Grape Commodity-Based Survey Reference

2015 Version

Cover image:
Close-up view of the fruits of the grape. R.A. Hammon, Colorado State University, www.bugwood.org

Authors:
Melinda Sullivan
USDA-APHIS-PPQ-CPHST
Plant Pathologist
2301 Research Blvd. Suite 108
Fort Collins, CO 80526
Phone (970) 490-4469
melinda.j.sullivan@aphis.usda.gov

Daniel Mackesy
USDA-APHIS-PPQ-CPHST
Biological Science Technician
2301 Research Blvd. Suite 108
Fort Collins, CO 80526
Phone (970) 490-4494
daniel.z.mackesy@aphis.usda.gov

Talitha Molet
USDA-APHIS-PPQ-CPHST
Biological Science Technician
1730 Varsity Dr. Suite 400
Raleigh, NC 27606
Phone (919) 855-7457
talitha.p.molet@aphis.usda.gov

Lisa Jackson
USDA-APHIS-PPQ-CPHST
Biological Scientist
1730 Varsity Dr. Suite 400
Raleigh, NC 27606
Phone (919) 855-7549
lisa.d.jackson@aphis.usda.gov

Reference Document Reviewers:
Joel Floyd
Domestic Diagnostics Coordinator
USDA, APHIS, PPQ National Identification Services
4700 River Rd., Unit 52, Rm. 4D-04B
Riverdale, MD 20737
Phone (301) 851-2115
Joel.P.Floyd@aphis.usda.gov

Mark Nakhla
Director -CPHST Beltsville Laboratory
USDA-APHIS-PPQ -CPHST
BARC-East, Bldg-580
Powder Mill Road
Beltsville, MD 20705-2350
Phone (301) 313-9211 (office), (301) 760-8870 (cell)
Mark.K.Nakhla@aphis.usda.gov

Individual Pest Datasheet Reviewers:

Many individuals have provided feedback, comments, and suggested changes to the pest datasheets. Many of these individuals have provided information on survey and identification methods and supplied images. Their help was instrumental in the completion of the Grape Commodity-based survey manual. See each pest datasheet for the specific reviewers of each datasheet.

Julieta Brambila
Domestic Identifier (Entomology)
USDA-APHIS-PPQ
1911 SW 34th Street
Gainesville, FL 32608
Julieta.Brambila@aphis.usda.gov

Robert C. Brown
Domestic Identifier (Entomology)
USDA-APHIS-PPQ
901 W. State St., Smith Hall
Purdue University
West Lafayette, IN 47907
Robert.C.Brown@aphis.usda.gov

Robert Davis
Research Leader, Molecular Plant Pathology Laboratory,
USDA-Agricultural Research Service
Beltsville, MD, 20705
Phone (301) 504-5745; (301) 504-6290
robert.davis@ars.usda.gov

Todd Gilligan
Research Scientist
USDA-APHIS-PPQ
2301 Research Blvd. Suite 108
Fort Collins, CO 80526
Todd.M.Gilligan@aphis.usda.gov

Sylvie Malembic-Maher and Xavier Foissac

Equipe Mollicutes
UMR 1332 Biologie du Fruit et Pathologie (BFP)
Institut National de la Recherche Agronomique (INRA-Bordeaux France)
71 avenue Edouard Bourlaux
CS20032
33882 Villenave d'Ornon Cedex
smalembi@bordeaux.inra.fr

Michael Maixner
Julius Kühn Institute (JKI),
Federal Research Centre for Cultivated Plants Institute for Plant Protection in Fruit Crops and Viticulture
-Bereich Weinbau-
Geilweilerhof
76833 Siebeldingen, Germany
Michael.Maixner@jki.bund.de

Mark Nakhla
Director -CPHST Beltsville Laboratory
USDA-APHIS-PPQ -CPHST
BARC-East, Bldg-580
Powder Mill Road
Beltsville, MD 20705-2350
Phone (301) 313-9211 (office), (301) 760-8870 (cell)
Mark.K.Nakhla@aphis.usda.gov

Steve Passoa
National Lepidoptera Specialist
USDA-APHIS-PPQ
The Ohio State University
1315 Kinnear Rd.
Columbus, OH 43212
Steven.C.Passoa@aphis.usda.gov

Draft Log

July, 2007: Draft sent for internal CPHST review

September, 2007: Draft sent for CAPS comment.

December, 2007: Final 2008 version posted on CAPS website

February, 2008: Revised draft posted on CAPS website

May, 2008: Grape Commodity map updated.

September, 2009: Updated NAPPFAST risk maps added to datasheets within the document.

June, 2010: Datasheets for *Diabrotica speciosa* and *Eupoecilia ambiguella* added, CAPS-Approved survey and diagnostic method information added, updated risk maps added, and tertiary pests removed. All tertiary pests were previously listed with name and photo only.

August, 2010: Updated hyperlinks for links now on the CAPS Resource and Collaboration site

April, 2012: Trap and lure information updated to reflect names used in the IPHIS Survey Supply Ordering System. *Lobesia botrana* lure effectiveness changed from three to four weeks. New NAPPFAST maps added for pests. *Xylella fastidiosa* (citrus variegated chlorosis strain) datasheet was removed per suggestion of the CAPS Pest List Working Group. Minor changes made for a few pest datasheets (host/distribution information primarily). Information about *Tort AI- Tortricids of Agricultural Importance*, a new diagnostic tool developed by CPHST's Identification Technology Program, was added where appropriate.

June, 2012: Removed *Copitarsia* spp. and *Planococcus minor* datasheets at the suggestion of the CAPS Pest List Working group for FY 2013 surveys. *Planococcus minor* has been deregulated. Both pests are not available for the 2013 survey season.

June, 2013: Updated '*Candidatus* Phytoplasma australiense' datasheet.

August, 2013: Added datasheets for three new 2014 AHP CAPS targets: '*Candidatus* Phytoplasma vitis', *Cryptoblabes gnidiella*, and *Pseudopezicula tracheiphila*.

June through November, 2014: Removed *Diabrotica speciosa* and *Adoxophyes orana* from grape manual. Upon review, CPHST discovered that these pests would unlikely be detected in grape. Manual content put into new manual format consisting of an Introduction and free-standing pest datasheets. Complete revision and update of all datasheets.

December, 2014: Posted on CAPS Resource and Collaboration site for review.

Grape Commodity-Based Survey Reference
Table of Contents

How to Use This Manual

I: Introduction

The first section of this manual describes the purpose of the Grape Commodity-based Survey Reference. This section provides background information about grapes including production and usage of grapes, why grapes are important, and where grapes are grown in the United States. This section also lists the pest species targeted in this survey and their current distribution within the United States.

Pest Datasheets

Pest datasheets have been developed for each target pest species. Datasheets contain specific information on the biology, ecology, hosts, distribution, survey methods, and identification resources for each pest target. Pest datasheets are located as separate links on the CAPS Resource and Collaboration site manuals page under Grape Reference (https://caps.ceris.purdue.edu/node/17) and on the Grape Reference page (https://caps.ceris.purdue.edu/node/596).

Host information (in all Pest Datasheets)

In general, host information in pest datasheets is based on host species present in areas where the target is distributed. These hosts may or may not be present in the United States.

II: Planning a Survey

This section describes how to plan a Grape Commodity-based Survey and includes information on the CAPS-approved survey and identification/diagnostic methods for each of the 12 grape pests. General information is provided on survey sites, survey season, and the approved traps.

States should consider a pathway approach when deciding on which grape pests to include in their respective Grape Commodity-based Surveys. Information regarding the hosts and climate of each pest should be considered as well.

III: Ordering Traps and Lures

This section gives specific information on how to order traps and lures for grape pest surveys.

