

INVASIVE INSECT FIELD GUIDE *for* UTAH

2014





Utah State University is committed to providing an environment free from harassment and other forms of illegal discrimination based on race, color, religion, sex, national origin, age (40 and older), disability, and veteran's status. USU's policy also prohibits discrimination on the basis of sexual orientation in employment and academic related practices and decisions. Utah State University employees and students cannot, because of race, color, religion, sex, national origin, age, disability, or veteran's status, refuse to hire; discharge; promote; demote; terminate; discriminate in compensation; or discriminate regarding terms, privileges, or conditions of employment, against any person otherwise qualified. Employees and students also cannot discriminate in the classroom, residence halls, or in on/off campus, USU-sponsored events and activities. This publication is issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Kenneth L. White, Vice President for Extension and Agriculture, Utah State University.

INVASIVE INSECT

FIELD GUIDE for UTAH

2014

by **Lori R. Spears**, Invasive Pest Survey Coordinator
and **Ricardo A. Ramirez**, Entomologist



ORDERING INFORMATION

A pdf version of this guide is available on the USU Extension Utah Pests website (<http://utahpests.usu.edu/caps/html/invaders/>). To order additional bound copies of this publication, contact Utah State University Extension Publications:

E-mail:

extension.publications@usu.edu

Website:

extension.cart.usu.edu

Phone:

(435) 797-2251
Monday - Friday
8 a.m. - 5 p.m. MST

TABLE OF CONTENTS

Introduction to Invasive Species 2

Using this Field Guide 4

Contact Information 5

Pests Present in Utah

Brown Marmorated Stink Bug	6
Spotted Wing Drosophila	8
Plum Curculio	10
Velvet Longhorned Beetle	12
Japanese Beetle.....	14

Pests Not Present in Utah

Gypsy Moth	16
Emerald Ash Borer	18
Asian Longhorned Beetle	20
Small Hive Beetle	22
Pine Shoot Beetle	24
Red Imported Fire Ant	26
European Corn Borer	28

Pests Not Present in the U.S.

Khapra Beetle	30
Brown Spruce Longhorned Beetle	32
Old World Bollworm	34

References & Other Resources 36

Photo Credits 37

ACKNOWLEDGMENTS

Compiled by:

Drew Flitton (USU Extension Intern)

Graphic design by:

Olivia Yeip (USU Extension Lead Designer)

Editing assistance by:

Diane Alston (USU Entomologist)

Marion Murray (USU IPM Project Leader)

Dawn Holzer (USDA Pest Survey Specialist)

Clint Burfitt (UDAF State Entomologist)

Donna Falkenborg (USU Extension Editor)

Julene Reese (USU Extension Writer)

Funding for this guide was provided by:

United States Department of Agriculture

Utah Department of Agriculture and Food

Utah State University Extension



What Are Invasive Species?

An invasive species is an organism that is not native to the local environment and is capable of harming the economy, environment, or human health. Not all non-native species are invasive. The term “invasive” is reserved for the most aggressive and destructive non-native species.

How do Invasive Species Spread?

RVs and other Transportation Networks: Vehicles, especially those that sit for long periods of time, can harbor pests that then hitch a ride to uninfested areas.

Passenger Baggage: Transporting animal or plant products back from domestic or international trips can move invasive pests to new locations.

Outdoor Gear: Invasive species can be moved to new areas on hiking boots, clothes, and camping equipment.

Wood Products: Movement of infested wood (firewood, shipping pallets, crates) has been implicated in the spread of several invasive pests, including the emerald ash borer (page 18).

Plants and Plant Parts: Movement of infested plant materials (e.g., fruit) to uninfested areas can spread invasive species much farther than they would travel normally on their own.

Wind and Storm Fronts: Weather systems can carry invasive pests along with them.

Natural Dispersal: Some invasive species, such as strong flying insects, can easily disperse to new areas on their own.

What Can You do to Prevent Invasive Species?

Learn to Identify: Use this guide and other resources to help identify troublesome insects.

Report Sightings: Report all suspected invasive species (see IF YOU FIND A NEW INVADER section on page 5).

Look for Signs: It only takes a few minutes to check plants, containers, and personal belongings for infestations and invasive hitchhikers!

Buy Local: Avoid transporting and shipping plant material or animals outside their area of origin. Buy local produce to avoid spreading invasive pests. Similarly, buy firewood where you plan to burn it.

Keep it Clean: Remove plants, soil, and animals from your personal belongings and pets when you travel.

Spread the Word: Tell your family and friends about invasive species and the economic and environmental dangers that are associated with them.

Learn to Manage: Learn what is being done to manage an invasive species if it is already present in your region.

Cooperate with Quarantines: Observe agricultural restrictions and assist local authorities in combating invasive pests.

What Is the State of Utah Doing to Prevent Invasive Species?

Utah State University (USU), Utah Department of Agriculture and Food (UDAF), and the United States Department of Agriculture (USDA) are working together to address the threats of invasive species, in part, through the Cooperative Agricultural Pest Survey (CAPS) program. The combined efforts of this collaboration include invasive species prevention, early detection, rapid response, control, research, and education. For more information about the Utah CAPS program visit <http://utahpests.usu.edu/caps>.

Using this Field Guide

This publication provides information on Utah's top priority invasive insects that have been reported in the state. In addition, information is provided on invasive insects that are considered to be a threat to Utah's agriculture and natural resources, but have only been reported elsewhere in the U.S. and abroad. Included is a brief description of each invasive insect, its host(s) and current distribution, symptoms to watch out for, and graphs of its expected activity throughout the season. Please note that native insects are often mistaken for invasive pests, and some of the symptoms described in this guide can be caused by native pests or by other factors such as weather, nutritional disorders, and over/under watering and fertilizing.

This guide does not provide information on management. For pest management decisions, consult a county Extension agent, a member of the Utah Plant Pest Diagnostic Lab at USU, or the state entomologist at UDAF (see contact information on the next page).

