Utah's Insect Pests of Concern: Fruit, Tree Borers, and Nuisance

Western Horticultural Inspection Society, October 1, 2015

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EXTENSION
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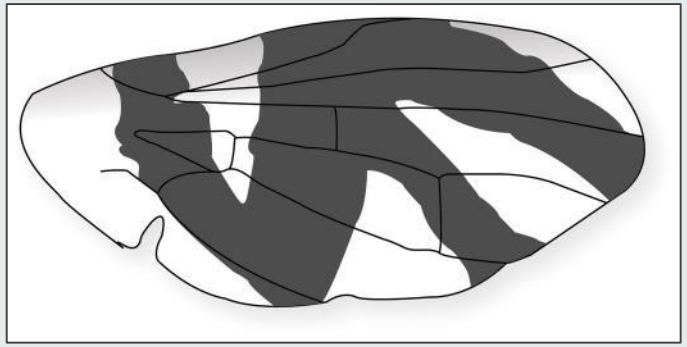
UTAH PESTS

Some of the Tenacious Fruit and Nut Insect Pests

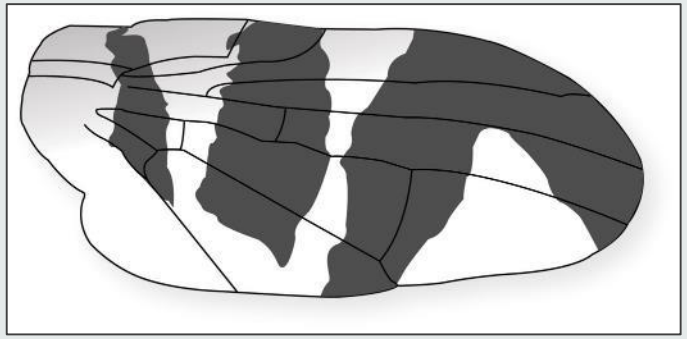
Tephritid Fruit Flies

- 'True' fruit flies (~1/4 inch long)
  - 3 primary pest species in Utah
- Females have a sharp ovipositor to lay eggs under the skin of fruits & husks
  - Susceptible when "soft enough", e.g., blushed cherry
- Characteristic banding pattern on wings
  - Differentiate species
- Maggots tunnel in fruit
  - Legless, cylindrical body (~1/4 inch long when full grown)
  - Tapered head, 2 dark mouth hooks

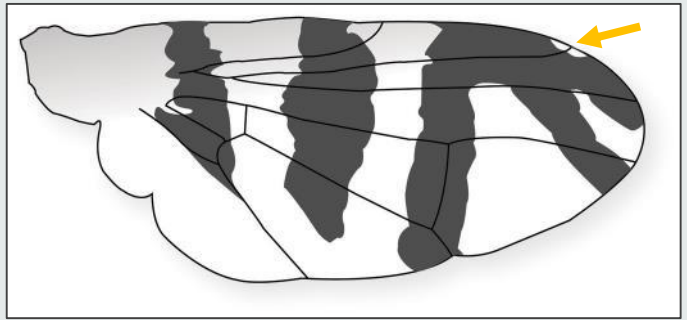
Apple Maggot: "F"
Quarantine Pest



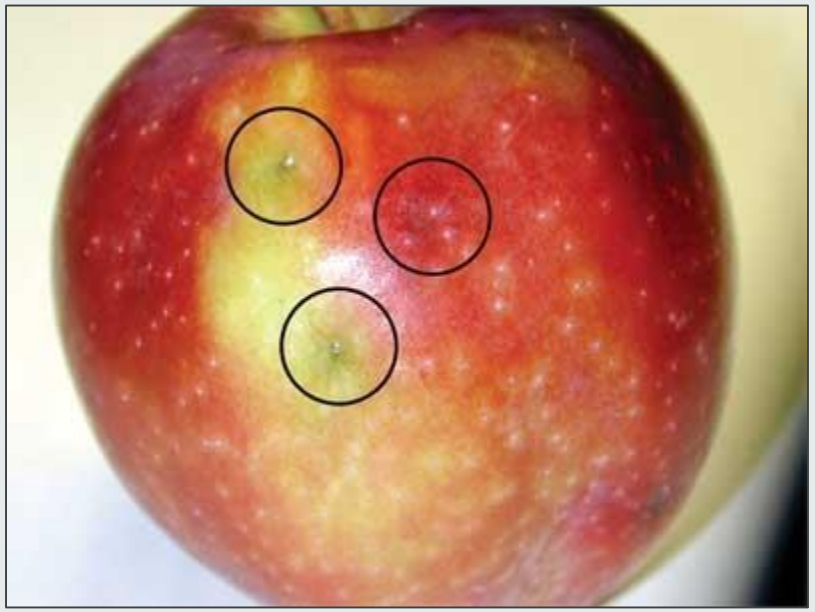
Walnut Huskfly:
"Inverted V"



Cherry Fruit Fly:
"Funky F &
Small Window"



Apple Maggot Native to Eastern North America:
Primarily a Pest of Apple



Egg-laying punctures in apple

Larval tunnels in apple flesh

Apple Maggot History in Utah

- Not currently a pest of commercial orchards
- Regulated as quarantine insect
  - If established in commercial orchards, inflict substantial economic harm through loss of export markets
- First detected in western U.S. in Oregon in 1979; has spread in the PNW
- In Utah, first detected in cherry orchards in Mapleton (Utah Co.) in 1983
- An extensive statewide survey in 1985 found it widely distributed in northern and west central UT
  - River hawthorn (*Crataegus rivularis* Nutt.)
  - Unmanaged cherries
- May be native to Utah (widely established)

Apple Maggot in Utah - 2013

- **Home yard plum fruits**
- **River hawthorn nearby**
- **No insecticide applications**

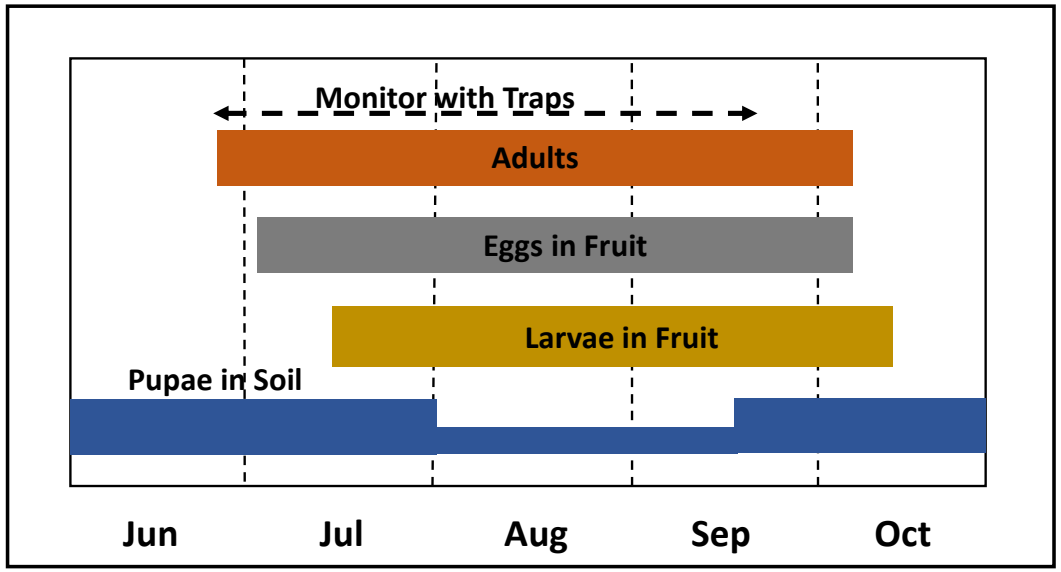
AM larva inside plum fruit

Apple maggot adult fly on domestic plum fruit, Salt Lake City, 2013

"F"-shaped wing pattern

Breakdown of plum flesh from AM feeding

Apple Maggot Life History



Broad host range: hawthorn, apple, crabapple, pear, plum, cherry, apricot, wild rose, mountain ash, cotoneaster, firethorn (*Pyracantha*)