IV: Conducting the Survey

This section gives specific information on how to conduct a survey for grape pests. This section lists symptoms and signs to look for when conducting a visual survey. It also provides information on trapping, including: trap placement, trap setup, lure handling, changing, and storage, checking traps, and the length of effectiveness for approved lures.

V: Sample Processing, Sorting, and Submission

This section gives specific information on how to submit samples for identification.

I: Introduction

Purpose

The purpose of the Grape Commodity-based Survey is to detect new infestations of target grape pest species at low population levels. This document provides standardized guidelines for conducting a grape commodity-based detection survey in the United States and its territories.

The target species of the survey were selected by the national committee of the Cooperative Agricultural Pest Survey (CAPS) Program. Target species are either exotic pests not known to occur in the United States or pests with limited distribution. Surveys are planned and coordinated through each Plant Protection and Quarantine, State Plant Health Director's office and state cooperators (State Departments of Agriculture). The goals of the Grape Commodity-based Survey are to obtain information about:

- The presence, distribution, or absence of the target species;
- Patterns of distribution throughout the United States;
- Possible pathways for introduction of target species.

The following elements are pivotal to the success of the Grape Commodity-based Survey:

- Interviews, inspection, and trapping activities in and around high-risk areas;
- Timely and accurate data reporting;
- Public outreach programs that create an awareness of grape pests and encourage reporting from growers and the public.

Background

Introduction to Grape

Cultivated grapes are consumed as fresh fruit, raisins, wine, and juice and are an important crop in the United States. The many varieties and cultivars of grape belong to the *Vitaceae* family. The *Vitis* genus grows in eastern Asia, Europe, the Middle East and North America between 25° and 50° N latitude. Grapes can be classified by either food usage or by species (Reiger, 2006).

The genus *Vitis* is divided into two subgenera: *Euvitis* and *Muscadinia*. *Euvitis*, or 'true grapes,' are characterized by fruits growing in elongated clusters and attached to stems at maturity. *Euvitis* grapes have forked tendrils, diaphragms in pith at nodes, and long strips of loose bark detached from the vine. *Muscadinia*, or muscadine grapes, have

small clusters of thick-skinned fruit which detach as they mature. Tendrils of muscadine grapes are simple, diaphragms in pith at nodes are lacking, and vines have smooth bark with lenticels (Reiger, 2006).

Grape production worldwide primarily consists of only four species or hybrids. *Vitis vinifera*, often named the 'Old World grape,' is prized for use in wine production and for table and raisin grapes. Worldwide production is dominated by *V. vinifera*, with 90% of grape production in this species and at least 500 *V. vinifera* cultivars grown. *Vitis rotundifolia* is a muscadine grape that is disease tolerant and grows vigorously. This species is native to the United States from Virginia south through central Florida, and west to eastern Texas. It is well adapted to the southeastern United States but not cold hardy. *Vitis labrusca* is found growing wild from Maine to the South Carolina Piedmont, west to Tennessee. This species includes the popular 'Concord' cultivar, among others, and is grown for grape juice, jams, and associated products. Lastly, there are French-American hybrids. The introduction of the phylloxera grape root louse to Europe in 1860 devastated vineyards composed of the susceptible *Vitis vinifera* species and created a need for resistant rootstocks. *Vitis labrusca* and other species native to the host range of the phylloxera (north-central United States) were hybridized with vinifera grape to produce a range of rootstocks with resistance (Reiger, 2006).

Grape production in the United States

The United States ranks third worldwide in grape production, contributing 9.1% of the total pounds produced globally. The U.S. grape industry is currently valued at approximately $4.9 billion dollars. In 2012, the United States produced a total of 7.34 million tons of grapes with an average price of $669 per ton. Grapes are the highest value non-citrus fruit/nut crop in terms of both utilized production and value. Grape-producing states include Arizona, Arkansas, California, Georgia, Michigan, Missouri, New York, North Carolina, Ohio, Oregon, Pennsylvania, Texas, Virginia, and Washington. The majority of U.S. grapes, 90%, are grown in California, with over 800,000 acres in production (NASS, 2013).

Food Usage

Classification of grapes by food usage includes table grapes, raisin grapes, sweet juice grapes, and wine grapes. Table grapes are those grown for and consumed as fresh fruit. *Vitis vinifera* 'Thompson seedless' grapes are widely grown as table grapes, as are many other cultivars. 'Thompson seedless' is the most common raisin grape cultivar, making up 90% of raisin production in the United States. Sweet juice grapes grown for juice, jelly, jam, preserves and certain types of wine are typically 'Concord' grapes. Commercial wine grape production is dominated by cultivars of *V. vinifera* (Reiger, 2006).

Domestication

It is thought that grapes (*Vitis vinifera*) are native to southwestern Asia near the Caspian Sea. Like other fruits native to that region, such as pears and apples, grapes most likely spread to new places as a result of trade. Grape seeds dating back to the Bronze Age have been found in excavated dwellings in south-central Europe. Egyptian

hieroglyphics told of wine making. Grapes were probably brought to Greece, Rome, and France by the Phoenicians. Early settlers to North America brought grape starts, but the grapes fared poorly on the east coast. Spanish missionaries introduced vinifera-type grapes to California in the 1700s, where they have flourished as a crop (Reiger, 2006).

Biology and Reproduction of Grapes

All grapes are woody, climbing vines. Muscadine grapes have smooth bark with lenticels and small, round, un-lobed leaves with dentate margins. Vinifera grapes are characterized by older vines with loose, flakey bark and large leaves. Vinifera leaves can vary greatly in both size and shape and may or may not be lobed. Small, green flowers appear on racemose panicles at the base of the current season's growth. Flowers have five sepals, five petals, and five stamens. Grape flowers have superior ovaries with two locules, each with two ovules. Vinifera and Concord grapes have perfect flowered, self-pollinating flowers, and some muscadine cultivars are only found with pistillate flowers. The majority of grapes are self-pollinating, with some exceptions in muscadine grapes. Fruits of grapes are true berries, round to oblong in shape, and have up to four seeds. Skin is variable in thickness, but most is thin. A fine, glaucous layer of wax may be present on the fruit surface. Anthocyanin compounds are found in the skin, which colors the fruit red, blue, purple, or black (Reiger, 2006).

Selection of Target Species

The target pest species in this survey were selected by the National Committee of the Cooperative Agricultural Pest Survey (CAPS) Program, in cooperation with the USDA-APHIS-PPQ Center for Plant Health Science and Technology (CPHST). All target species included are exotic pests to some area(s) of the United States but not necessarily every state. Specific pests, however, should only be surveyed for in states where that particular pest is not known to occur. Tables 1 and 2 outline the targets selected for this survey; their common name, pest type, and current level of distribution within the United States (see **Table 1. Target Pathogens/Nematodes for Survey** and **Table 2. Target Arthropods for Survey**).

Table 1. Target Pathogens for Survey

Scientific Name	Common Name	Type of Pest	Where in United States (U.S.) the Pest is Known to Occur
'Candidatus Phytoplasma australiense' 16SrXII-B	Australian Grapevine Yellows	Phytoplasma	Exotic to all of U.S.
'Candidatus Phytoplasma vitis' 16SrV-C	Flavescence Doreé	Phytoplasma	Exotic to all of U.S.
Pseudopezicula tracheiphila	Rotbrenner	Fungus	Exotic to all of U.S.

