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Animal and Plant Health Inspection Service

Plant Protection & Quarantine

Cooperating State Departments of Agriculture

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2009 Light Brown Apple Moth National Survey Guidelines

Epiphyas postvittana (Walk.)
Tortricidae

2009 Light Brown Apple Moth National Survey Guidelines
(*Epiphyas postvittana)* May, 2009

These survey guidelines were modified from the 2009 Light Brown Apple Moth National Survey document written by Lisa Jackson and Brian Kopper, USDA, APHIS, PPQ, Raleigh, NC. Additional contributors to the 2009 guidelines include USDA, APHIS, PPQ employees Ron Weeks, Craig Southwick, Joel Floyd, Todd Schroeder, Brett Miller, Dan Borchert, Steve Passoa, and Julieta Bramila. Other contributors include Todd Gilligan, Colorado State University, Marc Epstein and Megan O'Donnell, California Department of Agriculture, Richard Brown, Mississippi State University, and John Brown, USDA, ARS, Systematic Entomology Laboratory.

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For more information about the Light Brown Apple Moth program, consult the PPQ LBAM public website:

http://www.aphis.usda.gov/plant_health/plant_pest_info/lba_moth/index.shtml

Or the PPQ Eastern Region Sharepoint Website available to PPQ and some state cooperators with access:

http://ppqersharepoint.we.aphis.gov/edp/LBAM/default.aspx

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Jackson Trap, Joel Floyd, USDA, APHIS, PPQ

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2009 Light Brown Apple Moth National Survey Guidelines

I. Introduction

In March 2007, the first find of light brown apple moth (LBAM), *Epiphyas postvittana* (Lepidoptera: Tortricidae), on the U.S. mainland occurred in California. On February 6, 2007, a private citizen near Berkeley in Alameda County, California, reported that two suspect moths had been captured in a blacklight trap on his property. In response, pheromone-baited traps were placed on March 1, 2007, in Alameda and Contra Costa counties. On March 16, 2007, the ARS Systematic Entomology Laboratory (SEL) in Washington, DC, confirmed through morphological testing that the two samples submitted were LBAM.

Distribution

The light brown apple moth (LBAM) is a native pest of Australia and has been introduced into India, New Caledonia, New Zealand, and the United Kingdom (CAB International, 2005). Although it was reported in Hawaii in the late 1800s, the LBAM find in California is the first on the U.S. mainland.

Biology

There are generally three generations of LBAM per year in southern Australia and two to four in New Zealand (Wearing et al., 1991). Eggs are deposited in masses on the upper surface of leaves of apple, pear, apricot, citrus, and other smooth-leaved host plants (Wearing et al., 1991). Early instars feed on tissue beneath the leaf surface on the underside of leaves inside self-constructed silken webs (Thomas, 1998). Larger larvae construct feeding niches between two leaves, a leaf and fruit, in the bud, or on a single leaf (Thomas, 1998). Larvae go through five, six or seven instars. Pupation occurs within these rolled leaf sites. The larvae overwinter but do not undergo diapause. There is no available data on cold tolerance in LBAM. Since LBAM does not go into diapause in low temperatures, it is expected that lower temperatures will have a detrimental effect on the insect. Adults do not readily disperse out of favorable habitats (Danthanarayana, 1983) and only about 10% of the population migrate (Wearing et al., 1991).

Hosts

LBAM has a host range in excess of 150 plant genera in over 70 families, including nursery stock, cut flowers, stone fruit (peaches, plums, nectarines, cherries, and apricots), pome fruit (apples and pears), grapes, and citrus (Appendix 1). For a complete list of hosts of LBAM, search *Epiphyas postvittana* in the GPDD at https://www.gpdd.info/.

Economic damage

Damage is caused by larval feeding on the foliage, buds, shoots, and fruits of host plants (Wearing et al., 1991). Fruit damage has the greatest economic impact. The larvae feed mainly on the fruit surface, often where a leaf is tied to the fruit or between fruits, which causes the formation of large irregular blemishes (Wearing et al., 1991).

In Australia and New Zealand, LBAM is a serious pest of pome and stone fruits and of many other horticultural crops, including grape vine, citrus, kiwifruit, berry fruits,

avocadoes, and some vegetable and flower crops (Wearing et al. 1991). In the absence of insecticides, the percentage of damage to fruits in Australia and New Zealand ranges from 5 to 30% and 12-70% respectively (Wearing et al., 1991).

National survey

PPQ will conduct a national detection survey for LBAM to demonstrate area freedom and to discover any additional infestations. For 2009, the survey will be funded by APHIS. States are encouraged to utilize the guidance in this document to best determine where to conduct survey activities. States will ultimately decide which areas to place traps that will be most conducive to the detection of LBAM in their region.

States have been grouped into those at high, medium, and low risk for LBAM introduction (See Appendix 6). These groupings were made based upon NAPPFAST modeling. The number of traps, the number of months trapping is to take place, and funding is allocated accordingly. Traps will be between 50 and 350 per state and will be in place for between 3 and 5 months for the continental United States.

"Low" risk states are in this category due to a reduced risk of LBAM introduction resulting from climate and/or major crops of production. Most or all of these states are in USDA hardiness zones between 7 and 10. Most or all of these states are in the NAPPFAST risk modeling category of 5 or lesser. The guidelines for these states are 50 traps for 3 months.

"Medium" risk states are states which do not fit neatly into the high or low risk category. These states typically have a NAPPFAST risk rating of 7 or 8. These are states where a moderate number of counties (nearly 50%) are at risk due to climate and/or commodities produced. The guidelines for these states are 200 traps for 5 months.

"High" risk states are states at an increased risk of introduction due to climate and/or major crops of production. These are states whose geography is mostly or entirely made up of areas in the USDA hardiness zones between 7 and 10. All or most of these states have a NAPPFAST rating of 6 or higher for the risk of LBAM introduction. A high percentage of counties in these states are at risk to LBAM introduction. The guidelines for these states are 350 traps for 5 months.

The 2009 National LBAM survey will begin in July and run five months. Once the national plan is finalized and agreements have been entered into, states which determine a need to begin trapping earlier will be supported.

II. Prioritized areas to survey

This is a suggested prioritized list of areas to be surveyed. Due to the highly polyphagous nature of LBAM, areas have been selected to target as opposed to individual hosts. Each state will have varying amounts of acreage and number of hosts, crops, and pathway scenarios and will consequently need to develop its own priorities for survey.

Tier 1: Nurseries

As it is assumed that the infestation in California initially began from infested nursery stock, it is suggested that nurseries be at the forefront of the national survey. The following list prioritizes nurseries to be surveyed:

1. Nurseries that have received nursery stock from California
2. Nurseries in urban areas
3. Nurseries in general

Trapping sites should also include "seasonal" nurseries, which would include (1) retail and/or wholesale establishments that are open, for example, only during the spring planting seasons, and (2) "big box" and similar stores that sell nursery stock, as many of these establishments import from California and shipments to these stores are often difficult to trace. Trapping at these sites should not be restricted to periods when stock is present but should be continued throughout periods of the year when temperatures exceed 50º F, as insects could emerge from plants brought into these areas and begin breeding in the surrounding area.

Tier 2: Residential and urban landscaping, public parks, etc.

Due to LBAM's highly polyphagous nature and dispersal by human activity, the second suggested priority area for survey is residential and urban landscaping, public parks, etc. Urbanized areas are generally deemed higher risk for establishment of LBAM than are crop production areas because (1) they are more frequent sites of ornamental plantings (potential introductions) and (2) eradication options in those areas tend to be more limited due to social impacts of control measures. The following list prioritizes residential and urban landscaping, public parks, and other urban areas to be surveyed:

1. Public parks/forests and public landscaping, especially areas with large amounts of primary hosts: rose, pine, ornamental fruit trees, etc. (Appendix 1)
2. Forested and landscaped residential areas

Tier 3: Orchards/ vineyards

Many of the primary hosts are orchard fruits and berries that are widely distributed in the United States. Primary hosts of LBAM include: apple, avocado, blackberry, blueberry, citrus fruits, currants, grapes, kiwifruit, persimmons, and stone fruits (peaches, plums, etc.) (Wearing et al., 1991). The following list prioritizes orchards and vineyards to be surveyed:

1. Abandoned orchards/ vineyards near urban areas
2. Abandoned orchards/ vineyards in general
3. Residential fruit trees/ plantings of grapes, blueberry, etc.
4. Production acreage of primary hosts

Additional hosts/pathways

Due to the diversity of LBAM's host plants, there are many additional primary hosts not mentioned above (Appendix 1). The following hosts may be surveyed for specifically at the state's discretion.

1. Cut flowers: If cut flowers are received from CA, follow this pathway to areas of potential survey within the state (*i.e.*, if flowers are sold at open air markets, grocers, or nurseries, then place traps near those areas).
2. Primary crop hosts: alfalfa, beans (broad), clover (red and white), hops, potato
3. Primary forest hosts: eucalyptus (*Eucalyptus* spp.), pine (Monterey) (*Pinus radiata*), pine (*Pinus* spp.), and poplars (*Populus* spp.)
4. Additional primary hosts: apple (paradise) (*Malus pumila*), chrysanthemum (garden) (*Chrysanthemum x morifolium*), cotoneaster (*Cotoneaster* spp.), feijoa fruit (*Feijoa sellowiana*), hawthorn (*Crataegus* spp.), jasmine (*Jasminum* spp.), lychee (*Litchi chinensis*), privet (*Ligustrum vulgare*), rose (*Rosa* spp.)

III. Survey strategies

Regions to survey

Due to the highly polyphagous nature of LBAM, many states in the United States contain at least one of the many primary or secondary hosts of LBAM (Appendix 2, Fig. 1). The host map for LBAM gives an overview of LBAM host distribution in the United States based on six primary and thirteen secondary hosts (Appendix 2, Fig. 1). Based on the information available, there does not appear to be areas within the continental United States that can be excluded based on LBAM biology (Appendix 2, Fig. 2). However, there are areas of the United States where LBAM is less likely to occur based on the prevalence of preferred hosts and temperature (Appendix 2, Fig. 3). In addition, information from regions where LBAM is established (England, New Zealand, Australia, etc.) was analyzed and LBAM has only been reported in USDA Plant Hardiness zones 7 and above (Appendix 2, Fig. 4). Therefore, regions of the United States in USDA Plant Hardiness zones 1-6 may have a less likely chance of LBAM establishment. However, these areas are not to be considered excluded from possible establishment.