Native hawthorn shrub: River hawthorn

Monitoring and Management

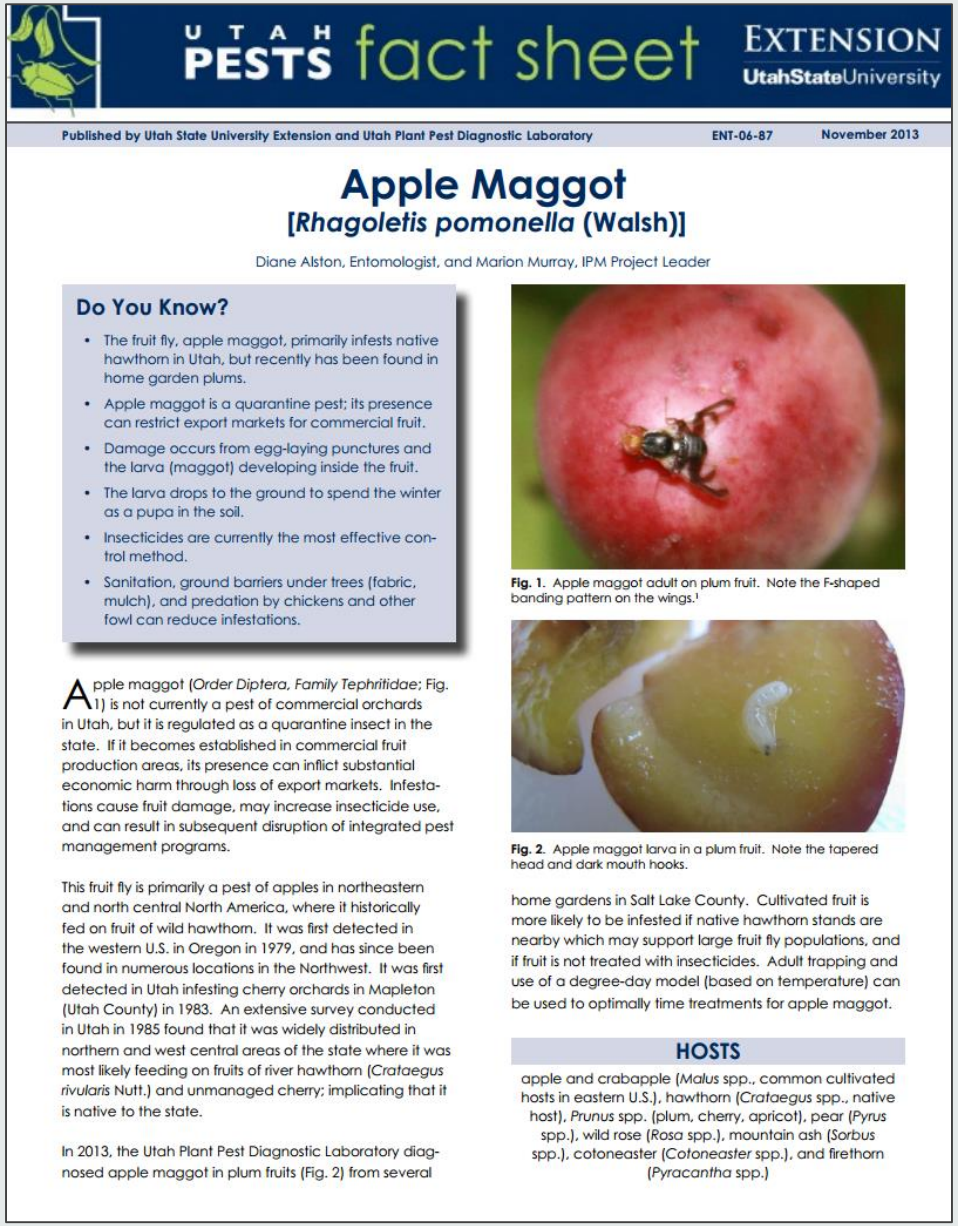
- Yellow sticky trap or red sphere
  - WITH AMMONIUM CARBONATE BAIT
- Degree-day model
  - Pest advisory, TRAPs website
  - First flies expected to emerge (1456 $DD_{44.1°F}$)
- IPM
  - Mass-trapping
  - Sanitation (fruit clean-up)
  - Ground barriers (mulch, temporary tarp)
  - Biological control (chickens, parasitoids in hawthorn)
  - Insecticides (see fact sheet)

Fig. 10. Apple maggot traps: Pherocon AM with ammonium carbonate lure (left); Ladd trap with lure (center); red sphere with fruit essence lure (right).[4]

Fact Sheet

www.utahpests.usu.edu

- Educate home gardeners
  - Master Gardener Program
  - IPM Tree Fruit Advisory
  - Online resources
  - County Extension Offices
- Prevent establishment of AM in commercial orchards
  - Sanitation
    - Remove fruit post-harvest
    - Remove nearby hawthorn stands
    - Remove abandoned orchards



UTAH PESTS fact sheet EXTENSION UtahStateUniversity

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Apple Maggot
[*Rhagoletis pomonella* (Walsh)]

Diane Alston, Entomologist, and Marion Murray, IPM Project Leader

Do You Know?

- The fruit fly, apple maggot, primarily infests native hawthorn in Utah, but recently has been found in home garden plums.
- Apple maggot is a quarantine pest; its presence can restrict export markets for commercial fruit.
- Damage occurs from egg-laying punctures and the larva (maggot) developing inside the fruit.
- The larva drops to the ground to spend the winter as a pupa in the soil.
- Insecticides are currently the most effective control method.
- Sanitation, ground barriers under trees (fabric, mulch), and predation by chickens and other fowl can reduce infestations.

Apple maggot (*Order Diptera, Family Tephritidae*; Fig. 1) is not currently a pest of commercial orchards in Utah, but it is regulated as a quarantine insect in the state. If it becomes established in commercial fruit production areas, its presence can inflict substantial economic harm through loss of export markets. Infestations cause fruit damage, may increase insecticide use, and can result in subsequent disruption of integrated pest management programs.

This fruit fly is primarily a pest of apples in northeastern and north central North America, where it historically fed on fruit of wild hawthorn. It was first detected in the western U.S. in Oregon in 1979, and has since been found in numerous locations in the Northwest. It was first detected in Utah infesting cherry orchards in Mapleton (Utah County) in 1983. An extensive survey conducted in Utah in 1985 found that it was widely distributed in northern and west central areas of the state where it was most likely feeding on fruits of river hawthorn (*Crataegus rivularis* Nutt.) and unmanaged cherry; implicating that it is native to the state.

In 2013, the Utah Plant Pest Diagnostic Laboratory diagnosed apple maggot in plum fruits (Fig. 2) from several

Fig. 1. Apple maggot adult on plum fruit. Note the F-shaped banding pattern on the wings.[1]

Fig. 2. Apple maggot larva in a plum fruit. Note the tapered head and dark mouth hooks.

home gardens in Salt Lake County. Cultivated fruit is more likely to be infested if native hawthorn stands are nearby which may support large fruit fly populations, and if fruit is not treated with insecticides. Adult trapping and use of a degree-day model (based on temperature) can be used to optimally time treatments for apple maggot.

HOSTS

apple and crabapple (*Malus* spp., common cultivated hosts in eastern U.S.), hawthorn (*Crataegus* spp., native host), *Prunus* spp. (plum, cherry, apricot), pear (*Pyrus* spp.), wild rose (*Rosa* spp.), mountain ash (*Sorbus* spp.), cotoneaster (*Cotoneaster* spp.), and firethorn (*Pyracantha* spp.)

Tree Fruit Insects

Walnut Husk Fly

- Active in late July to October
- Hosts: Black/Japanese/English walnut & peach/nectarine/apricot

Maggots tunnel in husk

Nutshell staining
Difficult to remove husks
Shriveled kernels

<u>Tunnel in peach flesh</u>
Late-maturing peaches at greatest risk

New Fact Sheet: Walnut Husk Fly

UTAH PESTS fact sheet EXTENSION UtahStateUniversity

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Walnut Husk Fly
[*Rhagoletis completa* (Cresson)]

Diane Alston, Entomologist - Marion Murray, IPM Project Leader - James Barnhill, Weber County Agriculture Agent

Do You Know?