Table 2. Target Arthropods for Survey

Scientific Name	Common Name	Type of Pest	Where in United States (U.S.) the Pest is Known to Occur
Autographa gamma	Silver Y Moth	Moth	Exotic to all of U.S.
Cryptoblabes gnidiella	Honeydew Moth	Moth	Exotic to all of U.S.
Epiphyas postvittana	Light Brown Apple Moth	Moth	California, Hawaii
Eupoecilia ambiguella	European Grape Berry Moth	Moth	Exotic to all of U.S.
Heteronychus arator	Black Maize Beetle	Beetle	Exotic to all of U.S.
Lobesia botrana	European Grapevine Moth	Moth	California
Spodoptera littoralis	Egyptian Cottonworm	Moth	Exotic to all of U.S.
Spodoptera litura	Cotton Cutworm	Moth	Hawaii
Thaumatotibia leucotreta	False Codling Moth	Moth	Exotic to all of U.S.

II. Planning a Survey

Choosing Target Species

Pest targets should be added to your detection survey based on their relevance to your particular state or territory. Determining which target species to survey for should be based on 1) the risk of introduction of the target and pathways of introduction; 2) presence of known or potential hosts in your state/territory; 3) climatic suitability of your state/territory for the target; 4) resources available (financial and staff) for survey and identification of the pest (see **Table 3. Target Pests by Approved Survey Method**); and; 5) the status/importance of a particular pest to your state/territory.

Table 3. Target Pests by Approved Survey Method

Scientific Name	Common Name	CAPS-Approved Survey Method	CAPS-Approved Identification/Diagnostic Method
Autographa gamma	Silver Y Moth	Trap and lure	Morphological
'Candidatus' Phytoplasma australiense 16SrXII-B	Australian Grapevine Yellows	Visual	Molecular
'Candidatus' Phytoplasma vitis 16SrV-C	Flavescence Doreé	Visual	Molecular
Cryptoblabes gnidiella	Honeydew Moth	Trap and lure	Morphological
Epiphyas postvittana	Light Brown Apple Moth	Trap and lure	Morphological
Eupoecilia ambiguella	European Grape Berry Moth	Trap and lure	Morphological
Heteronychus arator	Black Maize Beetle	Visual	Morphological
Lobesia botrana	European Grapevine Moth	Trap and lure	Morphological
Pseudopezicula tracheiphila	Rotbrenner	Visual	Morphological
Spodoptera littoralis	Egyptian Cottonworm	Trap and lure	Morphological

Scientific Name	Common Name	CAPS-Approved Survey Method	CAPS-Approved Identification/Diagnostic Method
Spodoptera litura	Cotton Cutworm	Trap and lure	Morphological
Thaumatotibia leucotreta	False Codling Moth	Trap and lure	Morphological

CAPS Approved Methods Webpage

The CAPS Approved Methods webpage (http://caps.ceris.purdue.edu/approved_methods) lists the most up-to-date, CAPS-approved methods (CAM) for survey and identification/diagnostics of CAPS target pests. The CAM pages list approved methods for pests from the Priority Pest List, consisting of pests from 1) commodity- and taxonomic-based surveys and 2) the Pests of Economic and Environmental Importance list. The information on the CAM pages supersedes any survey and identification/ diagnostic information found in any other CAPS document. Changes are first made on the CAM pages. CAPS documents are revised to reflect these changes as soon as possible; however, the CAM page should always be the authoritative source for the most up-to-date, CAPS-approved methods. To access the CAM information, go to the CAM page and select the survey year. From there, you can select the individual CAPS pest of interest.

Pathways

When planning surveys, states are encouraged to use a pathway approach when deciding on target species and locations to survey. It is understood that risk factors can be examined along a "risk continuum" beginning at offshore sites (points of origin) to points of potential establishment (commodity production areas, natural lands), and numerous risk points in between (wholesale distribution centers, nursery sites, transportation corridors, etc.).

Hosts and Climate

The hosts of the target species as well as the climatic suitability of the targets should be considered when planning a survey.

Pest Datasheets

Each pest datasheet within the manual gives specific guidance on the hosts, biology, pathway, and climactic suitability of the target.

NAPPFAST Maps

The North Carolina State University APHIS Plant Pest Forecasting System (NAPPFAST) produces maps to support CAPS and other PPQ surveys. Depending on

the level of biological data available, the pest datasheets will include host, risk, or Pareto NAPPFAST maps.

Host Maps
The host risk map describes the relative density (on a scale of 1-10) of susceptible hosts. The maps are based on National Agricultural Statistics Service (NASS) and Forest Inventory and Analysis (FIA) data. The scale of one to ten describes the proportion of total host acreage per county. For example, a rank of one indicates no host acreage, while a score of ten indicates that 100% of the acres in the county contain suitable hosts for the pest.

Final Risk Map
A final risk map represents the combined host and climatic suitability on a scale of 0-10. The NAPPFAST risk map and the host risk map were multiplied to obtain a final risk map. A value of one represents low density of susceptible hosts and low likelihood of pest growth and survival. A value of 10 indicates high density of susceptible hosts and a high likelihood of pest growth and survival. A value of zero or the gray area indicates an unsuitable climate for the pest

Pareto Map
The Pareto maps integrate maps of host abundance, climate, and pathway risks into a single risk map. Where no climate map exists, the maps were created from host and pathways only. The risk is rated on a scale of 1-10 based on a series of ordinal risk rankings. The Pareto Risk Map may more accurately reflect the risk potential of a pest than the Final Risk Map because it includes importation pathways.

NAPPFAST Zonal Statistics
States have different levels of hosts, varying environmental conditions, and pest introduction levels represented in the risk maps at county level. Zonal statistics can be used to identify the highest risk pests for an individual state. Files for each state may be viewed on the NAPPFAST page of the CAPS Resource and Collaboration website. If you are unfamiliar with how to analyze and use this data, please contact Dan Borchert for assistance.

For any NAPPFAST-related questions:
Dan Borchert
USDA-APHIS-PPQ-CPHST
Risk Analyst -Entomologist
1730 Varsity Drive, Suite 300
Raleigh, NC 27606
Phone: 919-855-7545
Daniel.M.Borchert@aphis.usda.gov

Survey Sites

When choosing a survey site, select a site that contains known or potential hosts and is large enough to hold all of the traps that will be placed there. When possible, trap near the preferred hosts for the target species. Consult the individual pest datasheets for this information.

Some of the lures can inhibit attraction of other target species; therefore, when trapping for more than one target species, separate traps with different lure types for different pest species by at least 20 meters (66 feet). See individual datasheets for information about trapping interactions.

Many of the target species in this manual also have other non-grape hosts that should be considered when planning surveys. For example, stone fruit trees are common hosts of some of the target species. As such, it may be appropriate to survey for certain targets in stone fruit orchards.

Survey Season

Certain pests may be more prevalent during certain seasons or at different times during the year. Pests may be more common on certain plant parts when compared to other plant parts. Please see the specific pest datasheet for each pest to help determine the time of year to survey for each pest/pest type.

Trap Types

Several different traps are recommended for the Grape Survey targets. Traps are recommended based on the biology of the pest. Refer to **Table 4. Grape Commodity-based Survey Trap and Lure Combinations** for the trap and lure product names as they appear in the IPHIS Survey Supply Ordering System. The six trap types recommended for CAPS Grape targets are:

- Diamond traps
- Jackson traps
- Large plastic delta traps
- Paper delta traps
- Plastic bucket traps
- Wing traps

Diamond Traps

This trap is in the shape of a diamond when pulled apart and assembled. The trap is made of waxed cardboard with all inside surface areas covered in an adhesive. This trap is not available through the IPHIS Survey Supply Ordering System.

Jackson traps (Fig. 1)
Jackson traps can be ordered through the IPHIS Survey Supply Ordering System. They are prism-shaped and made of paper. Moths enter through openings on the triangular ends and are captured on a disposable adhesive liner. The lures should be stapled to one of the non-sticky panels inside the trap.