Visual Survey

Inspection of plants in nurseries, parks, or residential areas may reveal larval infestations of LBAM; however, larvae will not be identified in the National LBAM Survey. Currently, morphological characters of larvae can not be used to definitively identify LBAM larvae. Molecular diagnostics are currently being used in California to identify LBAM larvae. However, the molecular tool currently being used was developed to differentiate LBAM from native California tortricids. Molecular diagnostics have not been developed to differentiate LBAM from native tortricids found in other parts of the country.

Pheromone Trapping

Trapping for adults using an LBAM lure is the method used in the National LBAM Survey:

Approved traps
For adult male trapping, several traps have been shown to be effective, including the *Jackson* fruit fly trap and the large plastic *Delta* trap. Delta traps used for gypsy moth and pink bollworm are not approved for use. Bucket traps or funnel traps are also currently not approved, as they have shown reduced efficacy in side-by-side comparisons in New Zealand. USDA, APHIS, PPQ purchased a large quantity of Jackson traps for the LBAM National Survey, and those are the only trap design that will be supported by funds provided for the national survey in FY 2009. Any other trap must be used at the expense of the agency conducting the survey.

Traps are hung on a post or pole at a height of 1 to 1.5 m near host plants, or can be hung on plants at the prescribed height.

Pheromone
The components of the female sex pheromone used are (E)-11-tetradecenyl acetate and (E,E)-9,11-tetradecadienyl acetate used in 20:1 ratio at a 3 mg dose per septum. The pheromone is dispensed on rubber septa distributed by the USDA, APHIS, PPQ-CPHST Laboratory at Otis Airforce Base, MA. The septum is placed on the sticky card on the bottom of the trap in the center.

Piggy-backing traps
Piggybacking of traps (placing more than one type of trap on the same property) conserves time and resources (Gilbert et al., 2005). LBAM traps may be piggy-backed with tephritid fruit fly, glassy-winged sharpshooter, and gypsy moth trapping systems, where available. In the case of fruit fly trapping, it is not necessary to place LBAM traps at the same density as fruit fly traps. Instead, place LBAM traps in the same density as described below.

Pheromone inhibition
As long as traps for other species are kept at a minimum distance of 5 m from LBAM traps, pheromone inhibition is not expected to occur.

Trap servicing
Traps should be checked every two weeks and lures should be changed every six weeks. Traps with removable bottoms or inserts should be changed as needed.

Trapping season
The reported length of time for development of a single generation of LBAM is roughly 640 DD with a base developmental temperature of 7.5 C (Danthanarayana, 1975).

Trap density

1. Nurseries: If possible, deploy at least 2 traps per site at a distance of >50 m apart. For very large nurseries (> 20 acres), larger numbers of traps could be considered. Traps could be either within or at the perimeter of nurseries.

2. General urban and suburban areas: Urban and suburban areas should be trapped in relatively uniform grids to the extent that resources will allow up to 1 trap per square mile.

3. Orchards, vineyards, and other host crop production acreage: Deploy 1 trap per 5 square miles or per farm for orchards, vineyards, and major crop hosts (*i.e.*, alfalfa, beans (broad), clover (red and white), hops, potato).

IV. Identification

A. Larvae

Larvae will not be identified as part of the 2009 National LBAM Survey**.**

B. Adult moths

Identification at state level (adult moths)

All sticky traps must be screened for LBAM suspect targets to limit material forwarded to the taxonomic specialists capable of confirming this species. Morphological screening of adult moths in sticky traps can be difficult. Traps baited with the LBAM pheromone lure will capture other moths including other tortricids. Some of these non-target, endemic species may be similar to LBAM in appearance. LBAM has four color forms which may resemble those of many other small brown moths. The often obscured condition of specimens captured in sticky traps further compounds the difficulty in recognizing the target species. Consequently, most screening for this survey will occur by someone familiar with characteristics of tortricids and the taxonomy of LBAM.

Traps that must be stored more than a few days should be kept in a cool location such as a refrigerator until they can be examined and processed. This will prevent deterioration of the specimens. Do not freeze traps except to kill the adults still alive in traps, which is necessary. Do not send live moths in traps through the mail to other locations.

Refer to Appendix 4 for the "Light Brown Apple Moth (*Epiphyas postvittana*) Screening and Identification Aid" developed by Passoa, S., Epstein, M , Gilligan, T., Brambila, J., and M. O'Donnell (2008).
http://www.aphis.usda.gov/plant_health/plant_pest_info/lba_moth/downloads/screening_guide.pdf

Field Sorting of Traps

Sorting is defined as the collection of, and separating out of traps for adult Lepidoptera of appropriate size, color, and shape. Traps may be discarded in the field if they 1) are devoid of moths, 2) contain moths of distinctly different coloration than LBAM, or 3) contain brown moths much larger or much smaller than the 5-7mm range of LBAM (Passoa et al. 2007).

1st Level Screening of Traps

1st Level Screening is defined as recognizing moths that appear to be in the family Tortricidae. This will require examination through a good hand-lens or dissecting microscope and should be performed by a screener with experience or training in recognizing characteristics of the family. Traps containing such moths are to be sent to a diagnostic laboratory or taxonomist in the state experienced with adult Lepidoptera identification (see Fig. 1 below).

2nd Level Screening of Traps

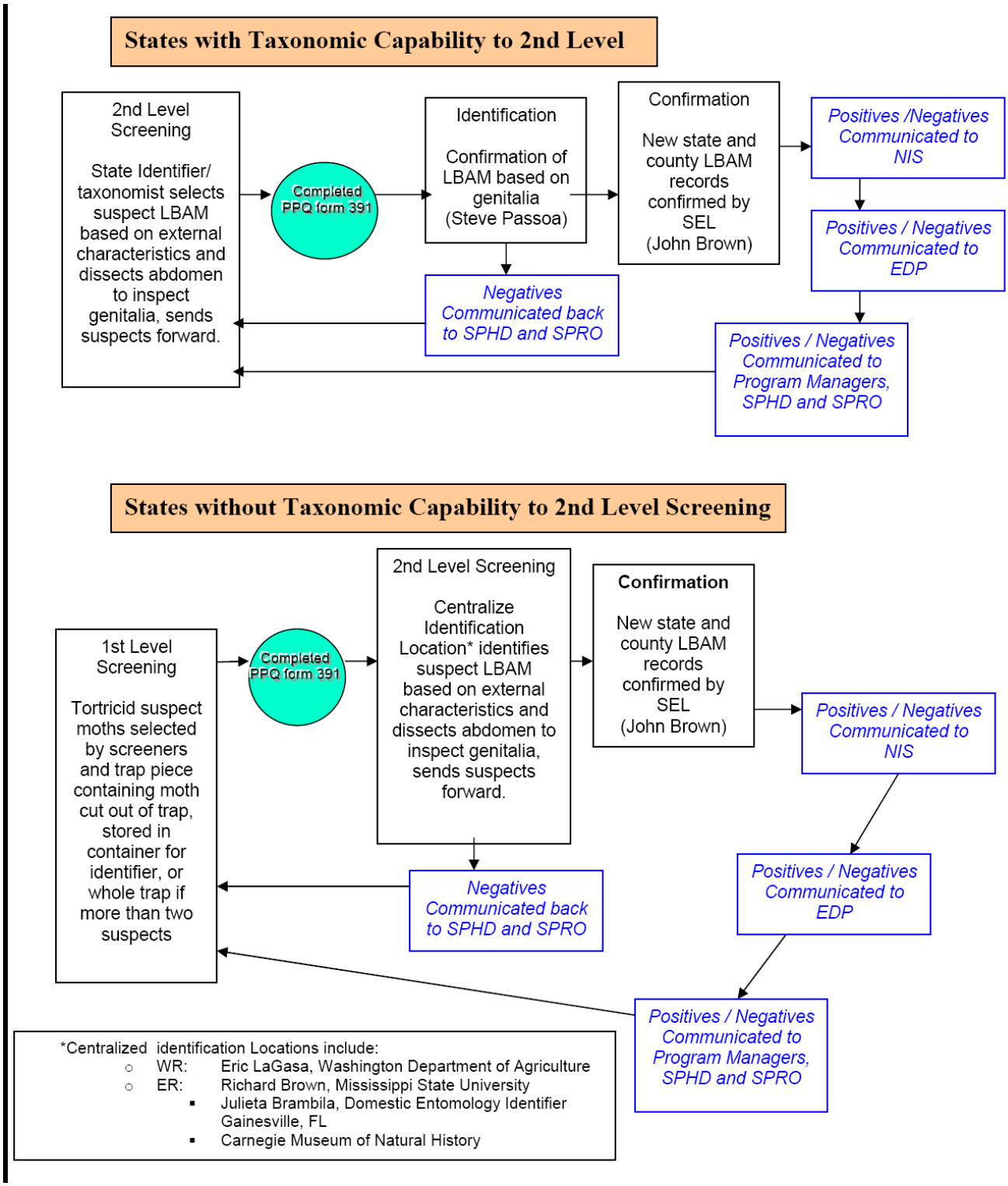
2nd Level Screening is defined as selection of suspect LBAM based on external characteristics (costal fold on wing and hind wing patterning) and dissection of abdomen to inspect genitalia. When forwarding dissected specimens, the genitalia from these specimens should not be mounted on slides. The genitalia should be sent forward in alcohol in a vial (in microvials with glycerin if available) with the whole adult moth specimen for final identification (see Fig. 1 below).

The routing and confirmation of the LBAM from 1st or 2nd level screening will depend on the stated taxonomic ability of a state/PPQ taxonomic infrastructure. State Departments of Agriculture or PPQ in a state with the taxonomic ability and capacity to make determinations to the 2nd level screening will forward suspect LBAM specimens to PPQ Lepidoptera Specialist, Steven Passoa. (Do not send traps or unscreened specimens to Dr. Passoa). If confirmed as LBAM, he will forward any new state or county records to John Brown with the USDA-ARS Systematic Entomology Laboratory.

States that do not have 2nd level screening will forward specimens or whole traps to one of several PPQ-designated Centralized Identification Locations.

Centralized Identification Locations will not identify everything in the sample, but will communicate “no LBAM” or process suspect LBAM as referred to under confirmation.

Figure 1. Flowchart of where to send specimens that depends on the level of taxonomic ability within a state.



Specimen preparation/ protocol (adult moths)
The method each state chooses (handling their own taxonomic process or using a Central Identification Location) will be communicated to their respective PPQ regional program managers, Ron Weeks in the Eastern Region and Craig Southwick in the Western Region. Likewise, the selection of which state will use which Centralized Identification Location will also be coordinated by the PPQ regional program managers.