- Walnut husk fly infests black and English walnuts, and late-maturing apricot and peach fruits when infested walnuts are nearby.
- Damage is caused by egg-laying punctures and larvae developing inside husks and fruits.
- Infested walnut husks can be difficult to remove; early-season infestations cause shriveled kernels.
- Non-chemical options include sanitation, ground barriers, tolerant cultivars, and predation by chickens and other fowl.
- Reduced-risk insecticides and attractant baits can provide effective control.

Walnut husk fly (Order Diptera, Family Tephritidae; Fig. 1) is the most common insect pest of walnuts in Utah. Husk fly larvae (maggots) tunnel in walnut husks, causing them to soften and decay, and stain the shell (Fig. 2). Damaged husks are difficult to remove. If husk fly infestation occurs early in kernel development, nuts may shrivel, darken, become moldy, and drop from the tree (Fig. 3). For commercial producers, discolored shells result in reduced quality for in-shell sales, and nut loss lowers profits. For home gardeners, difficult removal of softened husks is the primary problem. The husk fly also infests ripe apricot and peach fruits, usually only when infested walnuts are nearby. The larvae chew tunnels in fruits causing reduced quality and decay of the flesh (Fig. 4).

Fig. 1. Walnut husk fly adult on walnut husk. Note the inverted V-shaped banding pattern on the wing tips.

Fig. 2. Walnut husk fly larvae feeding in walnut husk. Decayed husks are difficult to remove and cause nut-shell staining.

Fig. 3. Shriveled walnut kernel caused by husk fly injury occurring in July to early August.

Fig. 4. Walnut husk fly larva tunneling in ripe apricot fruit.

To prevent development of insecticide resistance, rotate the class of insecticide (see mode of action classifications for insecticides below). Select insecticides that are safer for beneficial insects and mites to reduce the likelihood of flaring spider mites and other secondary pests. For example, insecticides such as carbaryl, malathion, and the synthetic pyrethroids (e.g., gamma-cyhalothrin, cyfluthrin) are toxic to predatory mites.

No insecticides are currently registered for soil application for control of walnut husk fly.

Table 1. Degree day (DD) model for walnut husk fly (Kasana and AliNiazee 1997).

DD since March 1 (°F)	Event	Recommendation	Typical calendar date (northern Utah)
1600		Set out traps	Mid- to late June
1900	First emergence of flies expected	Check traps daily	Late June to early July
2220	First mature females expected	If using spinosad or GF-120, apply now and repeat every 7 days	Early to mid-July
2480	Beginning of egg-laying	If using other insecticides, apply now and repeat according to label	Mid-July
2700	First egg hatch		Late July
3150	50% adult emergence	Continue checking traps for adults; if numbers decline, reduce or discontinue applications	Early August
3460	First larval exit		Mid-August

Home Use Insecticides

Bait Spray: a food bait mixed with insecticide attracts adult husk flies to more readily ingest the insecticide. Apply bait sprays as large, evenly spaced droplets. An advantage of bait sprays is that complete coverage of the tree is not necessary as the flies are attracted to the droplets.

- 4 to 6 Tbsp molasses per gallon of water plus spinosad concentrate; MOA = 5; residual = 7-14 days (Pickel 2014)

Table 2. Examples of **HOME USE** insecticides registered in Utah that are effective for control of walnut husk fly.

Brand Name	Active Ingredient	Mode of Action*	Residual (days)
Malathion	malathion	1	7
Sevin	carbaryl	1	7-14
Fertilome Triple Action, Pyganic°	pyrethrin	3	3-5
Spectracide Triazide	gamma-cyhalothrin	3	14
Ortho Flower, Fruit and Vegetable	acetamiprid	4	10-14
Bonide Captain Jack's, Fertilome Spinosad Lawn and Garden Insect Spray, Gardens Alive Bull's-Eye Bioinsecticide, Green Light Lawn and Garden Spray with Spinosad, Monterey Garden Insect Spray	spinosad	5	5-7
Surround°	kaolin clay	physical	3-5; repels adults; a suppressant only

Western Cherry Fruit Fly

UTAH PESTS fact sheet

UtahState University COOPERATIVE EXTENSION

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Western Cherry Fruit Fly (*Rhagoletis indifferens*)

Diane Alston, Entomologist • Marion Murray, IPM Project Leader

Do You Know?

- Western cherry fruit fly is the primary insect pest of sweet and tart cherries in Utah.
- Damage occurs from the larva developing inside fruit.
- Females lay eggs under the skin of fruit, so target adult flies for control.
- Insecticides are currently the most effective control method.
- Attract-and-kill (bait plus insecticide) can be effective for control in commercial and home cherry trees.
- Use of ground barriers (mulch, fabrics) can reduce pupation and fly emergence.
- Post-harvest sanitation can reduce populations.

Figure 1. Adult fly caught on trap.

Figure 2. Larvae feeding inside a cherry fruit.[1]

Figure 3. Damaged cherries with larval exit holes.

Figure 4. Cherry fruits are not susceptible to attack until they have a blush of salmon color.[1]

The western cherry fruit fly (Order Diptera, Family Tephritidae) is the most important pest of sweet and tart cherries in Utah. Once the skin of fruits becomes soft enough to penetrate, adult females (Fig. 1) insert eggs with their ovipositor, and larvae develop inside the fruits (Fig. 2). The result is "wormy" fruit that is unmarketable. It is difficult to determine whether a fruit is infested until the larva exits through a hole that it chews (Fig. 3) or the fruit is cut open to reveal the larva inside. For processed cherries, detection of one larva by the processor can result in rejection of the entire crop from that orchard and/or farm. Therefore, the best management strategy is to prevent fruit infestation.

Adult flies will migrate only short distances (< 40 m) if host fruit is available. This causes infestations to be spotty in a region; however, once established in an orchard, the western cherry fruit fly can spread rapidly and require annual control. Protective insecticide sprays are currently the major tactic for preventing infestation. An "attract-and-kill" technology where adult flies are enticed to feed on a sticky bait droplet containing an ultra low concentration of insecticide, has proven effective in Utah orchards.

There is one generation per year; however, adults can emerge from the soil over a period of 3 months or more. Cherry fruits are susceptible to infestation from when they first ripen to a salmon-blush color (Fig. 4) until they become too soft or fall from the tree.

HOSTS

Sweet, tart, and wild species of cherries

LIFE HISTORY

Pupa – Overwintering Stage

- **Size**: about 3/16 inch (5 mm) long
- **Color**: light to dark brown and shaped like a large grain of wheat
- **Where**: overwinters in the soil of the orchard floor, 1 - 4 inches (2.5 - 10 cm) deep
- Rate of pupal development and adult emergence affected by soil temperature and moisture

Adult – Monitoring Stage

- **Size**: about 1/5 inch (5 mm) long
- **Color**: black body with white bands on abdomen (posterior body region); wings are transparent with a distinctive pattern of dark bands (Figs. 1 and 7)

control treatments begin based on timing information described above, maintain protection of fruit through harvest. Reapply insecticides based on the protection interval stated on the label. It is best to rotate the type of insecticide applied between applications to reduce development of resistance and negative effects on beneficial insects and mites. For example, insecticides such as carbaryl, malathion, and the synthetic pyrethroids are especially toxic to predatory mites.

*Recommended Insecticides**

For home and commercial orchards:

- spinosad (GF-120, Success®, Entrust®) – reapply every 7 days
- carbaryl (Sevin®) – reapply every 7 days
- malathion (Malathion®) – best when used just before harvest as it lasts approximately 3 days
- esfenvalerate (Asana®, Ortho®)
- permethrin (Ambush®, Pounce®, Ortho®)

For commercial orchards only:

- imidacloprid (Provado) – reapply every 14 days
- azinphosmethyl (Guthion®) – reapply every 14 days (scheduled for phase-out by 2012 by the U.S. Environmental Protection Agency)
- phosmet (Imidan) – reapply every 14 days; do not use on sweet cherry
- diazinon (Diazinon) – reapply every 10-14 days
- synthetic pyrethroids – reapply every 7-10 days
  - cyfluthrin (Baythroid®)
  - lambda-cyhalothrin (Warrior®)

*All brand names are registered trademarks. Examples of brands may not be all-inclusive, but are meant to provide examples of insecticides registered on cherry trees in Utah. The availability of insecticides is changing rapidly. Always check the label for registered uses, application and safety information, and protection and pre-harvest intervals.

