



# Vegetable Integrated Pest Management

*Nick Volesky*

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# Aphids



Green Peach Aphid (*Myzus persicae*)



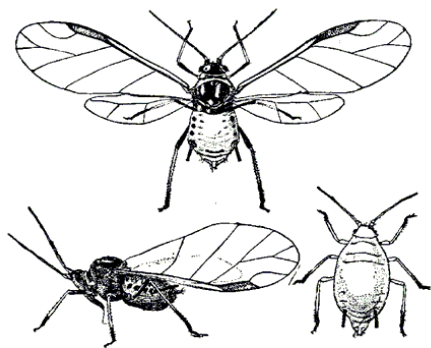
Potato Aphid (*Macrosiphum euphorbiae*)



Cabbage Aphid (*Brevicoryne brassicae*)



Melon Aphid (*Aphis gossypii*)



Winged Aphids



Cabbage Aphid Colony

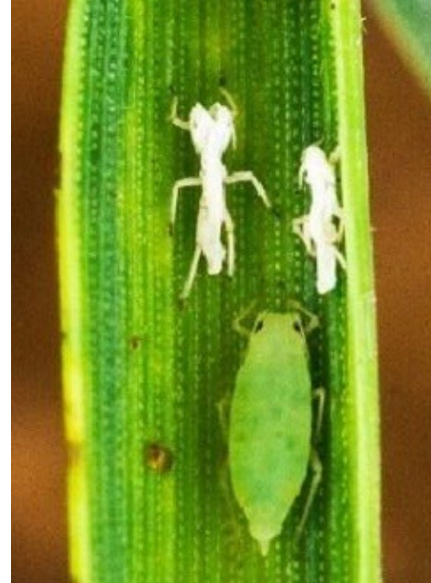
- Adults first seen late May and June.
- Adults and nymphs often found in clusters on leaves or stems, but may be found singly.
- Eggs laid in fall or winter on woody host plants, crop residue, or weeds.
- Watch for rapidly increasing populations and feeding damage in the late spring through early fall.

# Aphid Monitoring

- Thoroughly scout crops and weeds for signs or symptoms of aphids.
- Use yellow sticky traps to monitor aphid populations.
- Aphids may indicate the presence of aphids as they feed on their honeydew secretion.
- Scout for aphids on new “budding” growth



Ants may indicate aphid presence



Aphid skins



Aphids on new budding growth



Winged aphids on yellow sticky trap





Lacewing larva feeding on aphids



Adult ladybug feeding on aphids



Parasitic wasps parasitizing aphid



Weed control to deter aphid colonies



Spraying pesticides for aphid suppression

# Aphid Management

- Manage nitrogen levels; avoid excess.
- Encourage natural enemies; avoid toxic chemicals, provide nectar and pollen resources.
- Keep crop area weed-free.
- Aphids are common but typically do not cause severe economic damage unless they vector a virus or are present in high populations.
- Consider insecticides that use neem oil or insecticidal soap



Snail on Pea



Slug Eggs



Slugs in high tunnels



Snail feeding damage

# Slugs and Snails

- mollusks
- slugs (no shell), snail (shell)
- glide with a long, flat, muscular organ called a foot (mucus/slime secreted)
- eggs are small, white, laid in clusters
- hermaphrodites (neither male or female)
- active during night and dark/cloudy clouds  
seek shelter during the day
- need moisture to thrive, survive in dry conditions in protected areas
- chew irregular holes in foliage



Diatomaceous earth to deter slugs/snails



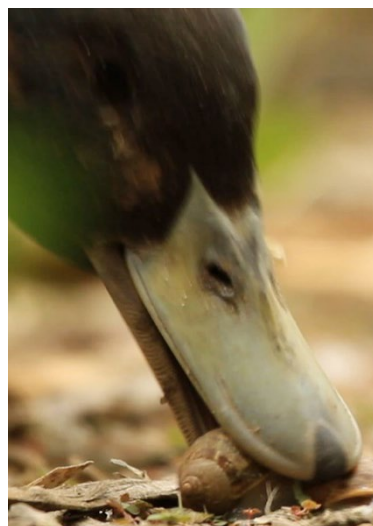
Copper barriers to deter slugs/snails



Slug/snail bait traps



Slug and snail bait



Natural predator

# Slug and Snail Management

- remove boards, stones, and another other debris that might shelter slug/snails
- rand remove slug/snails from host crops during peak activity hours
- protect crops with barriers like copper or diatomaceous earth (not effective when wet)
- use bait stations to trap slugs (effective products include metaldehyde or iron phosphate)
- encourage natural predations



Spinach Leafminer (*Pegomya hyoscyami*)



Leafminer Eggs



Leafminer Pupa

# Leafminers

- **Adults** flies range in color from black to gray; some bear yellow markings.
- **Eggs** are oblong and white in color.
- **Damage Symptoms:** Larvae feed and tunnel between the upper and lower leaf surfaces causing irregular shaped, whitish mines or “blisters”.
- Mines are initially opaque, eventually turning brown.
- Pale yellow larvae may be found within the mines





# Leafminer Management

- Starting in May, begin looking for small rows of white, oblong eggs on host leaves.
- Exclude adult flies with row cover.
- Crop rotation.
- Cultivate soil after harvest to disturb pupae.