If You Find a New Invader

Please report all suspected invading pests. If you are able to collect the suspected invasive insect to assist us with early-detection and identification, **it is very important that you kill the insect to avoid its spread.** We recommend placing the insect into a spill-proof vial containing alcohol (rubbing or other) or white vinegar. Please include the date and location of collection (i.e., street address or GPS coordinates), the plant that was affected (if applicable), and your contact information in case we have follow-up questions. Secure the sample using packing material to avoid breakage/damage. Mail the sample to one of the following labs:

Utah Plant Pest Diagnostic Laboratory

Utah State University
Department of Biology
5305 Old Main Hill
Logan, UT 84322
(435) 797-2435

<http://utahpests.usu.edu/upddl/>



Utah Department of Agriculture and Food

Plant Industry and Conservation Division
350 N. Redwood Road
Salt Lake City, UT 84114
(801) 538-7184

<http://ag.utah.gov/plants-pests/insects.html>



Brown Marmorated Stink Bug

Halyomorpha halys

Hemiptera, Pentatomidae

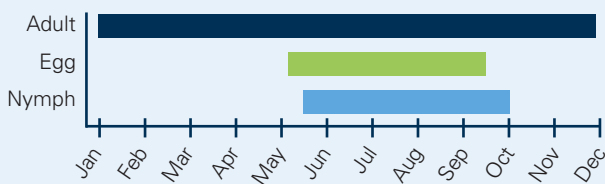
Hosts: Brown Marmorated Stink Bug (BMSB) has an expansive host range, including fruits, vegetables, landscape ornamentals, and some row crops, such as field corn and soybean.

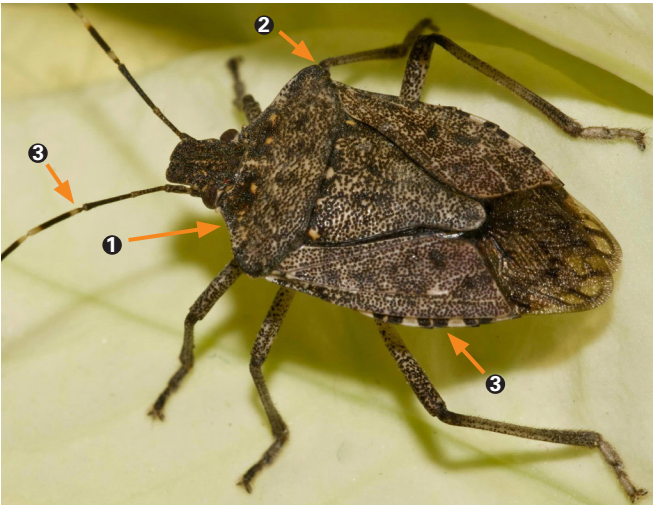
Symptoms: BMSB feeding causes dimpling and cat-facing on the exterior of plant tissue, and internal damage that appears cork-like. BMSB can also vector pathogens into host plants. BMSB is considered a nuisance pest because it overwinters in urban areas and releases a foul-smelling odor when disturbed or crushed.

Description: Adults are shield-shaped, mottled brown, and are approximately 5/8-inch long and 3/8-inch wide. Unlike other stink bugs, BMSB has a smooth edge along its pronotum ("shoulders"), rounded shoulder tips, and alternating dark and light bands on the antennae and along the abdominal edges. Adults deposit clusters of 20 - 30 eggs on the undersides of leaves. Eggs are pale green in color and 1/16-inch long. Newly hatched nymphs have yellow-red abdomens with black stripes and huddle around the egg mass. Older nymphs darken in color and disperse from the egg mass.

Distribution: BMSB is native to Asia and was first detected in the U.S. in Pennsylvania in the late 1990s. To date, BMSB has been detected in 41 states, including Utah where it has been found in Salt Lake and Utah Counties. No plant damage has been reported in Utah.

Seasonal Activity: BMSB overwinter as adults in urban areas, including on the walls of homes, garages, and other sheltered buildings.





Adult brown marmorated stink bug (BMSB) - arrows are pointing to 1) smooth shoulder, 2) rounded shoulder tip, and 3) alternating dark and light bands on antennae and abdomen



Eggs and newly hatched nymphs



Late instar nymph



BMSB feeding can cause depressions on the fruit surface



Interior corking injury is due to the necrosis of damaged tissue

Spotted Wing Drosophila

Drosophila suzukii

Diptera, Drosophilidae

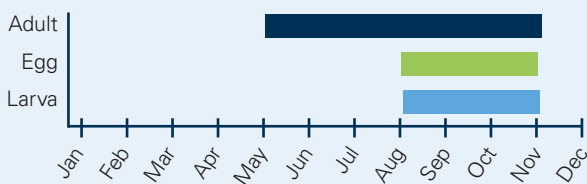
Hosts: Spotted Wing Drosophila (SWD) attacks ripening, ripe, and overripe fruit. Soft-skinned fruits (berries, cherries, peaches) and thin-skinned vegetables (tomatoes) have the greatest risk of SWD infestation. SWD also feeds on feral, ornamental, and wild fruits.

Symptoms: Physical damage to fruit includes egg-laying scars, secondary fungal infections around the site of egg-laying, and softened or collapsed fruit. Fruit may also be infested with eggs, larvae, and/or pupae.

Description: Adults are 1/16 - 1/8-inch long, and have red eyes and unbroken dark bands across the top of their abdomen. Males have a single spot on the leading edge of each wing. Females do not have markers on their wings, but can be identified by a large serrated ovipositor (the egg-laying structure). Eggs are white, oval-shaped, and 1/40-inch long with two small hair-like filaments at one end. Larvae are whitish maggots with no legs or head, 1/8-inch long when fully grown, are tapered at both ends, and have a pair of tan caudal spiracles. Pupae are brown, 1/8-inch long, and football-shaped with two small finger-like projections on one end.