[a] Restricted use products that require an applicator license.

[b] Insecticide products that may be available for use on home fruit trees.

It is critical to keep an adequate number of bait-insecticide droplets available to kill adults soon after they emerge and before they mate and/or females lay eggs. Currently it is only sold in larger volumes; larger than is practical for most home orchards.

Figure 9. Application of GF-120 attract-and-kill product with a 4-wheeler-mounted sprayer.[1]

Cultural Controls

Ground Cover and Mulches

Ground covers and mulches around the base of trees can prevent larvae from burrowing into the soil to complete development into the pupal stage. Successful vegetation covers include grasses and other plants with extensive, dense root systems (e.g., clover) that physically impede fruit fly larvae. Landscape fabric can prevent larval burrowing and emergence of adults from pupae in the soil (Fig. 10). Mulches of other dense materials may also interfere with their life cycle.

Sanitation

Maintaining a "clean" orchard wherein the fruit fly population is kept at low levels from one year to the next is important because high populations are more difficult to control, even with insecticides. In years when the crop is not harvested or not all fruit is removed from trees, fruit fly populations can increase and cause greater pest pressure the following year. Therefore, it is important to remove dropped fruit from the orchard floor as it may contain larvae. In addition, remove any nearby abandoned or wild cherry trees to prevent them from serving as unmanaged hosts that contribute to the local fruit fly population.

Biological Control

There are some natural enemies that will attack fruit fly life stages, such as parasitic wasps that lay eggs on larvae within fruit, but control has not been shown to be significant. Birds and rodents take a larger toll on fruit fly larvae, but they generally also consume the fruit and so

Figure 10. Landscape fabric under the trees can prevent larvae from burrowing into the soil to pupate.

are not considered beneficial. Chicken and other fowl have been shown to eat fruit fly larvae and pupae in the soil and may provide some benefit.

Some of the Priority Tree Borer Pests in Utah

Pitch Borers

Pitch Mass Borer Moths

Dioryctria spp. (Lepidoptera: Pyralidae)
Synanthedon sequoia-novaroensis complex (Lepidoptera: Sesiidae)

Hosts: Pines (Austrian, Scots, Ponderosa, Lodgepole, Pinyon), occasionally Douglas Fir and true firs

Attack weakened trees

Large, oozing masses of pitch caused by larvae feeding beneath the bark

Moths lay eggs in bark crevices near pitch masses

Larvae actively feed in late summer, can spend up to two years feeding on the resin

Boring larvae damage the tree's water conducting vessels

Pitch Borers

Douglas fir pitch moth (left) and sequoia pitch moth (right)

Management

Keep trees healthy, avoid stress, avoid summer pruning when moths lay eggs

Manually remove pitch masses, crush caterpillars, and allow wounds to heal

Preventive bark sprays
Late June through August for at least two years
bifenthrin, cyfluthrin, and carbaryl

Insecticides will not kill larvae under the bark, require several years to suppress

White Pine Weevil

Weevil: small beetle with a snout

Attacks terminal leaders of blue spruce trees in Utah (rarely attack pine in the West)

'Shepherd's crook', needle drop

Stunted growth, bushy growth with multiple leaders

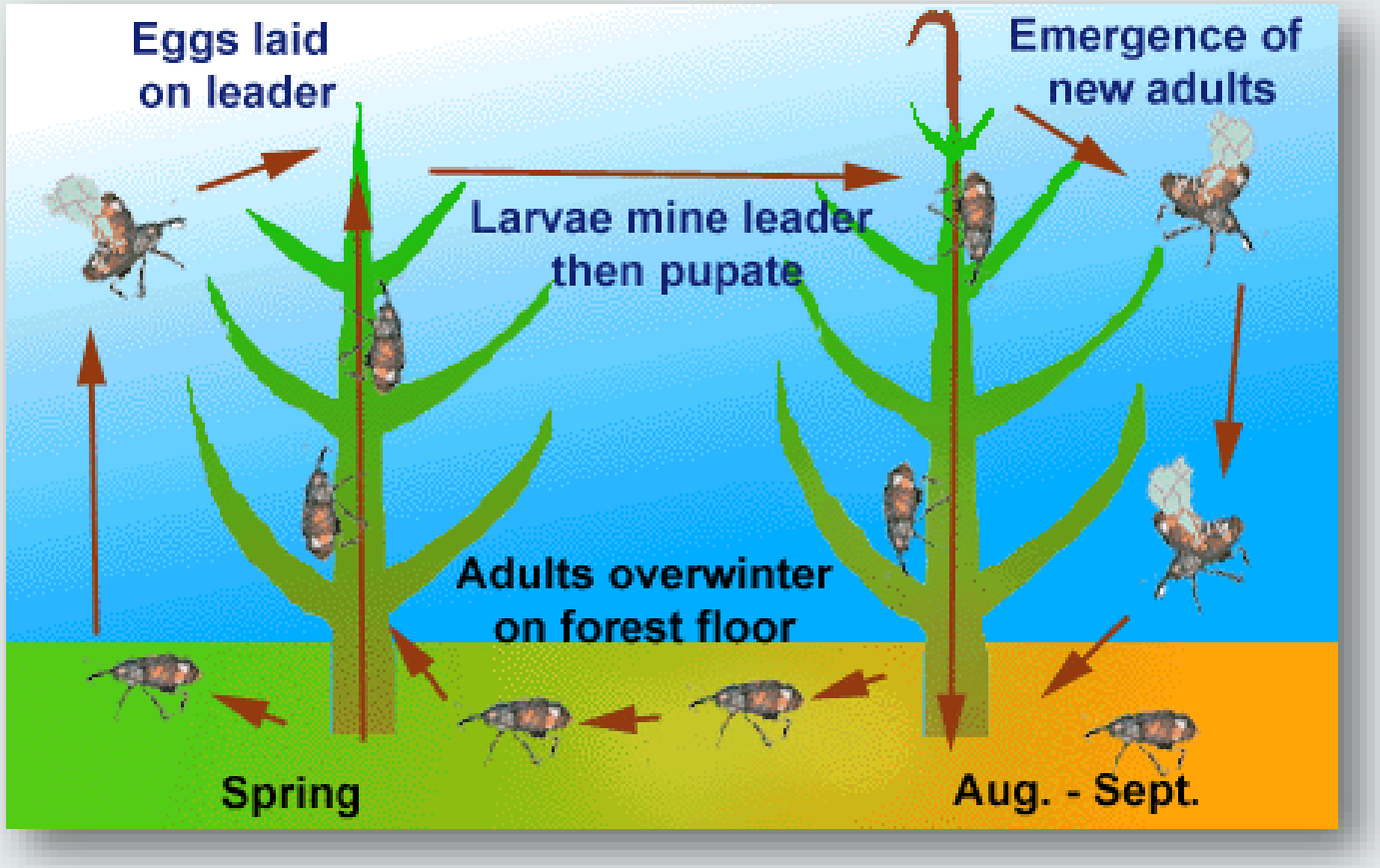
Adult weevils spend the winter in leaf litter under trees

Adults become active at full bloom of forsythia in the spring

Adults feed just below terminal bud, Lay eggs (up to 100 per female)

Grub-like larvae bore into terminal

White Pine Weevil



Management

Sanitation:
Clean up duff under trees in late fall to reduce populations for the following spring

Insecticides:
Apply preventive sprays to spruce terminal branches beginning at forsythia bloom and keep protected for two weeks
Pyrethroids: bifenthrin, cyfluthrin
Systemics: imidacloprid?