States With 2nd Level Screening and Identification Ability:

States handling their own LBAM taxonomy will follow state guidance for the documentation, preparation, and selection of suspects for state identifiers. State identifiers or PPQ taxonomists sending suspect LBAM samples to Steven Passoa for confirmation must include a completed PPQ form 391. Each PPQ form 391 forwarded will need to have the following minimum information:

1. Trap number
2. Collection number with two letter state abbreviation
3. Collector name, affiliation, phone number, and e-mail address
4. Location (address, coordinates, and State and County)
5. Nearby host plant genus and species (if applicable)
6. Number of suspect specimens in sample
7. Trap service dates:
    a. Date last serviced with lure change
    b. Date trap or trap insert pulled for sample submission

A fillable PPQ form 391 is posted on the homepage of the CAPS restricted website http://ceris.purdue.edu/caps/adm2008/adm2008NIS391.doc. An example of the form can be found in Appendix 5.

The state taxonomist should write their tentative determination in line 23 of the PPQ form 391. Label each vial and/or specimens with the trap number and collection number. Mark the outside of the package with the words: "LBAM Survey."

Suspect LBAM adult specimens are to be sent dry with the dissected genitalia not mounted on slides but placed in alcohol in a small vial (in microvials with glycerin if available) accompanying the adult. Be sure specimens are well protected with cushioning when shipping to prevent damage during transport.

The guide, "Insect Removal from Sticky Traps Using a Citrus Oil Solvent", by Miller, Passoa, Waltz, and Masto, 1993, should be followed to remove moth specimens from sticky traps.
http://www.aphis.usda.gov/plant_health/plant_pest_info/lba_moth/downloads/stickytrapremoval.pdf

Suspect LBAM are to be sent by overnight carrier to the following address:
Steven C. Passoa
USDA–APHIS–PPQ
The Ohio State University
Museum of Biological Diversity
1315 Kinnear Road
Columbus, OH 43212-1192

Phone: 614-688-4471
e-mail: steven.c.passoa@aphis.usda.gov

Send an e-mail notification with the overnight carrier tracking number to Dr. Passoa, the SPHD, and SPRO of your state along with notification to ppq.nis.urgents@aphis.usda.gov that suspect LBAM specimens are being forwarded, and how many, for confirmation.

States Without 2nd Level Screening and Identification Ability:

States using Centralized Identification Locations should perform sorting and 1st level screening. States should cut out the piece of trap containing the suspect Tortricidae or similar appearing moths and place the piece of trap in a vial (see Appendix 4) to protect it during shipping. Two such pieces can be placed back-to-back in the same vial if they come from the same trap. If more than two suspect specimens are found in a trap, the entire trap can be forwarded for identification. If sending whole sticky traps, fold them into a triangle and put a rubber band around them or tape to keep them from coming open during shipment.

Any specimens sent forward to a Centralized Identification Location must be accompanied by a completed PPQ form 391 (see Appendix 5). The ISIS system may have functionality to generate a PPQ form 391 version from data collected at the time of trap collection. Certain minimal data requirements from the field collection are necessary to complete the PPQ form 391 including:

1. Trap number
2. Collection number with two letter state abbreviation
3. Collector name, affiliation, phone number, and e-mail address
4. Location (address, coordinates, and State and County)
5. Nearby host plant genus and species (if applicable)
6. Number of suspect specimens in sample
7. Trap service dates:
    a. Date last serviced with lure change
    b. Date trap or trap insert pulled for sample submission

Label each trap piece, vial, or whole trap with specimens with the trap number and collection number. These should be forwarded to the Centralized

Identification Laboratory within one week of collection and 1st Level Screening. Mark the outside of the package with the words: "LBAM Survey." Be sure specimens are well protected with cushioning when shipping to prevent damage during transport.

Send by regular mail or overnight carrier to one of the locations at the following addresses depending on the Centralized Identification Location assigned to your state:

1. Julieta Brambila
USDA, APHIS, PPQ
CAPS Program
For regular mail: P.O. Box 147100
For overnight carriers: 1911 SW 34 Street
Gainesville, FL 32608

Phone: (352) 372-3505 ext. 438 or 464
E-mail: julieta.brambila@aphis.usda.gov

2. Richard Brown
Mississippi Entomological Museum
For Regular Mail: P.O. Drawer 9775
For Overnight Carriers: 100 Twelve Land
Mississippi State, MS 39762

Phone: (662) 325-2990
E-mail: RBrown@entomology.msstate.edu

3. Eric LaGasa
Pest Program / Plant Protection Division
Washington State Department of Agriculture
For regular mail: P.O. Box 42560
For overnight carriers: 1111 Washington Street, 2nd Floor NRB
Olympia, WA 98504-2560

Phone: (360) 902-2063
Email: elagasa@agr.wa.gov

Send an e-mail notification with the overnight carrier tracking number to the Centralized Identification Location, the SPHD, and SPRO of your state along with notification to ppq.nis.urgents@aphis.usda.gov that suspect LBAM specimens are being forwarded for confirmation.

Communications of Results

Not all of the moths in the trap will be identified to species if not suspect LBAM. Negative results mean LBAM is not in the sample. All negative LBAM

determinations made by Steven Passoa or Centralized Identification Locations will be communicated by them by e-mail back to the SPHD, SPRO, regional program managers, and submitter in the state of origin. These can be accumulated and sent summarized in a spreadsheet at the end of the week.

Any positive LBAM confirmations that are not new state or county records will be also communicated directly, but daily, to the SPRO, SPHD, and submitter and the LBAM regional program managers (WR: craig.southwick@aphis.usda.gov and ER: ron.d.weeks@aphis.usda.gov)..

When forwarding a suspect new state or county LBAM records, notification that specimens are being forwarded by either Steven Passoa or by Centralized Identification Locations to SEL will be sent by e-mail to ppq.nis.urgents@aphis.usda.gov e-mail address. A copy of the PPQ form 391 with the tentative determination must be faxed to the NIS urgent team (PPQ National Identification Service, fax number: 301-734-5276). The NIS urgent team will have the PPQ form 391 information entered in the PestID system and notify SEL that specimen(s) are being forwarded for final confirmation. NIS will send an e-mail alert to the headquarters PPQ Emergency and Domestic Programs staff that suspect LBAM specimens from a new state or county are being forwarded to SEL for confirmation. They will in turn notify the SPHD and SPRO in the state of origin, the Regional Program Managers.

Once SEL makes a final determination, positive or negative, the notification will be sent to the PPQ Emergency and Domestic Programs staff in Riverdale, MD who will forward the confirmations to the national and regional program mangers, SPHD and SPRO, who in turn will notify the appropriate state level personnel including the submitter.

V. Data collection/ ISIS

Please help us to collect and manage Light Brown Apple Moth (LBAM) National Survey Data using PPQ's Integrated Survey Information System (ISIS). Recently this system underwent significant revisions and upgrades. It is a much improved system that is sure to increase survey productivity, manage data more efficiently, and provide ready access to the data for reporting and analyses. An ISIS template, which has been developed based on the response to the LBAM finds in California, has been sent to all ISIS work unit managers (Appendix 3). The elements included in the template are required; however, additional data elements can be added to the template (*e.g.*, data needed to meet NAPIS requirements). Additional elements will need to be added at the field level as they will vary for each state.

ISIS is both a survey tool and a centralized database that PPQ has developed to manage operational data. For the LBAM National Survey, PPQ HQ, ER, and WR recommend its use. PPQ is committed to capturing operationally specific data and has designated the ISIS application to be utilized as a centralized database for this data. Evidence of this

commitment includes staffing a full-time ISIS support desk help, ISIS data managers in each region, a development team of programmers, and regional program manager support. Please utilize these resources fully to support your data needs for this survey.

The ISIS database is housed inside the APHIS network and is accessible to employees who have direct access to the APHIS network and to cooperators with APHIS VPN accounts. After receiving network access and a username and password for ISIS, users can log into the systems and utilize any (or all) of the three (3) data entry tools. These tools include: a web interface, a web upload tool, and a PDA (Hand Held Computer) software application. Each State will determine which mechanism is best for their business practices.

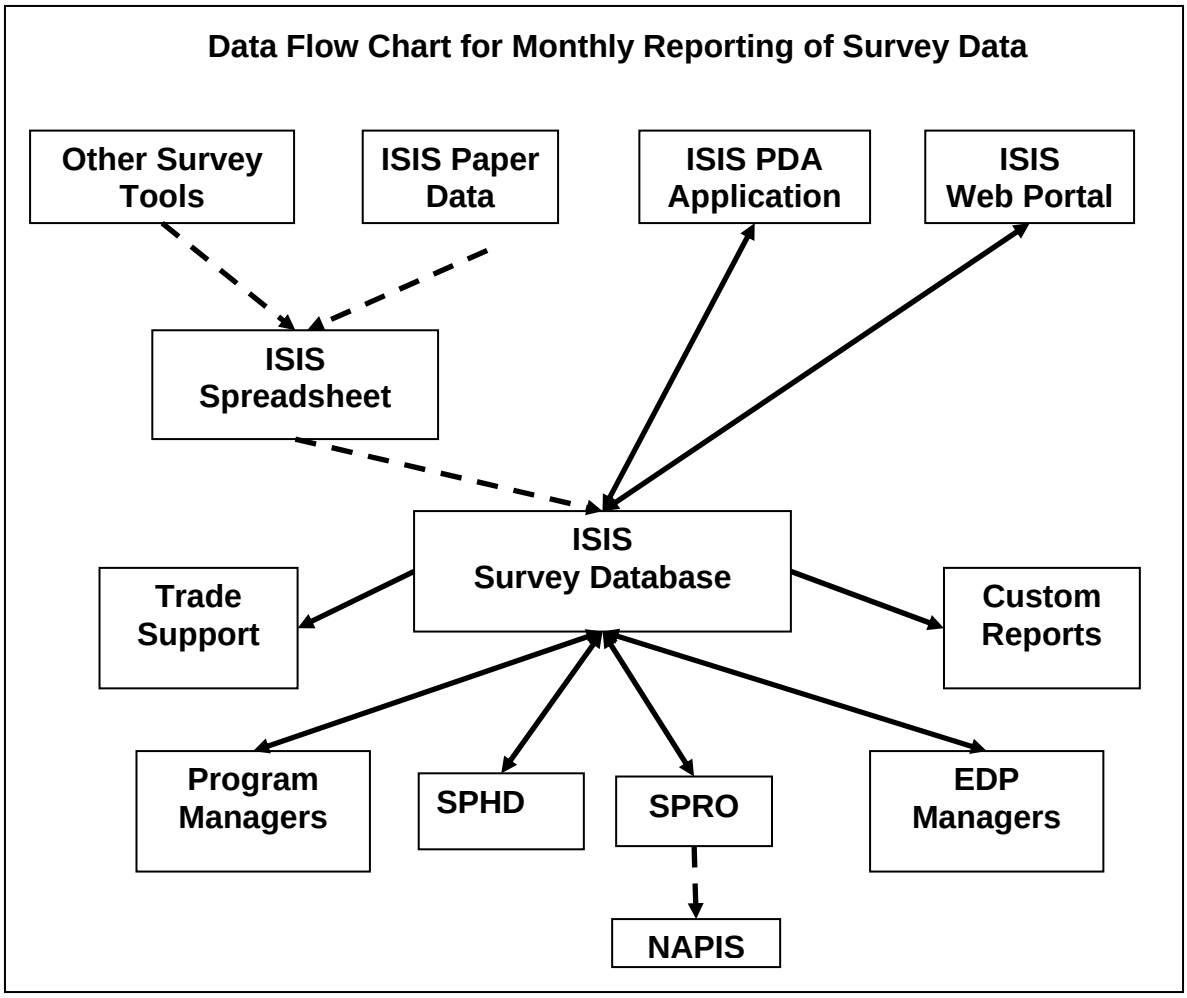
We encourage users to use the PDA portion of ISIS but understand organizations have existing tools and/or applications used to collect data in the field. Organizations utilizing methods other than the PDA (paper, spread sheets, or third party software platforms) can enter data directly into the web interface or "bulk" upload data from flat file spread sheets using the web upload tool.

