APPENDIX A-2

VERMONT SOIL SURVEY FOR PEAR THRIPS
PROTOCOL FOR REGIONAL SOIL SAMPLING PROGRAM

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University of Vermont

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SURVEY OBJECTIVES:

The objective of this regional survey is to determine the density and distribution of pear thrips in forest soils within the native range of the sugar maple (Acer saccharum). In cooperating states, soil samples will be taken in forest stands that have shown damage from thrips feeding and stands believed susceptible to pear thrips. Using previous experiences in Vermont as a guideline, potential damage by pear thrips next spring can be estimated from the current number of thrips in the soil. This sampling protocol was developed from research on pear thrips distribution in forest soils conducted by the University of Vermont in 1988 and 1989.

It must be recognized that the population density of pear thrips in the ground does not necessarily represent the number of thrips that will feed on the trees the following spring. At present the migration patterns of pear thrips are unknown. If widespread migration occurs in the early spring, the number of thrips in the ground may not relate directly to the level of foliage damage or the number of adults feeding in the buds. Landowners participating in this program must be informed of this possibility. The use of soil surveying to predict pear thrips populations or damage next spring has many potential limitations, but for now it is the best and only method available.

SITE SELECTION:

Sugarbushes, tapped or untapped, and hardwood forest stands with sugar maple comprising about 75% or more of the basal area should be chosen for sampling. Sites must have an area of 2 hectares (5 acres) or more. In Vermont, permanent sites for sampling were selected from three damage categories (based on aerial surveys of damage in 1988):

0 - light (less than 30% damage),
light - moderate (30 - 60% damage),
moderate - severe (60 - 100% damage).

This method can be used as a selection guideline in states known to have had previous thrips. In areas where pear thrips damage is unknown, sites should be selected based on forest species composition alone. The absence of previous thrips damage does not assure that pear thrips are not present.

If possible, a total of 10 sites should be sampled in each state. To obtain a complete picture of thrips population patterns in the state, ideally sites should be distributed in about five areas around the state. This arrangement will provide paired replication within regions of each state.

SAMPLING MATERIALS:

1. Tulip-bulb planter - 7.5 cm (3 in. top diameter), 10 cm (4 in.) length.
   These can be purchased for acout $3.00 at most hardware stores or garden or farm supply centers. (Contact the Entomology Research Laboratory if you can not find one.) The blades of the planter can be slightly sharpened on a grinding wheel to make cutting through roots or sod easier.

2. Plastic bags - approximate dimensions - 15 cm X 7.5 cm X 38 cm (6 in. X 3 in. X 15 in.). Any strong freezer type bag will work. Do not use zip-lock bags; they don't stay sealed.

3. Marking pens - magic markers, or similar waterproof pens.

4. White 3 X 5 in. index cards.

5. Metal tree tags, aluminum nails and flagging.

SAMPLE COLLECTION:

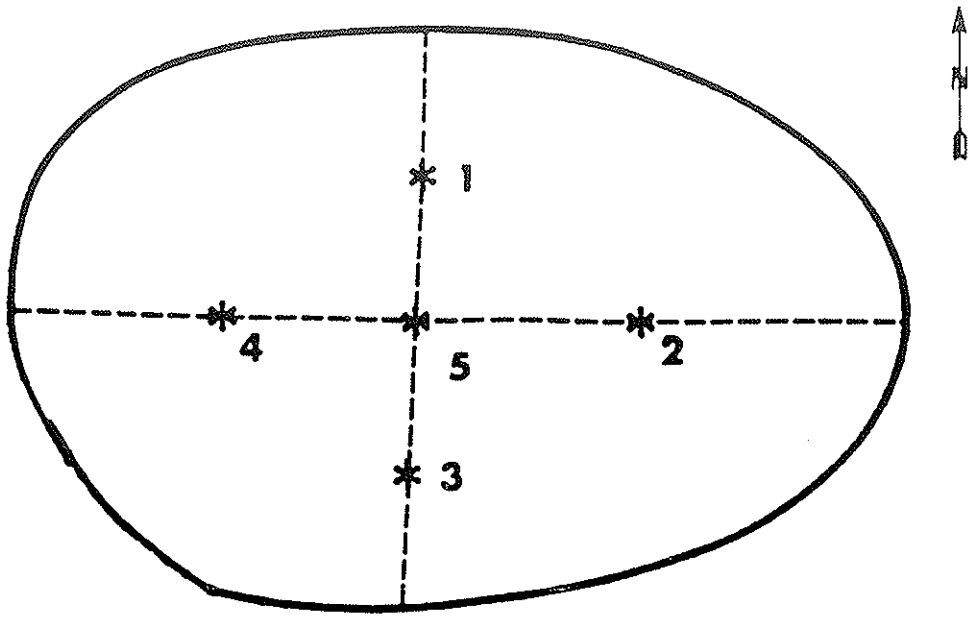
Sampling location. Analysis of our recent results on thrips distribution in two sugarbushes showed that, with 10 samples/sugarbush, the mean number of thrips/sample could be estimated in a range of accuracy of $\pm$ 7 thrips with 95% confidence. Therefore, for this survey ten soil samples, two from each of five sugar maples should be taken from each site.