Summer pruning:
Prune out terminal shoots with shepherd's crook & destroy before larvae pupate

Bark Beetles

Conditions that Promote Bark Beetles

- Drought
- Trees on dry, sloping sites
  - Tree stress
  - Dry soils in spring and fall
    - Supplemental irrigation is absent or inadequate
- Longer, hotter growing seasons
  - More bark beetle generations
- Warmer winters
  - Higher overwinter survival, more generations
- Cyclic populations of bark beetles
  - Established populations in an area
  - Spread from foci / sources

Primary bark beetles in urban landscapes of Utah

- *Ips hunteri & I. pilifrons*
  - blue & Engelmann spruce
- *Ips pini*
  - ponderosa & lodgepole pine
- *Ips confusus*
  - pinyon & singleleaf pine
- Banded elm bark beetle
  - *Scolytus schevyrewi*
  - elm
- Shot hole borer
  - *Scolytus rugulosus*
  - apple, pear, cherry, hawthorn
- Black walnut twig beetle
  - *Pityophthorus juglandis*
  - black walnut

Ips have obvious spines on rear of outer wings

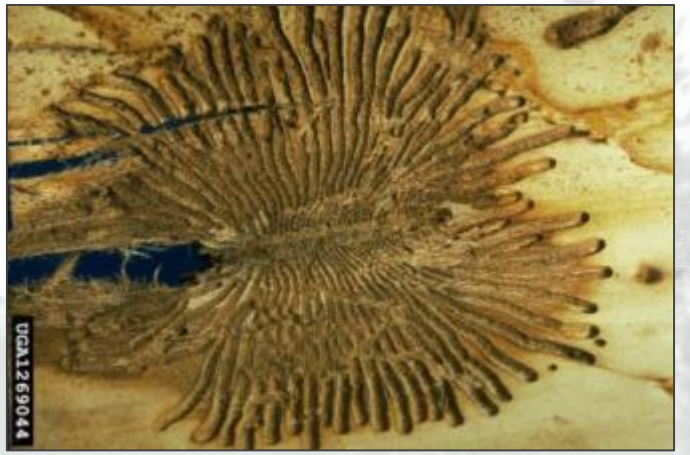
and a concave depression

Ips are tiny! 1/8 – 3/8 inch long

Distinguishing characteristics of bark beetles

Spruce Ips galleries: "octopus arms"

How do they feed and tunnel in trees?



Elm bark beetle galleries: "radiating arms"

Adult Pinyon Ips hind end

Size, shape, and color & spine patterns on adults

Banded elm bark beetle adult

Ips bark beetles

- In forests, Ips are usually considered secondary invaders of already declining trees, infest slash piles after logging
- In the urban landscape, Ips are primary attackers
  - Conifer mortality
    - Spruce (blue & Engelmann), pines
  - Attack smaller diameter limbs at top of tree first
    - Tree death within 1-2 yrs
- Last upswing in cycle of urban Ips infestations was ~2004-2005
  - Correlated to drought cycle
  - Started again in 2012-2013

Blue spruce attacked by *Ips hunteri*

Ips: pioneers & mass attack

- Pioneer beetles – stressed trees
  - Bore in –convert sap chemicals to an aggregation pheromone
  - Signal others to join
- Attack trees in mass numbers
  - Overcome tree's natural defenses
    - pitch tubes
  - Adult flights synchronized
    - Spring – April (Wasatch Front)
    - Fall – late Sep to Oct
- Life cycle: 6-8 wk duration
  - Several generations within a tree at same time
  - Up to 5 generations/yr

Pitch tubes & boring dust on bark of pinyon pine

Fatal attraction

- Males bore in, release sex pheromone to attract female
  - Nuptial gallery – larval galleries
- Bark beetle galleries
  - Disrupt transport of nutrients & water
  - Girdles the tree
  - Many bark beetles carry a fungus that inhibits water transport
- New generation of adults emerge through "shotholes"

Ips adult exit holes

Key Ips management strategy: Prevent tree stress

- Avoid dry planting sites
  - slopes, south-facing
  - fast-draining soils, inadequate irrigation
  - Provide deep irrigation
    - 2-4 inches water/month for established trees
- Avoid over-crowded plantings
- Avoid compacted soils
  - construction sites
- Prevent mechanical injuries
- Remove Ips-infested trees (foci)
  - remove infested wood
  - properly dispose: chip & dry, remove bark, burn

Ips control: Insecticides

- Preventive application
  - when infested trees are in the neighborhood
- Save trees infested ≤ 30%
  - Loss of central leader will permanently distort tree shape
- Apply insecticide to entire bole & interior of lateral limbs
  - Spring (April) before beetle flight
  - Daily temps >50°F
  - Kill beetles when chew thru insecticide-soaked bark
  - Fall (late Sept – Oct)
- High pressure (≥ 250 psi), drenching spray to run-off, professional applicator & equipment
  - Thorough coverage!

Examples of effective insecticides

- Carbaryl (carbamate)
  - Carbaryl 4L, Sevin XLR
- Bifenthrin (pyrethroid)
  - Bifen XTS
  - Onyx
- Permethrin (pyrethroid)
  - Astro
  - Hi Yield 38 Plus[Homeowner]
- 1-2 applications per year
- To date, systemic insecticides have not shown good efficacy

Sanitation: Treating infested wood

- Promptly remove wood from the landscape
  - ≥2-3 miles from host trees
- Check wood for live beetles
- Kill beetles within wood
  - Remove bark
  - Chip wood & spread to dry
  - Cover log pile with clear plastic
    - >130°F for a month (summer)
  - Burn wood

Ips pupa, larva, and adult within gallery tunnels

Cover infested logs with clear plastic to kill bark beetles with heat

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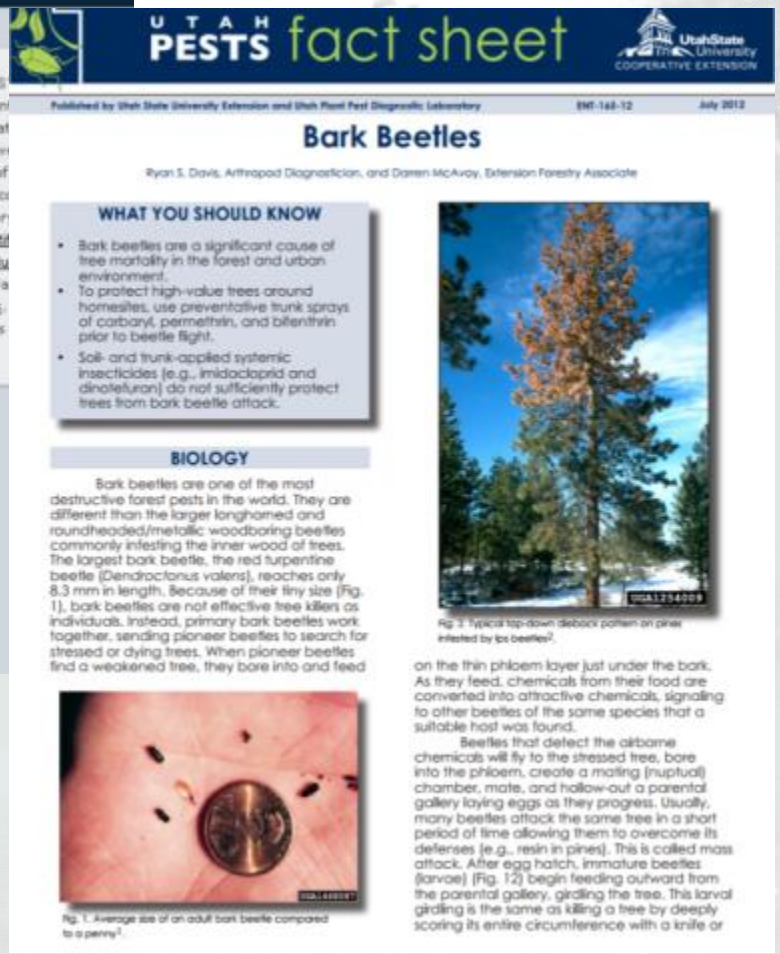
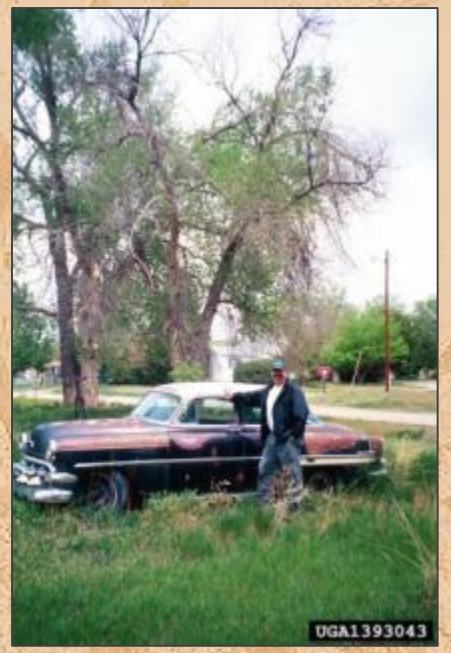