Figure 1. Jackson Trap (Image courtesy of John Crowe, USDA –APHIS).

Large plastic delta traps (Fig. 2)
Large plastic delta traps can be ordered through the IPHIS Survey Supply Ordering System. They are available in many different colors. Currently, the traps are available in orange, red, or white through the Ordering System. The color of the trap does not affect the efficacy for trapping any of these species. For *Lobesia botrana*, red is the recommended color for the large plastic delta trap as it has been shown to reduce trap catches of non-target insects. Large plastic delta traps are available with a disposable adhesive liner.

The traps are prism-shaped and made of corrugated plastic. Moths enter through openings on the triangular ends and are captured on an adhesive liner. The lures should be stapled to one of the non-sticky panels inside the trap.

Figure 2. Large plastic delta trap (Image courtesy of John Crowe).

Paper delta traps (Fig. 3)
Paper delta traps are available in many different colors. For this survey, the traps are available in orange, brown, or green. The color of the trap does not affect the efficacy for trapping grape target species. States may choose any one of the three colors. Paper delta traps are available with the adhesive applied to either two or three of the internal sides. Consult the specific pest datasheets for information on whether the two or three-sided traps should be used.

The traps are prism-shaped and made of plastic-coated cardboard. Moths enter through openings on the triangular ends and are captured on an adhesive that coats the inner surfaces. For some pests, the trap should be used with ends open. Consult the specific pest datasheets for this information. The lure should be stapled to one of the non-sticky panels inside the trap.

Figure 3. Paper delta trap. (Image courtesy of John Crowe).

Plastic bucket traps (Fig. 4)
This trap, also known as the unitrap, can be ordered through the IPHIS Survey Supply Ordering System. The trap has a green canopy, yellow funnel, and white bucket and is used with a dry kill strip. This trap (Fig. 4) allows for the collection of large amounts of specimens without damaging their identifying characteristics. See **Appendix A: Plastic Bucket Trap Protocol** for more information on how to use the trap.

Figure 4. Plastic bucket trap. (Image courtesy of Julieta Brambila and Robert Meagher).

Wing traps (Fig. 5)
Wing traps are available in either a plastic or paper version. Plastic and paper traps are both equally effective and the State may decide which trap to use. Wing traps have a disposable adhesive liner. When using a wing trap, the lure (a rubber septum) should be placed inside a lure holder, which is usually included with the trap. The lure holder should be stapled to the underside of the top of the trap on a non-sticky area. This trap can be ordered through the IPHIS Survey Supply Ordering System.

Review each pest datasheet for additional guidance or trap modifications for the specific species.

Figure 5. Wing trap (Image courtesy of John Crowe).

Table 4. Grape Commodity-based Survey Trap and Lure Combinations

Target Pest	Lure Product Name	Trap Product Name
Autographa gamma	*Autographa gamma* Lure	Plastic Bucket Trap
Cryptoblabes gnidiella	*Cryptoblabes gnidiella* Lure	1) Wing Trap Kit, Paper 2) Wing Trap Kit, Plastic 3) Plastic Bucket Trap
Epiphyas postvittana	*Epiphyas postvittana* Lure	1) Jackson Trap Body 2) Large Plastic Delta Trap Kits (Orange, Red, or White)
Eupoecilia ambiguella	*Eupoecilia ambiguella* Lure	1) Wing Trap Kit, Paper 2) Wing Trap Kit, Plastic
Lobesia botrana	*Lobesia botrana* Lure	1) Paper Delta Trap, 2 sticky sides (Brown, Green, or Orange) 2) Paper Delta Trap, 3 sticky sides, Orange 3) Large Plastic Delta Trap Kits, Red
Spodoptera littoralis	*Spodoptera littoralis* Lure	Plastic Bucket Trap
Spodoptera litura	*Spodoptera litura* Lure	Plastic Bucket Trap
Thaumatotibia leucotreta	*Thaumatotibia leucotreta* Lure	1) Wing Trap Kit, Paper 2) Wing Trap Kit, Plastic 3) Diamond Trap 4) Large Plastic Delta Trap Kits (Orange, Red, or White)

IMPORTANT: When more than one trap option is listed, consult the specific pest datasheet to determine which option is appropriate for your state.

IMPORTANT: When trapping for more than one species of moth, separate traps for different moth species by at least 20 meters (66 feet).

III. Ordering Traps and Lures

All traps and lures for the Grape Commodity-based Survey should be ordered through the IPHIS Survey Supply Ordering System during the open ordering season. By using the ordering system, PPQ can utilize quality assurance procedures that are not available when ordering directly from manufacturers.

Contact information for trap and lures

For questions about the IPHIS Survey Supply Ordering System or trap and lure quality issues:

Brian Kopper
National Operations Manager, Pest Detection
USDA-APHIS-PPQ
920 Main Campus Dr.
Raleigh, NC 27606
919-855-7318
Brian.J.Kopper@aphis.usda.gov

Kristian Rondeau
National Operations Manager, Farm Bill
USDA-APHIS-PPQ
2150 Centre Ave., Building B.
Ft. Collins, CO 80526
970-490-7563
Kristian.C.Rondeau@aphis.usda.gov

For technical trap, lure, and survey methodology questions:

Lisa Jackson
Biological Scientist
USDA-APHIS-PPQ-CPHST
1730 Varsity Dr., Suite 400
Raleigh, NC 27606
919-855-7549
Lisa.D.Jackson@aphis.usda.gov

IV. Conducting a Survey

Visual Survey

Several of the pests targeted in this survey can be detected visually by looking/scouting for characteristic symptoms/damage or signs of a pest and collecting samples of plant tissues in the field. A symptom is an indication of disease or a pest by reaction of the host (*e.g.*, canker, leaf spot, wilt, yellowing). A sign, in contrast, is an indication of a disease or pest from direct observation of a pest or its parts (physical evidence of the pest) (Fig. 6). It is important to note that none of these symptoms/signs, taken singly, are a diagnostic feature for any pest.

Figure 6: Top. A red grape plant with reddening of leaves (a symptom). Photo courtesy of of S. Malembic-Maher, INRA Bordeaux'. Bottom. Example of eggs and neonate larvae (a sign). Photo courtesy of http://www.defra.gov.uk/planth/pestnote/spod.htm

In the context of the current survey, surveyors should take note of the general condition of the plant and further examine the stems, leaves (both sides), flowers, and fruit for the pests of concern. The surveyors should pay close attention to symptomatic plants first. These would be the plants that have chlorosis (yellowing), necrosis (brown/dead tissue), feeding holes, or a generally unhealthy appearance. If no symptomatic plants are present, the surveyor should choose plants to examine based on convenience. While the surveyor should examine several plants within the site, only one data recording will be necessary for the site. It is recommended to conduct visual surveys multiple times over the survey season. If the surveyor is trapping for insect targets, he or she will need to visit the site multiple times to service the traps and replace lures. Visual surveys may be conducted during these trap-servicing visits as appropriate. There are four pests that have visual survey as a CAPS-approved method (see **Table 5. Grape Hosts Commodity-based Visual Survey**).