One living, dominant or co-dominant sugar maple tree, having a DBH greater than 20 cm (8 in.), in approximately the center of the site should be chosen at random for sampling. Four additional sugar maple trees meeting the above criteria should also be randomly selected for sampling. These four trees should be located approximately halfway between the center tree and the boundary of the site, one in each of the cardinal directions, north, south, east and west. Figure 1A shows a map of this typical star-shaped sampling arrangement. This method should be used in sites with and without an elevational gradient. If the site is unusually long and narrow, trees can be located in a line through the middle of the bush (oblong plot, Figure 1B).

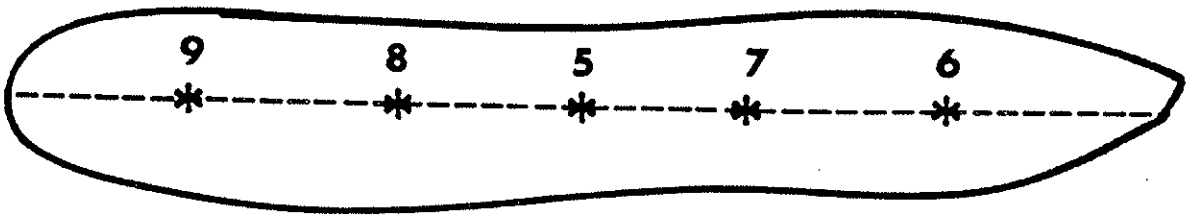
Two soil samples should be taken from each sample tree, one at 2 m (ca. 6 ft) and one at 4 m (ca. 12 ft) from the bole of the tree. All samples should be taken on the south side of the tree.

If sampling will be repeated in the future, all sample trees should be labelled with a metal tag placed on the south side of the tree, indicating the cardinal direction from the center tree and tree number. For the star-shaped plots, trees should be numbered beginning with the northern tree, and proceeding clockwise, ending with Tree 5 in the center (Figure 1A). For an oblong plot, trees are numbered in the sequence of 6, 7, 5, 8 and 9, with Tree 5 being the center tree (Figure 1B). To assure that sample trees can be located again, the site and sample trees should be flagged and a bearing and distance taken from the center tree to a known reference point.

A description of each site should be completed, using the attached sample log form. The approximate total area of the site should be noted on the log. Additional information on the understory vegetation at each site was gathered in Vermont, but is optional for this regional survey. The protocol follows. Using a 10-factor prism, the total and sugar maple basal area adjacent to each sample tree should be measured and recorded. The presence or absence of sugar maple seedlings and saplings should also be recorded for an 18.2 m radius (6 ft) at each prism point. Seedlings include all live sugar maple trees with a DBH of less than 2.5 cm (1 in.), and a height of at least 30.5 cm (1 ft). Saplings include all live sugar maples with a DBH between 2.5 - 12.5 cm (1 - 4.9 in.).



A. Star-shaped plot



* Sample tree

B. Oblong plot

Figure 1. Sampling arrangement within a site for the VT Soil Survey for Pear Thrips. A shows the star-shaped plot design, B shows an oblong plot.

Any other information about the site that might be of interest in future analysis can be included on the log form. The sample log should be deposited with the samples at the laboratory.

Timing of sampling. When possible, soil sampling should be done in September and October, however, it can be done whenever soil conditions permit sample collection, i.e., when the soil is not solidly frozen. Despite cold temperatures, the soil may not be frozen if insulated by snow. Therefore, it is worth trying to take samples even in the middle of winter. All samples for a particular site should be taken on the same day. If possible samples for the entire state should be taken within a 30 day period.

Sampling. Before taking the soil sample, the loose litter layer should be brushed away. Pear thrips have not been found in this layer, and removal of this light organic matter increases the speed and efficiency of thrips extraction.

The bulb planter is pressed firmly into the ground with rotating movements until the soil reaches the top of the sampler (a depth of ca. 10 cm [4 in.]). The planter, with the soil sample, is carefully removed from the ground, and placed into the plastic bag. It is important to collect as much of the soil sample as possible. In dry soils, it may be necessary to reach into the hole to collect the remainder of the soil sample that fell out of the planter. Generally the soil can be shaken from the sampler easily. However, in wet or clay soils, the sample may remain firmly lodged in the planter. In this case, turn the planter upside down within the bag and push the soil out of the planter. Clean off the planter completely before taking another sample.