While most issues surrounding connectivity have little to do with ISIS, (but more to do with government security requirements) the ISIS team understands unique connection situations still exist. In these cases, we will make every accommodation and, if needed, upload the data into the system. The ISIS team is always available to discuss end user needs and/or other solutions available regarding data collection and data management issues. Assistance and support is available from the ISIS help desk at the following:

National Support
Email: ISIS.Support@aphis.usda.gov
1-866-910-9091

ER ISIS Support
VACANT
919-855-7754

WR ISIS Support
Ryan J. Reynolds
ryan.j.reynolds@aphis.usda.gov
970-494-7557


Data Flow Chart for Monthly Reporting of Survey Data
Other Survey Tools
ISIS Paper Data
ISIS PDA Application
ISIS Web Portal
ISIS Spreadsheet
ISIS Survey Database
Trade Support
Custom Reports
Program Managers
SPHD
SPRO
EDP Managers
NAPIS

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Appendix 1. Primary Host List for LBAM. These hosts were listed as primary hosts in the Global Pest and Disease Database (GPDD). This list was compiled from hosts that were denoted "primary" in LBAM literature.

Alfalfa/ Lucerne	*Medicago sativa sativa*
Apple, paradise	*Malus pumila*
Apricot	*Prunus armeniaca*
Avocado	*Persea americana*
Bean, broad	*Vicia faba*
Blackberry	*Rubus fruticosa*
Blueberry	*Vaccinium* spp.
Chrysanthemum, Garden	*Chrysanthemum x morifolium*
Citrus	*Citrus* spp.
Clover	*Trifolium* spp.
Cotoneaster	*Cotoneaster* spp.
Currant	*Ribes* spp.
Eucalyptus	*Eucalyptus* spp.
Feijoa Fruit	*Feijoa sellowiana*
Grapevine	*Vitis vinifera*
Hawthorn	*Crataegus* spp.
Hop	*Humulus lupulus*
Jasmine	*Jasminum* spp.
Kiwifruit/ Gooseberry, Chinese	*Actinidia chinensis*
Lychee	*Litchi chinensis*
Peach	*Prunus persica*
Pears	*Pyrus* spp.
Persimmon/ Ebony	*Diospyros* spp.
Pine	*Pinus* spp.
Pine, Monterey	*Pinus radiata*
Poplars	*Populus* spp.
Potato	*Solanum tuberosum*
Privet	*Ligustrum vulgare*
Rose	*Rosa* spp.

Appendix 2. LBAM Maps.

Figure 1. Host Map for LBAM. A host map for LBAM was generated using National Agricultural Statistics Service (NASS) commodity data (Census of Agriculture 2002) and forest data from USFS FHTET (Forest Health Technology Enterprise Team). Host data in acres per county was combined for the primary hosts: apples, grapes, peaches, potatoes, pines, and soft hardwoods and secondary hosts: asparagus, beans (which included: snap bean, cowpeas, dried beans, dry lima beans, lima beans, and dried edible peas), broccoli, carrots, celery, citrus, corn, pears, strawberries, sunflowers, tomatoes, other softwoods and hardwood trees. The acreage of the primary and secondary hosts were combined separately, divided by the total number of acres per county classified into 10 classes, and combined in a 2:1 weighting to generate the LBAM Host Map. The scale of 1 to 8 describes the proportion of total host acreage per county: a rank of 1 indicates that there is no host acreage, and a score of 8 indicates that 0.25-0.50 of the acres in the county contain suitable hosts for the pest. It is important to note that this map only addresses the hosts listed above and that there are many reported hosts for LBAM not addressed in this host map.

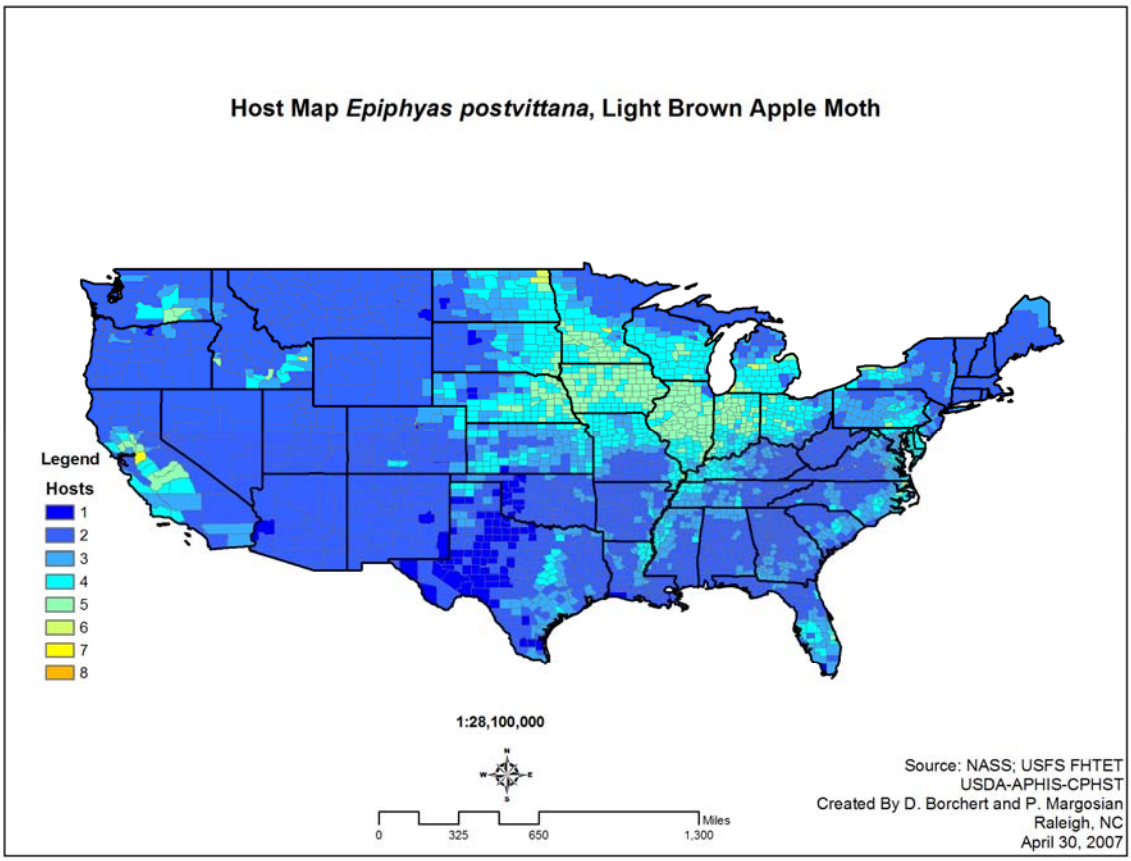


Figure 2. NAPPFAST Map LBAM. From a degree day model for LBAM generated in NAPPFAST, probability maps were generated estimating the probability of 1-5 generations occurrence. The probability maps were combined and divided by five to maintain a 10 class scale. A value of one represents low occurrence of multiple LBAM generations, while a value of 10 indicates that LBAM always has the degree days required to pass through 5 generations.

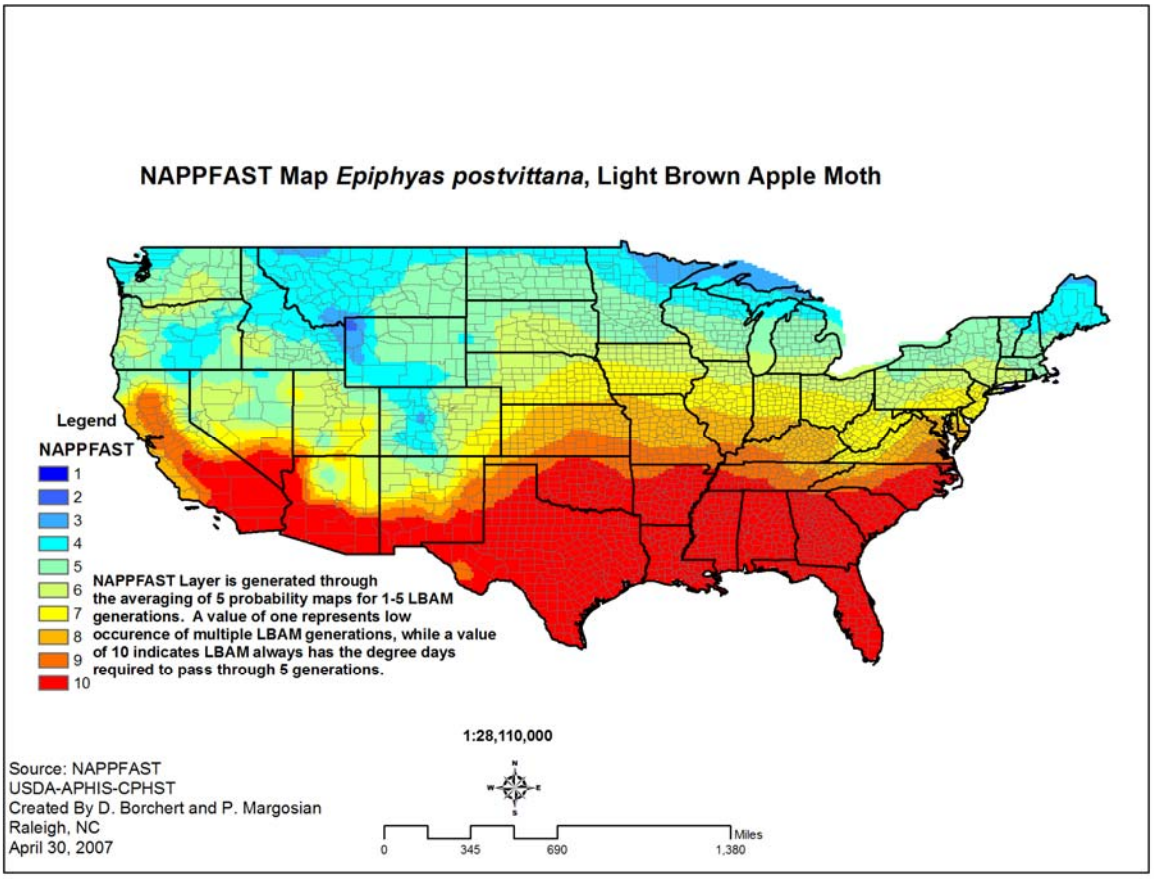


Figure 3. Risk Map for LBAM with all USDA Plant Hardiness zones. The LBAM Host Map and the LBAM NAPPFAST Map were multiplied by 0.66 and 0.34, respectively, and added together to obtain the final Risk Map for LBAM. The final risk map has 8 classes with 2 being the lowest relative risk and 9 the highest. A high risk level indicates that there are high levels of host commodities present and conditions consistently present for development of the pest organism.