Table 5. Grape Hosts Commodity-based Visual Survey

Scientific Name	Symptoms/Damage & Signs to Look For[1]
'Candidatus Phytoplasma australiense'	There are a variety of symptoms, which vary according to host. For grape, symptoms of the grapevine yellows disease can be observed in leaves, tendrils, and fruiting clusters. Leaves of white grape varieties tend to become yellowed and may have veinal necrosis, as well as downward curling of the leaf margins. Unlike some other grapevine diseases, the grapevine yellows diseases are characterized by shriveling/abortion/necrosis of fruiting clusters.
'Candidatus Phytoplasma vitis 16SrV-C'	Leaves turn yellow or red depending on the grape cultivar. They roll downward and become brittle. The interveinal areas of leaves may become necrotic. Shoots show incomplete lignification, and rows of black pustules develop on the green bark along the diseased branches; they are thin, rubbery, and hang pendulously. During winter they blacken and die. The inflorescences dry out and fall off. Fruit setting is reduced. In later infections, bunches are irregular and berries become shriveled. They have a significantly lower sugar content and higher acidity compared to healthy grapes.
Heteronychus arator	Stems experience external feeding, and the whole plant may be toppled or uprooted. Adult damage to plants typically involves chewing of the cortex of stems just below the surface of the ground. In grape, this type of damage occurs most frequently, causes greater growth distortion, and is potentially fatal to newly planted cuttings or seedlings. Black maize beetles eat the cuttings and rootlings at or just below ground level, causing ring barking, wilting, and collapse of the vine. At early stages of plant growth, beetles tend to chew deeper into the vine or chew more fully around the circumference of the thinner stems.
Pseudopezicula tracheiphila	Lesions on leaves are initially yellow on white cultivars and bright red to reddish brown on red cultivars. A reddish brown necrosis develops in the center of the lesion, leaving only a thin margin of yellow or red tissue between the necrotic and green areas of the leaf. The lesions are typically confined to the major veins and the edge of the leaf and are several centimeters wide. Early infections occur on the first to the sixth leaf position of young shoots, resulting in minor losses. Later infections attack leaves up to the 10th or 12th position on the shoot, which results in severe defoliation. The fungus also attacks the inflorescences and berries causing them to rot, dry out, and fall. Young leaves are susceptible after they reach a width of about 5 cm but the probability of infections increases from the 6-leaf stage. After an incubation period of two to four weeks, the fungus invades the vascular elements of infected leaves, causing symptom development.

[1] See pest datasheets for more specific pest information.

Trapping

In general, trapping is a type of survey that involves the use of a trap to catch arthropods of concern in a specific location. Often times, trap efficiency is increased through the use of some type of chemical or physical attractant. These attractants might be a light source, a food source, a pheromone, or host volatile that is attractive to the target species. In the context of the current survey, there are eight insect targets that have an approved trap and lure combination. See **Table 4: Grape Insect Trap and Lure Combinations** for information on which traps to use with each target species.

Trap Sites

When choosing a survey site, select a site that is large enough to hold all the traps that will be placed there. For moths, traps with different lure combinations are normally placed 20 meters (66 feet) apart.

Trap Placement

Many of the target species listed in this manual are polyphagous and could potentially be found in multiple types of environments. For the purpose of the grape manual, surveys should be targeted in areas with grape hosts. Surveys could occur in commercial grapevine crops (either in the field or in greenhouses when relevant) or in residential/urban areas where grapevines are grown or sold (community gardens/garden centers).

- Survey sites should have host species of the target species.
- When possible, place traps out of direct sunlight.
- Make sure traps are not obscured by vegetation. Clip or remove any such vegetation.
- Separate traps with different lure types by at least 20 meters (66 feet) for moths.

For specific information on where to place traps, see the specific pest datasheet as trap placement may vary between species.

Lure Handling

Care should be taken to avoid contaminating external surfaces of traps with the attractant (lure) or cross-contaminating traps with attractants (lures) of different species (Lance, 2006). For example:

- Use latex or latex-substitute gloves when handling lures;
- Minimize direct contact with lures;

- Do not touch external portions of traps with gloves that have contacted lures; and
- At a minimum re-glove after handling lures for one species before handling traps or lures for another.

Lure Storage

Inspect lures upon receiving them from the manufacturer. Notify the appropriate National Operations Manager of any lures that are damaged and request replacement lures. Store lures as directed by the manufacturer until used. It is generally acceptable to store lures for different species in the same freezer if they are doubly contained in factory-sealed packages that are, in turn, held separately by species in a secondary closed container such as a glass jar or re-sealable plastic bag (Lance, 2006).

Lure Changing

The length of effectiveness of lures is usually reported by lure manufacturers assuming temperatures of 30°C (86°F) during the day and 20°C (68°F) at night for a daily average of 25°C (77°F) under laboratory conditions. However, release rates of many lures are dependent on several factors including temperature, humidity, and other environmental conditions. Therefore, the length of effectiveness of lures may be reduced in hot and dry climates. In this manual, CAPS has listed a conservative length of effectiveness that should be effective for even the warmest climates in the United States (see **Table 6. Length of Effectiveness for Grape Commodity-based Survey Lures**). However, if you notice reduced non-target captures in your traps while the lure should still be effective, go ahead and change the lure and decrease the number of weeks between lure changes.

Table 6. Length of Effectiveness for Grape Commodity-based Survey Lures

Target Species	Lure Product Name	Length of Effectiveness
Autographa gamma	*Autographa gamma* Lure	28 days
Cryptoblabes gnidiella	*Cryptoblabes gnidiella* Lure	28 days
Epiphyas postvittana	*Epiphyas postvittana* Lure	42 days
Eupoecilia ambiguella	*Eupoecilia ambiguella* Lure	42 days
Lobesia botrana	*Lobesia botrana* Lure	28 days
Spodoptera littoralis	*Spodoptera littoralis* Lure	84 days
Spodoptera litura	*Spodoptera litura* Lure	84 days
Thaumatotibia leucotreta	*Thaumatotibia leucotreta* Lure	56 days

Checking Traps

- Check traps every two weeks or after bad weather events (rain, strong winds, or snow) which can disturb the sample.
- Examine traps for damage.
- Remove any debris blocking entrances, including leaves, twigs, spider webs, etc.
- Ensure that all lures are still in place.
- Remove any suspect specimens from the trap and submit the samples per the sample submission instructions.
- Change lures per the length of effectiveness for each species (see **Table 6. Length of Effectiveness for Grape Commodity-based Survey Lures**).

Trapping Season

The trapping period will be the period of expected flight activity of adult moths. Traps should be placed in the field as soon as adult flight activity is expected to begin and remain throughout the active period. Actual trapping seasons may vary by location and target species. Refer to individual pest datasheets to determine the trapping season for each target. Flight period descriptions in the datasheets are usually based on the flight season in the pest's native range. The country/region is listed in the datasheet. States should compare the hardiness zones of these regions to the hardiness zones of their state to determine the predicted flight period in their state. Degree Days may also be used, where listed.

V. Sample Processing, Sorting, and Submission

Consult the most recent version of "Procedures for Submitting Survey Samples to Domestic and Other Identifiers" for information on how to process and submit survey samples. Please follow the instructions in Appendix E-2 of the CAPS Guidelines found here.

For '*Candidatus* Phytoplasma australiense' and '*Candidatus* Phytoplasma vitis', follow the instructions in Phytoplasma sample submission for Cooperative Agricultural Pest Survey (CAPS) Program and Farm Bill Goal 1 surveys FY 2014 and 2015.

Screening Specimens

Screeners should have had some training in recognition of common native grape pests. Familiarity with the CAPS target species is also helpful. Work with your state or university taxonomists for individual training and consult the screening aids that are available for some groups at: http://caps.ceris.purdue.edu/screening_aids.

For states without screening ability, there are PPQ domestic identifiers and several other options. If your state would like to take advantage of the arrangements listed below to receive unscreened samples, please contact your PPQ Program Manager (Brian Kopper) for more information prior to the trapping/survey season.