If the planter cannot be forced into the soil because of a large root or rock, remove any soil in the planter, and start over in another nearby suitable location. In some cases the soil may be very shallow, making it impossible to get a complete sample. If, on the third sampling attempt, a complete sample can not be collected, take the sample from just this one hole, even if it is not a full sample. Do not make a full sample by sampling in two holes. Write 'incomplete sample' on the bag and label of these samples. The bag should be pressed together against the sample to remove air from the bag before it is knotted loosely at the top.

Sample labelling. Clear, legible and waterproof labelling of the bags is essential to accurate processing. Make sure the ink is dry before using the bag. In cold weather the ink is slow to dry and may smudge. Each sample bag should be labelled individually on the outside of the bag in the following way:

Sample site - Landowner or site name, town and county
Date of collection - Month, Day, and Year
Sample tree - 1 - 5 or 5 - 9
Distance from tree - 2 m or 4 m

This information should also be written on an index card and placed inside the bag.

REGIONAL PEAR THRIPS SOIL SAMPLING LOG

1. Sample site (Town & Co.): 2. Collectors:_____

3. Bearing and distance from center tree:_____

4. Approximate total area of site (acres):_____

5. Site type (circle one):

tapped sugarbush untapped sugarbush hardwood stand

6. Landowner Name:

Address:

Telephone number:

7. Date of collection: _____

8. Damage rating (previous spring) (circle one):

0 - light light - moderate moderate - severe

9. Previous history of thrips damage (if known):

10. Previous history of other potential stress factors (if known):

11. Total stand basal area (optional):

Tree 1_____ Tree 2_____ Tree 3_____ Tree 4_____ Tree 5_____

12. Basal area of sugar maple (optional):

Tree 1_____ Tree 2_____ Tree 3_____ Tree 4_____ Tree 5_____

Saplings_____ _____ _____ _____ _____
(Yes or no) (optional)

Seedling_____ _____ _____ _____ _____
(Yes or no) (optional)

13. Other comments:

VERMONT STATEWIDE PEAR THRIPS SOIL SURVEY

Amended Protocol for September, 1992

Entomology Research Laboratory
655B Spear Street
South Burlington, VT

Soil samples should be taken at 2 and 4 m from the same trees that have been sampled in the previous years. Because of the potential soil disruption caused by sampling or emergence trapping, we would like you to take samples on the **NORTH** side of the trees this year. If the original sample tree has died or for some reason the tree has been removed or you can't find it, note that on the data sheet and pick another tree that is nearby. All trees should be reflagged and retagged if the old tags are missing or worn out. A complete list of the sites that should be sampled this year is attached.

As in previous years, the loose leaf litter layer should be removed before taking the sample, and for your reference a copy of the original protocol is attached. We will supply bags in which to take the samples. These bags will be distributed by the Regional Pest Specialists. Samples should be kept refrigerated following collection. If that is not possible, however, try to keep them as cool as possible and out of the sun. The sooner they are delivered to the Entomology Lab the better. Personnel from the lab travel weekly to Randolph, and we can pick samples up there if that is convenient.

We greatly appreciate your cooperation in this work. This data will be a valuable addition to our knowledge of the population dynamics of pear thrips, and the sugarmakers greatly appreciate our joint efforts to keep them informed of the status of this pest. As in previous years we will prepare a report of the results which will be given to the Regional Pest Specialists for distribution. In addition each cooperating landowner will be informed separately by letter of the thrips populations in his/her stand. If you have any questions regarding this years sampling feel free to contact Bruce L. Parker or Margaret Skinner, 658-4453.

Thrips Soil Sample Labels

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________________ COUNTY
DATE
TREE 1 2 3 4 5 6 7 8 9 10
DISTANCE 2 4 M