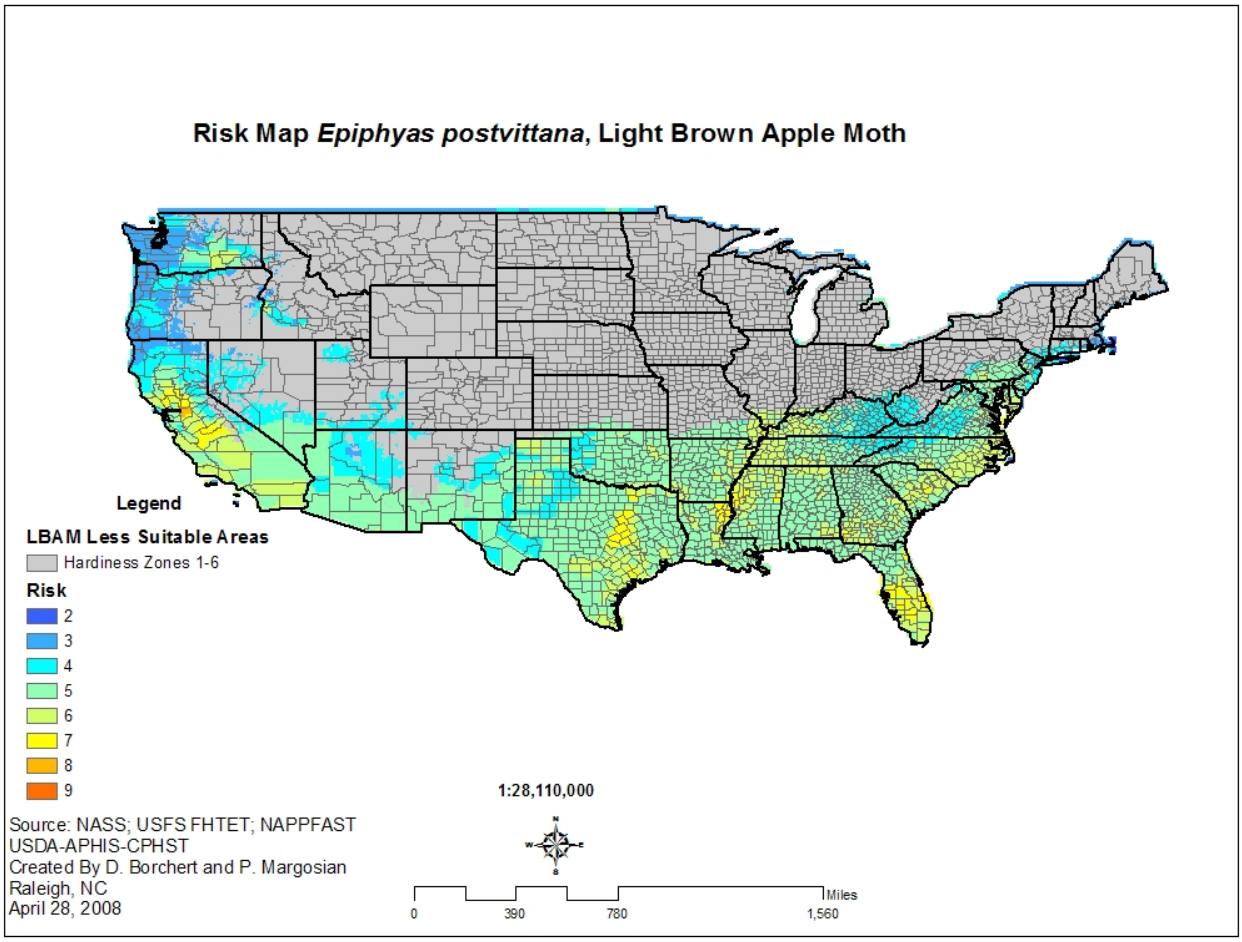
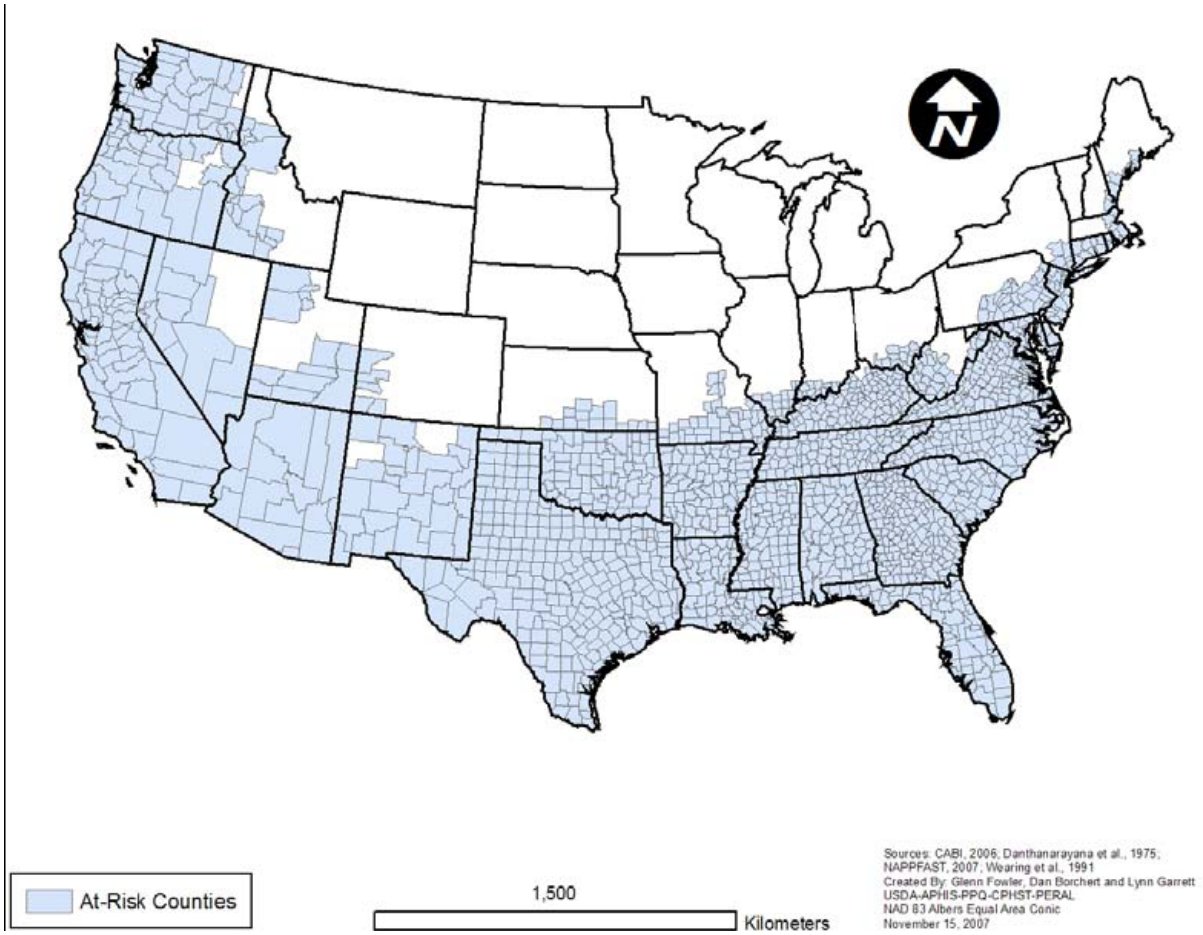


Figure 4. Risk Map for LBAM with USDA Plant Hardiness zones 7-10. Information from regions where LBAM is reported (England, New Zealand, Australia, etc.) was analyzed. LBAM has only been reported in USDA Plant Hardiness zones 7 and above. Regions representing USDA Plant Hardiness zones 7 and above are in gray below.



Appendix 3. ISIS Data Management Structure For: Light Brown Apple Moth (LBAM)
This aid was created to help collect LBAM National Survey Program specific data. The data fields on this form can be transcribed directly into the ISIS website or spreadsheet. Many but not all NAPIS fields are represented here. Those data fields not collected on this form or in the ISIS system are assumed to be self-evident and readily accessible to cooperators for complete NAPIS data entry. Data should be deposited into the ISIS database on a regular monthly schedule through-out the survey season and until all samples have been processed.