Brian Kopper
National Field Operations Manager for Pest Detection
USDA-APHIS-PPQ
920 Main Campus Dr.
Raleigh, NC 27606
Ph. 919-855-7318
Brian.J.Kopper@aphis.usda.gov

Domestic Identifiers for arthropods:
Western United States
Kira Metz
412 Minnie Belle Heep
2475 TAMU
College Station, TX 77843
979-450-5492
Kira.Metz@aphis.usda.gov

Eastern United States:
Julieta Brambila
CAPS Office
USDA, APHIS, PPQ
1911 SW 34th Street
Gainesville, FL 32608
352-372-3505 ext. 438

Julieta.Brambila@aphis.usda.gov

The identifiers for *'Candidatus* Phytoplasma australiense' and '*Ca.* P. vitis' are:
Screening:
Curt Colburn
Clemson University
Molecular Plant Pathogen Detection (MPPD) laboratory
511 Westinghouse Rd.
Pendleton, SC 29670
864-646-2133
gcolbur@clemson.edu

Kevin Ong
Texas Plant Disease Diagnostic Lab
1500 Research Parkway, Suite A130
College Station, TX 77845
979-845-8032
kevo@tamu.edu

Craig Webb
Plant Pathologist - Domestic Identifier
USDA, APHIS, PPQ
Department of Plant Pathology
Kansas State University
4024 Throckmorton Plant Sciences
Manhattan, Kansas 66506-5502
785-532-134
Craig.A.Webb@aphis.usda.gov

Arthropods:
Prescreened suspect samples of CAPS arthropod target species must be sent to the state or university insect taxonomist in your state for identification. If there is no such position, and/or if arrangements are not made with the entities listed in the previous section, as a fall-back procedure, the specimens can be sent to the PPQ Area Identifier that covers the geographic area. Consult The Lists of PPQ Identifiers and PPQ National Specialists for contact information. Check their areas of coverage and notify the identifier prior to sending any specimens.

If a state or university taxonomist or PPQ area identifier believes the submitted specimen is a species new to the United States or state and/or a CAPS target species, it is necessary to send the preserved specimens to the USDA-ARS Systematic Entomology Laboratory (SEL) for final confirmation. If an Area Identifier or other taxonomist is uncertain as to the possibility that the specimen is a new or target species, consider sending the specimens first to one of the contacts listed above, as an intermediate step before forwarding to SEL.

When sending to SEL, be sure to include the PPQ form 391 (see Appendix B or use the fillable form available at: http://www.aphis.usda.gov/library/forms/pdf/PPQ_Form_391.pdf) marked "Prompt" with the sample going forward. Notify and send an electronic copy of the 391 to the PPQ National Identification Services (NIS) Urgent Team at ppq.nis.urgents@aphis.usda.gov, an e-mail group, with the sample number and date forwarded.

If you have any questions, contact the National Field Operations Manager for Pest Detection or the Domestic Diagnostic Coordinator (addresses below);

Brian Kopper
National Field Operations Manager for Pest Detection
USDA-APHIS-PPQ
920 Main Campus Dr.
Raleigh, NC 27606
Ph. 919-855-7318
Brian.J.Kopper@aphis.usda.gov

Joel Floyd
Domestic Diagnostics Coordinator
USDA, APHIS, PPQ National Identification Services
4700 River Rd., Unit 52, Rm. 4D-04B
Riverdale, MD 20737
301-851-2115
Joel.P.Floyd@aphis.usda.gov

PPQ identifiers processing domestic samples can notify submitters of non-target and native species identifications without entering the samples in the AQAS database; however, any suspects that are forwarded to SEL for final identification must be entered into AQAS prior to sending.

Send the specimen(s) to the following address:
Location Leader
Systematic Entomology Laboratory
Attn: Communication and Taxonomic
Services Unit
Building 005, Room 137, BARC-West
10300 Baltimore Avenue
Beltsville, MD 20705
Phone number for overnight carrier airway bill 301-504-7041

The specimens will be routed by the SEL location leader to the appropriate specialist for final confirmation. Communications of identification results will be through the PPQ NIS domestic diagnostics coordinator in Riverdale, Maryland.

Pathogens:
For '*Candidatus* Phytoplasma australiense' and *'Candidatus* Phytoplasma vitis', follow: Phytoplasma sample submission for Cooperative Agricultural Pest Survey (CAPS) Program and Farm Bill Goal 1 surveys FY 2014 and 2015.

Prescreened suspect samples of non-phytoplasma CAPS pathogen target species must be sent to the state or university taxonomist in your state for identification. If there is no such position, and/or if arrangements are not made with the entities listed in the previous section, as a fall-back procedure, the specimens can be sent to the PPQ Area Identifier that covers the geographic area. Consult The Lists of PPQ Identifiers and PPQ National Specialists for contact information. Check their areas of coverage and notify the identifier prior to sending any specimens.

If a state or university taxonomist or PPQ area identifier believes the submitted specimen is a species new to the United States or state and/or a CAPS target species, it is necessary to send the samples to the CPHST Beltsville Laboratory for final confirmation.

When sending to CPHST Beltsville, be sure to include the PPQ form 391 (see Appendix B or use the fillable form available at http://www.aphis.usda.gov/library/forms/pdf/PPQ_Form_391.pdf) marked "Prompt" with the sample going forward. Notify and send an electronic copy of the 391 to the PPQ National Identification Services (NIS) Urgent Team at ppq.nis.urgents@aphis.usda.gov, an e-mail group, with the sample number and date forwarded.
If you have any questions, contact the National Field Operations Manager for Pest Detection or the Domestic Diagnostic Coordinator (addresses below);

Brian Kopper
National Field Operations Manager for Pest Detection
USDA-APHIS-PPQ
920 Main Campus Dr.
Raleigh, NC 27606
Ph. 919-855-7318
Brian.J.Kopper@aphis.usda.gov

Joel Floyd
Domestic Diagnostics Coordinator
USDA, APHIS, PPQ National Identification Services
4700 River Rd., Unit 52, Rm. 4D-04B
Riverdale, MD 20737
301-851-2115
Joel.P.Floyd@aphis.usda.gov

PPQ identifiers processing domestic samples can notify submitters of non-target and native species identifications without entering the samples in the AQAS database;

however, any suspects that are forwarded to CPHST Beltsville for final ID must be entered in AQAS prior to sending.

Send the specimen(s)/samples to the following address:

Sample Diagnostics:
USDA-APHIS-PPQ-CPHST
BARC-East, Bldg. 580
Powder Mill Road
Beltsville, MD 20705-2350
301-504-7100
Group E-mail Address: APHIS-PPQCPHSTBeltsvilleSampleDiagnostics@aphis.usda.gov
Communications of identification results will be through the PPQ NIS domestic diagnostics coordinator in Riverdale, Maryland.

Communication of Results

Native or non-target species identifications will be communicated directly back to the state taxonomist, identifier, or originator of the sample. If the insect/pathogen is confirmed as a CAPS target species or new pest to the United States, the Domestic Diagnostics Coordinator will alert the National Survey Coordinator of the identification. The notification will then go to PPQ Policy Management and Field Operations program managers, and the SPHD and SPRO of the state of origin. One of these individuals will then forward the confirmation to the originator of the sample and other state CAPS personnel. Confirmations of CAPS targets or new species to the United States can then be entered in the NAPIS system.

General References

Lance, D. 2006. Guidelines for Detection Trapping of Exotic Lymantriid and Lasiocampid Moths. USDA-APHIS-PPQ.

NASS (National Agricultural Statistics Service). 2013. Noncitrus fruits and nuts: 2012 preliminary summary. Agricultural Statistics Board, USDA-NASS.

Reiger, M. 2006. Grapes – *Vitis* spp. (Introduction to Fruit Crops), University of Georgia. http://www.uga.edu/fruit/ Accessed on 2/26/2007.