Distribution: SWD is native to Asia and was first found in the continental U.S. in California in 2008. SWD has since spread to nearly every state and is causing severe damage to fruit crops in some states. In Utah, SWD has been found in Rich, Cache, Box Elder, Weber, Davis, and Utah Counties. No fruit damage has been observed.

Seasonal Activity: SWD overwinter as both adults and larvae in fruit or ground debris.





Adult male spotted wing drosophila (SWD)



Adult female - arrow is pointing to ovipositor



Larva - arrow is pointing to caudal spiracles



Raspberry that has collapsed due to SWD



Cherries infested with SWD larvae and pupae

Plum Curculio

Conatachelus nenuphar

Coleoptera, Curculionidae

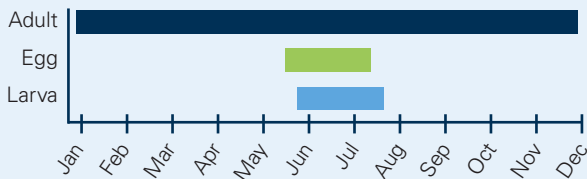
Hosts: Plum Curculio (PC) will attack most fruits, including feral, ornamental, and wild species. In Utah, the primary source of infestations are neglected or unmanaged residential fruit trees and abandoned orchards.

Symptoms: PC causes crescent-shaped egg-laying scars, circular feeding scars, and malformed/larvae-infested fruit that drop prematurely to the ground. PC feeding can provide entry for secondary pathogens, such as brown rot.

Description: Adults are nocturnal beetles that are 1/4-inch long, steel gray to dark brown in color with lighter white or gray mottling, and have clubbed antennae. The back is rough with two prominent and two not-so prominent humps. Their mouthparts are elongated into a short snout. Females chew a shallow, crescent-shaped cavity in fruit to lay their pearly-white, 3/16-inch long eggs. Larvae are 1/3-inch long when fully grown, gray-white in color with brown heads, legless, and C-shaped. Larvae will tunnel out of the fruit and fall to the ground to pupate. Pupae are white or cream-colored and 1/4-inch long.

Distribution: PC is native to the eastern U.S. The only known occurrence of PC in the western U.S. is in the fruit-growing areas of Box Elder County, Utah. PC was first found in Utah in the early 1980s.

Seasonal Activity: PC overwinter as adults under ground debris and in areas adjacent to orchards.

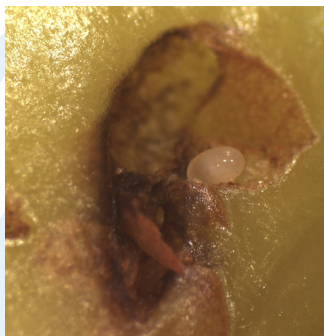




Adult plum curculio (PC)



PC adult and damage



Egg and egg-laying scar



PC larva



PC damage

Velvet Longhorned Beetle

Trichoferus campestris

Coleoptera, Cerambycidae

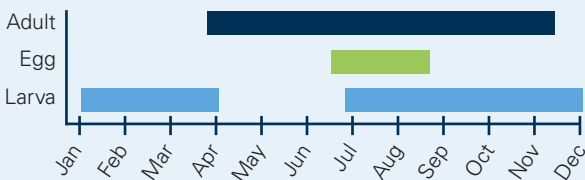
Hosts: Velvet Longhorned Beetle (VLB) attacks a wide range of forest and landscape trees, but may have a preference for fruit trees, especially apple, mulberry, and cherry. VLB attacks dead and dying wood. It is unknown whether VLB is able to damage healthy trees.

Symptoms: Signs of VLB damage include thinning or yellowing of the tree's canopy, sucker growth and/or frass (insect excrement) at the base of the tree, larval tunneling underneath the bark, and adult emergence holes on the trunk and main branches. VLB feeding is not believed to cause rapid tree death, but can have an impact on fruit yield, wood marketability, and tree longevity.

Description: Adults are 3/4-inch long, dark brown to orange-brown in color, and have legs and antennae that are lighter in color than the rest of the body. Their body is covered in fine hairs and their antennae are shorter in length than their body. Larvae are 1-inch long when fully grown, yellow-white in color, and have a brown head and short, poorly developed legs.

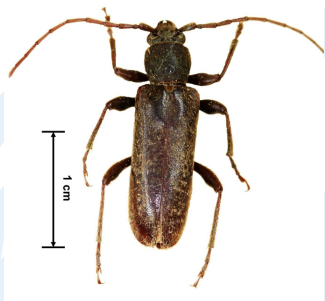
Distribution: VLB is native to Asia and parts of Eastern Europe. VLB was first discovered in North America in 2002 (Canada) and 2006 (U.S.). To date, VLB has been detected in the U.S. in Rhode Island, New Jersey, Ohio, Illinois, Colorado, and Utah. The first detection in Utah occurred in 2010 in Salt Lake. VLB has been found in both Salt Lake and Utah Counties.

Seasonal Activity: VLB overwinter as larvae underneath tree bark and may spend more than one year inside the tree.





Adult velvet longhorned beetle (VLB)



Adult VLB



VLB larva



Canopy dieback in a peach tree



Adult exit holes

Japanese Beetle

Popillia japonica

Coleoptera, Scarabaeidae

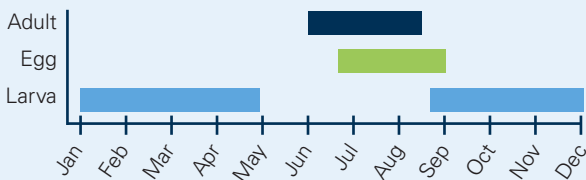
Hosts: Japanese Beetle (JB) adults have a broad host range of more than 300 plant species, including numerous trees, ornamentals, vines, flowers, fruits, vegetables, weeds, and field crops. JB larvae prefer to feed on turfgrass roots.

Symptoms: JB adults can skeletonize leaves or completely defoliate the host plant. Larval damage in turf begins as localized discolored patches that gradually enlarge. Damaged turf feels spongy under foot and can be easily pulled back from the soil's surface.