Data Dictionary for National LBAM Survey

Record Name – A unique identifier that links all associated data associated
Survey Date – The date the survey began (i.e., when the trap was placed)
Target Pest – The pest that is being surveyed for
(EPA Pest Code) - The NAPIS code for the pest that is being surveyed for
Site Date – The date the site was established
Location Type – The setting that the survey is being conducted in
Location ID – The name or abbreviation of the site
Trap Number – The alpha-numeric symbol associated with the individual trap
Crop Situation – Detection or Delimitation
Address – A physical address that marks the trap or observation
City-State-County – The city, state, and county where the Record was conducted.
Zip Code - The ZIP code is the system of postal codes used by the United States Postal Service (USPS). The letters ZIP, an acronym for Zone Improvement Plan
Section – The section is a specific number location of the legal description used in conjunction with township and range on plat maps.
Latitude – The latitude Recorded by the GPS unit.
Longitude – The longitude Recorded by the GPS unit.
Service Date – The date the service or observation occurred
Primary Surveyor - APHIS PPQ suggests using the badge number or an employee ID number for temporary or seasonal employees. **Service Action –** What was done to the trap or observation
Trap Type - What type of trap or observation is being used
Lure Type – What type of lure is being used in the trap
Load Rate – self-explanatory
Sample Taken - Yes or no
Survey Method – (NAPIS Required) Trap Type Determines Method
Sample ID - The number used to track the sample.
Count (Quantification) – The actual count of the pest surveyed
Descriptor (Descriptor Units) – The rating of the pests surveyed, from 0 to 5 with (0 – negative), (1 – present), (2 – light), (3 – moderate), (4 – heavy), and (5 – extreme).
Sample Status - Pending or completed
Pest Status (Status) – Negative or positive

Core data required for National LBAM Survey			
Data Element	**Data**	**Format / Definition**	**Status**
Record Name		Recommend Grid + Trap #	Required
Survey Date		00/00/0000 (Record Date)	Required
Target Pest	LBAM	Default	Required
Site Date		00/00/0000, Site Established	Recommended
Location Type	Commercial, Industrial, Crop, Nursery, Residential, Other	Circle choice, Or user can define	Required
Location ID		Open Text, Identifier	Recommended
Trap Number		Open Text, Identifier	Required
EPASite (Host)		User Defined	Required
Crop Situation	Detection, Delimitation	Circle choice, Default	Required
Address		Open text	Recommended
City		Open text	Recommended
State		State	Recommended
FIPS (County)		County Code	Required
Zip Code		Open text	Recommended
Section (Grid)		Open Text	Required
Latitude		Decimal Degrees	Required
Longitude		Decimal Degrees	Required
Service Date		00/00/0000 (Activity Date)	Required
Primary Surveyor		Open text, Name or Initials	Recommended
Service Action	Install Trap/Lure, Monitor Trap/Lure, Remove Trap/Lure, Replace Lure, Replace Trap	Circle choice, User Define	Required
Trap Type	Delta, Jackson, Pherocon II, Other	Circle choice, User Can Define	Required
Lure Type	Laminate, Septa	Circle choice, User Can Define	Required
Load Rate (mg)	0.1, 3	Circle choice, Number	Required
Sample Taken (Y/N)	Yes, No	Circle choice	Required
Service Comments		Open Text	Optional
Survey Method	Delta, Jackson, Pherocon II,	Circle Choice, User Defined	Required
Sample ID		Text or #	Required (If Applicable)
EPA Pest (Code)		LBAM	Required (If applicable)
Pest Lifestage	Adult	Circle choice	Required (If Applicable)
Count		Open Text, Number	Required (If applicable)
Descriptor Units	Pests In traps	User Can Define	Required (if Applicable)
Pest Comments		Open Text	Optional
Date Sent to Lab		00/0/0000	Required (if app)
Sample Status	Pending, Completed	Circle choice	
Pest Status	Positive, Negative	Check Box	Required (if app)

Data Element Reference Card – Light Brown Apple Moth – Trap (National)

Data Element Reference Card - Light Brown Apple Moth – Trap (National)

Ver. 4/28/2008

State-GridNumber-TrapNumber

Record Name based on "State-GridNumber-TrapNumber"

Main

SurveyDate: 3/17/2008
TargetPest: ITBUBPA: LIGHT BROWN APPLE MOTH, EPIPHYAS POSTVITTANA
TemplateVersion: 03/17/2008

1.

1. Main: information about the survey. In this example, "Survey Date" is the Record creation date and "Target Pest" is LBAM

Site

SiteDate: 3/17/2008
Location Type: Residential
Location ID: Local Name or #
TrapNumber: Number
EPASite: Host
CropSituation: 29024: DETECTION SURVEY
AddressLine1: Number Name
City: City
State:
FIPS: County
Zip: 00000
Section: Grid
Latitude: 00.00000
Longitude: -00.00000

Add Site Record | Save | Cancel

2.

2. Site: where the service (survey) occurred. Location Information can be the physical address and/or geographic coordinates.

Service

ServiceDate: 3/17/2008
Primary Surveyor: Surveyor Name
ServiceAction: Install Trap/Lure
TrapType: Pherocon II
LureType: Septa
Load Rate (mg): 3
Suspect Taken (Y/N) ☑
Service Comments: Text

Add Service Record | Save | Cancel

3.

3. Service: when (date) and what (activity) occurred at a site. Sites can have many services. When "Suspect Taken" is checked, enter further information in pest record (step # 4).

Add Pest Info

SurveyMethod: - Select Value -
SampleID:
EPAPest: ITBUBPA: LIGHT BROWN APPLE MOTH, EPIPHYAS POSTVITTANA
PestLifestage: - Select Value -
Count:
DescriptorUnits *: 330: PEST(S) IN TRAP(S)
PestComments:

Date Sent To Lab:
Sample Status: Pending
PestStatus: ☐ -: NEGATIVE (NOT PRESENT IN SAMPLE) ☐ +: POSITIVE (PRESENT)

4a.

4a. Pest: how (method) and what (pest) was collected during servicing.

4b.

4b. Lab Info: shaded area is used when a sample is sent to a lab, and updated when results come back to the originating office.

ISIS Data Entry Steps

1. Main – basic info about the survey
2. Site – where service/survey occurred
3. Service – when and what occurred at site
4. Pest – what pest was collected, and how It was collected

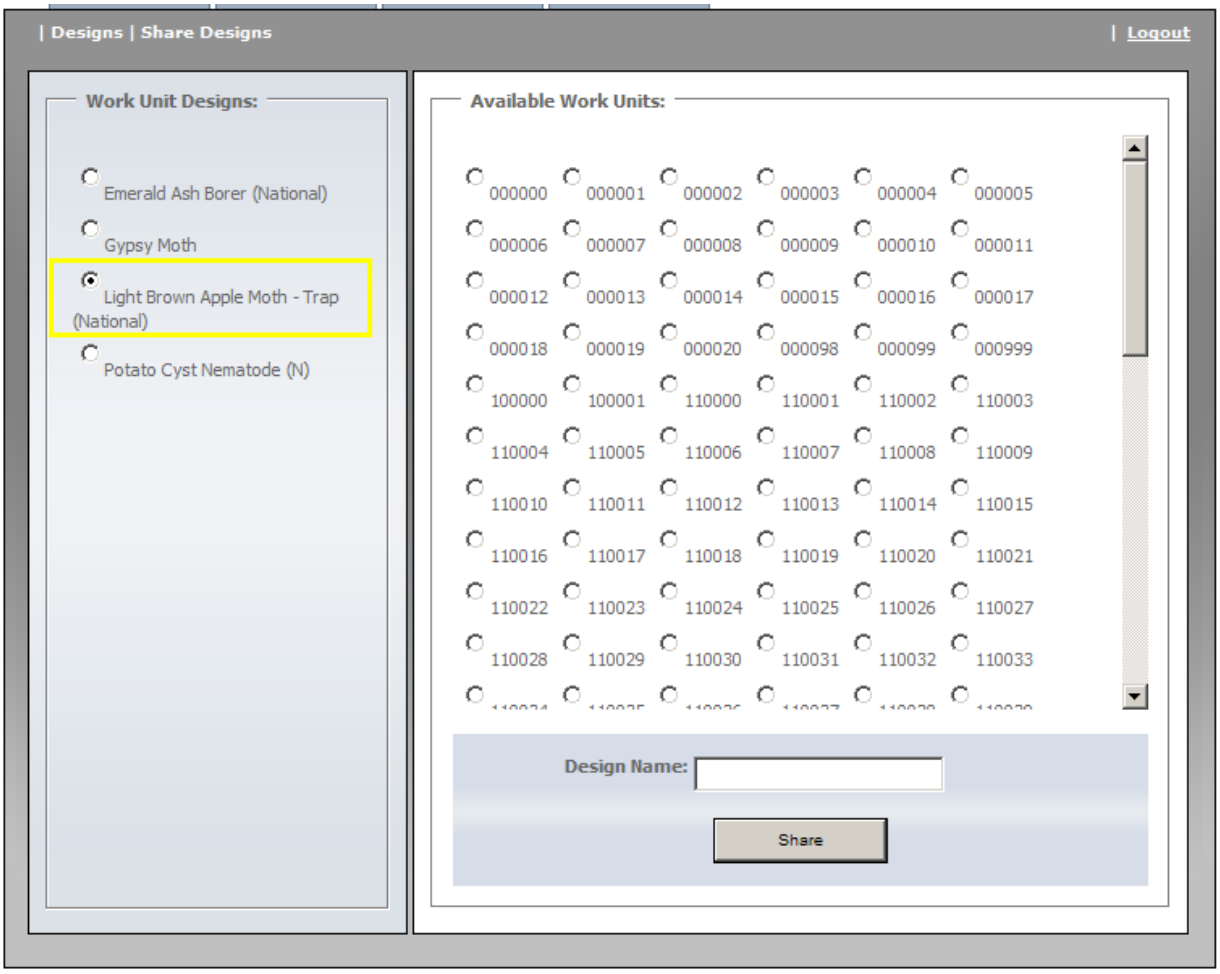
Template Share Site

The "Light Brown Apple Moth - Trap (National)" Template is available at the following work unit (share site):

Username: ISISDesigns
Password: password

This work unit was created as a "Sand Box" work unit, for all users to have access to pre-designed ISIS templates. Users can access the work unit using the above username and password and "share" the template they want to their home work unit(s). If users have any questions regarding this procedure, please contact the ISIS help desk.

National Support
Email: ISIS.Support@aphis.usda.gov
1-866-910-9091



Appendix 4. Light Brown Apple Moth Screening and Identification Aid

Light Brown Apple Moth (LBAM)

Epiphyas postvittana (Walker)

Screening and Identification Aid

S. Passoa[1], M. Epstein[2], T. Gilligan[3], J. Brambila[4], M. O'Donnell[2]

The light brown apple moth (LBAM) is a member of the Tortricidae, a large family of moths (Lepidoptera) that includes many pest species. In North America there are approximately 1200 species of tortricids, which are often referred to as "leafrollers" because the larvae of some species feed inside a rolled leaf. Most tortricid moths are small and brown with a wingspan of approximately 10-30 mm. Although wing pattern can be used to identify some tortricids, the forewings of LBAM are extremely variable and wing pattern should not be used for identification.

Figure 1: Outline of a light brown apple moth in resting position.

This aid is designed to assist in the screening and identification of LBAM adults collected from sticky traps in the United States. It covers basic sorting of traps, first and second level screening, and identification based on morphological characters. Due to the extreme variability of LBAM adults, prior knowledge of dissection techniques and Lepidopteran morphology may be necessary to identify suspect LBAM specimens.

Figure 2: Examples of LBAM adults caught in a sticky trap.

