden	Jericho	Red	9/21/2007	10/5/2007	0	N/A
FPR1C	44.45292	72.92146	VT	Chittenden	Jericho	Red	9/21/2007	10/5/2007	0	N/A
FPR2A	44.26471	73.12776	VT	Addison	Monkton	Red	9/21/2007	10/5/2007	1	September
FPR2B	44.26471	73.12776	VT	Addison	Monkton	Red	9/21/2007	10/5/2007	0	N/A
FPR2C	44.26471	73.12776	VT	Addison	Monkton	Red	9/21/2007	10/5/2007	0	N/A
FPR3A	44.23676	73.2334	VT	Addison	Ferrisburg	Red	7/27/2007	9/7/2007	4	July, August
FPR3B	44.23676	73.2334	VT	Addison	Ferrisburg	Red	9/7/2007	9/21/2007	1	September
FPR3C	44.23676	73.2334	VT	Addison	Ferrisburg	Red	5/29/2007	10/5/2007	0	N/A
FPR4A	43.98607	73.19671	VT	Addison	Cornwall	Red	5/29/2007	10/5/2007	0	N/A
FPR4B	43.98607	73.19671	VT	Addison	Cornwall	Red	5/29/2007	10/5/2007	0	N/A
FPR5A	43.85723	73.37009	VT	Addison	Shoreham	Red	7/27/2007	8/9/2007	2	July, August
FPR5B	43.85723	73.37009	VT	Addison	Shoreham	Red	7/27/2007	8/9/2007	0	N/A
								total # siricids:	58	