Description: Adults are 1/2-inch long, oval-shaped, and have metallic green bodies, copper-colored wings, and six white tufts of hair along each side of their body. Males are smaller than females. Larvae are creamy-white, C-shaped grubs that are 1-inch long when fully grown. Adults are found on plants, whereas larvae are in the soil.

Distribution: JB is native to Japan. The first detection of JB in the U.S. was in New Jersey in 1916. To date, JB is well-established east of the Mississippi River, and has been found in many western states. In Utah, JB has previously been found in Cache, Salt Lake, and Utah Counties, but recent monitoring traps have detected extremely low adult activity.

Seasonal Activity: JB overwinter as larvae under the soil surface.





Adult Japanese beetle (JB)



JB larva



JB adults tend to congregate in groups



Larval feeding causes patches of discolored turf. Other animals damage turf even further as they search for grubs.



JB adult feeding can appear as skeletonized leaves

Gypsy Moth

Lymantria dispar

Lepidoptera, Erebidiae

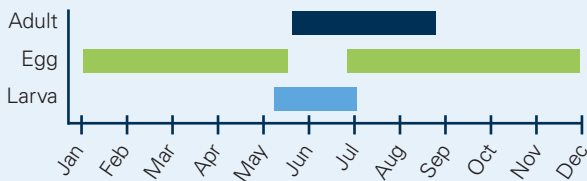
Hosts: Gypsy Moth (GM) larvae feed on the foliage of hundreds of tree species, including oak, willow, aspen, and several evergreen species.

Symptoms: GM feeding can lead to complete defoliation of trees and after several consecutive years, may cause tree mortality.

Description: Adult males are grayish-brown, and have feathery antennae and a wingspan less than 2-inches. Female moths are flightless, and are creamy-white with black marks, have thread-like antennae, and a wingspan up to 2 1/2-inches. GM females lay 500 - 1,000 eggs in masses that are 1 - 2-inches long, teardrop-shaped, and covered in yellow-brown fuzz. Egg masses are found on many surfaces, including outdoor furniture, vehicles, and beneath soffits on homes and garages. Larvae are hairy and range from black to brown. As they age, they develop five pairs of blue dots followed by six pairs of red dots. Larvae are 2 1/2-inches long when fully grown and can occur in large groups (100+).

Distribution: The European GM (*L. dispar*) and Asian GM (*L. dispar asiatica*) are two subspecies of concern to the U.S., although it is not easy to distinguish one from another. European GM was introduced to the U.S. in 1869 in an attempt to start a silkworm industry. It is well-established in the eastern U.S. and has been spotted in nearly every state. European GM has been found and eradicated twice in Utah. The first detection of GM in Utah was in 1988. The Asian GM has not been found in Utah.

Seasonal Activity: GM overwinters as a partially grown larva inside the egg.





Mature gypsy moth (GM) larva



Adult female (L), male (R), and egg mass



Egg masses on tree



GM larvae tend to occur in large groups



Larva on leaf with feeding damage

Emerald Ash Borer

Agilus planipennis

Coleoptera, Buprestidae

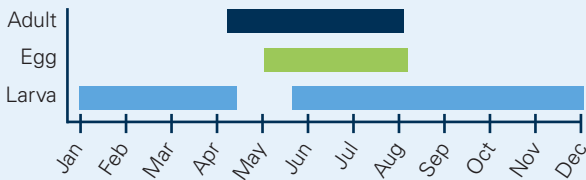
Hosts: Emerald Ash Borer (EAB) specializes on all species of ash (*Fraxinus* spp.).

Symptoms: Early EAB infestations are difficult to detect since adults first attack the tops of trees. EAB infestations lead to bark splits, thinning or dieback of the crown, increased woodpecker feeding, and suckers at the base of large, dead branches or the tree. EAB adults leave distinctive D-shaped exit holes (1/8-inch wide) when they emerge from trees in the spring. Adults feed on ash foliage but cause little damage. When EAB larvae chew through tree bark, they create serpentine-shaped, excrement-filled channels that disrupt nutrient and water flow and will eventually kill the tree. Larval galleries can be seen by peeling off the bark.

Description: Adults are metallic, green-colored beetles with a flattened body, have an iridescent purple abdomen hidden beneath their forewings, and are 1/2-inch long and 1/8-inch wide. Larvae are cream-colored, tapeworm-like, and have a flattened abdomen with 10 segments and a pair of pincer-like appendages on the last segment. Larvae can reach 1-inch in length.

Distribution: EAB is native to parts of Asia and small areas of Russia and Mongolia. EAB was first discovered in the U.S. in Michigan in 2002. EAB has since been found in more than 20 mid-western and eastern states, killing tens of millions of trees. EAB was found in Colorado in 2013, marking the farthest west EAB has yet been detected. Given this proximity, Utah must be vigilant in early-detection activities.

Seasonal Activity: EAB overwinter as larvae.





Adult emerald ash borer (EAB)



EAB adults are 1/2-inch long



EAB larvae are tapeworm-like in appearance



Feeding larvae create serpentine-shaped galleries underneath tree bark



EAB adults emerge from D-shaped exit holes

Asian Longhorned Beetle

Anoplophora glabripennis

Coleoptera, Cerambycidae

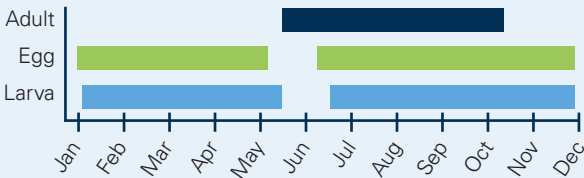
Hosts: Asian Longhorned Beetle (ALB) can attack dozens of hardwood tree species, including ash, birch, maple, elm, and willow.