Sorting

Traps should be initially sorted based on the presence of moths of the appropriate size, color, and shape. Traps that contain moths meeting all of the following requirements should be moved to level 1 screening:

1) moths are approximately 7-12 mm long (forewing length) (Fig. 2 & 3)

2) moths caught in sticky traps have yellowish-brown to dark brown appearance (Fig. 2)

3) moths caught in sticky traps will generally have standard appearance similar to the outline shown in Fig. 1

Figure 3: Actual size (7-12 mm forewing length) of an LBAM adult.

1) USDA-APHIS-PPQ, Columbus, OH; 2) Plant Pest Diagnostics Branch, California Department of Food & Agriculture, Sacramento, CA; 3) Colorado State University, Fort Collins, CO; 4) USDA-APHIS-PPQ, Gainesville, FL

Level 1 Screening

Moths that meet the sorting requirements should be screened for suspect tortricids. Level 1 screening of individuals can be performed without a genitalic dissection and covers couplets 1-4 of the screening key (page 4). Tortricid moths can be identified by the following combination of characters:

1) Antennae simple, thread-like, and never pectinate (feathery).
2) Tympanum absent. Members of the Pyraloidea may appear similar but have a tympanum at the base of the abdomen.
3) Labial palpi pointed and project forward. Some families have labial palpi that curve upwards.
4) Maxillary palpi are very reduced and not visible in tortricids. Maxillary palpi may be visible under magnification in some commonly intercepted pyralid species.
4) Proboscis (tongue) unscaled. Members of the Gelechioidea and Pyraloidea have a scaled proboscis.
5) Chaetosema (patch of bristle-like setae) present above the compound eye. (Chaetosema may be difficult to see without a high-quality microscope.)

Figure 4: Costal fold on a male LBAM.

Figure 5: Suspect tortricid on a 2 x 2 cm card cut from a sticky trap and protected for storage or transport.

Moths meeting the above criteria should be further examined to determine if they are male or female. Males have a single frenulum bristle on the hindwing and a slit where the valves meet on the end of the abdomen. Females have multiple frenulum bristles on the hindwing and hairy ovipositor lobes on the end of the abdomen. If the specimen is determined to be a female tortricid it should be moved to level 2 screening. If the specimen is determined to be a male, the forewing should have a fold at the base of the costal margin (Figs. 4). Males lacking this costal fold can be discarded as not LBAM; males with a costal fold should be moved to level 2 screening. Both male and female LBAM have mottled hindwings (Fig. 6). This faint spider web-like reticulation should be visible in a majority of LBAM specimens; any specimens with mottled hindwings should be moved to level 2 screening.

Figures 6: Spread LBAM adult showing characteristic mottled hindwing.

Suspect tortricids may be sent to level 2 screening on individual 2 x 2 cm cards cut from the sticky trap. Cards can be safely transported in small jars or vials (Fig. 5) either singly or back-to-back to avoid damaging the specimens. If jars or vials are not available, pin the card to a foam bottom mailing box with several insect pins. Screeners that have more than two suspect LBAM adult specimens in a single trap should send the whole trap rather than cut out individual specimens if using a Centralized Identification Laboratory. Samples must be properly labeled with trap number, location, collection date, and any other information required by the LBAM National Survey Guidelines.

Level 2 Screening

Suspect tortricids should be cleaned and dissected to identify suspect LBAM specimens. Details on cleaning specimens caught in sticky traps can be found in the following article:

> Miller, R. S., S. Passoa, R. D. Waltz & V. Mastro. 1993. Insect removal from sticky traps using a citrus oil solvent. Ent. News 104(4): 209-213.

Cleaned specimens should be pinned and the abdomen removed for dissection. The pinned specimen, and all appropriate data, should be retained as a voucher along with a label that associates the pinned specimen with the separated abdomen. Standard dissection procedures for Lepidoptera are outlined in Clarke (1951) and Robinson (1976). Dissected tortricids can be screened based on the following characters. Level 2 screening covers couplets 4-6 of the screening key (page 4).

Males

Male LBAM genitalia (Fig. 7) can be distinguished based on a combination of two characters:

1) Uncus spatulate (spoon-shaped) (Fig. 8). This character should not be used alone since several common non-target tortricids (*Choristoneura rosaceana* and many *Clepsis* species) have a similarly shaped uncus.

2) Valva with a membranous lobe on the apex (Fig. 9). This is the best diagnostic character for male LBAM, although the lobe may vary in size and may be difficult to see in some specimens. Questionable specimens should be sent forward for identification.

Females

Female LBAM are difficult to screen. LBAM has a long straight ductus bursae and a corpus bursae with a signum, but this combination is not unique. A common non-target in California, *Clepsis peritana* (garden tortrix), has a spiral ductus bursae; this character can often be seen by brushing scales off the abdomen while the specimen is in alcohol or a cleaning agent. Females with characters similar to those in Figs. 10-11 should be sent forward for identification.

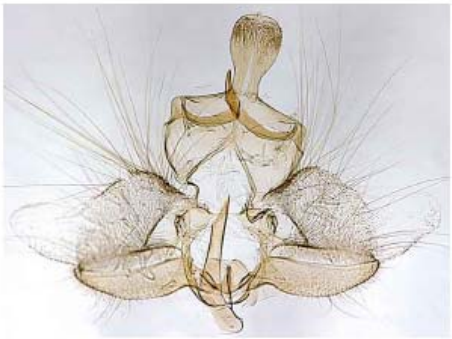


Figure 7: Complete male LBAM genitalia.

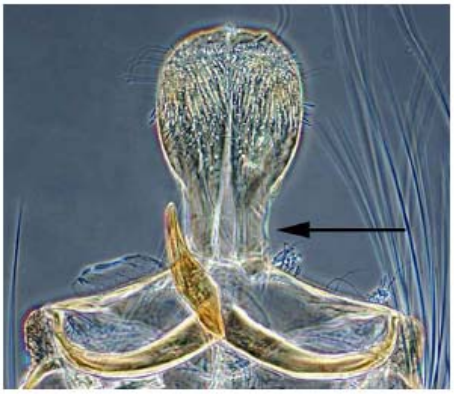


Figure 8: Male LBAM spatulate (spoon-shaped) uncus (phase contrast image).

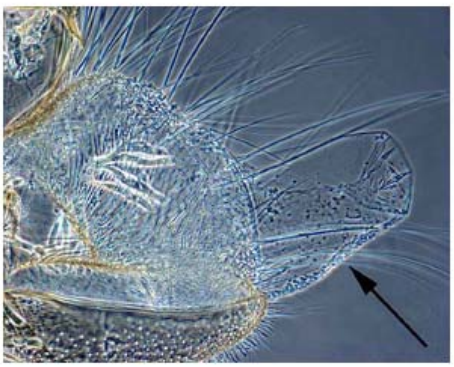


Figure 9: Membranous lobe on the apex of the male LBAM valva (phase contrast image)

Key to Screen LBAM Suspects in the United States

The following key covers both level 1 and 2 LBAM screening for suspect tortricids. Sticky traps normally capture only males moths, although California LBAM traps capture female tortricids more often than expected. Both sexes of moths are included along with notes to help the identifier with each couplet.

1. Abdominal or thoracic tympanum present; antenna pectinate; labial palpi upturned; proboscis scaled or absent; moths not about 7-12 mm long ..... **Not LBAM**

1'. Abdominal and thoracic tympanum absent; antenna simple; labial palpi pointed and projecting forward; proboscis not scaled; moths about 7-12 mm long **2**

2. Chaetosema absent..... **Not LBAM**

2'. Chaetosema present or condition unknown **3**

3. Males.....**4**

3'. Females **6**

4. Costal fold absent; uncus tubular ..... **Not LBAM**

4'. Costal fold present; uncus spatulate.....**5**

5. Membranous lobe from apex of valve absent ..... **Not LBAM**

5'. Membranous lobe from apex of valve present..... **LBAM Suspect**

6. Ductus bursae in a spiral; signum absent ..... **Not LBAM**

6'. Ductus bursae straight, never in a spiral; signum present **7**

7. Ductus bursae no more than 2-3 times as long as the corpus bursae and entire bursae 1/2 the length of the abdomen or less..... **Not LBAM**

7'. Ductus bursae 4-5 times as long as the corpus bursae and entire bursae (ductus + corpus bursae) at least 2/3 length of abdomen..... **LBAM Suspect**

Figure 10: Female LBAM papillae anales and sterigma.

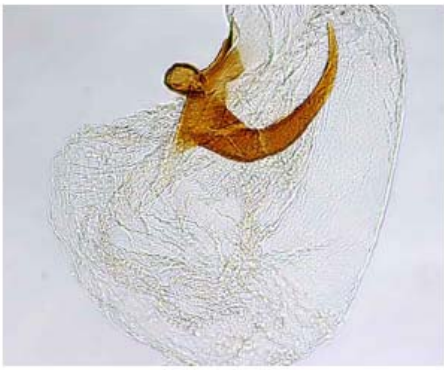


Figure 11: Female LBAM hook-shaped signum in corpus bursae.

Notes: 1) In California, crambid moths in the genus *Achyra* are often captured. Based on previous surveys in the Eastern United States in the 1990's, LBAM traps have commonly captured a species of *Pyrausta*. Therefore it is particularly important to understand how to separate Crambidae from Tortricidae in any LBAM survey. **2)** If the chaetosema are clearly absent, this can be used to rule out LBAM. If chaetosema are present, or the user is unsure of this difficult character, it is best to proceed with LBAM as a possibility. **3)** Knowledge of separating males from females is required to effectively use the key. **4)** The costal fold is a sexual character in tortricids, found only in the males of some species, including LBAM. The uncus is spatulate (spoon-shaped) in the LBAM but also a few common non-target tortricids. **5)** It is best to send forward any male specimens with a membranous lobe on the valve. **6)** Female LBAM have a long straight ductus bursae and a corpus bursae with a signum, but this combination is not unique. A common non-target in California, *Clepsis peritana* (garden tortrix), has a spiral ductus bursae; this character can often be seen through the abdomen if the scales are brushed off while the specimen is in alcohol or a cleaning agent.

Identification

Male LBAM can be distinguished by the large membranous lobe extending laterally from the apex of the valve (Dugdale et al. 2005) (Fig. 9). In addition, the base of the uncus is only slightly narrowed (Fig. 8). Powell (1964) reports *Clepsis virescana* as having a weak membranous lobe on the apex of the valve; however, this lobe is much smaller than the lobe found in LBAM and *virescana* males do not have a costal fold. Dugdale et al. (2005) mentions the shape of the costal fold as a potential character, but similarity to other species (like *C. rosaceana*) limits its usefulness by non-specialists. Identification of LBAM based on female genitalia is difficult and best left to specialists. Instructions for submitting suspect LBAM specimens for identification are outlined in the LBAM National Survey Guidelines.