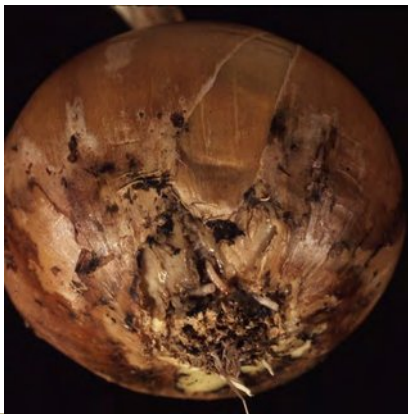
Seedcorn Maggot (*Delia platura*)



Cabbage Maggot (*Delia radicu*)

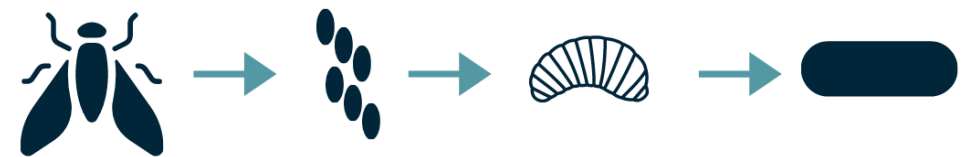


Onion Bulb Maggot (*Delia antiqua*)



# Root Maggots

- **Adult** flies are slightly smaller and more slender than houseflies with longer legs and overlapped wings at rest.
- **Eggs** are oblong and white in color.
- **Damage Symptoms:** Larvae feed on roots of crops and can tunnel through taproots providing entry for decay, fungi, and bacteria. Damaged plants show wilting, reduced growth, and lighter green plant parts.
- Larvae burrow into seeds and roots of many vegetable crops, destroy the seed germ, and may cause rot in plant tissue.
- Seeds and plants attacked may not emerge causing reduced stands. Larvae are sometimes secondary pests on plants that have been damaged by disease.





# Root Maggot Management

- Plant seeds into raised soil beds to promote soil drying and warming.
- Destroy or disc under crop residues immediately after harvest.
- Rotate susceptible crops with unrelated crops.
- Plant seeds into raised soil beds to promote soil drying and warming.
- Destroy or disc under crop residues immediately after harvest.





Various Species of Flea Beetles



Cucumber Beetles



Colorado Potato Beetle



Three-lined Potato Beetle



Cereal Leaf Beetle



*Monoxia* spp. Beetle

# Beetles

- There are several beetle species (Order Coleoptera) that are considered pests to vegetables. This includes Flea Beetles, Cucumber Beetles, and Leaf Beetles.
- Adults beetle species can chew on fruits, stems, leaves, and flowers.
- Larvae of some beetle species can cause foliar, stem, or root damage with their feeding.



# Beetle Monitoring

- Adults emerge from early April to mid-June.
- Adults can be found feeding on the foliage of host plants.
- Monitor seedlings in spring for flea beetle presence or round holes in leaves.
- Use yellow sticky cards and visual scouting when seedlings emerge.
- Pheromone traps are available for some species of beetles.



Three-lined Potato Beetle Larva



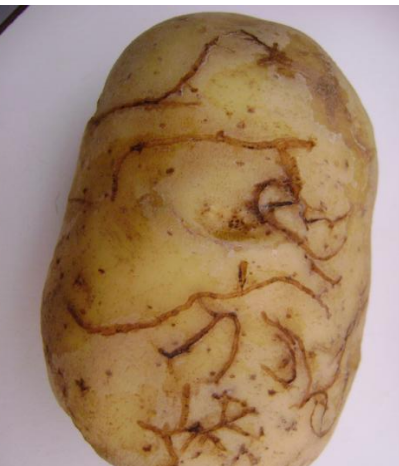
Colorado Potato Beetle Larva



Cucumber Beetle Larva Feeding Damage



Cucumber Beetle Feeding Damage



Flea Beetle Larva Damage



Cucumber Beetle Damage



Flea Beetle Damage

# Beetle Management



- Rotate crops with non-host crops
- Keep crop area free of weeds.
- Use row covers to physically exclude beetles from accessing the plants.
- Use plastic or organic mulches and drip irrigation.
- Lure beetles away with trap crops.
- Fall tillage can help destroy or expose overwintering pupae.