Symptoms: Adults and larvae feed on living host trees. Adult females chew craters (oviposition pits) into tree bark and their mandibles leave marks that can be seen around the edges of the pit. ALB adult exit holes are perfectly round, dime-sized, and are sometimes associated with dripping sap. Infested trees commonly have dead branches, sawdust-like excrement at the base of the tree, and larval boring scars underneath the bark.

Description: Adults are large (3/4 – 1 1/2-inches long) conspicuous beetles that have long black and white banded antennae and a glossy-smooth black body with irregular white spots. Some adults have a bluish tinge to their feet and antennae. The white-spotted sawyer is a common longhorned beetle of conifers in Utah and is easily mistaken for ALB. Unlike ALB, it does not have a shiny body and has one white dot between the top of its wings. Females lay rice-like eggs that are 1/4-inch long and deposited individually in bark crevices or under the bark. Eggs are initially off-white, but turn yellowish-brown just before they hatch. ALB larvae are off-white, soft-bodied with a brown head, and can reach 2-inches long.

Distribution: ALB was first detected in the U.S. in New York in 1996. ALB is currently found in Massachusetts, New York, and Ohio, and has been successfully eradicated from Illinois and New Jersey.

Seasonal Activity: ALB overwinter as eggs or larvae underneath tree bark.





Adult Asian longhorned beetle (ALB)



ALB larva



Newly chewed oviposition (egg-laying) pit



Adult exit hole



ALB adult and cross-section of ALB damage

Small Hive Beetle

Aethinia tumida

Coleoptera, Nitidulidae

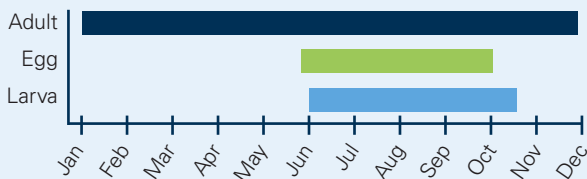
Hosts: Small Hive Beetle (SHB) is an insect pest of honey bee hives.

Symptoms: SHB is considered an opportunistic pest because it tends to attack already stressed or weakened honey bee colonies. They can also be found in stored bee equipment. Adults and larvae feed on honey and pollen, kill bee brood, and defecate in honey, causing discolored, fermented, and frothy honey. Fermented honey is reported to smell like rotting oranges. Severe hive beetle infestations will cause bees to abandon their colony. SHB may also vector honey bee viruses.

Description: Adults are small (1/4-inch long), flattened beetles that are oblong in shape, and range in color from tan to reddish-brown to black. Adults tend to hide on the bottom of honey bee hives or just under the lid and scatter quickly when the hive is opened. Eggs are pearly-white, typically laid in corners of hives, and look like a smaller version of honey bee eggs. Larvae are 3/8-inch long, cream-colored, and have small spines along their back and three pairs of well-developed legs near their head.

Distribution: SHB is native to Africa, but is not considered a serious hive pest in its native habitat. SHB was first found in the U.S. in Florida in 1998. They have since spread to more than 30 states and are especially common in the southeast.

Seasonal Activity: SHB overwinter as adults inside the hive.





Small hive beetle (SHB) adults on honey bee combs



SHB adult



SHB larvae on combs



SHB larva



SHB larvae can cause blackened, fermented honey

Pine Shoot Beetle

Tomiscus piniperda

Coleoptera, Curculionidae

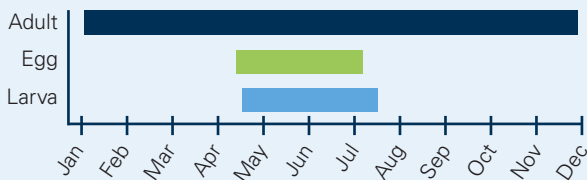
Hosts: Pine Shoot Beetle (PSB) typically infests pine trees and appears to prefer Austrian and Scotch pines. Adults will also breed in fir and spruce trees.

Symptoms: PSB adults are the most damaging life-stage. They feed on young shoots of healthy trees, causing stunted growth. Infested shoots have round entrance holes (1/10-inch wide) surrounded by pitch. Damaged shoots first turn yellow or red, and then eventually brown before drooping and falling from the tree. Larvae feed inside weakened trees or cut stumps, and keep their galleries clear of frass (excrement).

Description: Adults are brown to shiny black, have wing covers that vary in color from reddish-brown to black, and are 1/5-inch long and cylindrical in shape. They lay 1/25-inch long, oval, shiny-white eggs along galleries they have chewed inside weakened trees. Larvae are legless, have a white body with a brown head, and grow to 1/5-inch long.

Distribution: PSB is native to Eurasia and northern Africa and was first detected in the U.S. in Ohio in 1992. It is well-established in the upper midwestern and northeastern regions of the U.S.

Seasonal Activity: PSB overwinter as adults inside hollowed shoots or in protected areas on the bark.





Adult pine shoot beetle (PSB)



Larval galleries



Adult PSB exiting a pine shoot



Visible damage to pine shoots



Adult exit hole

Red Imported Fire Ant

Solenopsis invicta

Hymenoptera, Formicidae

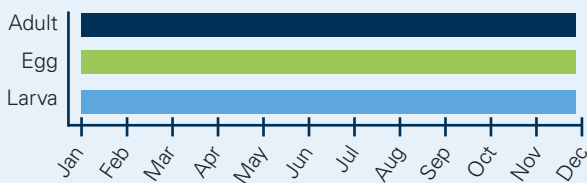
Hosts: Red Imported Fire Ant (RIFA) feeds on a variety of animals, including insects, small birds, and rodents, and plant structures, such as seeds, buds, and fruit of numerous agricultural crops. Mound-building behavior is widespread, although moist soils are preferred.

Symptoms: Mound-building activities can damage plant roots, interfere with cultivation in agricultural fields, and leave unstable soil in turf settings. RIFA is aggressive and can inflict a painful sting, resulting in swelling and blisters. Medical complications can arise in people sensitive to the venom, including severe allergic reactions and even death. RIFA can harm livestock and wildlife from stings and habitat loss.