NAME
________________ COUNTY
DATE
TREE 1 2 3 4 5 6 7 8 9 10
DISTANCE 2 4 M

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DISTANCE 2 4 M

SITES FOR SOIL SAMPLING 1993-94

NORTHEAST REGION

County	Plot Name (#)	Town	Sampler
1. Washington	Hall (Cleaves)(4)	E. Montpelier	B. Barton
2. Washington	Carpenter (5)	Cabot	B. Barton
3. Washington	Morse (6)	E. Montpelier	B. Barton
4. Washington	W. Smith (8)	Marshfield	B. Barton
5. Washington	Bravakis (10)	Worcester	B. Barton
6. Washington	Angney(Badger)(11)	E. Montpelier	B. Barton
7. Washington	Cottonbrook I (13)	Waterbury*	B. Barton
8. Washington	Jewitt (15)	Barre	J. Lackey
9. Washington	Ralph (17)	Warren	J. Lackey
*replacement for Cottonbrook if necessary:			
7. Washington	Cate (9)	E. Montpelier	B. Barton
10. Orleans	Drown (1)	Coventry	J. St. Arn.
11. Orleans	Whitcomb (3)	Albany	J. St. Arn.
12. Orleans	Shelton (4)	Glover	J. St. Arn.
13. Orleans	Bald Mtn. (5)	Westmore	J. St. Arn.
14. Orleans	Davis (6)	Derby	J. St. Arn.
15. Caledonia	Laggis (1)	Walden	J. St. Arn.
16. Caledonia	Rowe (2)	Peacham	H. Prior
17. Caledonia	Percy (3)	Wheelock	H. Prior
18. Caledonia	Beaver Brk. (5)	Groton	H. Prior
19. Caledonia	Laramie (8)	Newark	H. Prior
20. Caledonia	Newell (10)	Danville	H. Prior
21. Essex	DeAnjou(Hill)(1)	Canaan	H. Prior
22. Essex	Colby (4)	Lunenberg	H. Prior

SITES FOR SOIL SAMPLING 1993-94

SOUTHEAST REGION

County	Plot Name (#)		Town	Sampler
1. Bennington	Twitchell	(8)	Landgrove	N. Fice
2. Windham	Hazelton 1	(1)	Dummerston	A. Sands
3. Windham	Plummer	(3)	Grafton	A. Sands
4. Windham	Thurber	(4)	Brattleboro	A. Sands
5. Windham	Crocker	(9)	Westminister W.	B. Burns
6. Windham	Mullen	(10)	Rockingham	A. Sands
7. Windham	Matt	(11)	Marlboro	A. Sands
8. Windsor	Barlow	(3)	Springfield	A. Sands
9. Windsor	Fisher	(4)	Pomfret	A. Sands
10. Windsor	Motchman	(5)	Hartland	A. Sands
11. Windsor	Hunter	(8)	Weathersfield	B. Burns
12. Windsor	Harlow	(11)	Reading	A. Sands
13. Windsor	Wiswell	(13)	Hartland	A. Sands
14. Windsor	Goodhouse	(14)	Woodhouse	B. Burns

SITES OMITTED FROM SOIL SAMPLING IN 1993-94

NORTHWEST REGION

County	Plot Name (#)	Town	Sampler
1. Grand Isle	Church Lot (2)	North Hero	P. Reed
2. Addison	Folino (1)	Starksboro	P. Reed

NORTHEAST REGION

3. Washington	Fitch (7)	E. Montpelier	B. Barton
4. Washington**	Mad Riv. Gl. (2)	Waitsfield	J. Lackey
*replacement for Cottonbrook if necessary:			
5. Washington	Cate (9)	E. Montpelier	B. Barton
6. Caledonia	Barnet Sch. (7)	Barnet	H. Prior
7. Caledonia	Willard (9)	Peacham	H. Prior
8. Caledonia	Blake Hill (4)	Peacham	H. Prior
9. Essex	Venheim (2)	Lunenberg	H. Prior
10. Essex	Umpire Mtn. (3)	Victory	H. Prior
11. Essex	Porter (5)	Brighton	H. Prior

SOUTHEAST REGION

12. Windham	Hazelton 2 (2)	Dummerston	A. Sands
13. Windham	Cole (6)	Wilmington	A. Sands
14. Windham	Whithington (Nelson) (7)	Brattleboro	A. Sands
15. Windsor	Begin (1)	Springfield	J. Barrows
16. Windsor	Crane (2)	Woodstock	A. Sands
17. Windsor	Curtis Hollow (6)	Reading	B. Burns
18. Windsor	Morgan (9)	Woodstock	A. Sands
19. Windsor	Richardson (10)	Hartland	A. Sands
20. Windsor	Johnson Timber(15)	Reading	B. Burns
21. Windsor	Wood (7)	Weathersfield	B. Burns

SOUTHWEST REGION

22. Orange	Ainsworth (6)	Williamstown	J. Lackey
23. Orange	Vinton (4)	Braintree	J. Lackey
24. Rutland	Frederick (3)	Wallingford	J. Barrows
25. Rutland	Smokey Hse (1)	Danby	J. Barrows
26. Bennington	Frost (10)	East Dorset	N. Fice
27. Bennington	Williamson 2 (3)	Shaftsbury	N. Fice
28. Bennington	Hinkley (9)	Manchester	N. Fice
29. Bennington	Strohmeir (2)	Pownal	N. Fice

** In 1991 Jay Lackey asked that all correspondence be sent to him not the landowner.