USDA-ERS. 2014. USDA-Economic Research Service. Accessed May 1, 2014 from: http://www.ers.usda.gov/

Appendix A: Plastic Bucket Trap Protocol

Plastic Bucket Trap Protocol

The plastic bucket trap is a long-lasting insect trap used in conjunction with a lure to monitor or detect various species of moths. The plastic bucket trap is the preferred trap for some moth species as it is able to catch large numbers of moths without damaging some of their identifying characters. The trap has four parts: 1) lid, 2) lure basket with cap, 3) funnel, and 4) bucket. The trap is available in various color combinations. For PPQ programs, the trap consists of a green lid, yellow funnel, and white bucket. Fig. 1 is a photograph of a trap cut in half.

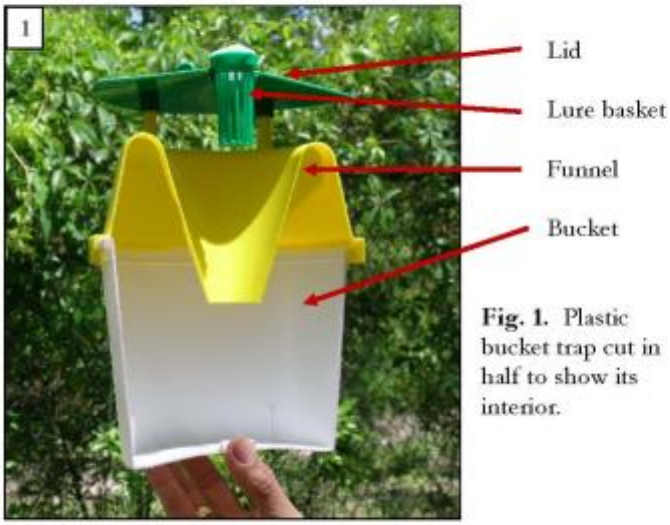


Fig. 1. Plastic bucket trap cut in half to show its interior.

1

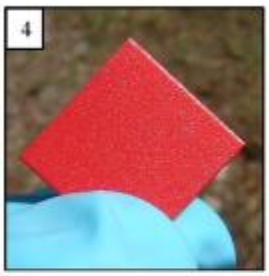
Follow the steps below to prepare the bucket traps for use in the field.

1. Pheromone

Unwrap a pheromone lure and place it inside the lure basket. Handle lures with gloves (see Fig. 4). Close the basket with a cap and insert the basket through the circular opening on the center of the lid (Fig. 2). If the cap no longer snaps snuggly into the trap lid opening, secure it with a piece of tape.

Fig. 2. Lure basket with cap inserted through center of lid.

The synthetic pheromone is embedded in a small rubberized square (as seen in the photos below) or septum (similar to a pencil eraser). If the lure is flat and small (Figs. 3 and 4) you may attach the lure to a small paper clip and fold the clip so that the lure does not fall out of the basket. If a lure basket is not available, attach the lure to a cork with a pin and place the cork in the lid's opening. Always carry extra corks.



Figs. 3 and 4. Lure made of a small rubberized square with embedded synthetic pheromone chemicals.

When not in use, the lures should be stored, unwrapped, in a freezer not used for food or drinks. MSDS documents for the pheromones to be used should be available and should be read.

2. Handle

Attach a wire handle to the lid through its two loops, as shown in the photos below (Figs. 5 and 6). A wire handle is usually included with each purchased trap. If a handle is not included, is lost, or is damaged and needs to be replaced, make one with a 12-inch long wire or with string, but the latter does not last as long as the wire.

Figs. 5 and 6. Wire handle attached to trap's lid.

3a. Sponge

Place a dry cellulose sponge in the bottom of the trap, as shown in Fig. 7. The sponge will absorb rainwater (except for extremely heavy amounts) that may enter the trap, keeping the moths somewhat dry.

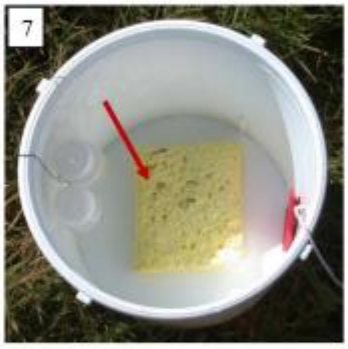


Fig. 7. Cellulose sponge inside the trap.

3

3b. Wire screen

Alternatively, the bottom part of the trap, the bucket, requires two modifications. Drill two to four drain holes in the bottom (see Fig. 8). If water remains in the trap, the killing agent (the pesticide) can spoil; in addition, the trapped insects may decay, making identification impossible.

Fig. 8. Bucket with four drilled holes.

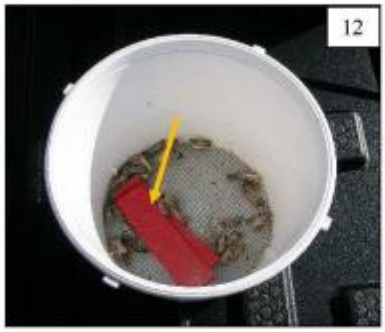
Then, add a wire screen slightly larger than the bucket bottom's inside diameter (Figs. 9 and 10). The screen keeps the pesticide strip(s) and the moths from getting too wet from rainwater accumulated in the trap. Prepare a cardboard template for long term use. Cut the wire mesh with metal-cutting scissors.

Figs. 9 and 10. Metal wire screen inside the bucket.

4

4. Insecticidal strips

Place two insecticidal strips (Figs. 11 and 12), which kill the moths that enter the bucket. The active ingredient in the strips is Dichlorvos, also known as DDVP and Vapona. The strips should be handled with gloves. Read and have available the MSDS documents for this product. Store unopened strips in a freezer not used for food or drink. Rain, wind, high heat or an abundance of captured moths may reduce its potency from 3 to 4 weeks to a week or less. If using only one kill strip, change it every 2 weeks.



Figs. 11 and 12. Pesticide strips.

5. Label the trap

Attach a rain-proof printed label (see Fig. 13) or handwrite a note with a water-proof black marker on the bucket trap. It should indicate that the trap belongs to a state or a PPQ program. Include a phone number in case someone has concerns or questions about the trap.

Fig. 13. Label on the trap's lid.

5

6. Placement of traps

The traps function best when placed in the open, away from foliage, as illustrated on Fig. 14. When hung under foliage, the 3-dimensional shape of the pheromone plume (chemical in the air) is disrupted and the effectiveness of the trap is much reduced. Hang the traps from such places as greenhouse roofs or in the open using metal rods (see Fig. 14) or other materials.

Figs. 14. Trap set away from foliage, in open field.

In the field, transfer the caught moths to labeled zip-loc bags and store them in a cooler (Figs. 15 and 16). Place them overnight in a freezer to kill any surviving specimens.

Figs. 15 and 16. Moths placed in a ziploc bag and stored in a cooler.