Description: Adults are 1/16 - 1/4-inch long, and have a reddish-brown front end, a dark brown to black rear end, and two nodes that attach the abdomen to the thorax. They build large mound nests that are irregular in shape and between 2 - 4 square feet in size. RIFA has castes of small and mid-size workers, a queen, and winged ants.

Distribution: RIFAs were accidentally introduced to the U.S. in the 1930s from South America. Active infestations can be found in the south and some western states, including New Mexico, Arizona, California, and Oregon. RIFA has been successfully eradicated from Nevada. The non-native black IFA (*Solenopsis richteri*) also poses a danger to humans, pets, livestock, and wildlife.

Seasonal Activity: RIFA overwinters inside mounds. Worker ants forage when temperatures range from 72° to 96° F.





Adult red imported fire ant (RIFA)



Winged RIFA



Stings appear as raised welts with white pustules



RIFA mounds are usually in close proximity to human dwellings and structures



RIFA will feed on birds, rodents, and other insects, including larvae

European Corn Borer

Ostrinia nubilalis

Lepidoptera, Crambidae

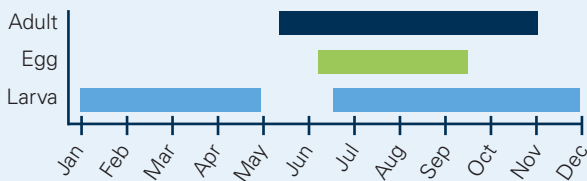
Hosts: European Corn Borer (ECB) is mostly a pest of corn, but can feed on and damage other plant species including vegetables, fruits, field crops, and weeds.

Symptoms: ECB larvae feed on all above ground tissues of host plants. They cause shot-hole damage on corn leaves, poor ear development, broken stalks, and dropped ears. Larval feeding inside the stalk interferes with the transport of water and nutrients, causing reduced plant strength and subsequent stalk breakage and ear drop. Chewing damage from larvae can also allow infection of plant pathogens.

Description: Adult female moths are 1/2-inch long, and pale yellow to brown with irregular dark bands on their wings. Male adults are darker in color and usually smaller in size. Eggs are 1/25-inch long, oval, flattened, and creamy-white in color initially, and orange-tan with age. Eggs are deposited in masses on the underside of corn leaves (often along the leaf midrib), leaf sheaths, or corn ears. Larvae can reach a length of 1-inch, are gray or pinkish-tan in color, and have rows of small brown spots running down the length of their bodies.

Distribution: ECB is thought to be native to Europe, where it is widespread. It was first detected in the U.S. in Massachusetts in 1917 and has since spread as far west as the Rocky Mountains.

Seasonal Activity: ECB overwinter as late-instar larvae located inside corn stalks, cobs, or plant debris.





European corn borer (ECB) larva



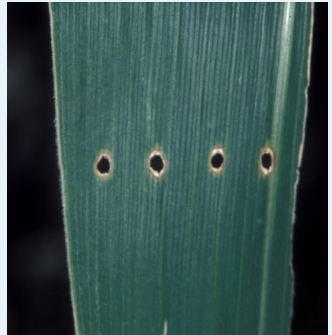
ECB adult male (L) and female (R)



Recently hatched ECB larvae



ECB larva and feeding damage to ear tip



ECB adult feeding appears as shot-hole damage in leaves

Khapra Beetle

Trogoderma granarium

Coleoptera, Dermestidae

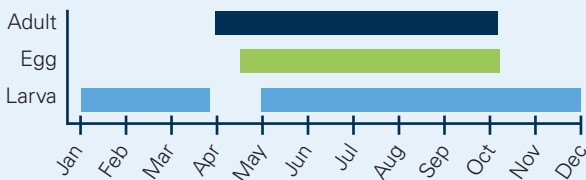
Hosts: Khapra Beetle (KB) is considered to be one of the world's most destructive pests of stored products and dried foods, particularly grain products. KB is also a pest of dried animal matter, including dog food.

Symptoms: Obvious signs of KB include larvae and cast skins. This pest feeds only a little on each grain, but a single beetle can still damage large amounts of product. KB infestations are difficult to control because adults can survive long periods of time with little food and water, hide easily in tiny cracks and crevices, and are relatively resistant to pesticides.

Description: Adults are oval in shape, brown, 1/10-inch long, covered in dense hairs, and have wings. Eggs are cylindrical, 1/35-inch long, and milky-white in color and pale yellow before larvae emerge. One end of the egg is rounded, while the other end is pointed and bears spine-like projections. Larvae are yellowish-white, but turn golden or reddish-brown as they mature. Larvae reach 1/4-inch long, and have brown heads and small, stiff body hairs that point upwards. Note that there are several native dermestids that can be mistaken as KB.

Distribution: KB is thought to be native to India, and is common in areas of the Middle East, Africa, and South Asia. KB was detected in the U.S. in California in 1953. It was later found in New Jersey, Maryland, Michigan, New York, Pennsylvania, and Texas, but is currently considered to be completely eradicated from the U.S. KB is, however, regularly intercepted at U.S. ports of entry.

Seasonal Activity: KB overwinter as larvae.

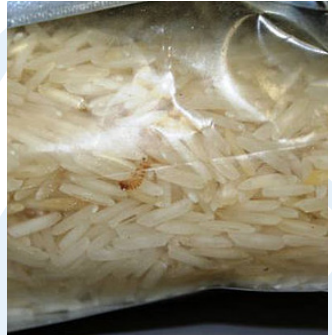




Adult khapra beetle (KB)



Adult KB



KB larvae are the size of a piece of rice



KB larva



KB damage to wheat grains

Brown Spruce Longhorned Beetle

Tetropium fuscum

Coleoptera, Cerambycidae

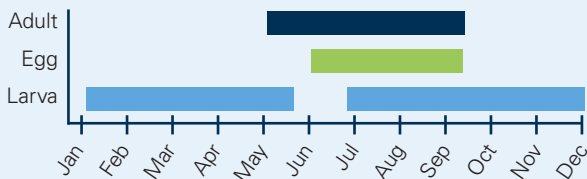
Hosts: Brown Spruce Longhorned Beetle (BSLB), in its native habitat, feeds on dead, felled, or stressed spruce trees, but will also attack pines, firs, and some hardwood species. In Canada, it has also been found on healthy, non-stressed trees.