Scolytus spp.: Elm bark beetles

Banded elm bark beetle
Scolytus schevyrewi (1/8 inch)

European elm bark beetle
Scolytus multistriatus (1/16-1/8 inch)



Dying elm trees

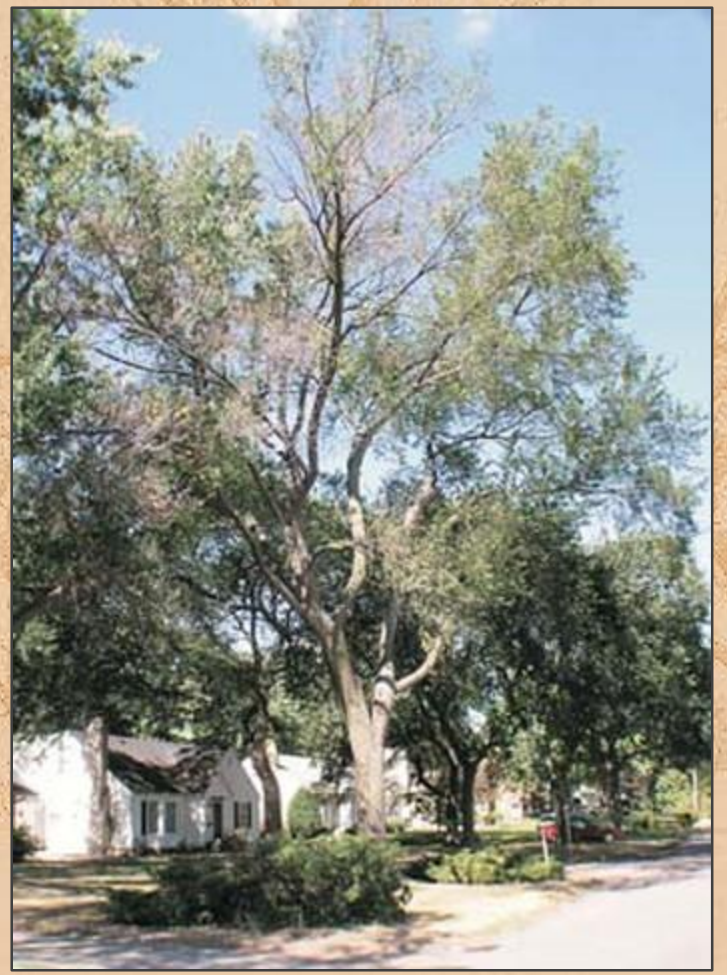
Attack elm (American, Siberian, English, rock),
Prunus spp., willow, Russian olive, possibly Zelkova

Vector Dutch elm disease (fungus)

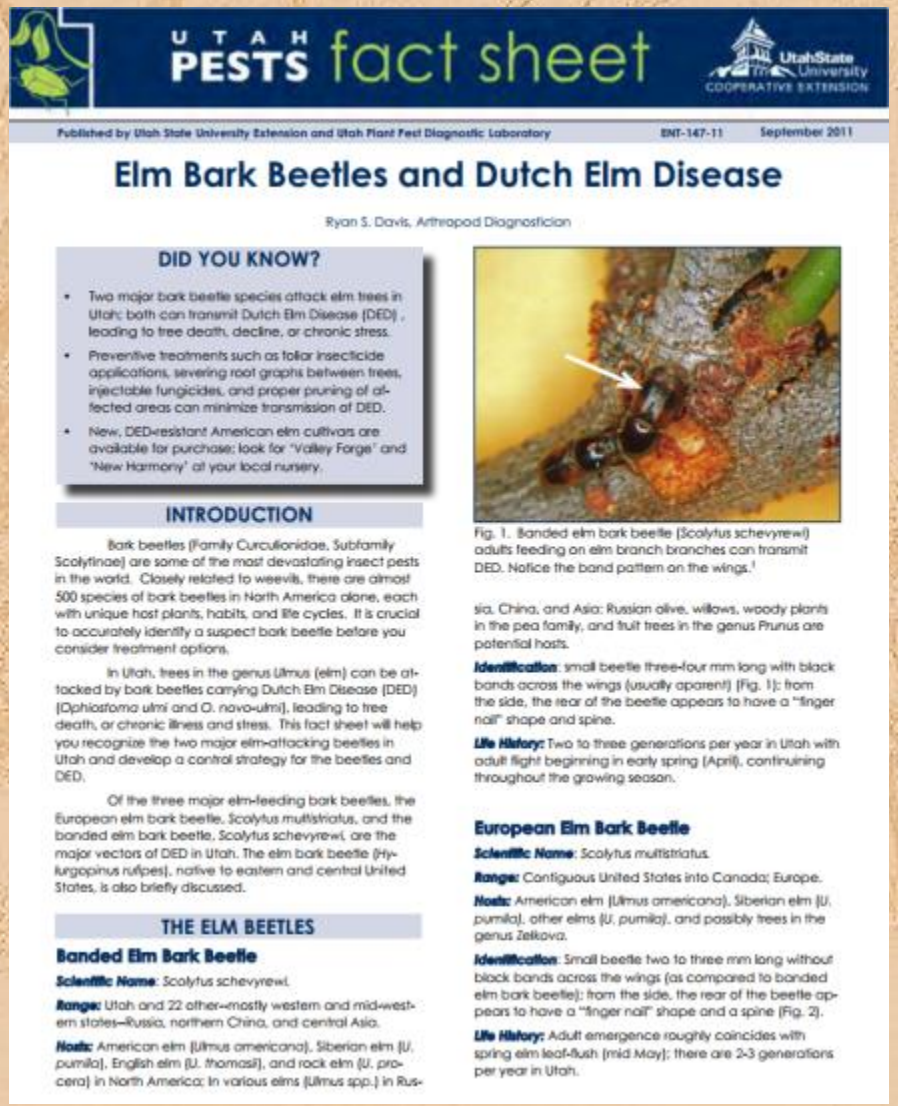
Galleries with "radiating arms"
External twig & branch crotch feeding

Elm bark beetle & Dutch elm disease (DED) management

- DED resistant elm cultivars
  - 'Valley Forge', 'New Harmony', 'American Liberty', 'Princeton'
- Preventive insecticides
  - adult emergence: May-June (1-3 gens/yr)
  - canopy, limbs, and upper trunk
  - bifenthrin, cypermethrin, permethrin, carbaryl
- Prune out infected limbs
  - brown vascular tissue in limbs, twigs
- Sever root graphs between elm trees (fungus spread)



Elm bark beetle & DED fact sheet



UTAH PESTS fact sheet

UtahState University COOPERATIVE EXTENSION

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory ENT-147-11 September 2011

Elm Bark Beetles and Dutch Elm Disease

Ryan S. Davis, Arthropod Diagnostician

DID YOU KNOW?

- Two major bark beetle species attack elm trees in Utah; both can transmit Dutch Elm Disease (DED) , leading to tree death, decline, or chronic stress.
- Preventive treatments such as foliar insecticide applications, severing root graphs between trees, injectable fungicides, and proper pruning of affected areas can minimize transmission of DED.
- New, DED-resistant American elm cultivars are available for purchase; look for 'Valley Forge' and 'New Harmony' at your local nursery.

INTRODUCTION

Bark beetles (Family Curculionidae, Subfamily Scolytinae) are some of the most devastating insect pests in the world. Closely related to weevils, there are almost 500 species of bark beetles in North America alone, each with unique host plants, habits, and life cycles. It is crucial to accurately identify a suspect bark beetle before you consider treatment options.