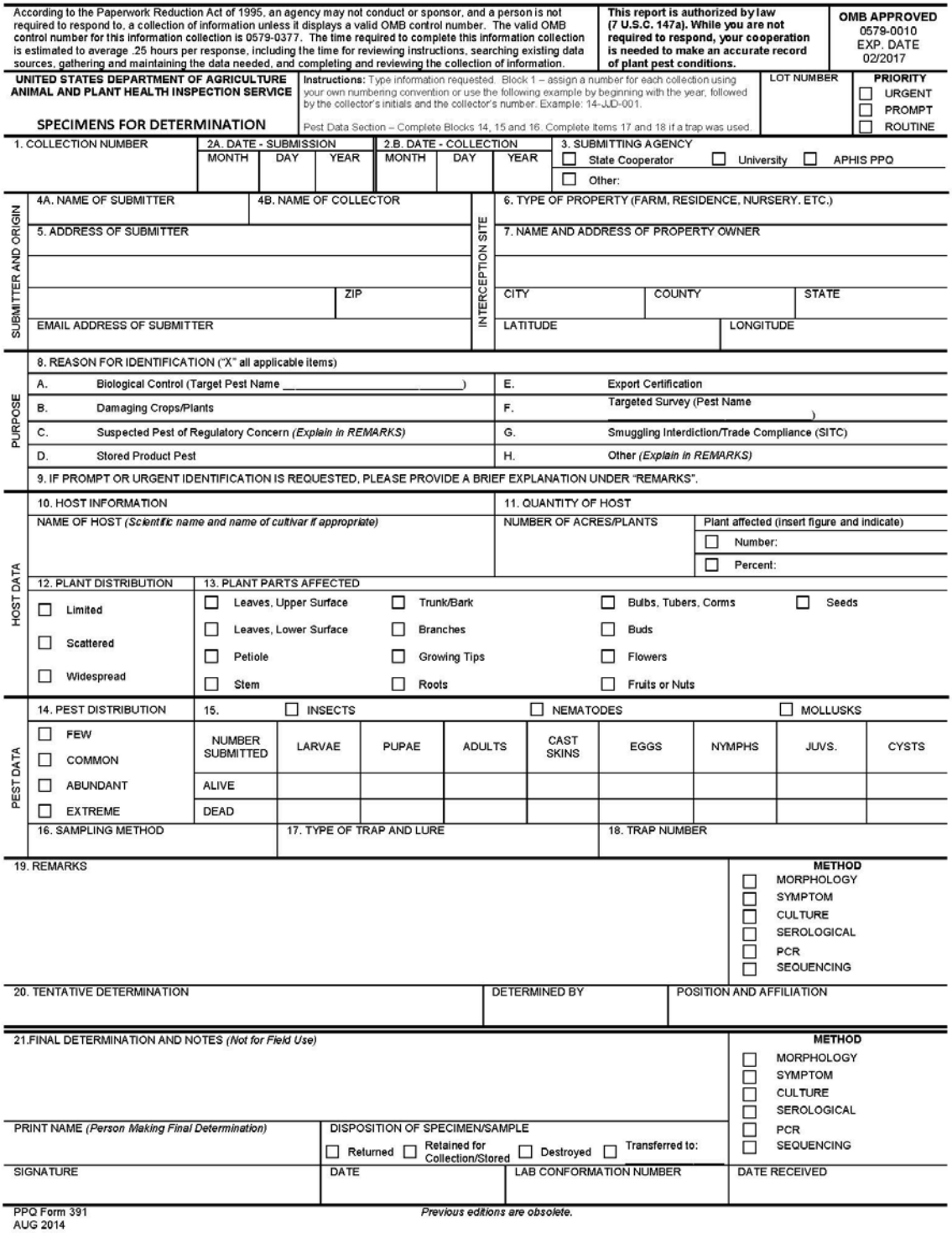
Prior to shipping, screen the samples. Remove any moth vastly different from the target and all other arthropods (beetles, flies, spiders). Write on PPQ Form 391 the approximate number of moths being submitted. Place an absorbent paper, such as a piece of a paper towel, inside each plastic bag to reduce moisture and to pad the specimens for their protection. The specimens should be well padded inside a box to prevent the specimens from being crushed or otherwise damaged. If longer-term storing is necessary, freezing works best, but refrigeration is acceptable as well.

The general recommendation for maintenance of the plastic bucket traps is to wash them occasionally with soap and water to keep them clean, and to store them indoors, or at least protected from sun, rain and dust. Keep the wire handle and the wire screen in good repair. The traps can be used multiple times and for multiple species since the chemicals degrade quickly in outdoor conditions. These traps usually last more than 5 years.

This protocol is designed to aid in the detection of exotic moths of concern by giving instructions on how to use generic plastic bucket traps. All photos were taken by J. Brambila and R. Meagher. These instructions are primarily based on work by R. Meagher.

This aid was prepared by Julieta Brambila (USDA/APHIS/PPQ Eastern Region), Lisa Jackson (USDA/APHIS/PPQ/CPHST), and Dr. Robert L. Meagher (USDA/ARS/CMAVE), on April 2010.

Appendix B: PPQ Form 391



According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not 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 0579-0377. 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.

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.

OMB APPROVED 0579-0010 EXP. DATE 02/2017

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE

SPECIMENS FOR DETERMINATION

Instructions: Type information requested. Block 1 – assign a number for each collection using your own numbering convention or use the following example by beginning with the year, followed by the collector's initials and the collector's number. Example: 14-JJD-001.

Pest Data Section – Complete Blocks 14, 15 and 16. Complete Items 17 and 18 if a trap was used.

LOT NUMBER

PRIORITY
☐ URGENT
☐ PROMPT
☐ ROUTINE

1. COLLECTION NUMBER

2A. DATE - SUBMISSION (MONTH / DAY / YEAR)

2.B. DATE - COLLECTION (MONTH / DAY / YEAR)

3. SUBMITTING AGENCY
☐ State Cooperator ☐ University ☐ APHIS PPQ
☐ Other:

SUBMITTER AND ORIGIN

4A. NAME OF SUBMITTER

4B. NAME OF COLLECTOR

5. ADDRESS OF SUBMITTER

ZIP

EMAIL ADDRESS OF SUBMITTER

INTERCEPTION SITE

6. TYPE OF PROPERTY (FARM, RESIDENCE, NURSERY, ETC.)

7. NAME AND ADDRESS OF PROPERTY OWNER

CITY | COUNTY | STATE

LATITUDE | LONGITUDE

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. Export Certification
F. Targeted Survey (Pest Name _____)
G. Smuggling Interdiction/Trade Compliance (SITC)
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 and name of cultivar if appropriate)*

11. QUANTITY OF HOST
NUMBER OF ACRES/PLANTS
Plant affected (insert figure and indicate)
☐ Number:
☐ Percent:

12. PLANT DISTRIBUTION
☐ Limited
☐ Scattered
☐ Widespread

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

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. REMARKS

METHOD
☐ MORPHOLOGY
☐ SYMPTOM
☐ CULTURE
☐ SEROLOGICAL
☐ PCR
☐ SEQUENCING

20. TENTATIVE DETERMINATION | DETERMINED BY | POSITION AND AFFILIATION

21.FINAL DETERMINATION AND NOTES *(Not for Field Use)*

METHOD
☐ MORPHOLOGY
☐ SYMPTOM
☐ CULTURE
☐ SEROLOGICAL
☐ PCR
☐ SEQUENCING

PRINT NAME *(Person Making Final Determination)*

DISPOSITION OF SPECIMEN/SAMPLE
☐ Returned ☐ Retained for Collection/Stored ☐ Destroyed ☐ Transferred to:

SIGNATURE | DATE | LAB CONFORMATION NUMBER | DATE RECEIVED

PPQ Form 391
AUG 2014

Previous editions are obsolete.

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 using your own numbering convention or use the following example by beginning with the year, followed by the collector's initials and the collector's number. **EXAMPLE** In 2014, Brian K. Long collected his first specimen of the year for determination. His first collection number is 14-BLK-001 2. Enter the collection number
2A-2B	Enter dates
3	Check block to indicate Agency submitting specimens for identification
4A	Enter name of submitter
4B	Enter name of collector
5	Enter address of submitter
6	Enter type of property specimen obtained from (farm, nursery, residence, etc.)
7	Enter name and address of property owner
8A-8H	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	Provide a brief explanation if Prompt or URGENT identification is requested
20	Enter a tentative determination and who made it
21	Leave blank

Distribution of PPQ Form 391

Distribute PPQ Form 391 as follows:

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

PPQ Form 391 Reverse