Symptoms: Larvae feed in frass-filled, L-shaped galleries underneath the bark and in the wood. Other physical signs of infestation are excessive resin production on the bark, yellowing of the foliage and eventual needle loss, and 1/4-inch oval or round adult exit holes.

Description: Adults are 1/2-inch long with a flattened body, black-brown head, and reddish-brown wing covers with 2 - 3 longitudinal stripes. The antennae are also reddish-brown and are half the body length. Eggs are 1/25-inch long, oblong, and are white with a hint of green. Larvae are yellowish-white, have a flattened body, and reach a length of just over 1-inch.

Distribution: BSLB is native to Europe and Asia and was found in Nova Scotia, Canada in the 1990s. This pest is not known to occur in the U.S., but it may move to new areas via infested wood material such as firewood. BSLB is considered to be a major threat to U.S. forests.

Seasonal Activity: BSLB overwinter as larvae within the tree.





Adult brown spruce longhorned beetle (BSLB)



Adult BSLB



BSLB egg



BSLB egg casing (L) and larva (R)



BSLB larval galleries

Old World Bollworm

Helicoverpa armigera

Lepidoptera, Noctuidae

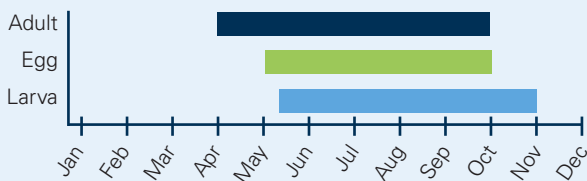
Hosts: Old World Bollworm (OWB) larvae feed on more than 120 cultivated and wild plant species, including corn, tomato, soybean, squash, bean, pepper, cotton, potato, alfalfa, maize, small grains, fruit, and some forest trees. OWB is considered the world's single worst insect pest of agriculture because of its polyphagous feeding behavior, its ability to tolerate a wide range of environmental conditions, and its high resistance to insecticides.

Symptoms: OWB larvae cause chewing damage to leaves, growing tips, buds, flowers, seeds, and fruits. Larvae can also burrow into fruits and vegetables, causing extensive internal damage.

Description: Adults are stout-bodied moths that range in size from 1/2 - 3/4-inch in length. Female adults vary from yellow to orange in color, whereas males are greenish-gray and have a dark band on the edges of their wings. Eggs are spherical, 1/50-inch in diameter, and white in color and turn green before hatching. Eggs are laid singly or in small clusters and are typically found on the top third of the host plant. Larvae vary in color from green to yellow to reddish-brown. They have a cream stripe that runs along each side and a single dark stripe running along the middle of the back.

Distribution: OWB is thought to be native to areas of Europe, Asia, Africa, and Australia. OWB has been found in Brazil, and is regularly intercepted at U.S. ports of entry. OWB is related to the corn earworm (*Helicoverpa zea*), an important pest of corn that is common in the U.S.

Seasonal Activity: OWB overwinter as pupae.





Old world bollworm (OWB) larva feeding on a ripe tomato



OWB adult female



OWB adult male



OWB larva and damage on cotton



OWB larva feeding on corn

REFERENCES & OTHER RESOURCES

The information in this guide was obtained from a number of sources, including:

CAPS Resource and Collaboration Site

<http://caps.ceris.purdue.edu>

USDA-APHIS-PPQ

www.aphis.usda.gov

www.hungrypests.com

Center for Invasive Species and Ecosystem Health

www.invasive.org

www.bugwood.org

USDA's Asian Longhorned Beetle Site

www.beetlebusters.info

National Invasive Species Information Center

www.invasivespeciesinfo.gov

National Invasive Species Council

www.invasivespecies.gov

Nature Conservancy's - Don't Move Firewood Campaign

www.dontmovefirewood.org

Stop the Beetle

www.stopthebeetle.info

Emerald Ash Borer

www.emeraldashborer.info

Note: For more information about the Utah CAPS program, visit <http://utahpests.usu.edu/caps/>.

PHOTO CREDITS

Front Cover

(from top then left to right)

- Photo 1: *Brown marmorated stink bug* - Stephen Ausmus, USDA, via Wikimedia Commons⁴
- Photo 2: *Cherries infested with spotted wing drosophila larvae and pupae* - Peter Shearer, Oregon State Univ.⁵
- Photo 3: *Asian longhorned beetle and oviposition pit* - R. Anson Eaglin, USDA-APHIS, via Wikimedia Commons⁴
- Photo 4: *Apple infested by Brown Marmorated Stink Bug* - Christopher Bergh, Virginia Tech⁵
- Photo 5: *Emerald ash borer larval galleries* - Pennsylvania Department of Conservation and Natural Resources - Forestry Archive, Bugwood.org¹
- Photo 6: *Japanese beetle larva* - David Cappaert, Michigan State Univ., Bugwood.org³
- Photo 7: *Japanese beetle adult feeding on rose (in background)* - Whitney Cranshaw, Colorado State Univ., Bugwood.org¹

Inside Cover

- Photo 1: *Japanese beetle adult* - Jon Yuschock, Bugwood.org²

Back Cover

- Photo 1: Lori Spears, Utah State Univ. Extension

Present in Utah

Page 7: **Brown Marmorated Stink Bug**

- Photo 1: Susan Ellis, Bugwood.org¹
- Photo 2: David R. Lance, USDA APHIS PPQ, Bugwood.org¹
- Photo 3: Gary Bernon, USDA APHIS, Bugwood.org¹
- Photo 4,5: Christopher Bergh, Virginia Tech⁵