In Utah, trees in the genus *Ulmus* (elm) can be attacked by bark beetles carrying Dutch Elm Disease (DED) (*Ophiostoma ulmi* and *O. novo-ulmi*), leading to tree death, or chronic illness and stress. This fact sheet will help you recognize the two major elm-attacking beetles in Utah and develop a control strategy for the beetles and DED.

Of the three major elm-feeding bark beetles, the European elm bark beetle, *Scolytus multistriatus*, and the banded elm bark beetle, *Scolytus schevyrewi*, are the major vectors of DED in Utah. The elm bark beetle (*Hylurgopinus rufipes*), native to eastern and central United States, is also briefly discussed.

THE ELM BEETLES

Banded Elm Bark Beetle

Scientific Name: *Scolytus schevyrewi*.

Range: Utah and 22 other--mostly western and mid-western states--Russia, northern China, and central Asia.

Hosts: American elm (*Ulmus americana*), Siberian elm (*U. pumila*), English elm (*U. thomasii*), and rock elm (*U. procera*) in North America; In various elms (*Ulmus spp.*) in Russia, China, and Asia: Russian olive, willows, woody plants in the pea family, and fruit trees in the genus *Prunus* are potential hosts.

Fig. 1. Banded elm bark beetle (*Scolytus schevyrewi*) adults feeding on elm branch branches can transmit DED. Notice the band pattern on the wings.[1]

Identification: small beetle three-four mm long with black bands across the wings (usually apparent) (Fig. 1); from the side, the rear of the beetle appears to have a "finger nail" shape and spine.

Life History: Two to three generations per year in Utah with adult flight beginning in early spring (April), continuining throughout the growing season.

European Elm Bark Beetle

Scientific Name: *Scolytus multistriatus*.

Range: Contiguous United States into Canada; Europe.

Hosts: American elm (*Ulmus americana*), Siberian elm (*U. pumila*), other elms (*U. pumila*), and possibly trees in the genus *Zelkova*.

Identification: Small beetle two to three mm long without black bands across the wings (as compared to banded elm bark beetle); from the side, the rear of the beetle appears to have a "finger nail" shape and a spine (Fig. 2).

Life History: Adult emergence roughly coincides with spring elm leaf-flush (mid May); there are 2-3 generations per year in Utah.

www.utahpests.usu.edu
Fact sheets:
Insects – Landscape Orn.

Shothole Borer: *Scolytus rugulosus*

Hosts: *Prunus* spp.
cherry, apple, pear, hawthorn
< 1/16 inch diam holes
1/8 inch long beetle

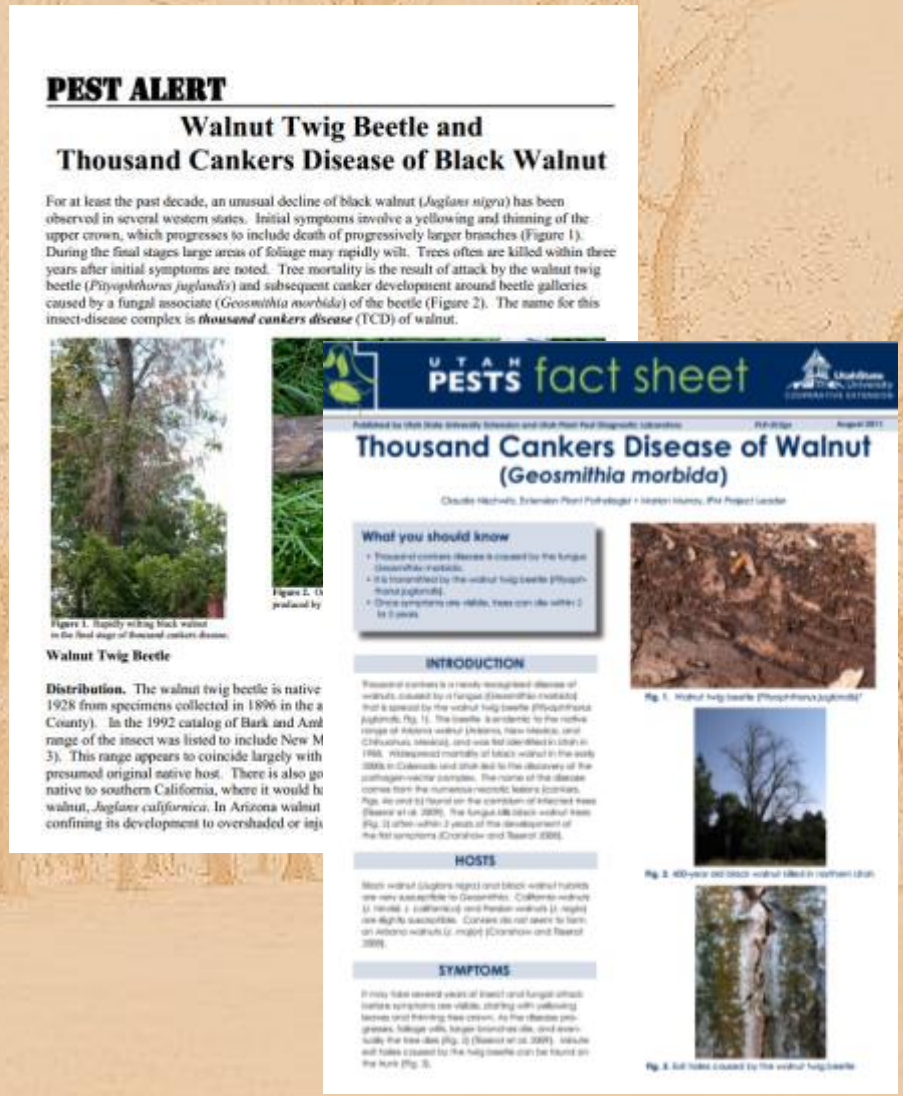
Entry holes with sap

Exit holes: "shothole"

-Cut out infested limbs
-Keep trees healthy
-Attack stressed trees
-Insecticides at peak adult flights:
spring & fall

Walnut twig beetle *Pityophthorus juglandis*

- Vectors tree-killing fungus
  - Thousand Cankers Disease
- Primary host: black walnut
  - can attack & kill other walnuts
- Primarily attack limbs ≥ ¾ inch diam
- Colorado State Univ. Pest Alert (online)
- USU Fact Sheet
  - www.utahpests.usu.edu



PEST ALERT

Walnut Twig Beetle and Thousand Cankers Disease of Black Walnut

For at least the past decade, an unusual decline of black walnut (*Juglans nigra*) has been observed in several western states. Initial symptoms involve a yellowing and thinning of the upper crown, which progresses to include death of progressively larger branches (Figure 1). During the final stages large areas of foliage may rapidly wilt. Trees often are killed within three years after initial symptoms are noted. Tree mortality is the result of attack by the walnut twig beetle (*Pityophthorus juglandis*) and subsequent canker development around beetle galleries caused by a fungal associate (*Geosmithia morbida*) of the beetle (Figure 2). The name for this insect-disease complex is ***thousand cankers disease*** (TCD) of walnut.

Walnut Twig Beetle

Distribution. The walnut twig beetle is native

1928 from specimens collected in 1896 in the a

County). In the 1992 catalog of Bark and Amb

range of the insect was listed to include New M

3). This range appears to coincide largely with

presumed original native host. There is also go

native to southern California, where it would h

walnut, *Juglans californica*. In Arizona walnut

confining its development to overshaded or inj

UTAH PESTS fact sheet

Thousand Cankers Disease of Walnut

(Geosmithia morbida)

What you should know

INTRODUCTION

HOSTS

SYMPTOMS

Thousand Cankers Disease Symptoms

- Yellowing & thinning of upper crown
- Death of progressively larger branches
- Rapid wilt of foliage (final stages)
- ~ 3 yrs to kill trees

Geosmithia morbida cankers and black walnut limb death

Distribution of walnut twig beetle & thousands cankers disease

Figure 3. Distribution of the walnut twig beetle and thousand cankers disease. In green are states and the California county of Los Angeles with records of the species prior to 1960 States in orange have reported the insect since 1988. The recent (2010-2011) records from states east of the Mississippi are presently known only from limited areas: Tennessee/Knox County and surrounding areas; Virginia/Richmond; and Pennsylvania/Bucks County.