M. O'Donnell & M. Epstein, CDFA

Figure 12: Dorsal view of wing pattern variation in LBAM adults.

M. O'Donnell & M. Epstein, CDFA

Figure 13: Lateral view of wing pattern variation in LBAM adults.

Figure 14: LBAM adult on sticky trap. Note partially visible mottled hindwing.

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Acknowledgements

The authors would like to thank all of the coordinators of the LBAM National Survey. Specifically, Richard Brown and John Brown provided helpful comments regarding the identification of LBAM specimens.

Appendix 5. Specimen submittal forms.

PPQ 391: Specimens for Determination.

This report is authorized by law (7 U.S.C. 147a). While you are not required to respond your cooperation is needed to make an accurate record of plant pest conditions. *See reverse for additional OMB information.*

FORM APPROVED
OMB NO. 0579-0010

U.S. DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE

SPECIMENS FOR DETERMINATION

Instructions: Type or print information requested. Press hard and print legibly when handwritten. Item 1 - assign number for each collection beginning with year, followed by collector's initials and collector's number. Example (collector, John J. Dingle): 83-JJD-001.
Pest Data Section – Complete Items 14, 15 and 16 or 19 or 20 and 21 as applicable. Complete Items 17 and 18 if a trap was used.

FOR IIBIII USE
LOT NO.
PRIORITY

1. COLLECTION NUMBER

2. DATE — MO | DA | YR

3. SUBMITTING AGENCY
☐ State Cooperator ☐ PPQ ☐ Other _____

SENDER AND ORIGIN

4. NAME OF SENDER

6. ADDRESS OF SENDER

ZIP

INTERCEPTION SITE

5. TYPE OF PROPERTY *(Farm, Feedmill, Nursery, etc.)*

7. NAME AND ADDRESS OF PROPERTY OR OWNER

COUNTRY/ COUNTY

PURPOSE

8. REASON FOR IDENTIFICATION *("x" ALL Applicable Items)*

A. ☐ Biological Control (Target Pest Name)
B. ☐ Damaging Crops/Plants
C. ☐ Suspected Pest of Regulatory Concern *(Explain in* REMARKS*)*
D. ☐ Stored Product Pest
E. ☐ Livestock, Domestic Animal Pest
F. ☐ Possible Immigrant *(Explain in* REMARKS*)*
G. ☐ Survey *(Explain in* REMARKS*)*
H. ☐ Other *(Explain in* REMARKS*)*

9. IF PROMPT OR URGENT IDENTIFICATION IS REQUESTED, PLEASE PROVIDE A BRIEF EXPLANATION UNDER "REMARKS".

HOST DATA

10. HOST INFORMATION
NAME OF HOST *(Scientific name when possible)*

11. QUANTITY OF HOST
NUMBER OF ACRES/PLANTS
PLANTS AFFECTED *(Insert figure and indicate* ☐ Number ☐ Percent*)*:

12. PLANT DISTRIBUTION
☐ LIMITED
☐ SCATTERED
☐ WIDESPREAD

13. PLANT PARTS AFFECTED
☐ Leaves, Upper Surface
☐ Leaves, Lower Surface
☐ Petiole
☐ Stem
☐ Trunk/Bark
☐ Branches
☐ Growing Tips
☐ Roots
☐ Bulbs, Tubers, Corms
☐ Buds
☐ Flowers
☐ Fruits or Nuts
☐ Seeds

PEST DATA

14. PEST DISTRIBUTION
☐ FEW
☐ COMMON
☐ ABUNDANT
☐ EXTREME

15. ☐ INSECTS ☐ NEMATODES ☐ MOLLUSKS

NUMBER SUBMITTED	LARVAE	PUPAE	ADULTS	CAST SKINS	EGGS	NYMPHS	JUVS.	CYSTS
ALIVE								
DEAD								

16. SAMPLING METHOD

17. TYPE OF TRAP AND LURE

18. TRAP NUMBER

19. PLANT PATHOLOGY – PLANT SYMPTOMS *("X" one and describe symptoms)*
☐ ISOLATED ☐ GENERAL

20. WEED DENSITY
☐ FEW ☐ SPOTTY ☐ GENERAL

21. WEED GROWTH STAGE
☐ SEEDLING ☐ VEGETATIVE ☐ FLOWERING/FRUITING ☐ MATURE

22. REMARKS

23. TENTATIVE DETERMINATION

24. DETERMINATION AND NOTES *(Not for Field Use)*

SIGNATURE

DATE

FOR IIBIII USE
DATE RECEIVED
NO.
LABEL
SORTED
PREPARED
DATE ACCEPTED
RR

PPQ FORM 391 *Previous editions are obsolete.*
(AUG 02)

This is a 6-Part form. Copies must be disseminated as follows:
☐ PART 1 – PPQ ☐ PART 2 – RETURN TO SUBMITTER AFTER IDENTIFICATION ☐ PART 3 – IIBIII OR FINAL IDENTIFIER
☐ PART 4 – INTERMEDIATE IDENTIFIER ☐ PART 5 – INTERMEDIATE IDENTIFIER ☐ PART 6 – RETAINED BY SUBMITTER

OMB Information

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0579-0010. The time required to complete this information collection is estimated to average .25 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Instructions

Use PPQ Form 391, Specimens for Determination, for domestic collections (warehouse inspections, local and individual collecting, special survey programs, export certification).

BLOCK	INSTRUCTIONS
1	1. Assign a number for each collection beginning the year, followed by the collector's initials and collector's number **EXAMPLE** In 2001, Brian K. Long collected his first specimen for determination of the year. His first collection number is 01-BLK-001 2. Enter the collection number
2	Enter date
3	Check block to indicate Agency submitting specimens for identification
4	Enter name of sender
5	Enter type of property specimen obtained from (farm, nursery, feedmill, etc.)
6	Enter address
7	Enter name and address of property owner
8A-8L	Check all appropriate blocks
9	Leave Blank
10	Enter scientific name of host, if possible
11	Enter quantity of host and plants affected
12	Check block to indicate distribution of plant
13	Check appropriate blocks to indicate plant parts affected
14	Check block to indicate pest distribution
15	• Check appropriate block to indicate type of specimen • Enter number specimens submitted under appropriate column
16	Enter sampling method
17	Enter type of trap and lure
18	Enter trap number
19	Enter X in block to indicate isolated or general plant symptoms
20	Enter X in appropriate block for weed density
21	Enter X in appropriate block for weed growth stage
22	Provide a brief explanation if Prompt or URGENT identification is requested
23	Enter a tentative determination if you made one
24	Leave blank

Distribution of PPQ Form 391

Distribute PPQ Form 391 as follows:

1. Send Original along with the sample to your Area Identifier.
2. Retain and file a copy for your records.

Light Brown Apple Moth National Survey Trap Slip

If the state does not have a form with the required information for each trap submitted to taxonomist within their state, and a PPQ form 391 is not completed for each trap when submitted, the form below can be used. A PPQ form 391 will still need to be completed if specimens are sent for confirmation by Steve Passoa or a Centralized Identification Location.

Light Brown Apple Moth National Survey
Trap Slip

1. Trap number _____
2. Collection number with two letter state abbreviation

   _____
3. Number of suspect specimens in trap sample _____
4. Location (address, coordinates, and State and County)

   _____
   _____
   _____
5. Nearby host plant genus and species (if applicable)

   _____
6. Trap service dates:
   c. Date last serviced with lure change
      _____/_____/_____
   d. Date trap or trap insert pulled for sample submission
      _____/_____/_____
7. Sender name, affiliation, phone number, e-mail address

   _____
   _____
   _____

Appendix 6 State Risk Categories and Maximum Trap Numbers

Appendix 6 This table shows the maximum number of traps and trapping duration for each state for the National LBAM survey. The total number of traps is reflective of funds sharing and not scientific determination- do the very best you can with what you know about your state and risk potentials.

State / Territory	Tier	Number of Traps	Number of Months	Trap Months	Servicings (at once per two weeks)
Eastern Region					
Alabama	1	350	5	1750	3675
Florida	1	350	5	1750	3675
Georgia	1	350	5	1750	3675
Kentucky	1	350	5	1750	3675
Mississippi	1	350	5	1750	3675
North Carolina	1	350	5	1750	3675
South Carolina	1	350	5	1750	3675
Tennessee	1	350	5	1750	3675
Virginia	1	350	5	1750	3675
Pennsylvania	2	200	5	1000	2100
West Virginia	2	200	5	1000	2100
Connecticut	3	50	3	150	315
Delaware	3	50	3	150	315
Illinois	3	50	3	150	315
Indiana	3	50	3	150	315
Maine	3	50	3	150	315
Maryland	3	50	3	150	315
Massachusetts	3	50	3	150	315
Michigan	3	50	3	150	315
Minnesota	3	50	3	150	315
New Hampshire	3	50	3	150	315
New Jersey	3	50	3	150	315
New York	3	50	3	150	315
Ohio	3	50	3	150	315
Rhode Island	3	50	3	150	315
Vermont	3	50	3	150	315
Wisconsin	3	50	3	150	315
Puerto Rico		80	5	400	840

Western Region					
State / Territory	**Tier**	**Number of Traps**	**Number of Months**	**Trap Months**	**Servicings (at once per two weeks)**
Arizona	1	350	5	1750	3675
Arkansas	1	350	5	1750	3675
Louisiana	1	350	5	1750	3675
New Mexico	1	350	5	1750	3675
Oklahoma	1	350	5	1750	3675
Oregon	1	350	5	1750	3675
Texas	1	350	5	1750	3675
Idaho	2	200	5	1000	2100
Missouri	2	200	5	1000	2100
Nevada	2	200	5	1000	2100
Washington	2	200	5	1000	2100
Alaska	3	50	3	150	315
Colorado	3	50	3	150	315
Iowa	3	50	3	150	315
Kansas	3	50	3	150	315
Montana	3	50	3	150	315
Nebraska	3	50	3	150	315
North Dakota	3	50	3	150	315
South Dakota	3	50	3	150	315
Utah	3	50	3	150	315
Wyoming	3	50	3	150	315
Hawaii		350	6	2100	4410

Appendix 7 Resources

Ordering nematode vials used in packaging suspect LBAM adults cut out of traps:

Taral Plastics container Co.
725 Zwissig Way
Union City, CA 94587

510-487-0888
510-487-6646 fax

The jars are ½ oz. 33 mm clear san jars 1300 per case.
The caps are 33 mm lined white metal caps 4700 per case.

These are not one unit (i.e., you must order both to receive both).

Ordering traps and lures:

Craig Southwick (WR) and Ron Weeks (ER) will coordinate lure and trap orders.