Page 9: **Spotted Wing Drosophila**

- Photo 1: Ryan Davis, Utah State Univ. Extension⁵
- Photo 2,3: Elizabeth Beers, Washington State Univ.⁵
- Photo 4: Vaughn Walton, Oregon State Univ.⁵
- Photo 5: Peter Shearer, Oregon State Univ.⁵

Page 11: **Plum Curculio**

- Photo 1: Jerry A. Payne, USDA Agricultural Research Service, Bugwood.org¹
- Photo 2,4: Clemson Univ. - USDA Cooperative Extension Slide Series, Bugwood.org¹
- Photo 3,5: Diane Alston, Utah State Univ. Extension⁵

Page 13: **Velvet Longhorned Beetle**

- Photo 1,3,4,5: Clint Burfitt, Utah Dept. of Agriculture and Food⁵
- Photo 2: Christopher Pierce, USDA APHIS PPQ, Bugwood.org¹

Page 15: **Japanese Beetle**

- Photo 1: Russ Ottens, Univ. of Georgia, Bugwood.org¹
- Photo 2: David Cappaert, Michigan State Univ., Bugwood.org³
- Photo 3,4: M.G. Klein, USDA Agricultural Research Service, Bugwood.org²
- Photo 5: Steven Katovich, USDA Forest Service, Bugwood.org¹

Not Present in Utah

Page 17: **Gypsy Moth**

- Photo 1: John H. Ghent, USDA Forest Service, Bugwood.org¹
- Photo 2,4: Daniel Herms, Ohio State Univ., Bugwood.org¹
- Photo 3: Daniela Lupastean, Univ. of Suceava, Bugwood.org³
- Photo 5: USDA APHIS PPQ Archive, USDA APHIS PPQ, Bugwood.org³

Page 19: **Emerald Ash Borer**

- Photo 1: David Cappaert, Michigan State Univ., Bugwood.org³
- Photo 2,3: Eric R. Day, Virginia Polytechnic Institute and State Univ., Bugwood.org¹
- Photo 4: Christopher Asaro, Virginia Department of Forestry, Bugwood.org³
- Photo 5: Debbie Miller, USDA Forest Service, Bugwood.org³

Page 21: **Asian Longhorned Beetle**

- Photo 1: Pennsylvania Department of Conservation and Natural Resources - Forestry Archive, Bugwood.org¹
- Photo 2: Thomas B. Denholm, New Jersey Department of Agriculture, Bugwood.org¹
- Photo 3: Donald Owen, California Department of Forestry and Fire Protection, Bugwood.org³
- Photo 4: Joe Boggs, Bugwood.org³
- Photo 5: E. Richard Hoebeke, Cornell Univ., Bugwood.org³

Page 23: **Small Hive Beetle**

- Photo 1: Jessica Louque, Smithers Viscient, Bugwood.org¹
- Photo 2,3: James D. Ellis, Univ. of Florida, Bugwood.org¹
- Photo 4: Pest and Diseases Image Library, Bugwood.org³
- Photo 5: Jeffrey W. Lotz, Florida Department of Agriculture and Consumer Services, Bugwood.org¹

Page 25: **Pine Shoot Beetle**

- Photo 1,2,5: Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org¹
- Photo 3: Steve Passoa, USDA APHIS PPQ, Bugwood.org³
- Photo 4: E. Richard Hoebeke, Cornell Univ., Bugwood.org³

Page 27: **Red Imported Fire Ant**

- Photo 1: April Noble, Antweb.org, Bugwood.org³
- Photo 2: Johnny N. Dell, Bugwood.org³
- Photo 3: USDA APHIS PPQ Archive, USDA APHIS PPQ, Bugwood.org¹
- Photo 4: Jake Farnum, Bugwood.org³
- Photo 5: Herbert A. 'Joe' Pase III, Bugwood.org³

Page 29: **European Corn Borer**

- Photo 1: Keith Weller, USDA Agricultural Research Service, Bugwood.org¹
- Photo 2: Adam Sisson, Iowa State Univ., Bugwood.org¹
- Photo 3: Phil Sloderbeck, Kansas State Univ., Bugwood.org³
- Photo 4: Jan Samanek, State Phytosanitary Administration, Bugwood.org¹
- Photo 5: Frank Peairs, Colorado State Univ., Bugwood.org¹

Not Present in the U.S.

Page 31: Khapra Beetle

- Photo 1,2: Pest and Diseases Image Library, Bugwood.org³
- Photo 3,4: U.S. Customs and Border Protection
- Photo 5: Ministry of Agriculture and Regional Development Archive, Ministry of Agriculture and Regional Development, Bugwood.org²

Page 33: Brown Spruce Longhorned Beetle

- Photo 1,4,5: Georgette Smith, Canadian Forest Service, Bugwood.org²
- Photo 2: Jon Sweeney, Natural Res. Canada, Bugwood.org³
- Photo 3: Jessica Price, Natural Res. Canada, Bugwood.org³

Page 35: Old World Bollworm

- Photo 1: Central Science Laboratory, Harpenden Archive, British Crown, Bugwood.org²
- Photo 2: Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org¹
- Photo 3: Merle Shepard, Gerald R. Carner, and P.A.C Ooi, Insects and their Natural Enemies Associated with Vegetables and Soybean in Southeast Asia, Bugwood.org¹
- Photo 4: O.P. Sharma, Bugwood.org³
- Photo 5: Antoine Guyonnet, Lépidoptères Poitou-Charentes, Bugwood.org³

Photo Licenses & Permissions

1. This work is licensed under a Creative Commons Attribution 3.0 License.
2. This work is licensed under a Creative Commons Attribution-Noncommercial 3.0 License.
3. This work is licensed under a Creative Commons Attribution-Noncommercial 3.0 United States License.
4. This file is licensed under a Creative Commons Attribution 2.0 Generic License.
5. Permission to use image was kindly given by the photographer.



EXTENSION 
UtahStateUniversity