-Black walnut tree death in Utah first noticed in early 1990's
-First UT WTB specimen – 1988
-Arizona walnut, *Juglans major*, may be native host for WTB
-Earliest specimens: 1898 (NM)

Walnut twig beetle adult ~ 1/16 inch, yellowish-brown color

Management of WTB and TCD

- No controls for fungus – prevention of beetle attack
- Preventive insecticides
  - Spring & summer – same products as for other BBs
- Sanitation
  - Pruning
  - Removal & disposal of infested wood
- Quarantines on transport of black walnut wood to some states

Monitoring walnut twig beetle

- USFS Entomology Team developed pheromone trap
- Identified aggregation pheromone
- Pheromone-baited funnel trap
- Trapped WTB from Richmond (N) to Cedar City (S)
- Contech pheromone lure & funnel trap available from Forestry Distributing
  - www.forestrydistributing.com

Place traps ~10 ft high near host trees

Bark Beetle Take-Home Points

- Prevention!!
  - Maintain tree health / prevent stress
    - Planting site, irrigation, protection
- Sanitation!
  - Promptly prune affected limbs or remove infested trees
  - Properly dispose of infested wood
    - Chip, tarp, burn, dispose ≥3-4 miles
- Insecticides (preventive)
  - Timed for spring and fall (adult flight periods)
  - Good coverage, high pressure, soak bark

Mountain pine beetle is devastating Uinta Mountain pines

Recent Invasive Nuisance Insect Pests

Elm Seed Bug

First confirmed detection in Utah: July, 2014
(Salt Lake and Cache Counties)

Native to Europe
Idaho in 2012
Oregon in 2013

Seed bug family: Lygaeidae
Feeds primarily on elm seeds, also other trees

Major nuisance pest
Enters buildings (like boxelder bug)
Emits a pungent odor from scent glands
(bitter almonds)

In Italy, apply insecticides to host trees when immature stage (nymph) is present (spring and early summer; May-June)

Use building exclusion techniques like for boxelder bug; vacuum congregations – warm soapy water

Elm Seed Bug Article: Utah Pests News, Fall 2014

UTAH PESTS News

Utah Plant Pest Diagnostic Laboratory and USU Extension — Vol.VIII, Fall 2014

What's Inside

News Highlights

WELCOME TO NEW VEGETABLE IPM ASSOCIATE

Bonnie Bunn recently joined the Utah Pests team to conduct outreach in vegetable integrated pest management. Bonnie is completing her M.S. in Biology at USU under Diane Alston. She has already made a great impact this summer by running the vegetable IPM advisories, monitoring and trapping for vegetable pests, and expanding our vegetable diagnostics image database. Bonnie will also develop fact sheets, expand our online content, and conduct presentations.

utahpests.usu.edu

First Report of Elm Seed Bug in Utah

In July 2014, the UPPDL received multiple submissions of a small, brown and black insect. We identified it, with confirmation from USDA APHIS, as elm seed bug (*Arocatus melanocephalus*), marking its first official appearance in the state. A native of Europe, the elm seed bug was first identified in the U.S. in Idaho in 2012 and then in Oregon in 2013. While the Utah sample submissions came from Salt Lake County, I also collected and identified this insect in Cache County around the same time. It is possible that the elm seed bug is already widely distributed along the Wasatch Front.

As a member of the family Lygaeidae, or the seed bugs, this insect feeds primarily on elm seeds, but can be found on other trees. In northern Italy, this insect has become a major nuisance pest, entering homes and buildings by the thousands, similar to the boxelder bug in Utah. Unlike boxelder bug, elm seed bugs can emit a pungent smell from scent glands, similar to bitter almonds.

The specifics of the elm seed bug life cycle in the U.S. are only generally understood. In northern Italy (Turin ~ 45°N and Modena ~ 44°N; Salt Lake City ~ 40°N), the insects overwinter as adults and begin to move from overwintering sites to host trees in March. Eggs are laid starting in early May on elm fruits (samara) and young nymphs emerge in mid-to-late May. The nymphs progress through 5 growth stages before becoming a winged adult. There can be many overlapping life stages present during the summer, but in Italy, the insects have one generation per year. Invasions of buildings have occurred anytime between late May and late September and were seen to coincide with peak summer temperatures.

Control of elm seed bug with insecticides may be difficult due to their mobile behavior. Italian entomologists report that city governments attempted control with etofenprox, pyrethrum, and rotenone, but only etofenprox showed efficacy. In Italy, insecticides are most effectively applied to host trees when immature stages are present, beginning in early May.

Unfortunately, adult emergence dates, egg laying, and egg hatch are not known in Utah. Proper spray timing for elm seed bug in Utah should be accurately timed to coincide with the presence of the nymph stages for greatest results. Adults may start appearing in March and their nymphs, in April and May.

Pest-proofing homes and buildings is the best tactic to deal with nuisance pests like the new elm seed bug, just as it is for the

continued on next page

Red Fire Bug

- First North America detection in Salt Lake City in 2008
  - Detected in Kaysville (Davis Co.) in 2014 and Pleasant Grove (Utah Co.) in 2015
- Native to Europe and Asia
- Seed feeders (Pyrrhocoridae): Malvaceae
  - linden, mallow (dry, ripe seeds)
- Seek shade on hot days
- Congregate on structures, plants and under leaf litter
- Manage like boxelder bug

UTAH PESTS fact sheet — UtahState University extension

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory — ENT-126-08 — July 2008

Red fire bugs

Erin W. Hodgson
Extension Entomology Specialist

What You Should Know

- Red fire bugs were first discovered in North America in Salt Lake City, Utah in 2008.
- These insects are seed feeders on a wide range of plants, including linden and mallow.

Red fire bugs, *Pyrrhocoris apterus* (Heteroptera: Pyrrhocoridae), are true bugs with vibrant red body and wing coloration (Figs. 1-2). These insects are native to central Europe, but are also found in western Siberia, southwestern Mongolia, India and northwestern China. In 2008, the red fire bug was first discovered in North America in the southeastern area of Salt Lake City, Utah. Their recent appearance in the United States cannot be explained, but likely they were transported on plant material from Europe or Asia. Much is unknown about the red fire bug in Utah, including what type of host plants they prefer. In Europe, they feed on a wide range of dry, ripe seeds; the nymphs and adults are most commonly found on mallow, linden and limes. A few thriving populations of red fire bugs exist in Salt Lake City, and they will likely expand their range throughout much of urbanized Utah.

Fig. 1. Red fire bugs massing on a flower pot, note the variable wing sizes and color patterns.[1]

Fig. 2. Red fire bugs mating, note the shortened wings exposing the abdomen.[1]

Life Cycle and Description

Red fire bugs go through simple metamorphosis (egg, nymph, adult) and typically have one generation per year, although some adults can live up to two years. The entire life cycle can take 2 to 3 months depending on the temperature. Overwintered females lay 40-80 eggs in a lifetime, starting in April and May. Eggs are white but gradually turn yellow-red before hatching in 10 to 14 days. Red fire bug nymphs go through five instars in 17 to 24 days before molting into adults. Young nymphs look similar to boxelder bugs (Fig. 3) while older nymphs look like the adults except are smaller and have reduced wing pads. Adults begin mating within a week of emerging; however, females do not lay eggs until the next year. Adults overwinter by entering a resting stage, called diapause, when the day length is less than 12 hours per day.

Red fire bugs are 6.5-12 mm long, and in general the females are slightly longer and wider. The forewings are variable in size, ranging from shortened to absent. The most common form in Utah is the shortened wing adult. The forewing color pattern is also highly variable when present, but is generally red with black spots. The wings cross over the back and are held flat against the body at rest. Red fire bug antennae are 4-segmented, slightly enlarged at the end, and are usually at least half the length of the body. The eyes are prominent, almost appearing to come from the "shoulders" (Fig. 2).

USU Horticultural Research Farm, Kaysville (Davis Co.)
Red Fire Bugs Congregating on Tart Cherry Tree Trunks