# Caterpillar Pests

- There are several caterpillar species (Order Lepidoptera) that are considered pests to vegetables. This includes cabbage and alfalfa loopers, diamondback moths, imported cabbageworms, cutworms, corn earworms, armyworms, and horn worms.
- These caterpillars are the larval stage of various moths and butterflies.
- Larva have chewing mouthparts and can cause damage to foliage, stems, fruits, and sometimes roots.



Cabbage Looper (*Trichoplusia ni*)



Diamondback Moth Larva (*Plutella xylostella*)



Imported Cabbageworm Larva (*Pieris rapae*)



Alfalfa Looper (*Autographa californica*)



Corn Earworm (*Helicoverpa zea*)



Armyworms (Family Noctuidae)



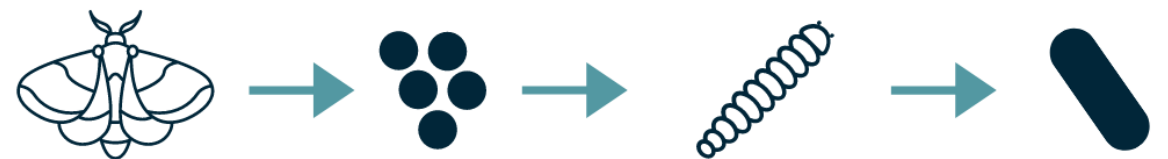
Cutworms (Family Noctuidae)



Yellowstriped Armyworm (*Spodoptera ornithogalli*)



Hornworms (*Manduca* spp.)





# Caterpillar Management

- Conduct regular scouting for larvae and damage (hand removal)
- In large fields, consider using pheromone traps for adults.
- Plow or disc field/garden after harvest to disrupt overwintering life stage.
- Rotate crops
- Reduce weeds (alternate hosts)
- Encourage natural enemies
- Consider insecticides with active ingredients like carbaryl, cyfluthrin, permethrin, zeta-cypermethrin, spinosad *Bacillus thuringiensis*, or oil based products.



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# Squash Bugs



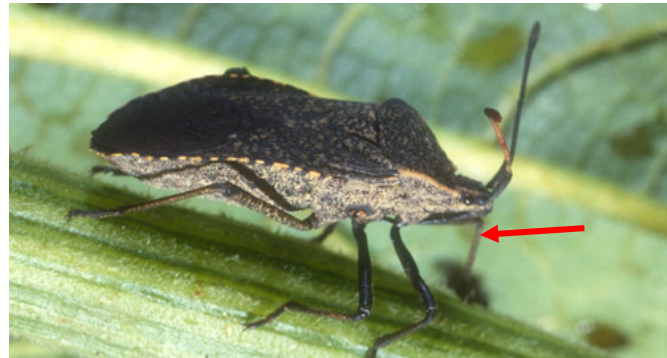
Squash Bug Eggs



Squash Bug Feeding Symptoms



Squash Bug Nymph Stages



Squash Bug Feeding

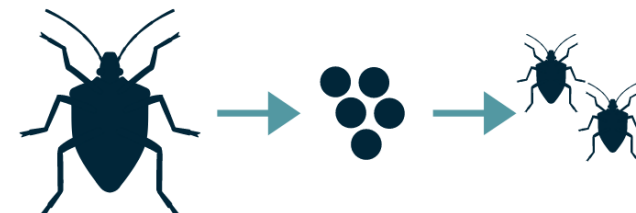


Squash Bug Adult



Squash Bug's "straw-like" mouthpart

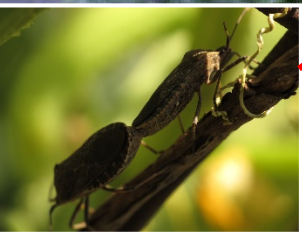
- Squash bugs are the primary pest of cucurbit crops, and can kill plants.
- Feed with a piercing-sucking mouthpart, removing large amounts of plant sap.
- Adults are 5/8-inch long with wings folded over a flat back.
- There are five nymph squash bug stages (immatures), that range in color from reddish to green-gray.
- Squash bugs spend the winter as adults in protected sites under plant debris, compost piles, around building foundations, etc.
- emerge in spring, typically during May in northern Utah.
- They fly to host plants to feed, mate, and lay eggs.
- Each female lays up to 250 clusters of 4-40 eggs on the undersides of leaves.
- The eggs hatch into nymphs that take 4 to 6 weeks to mature to adults. The summer generation of adults appears in late July in northern Utah





# Squash Bug Monitoring

- Monitor in the spring for squash bug adults under plant debris, perennial plants, or near buildings.
- Look daily for eggs under leaves starting in late spring and early summer until harvest.
- Watch for plant wilt.
- Adults and nymphs congregate on lower parts of the plant.



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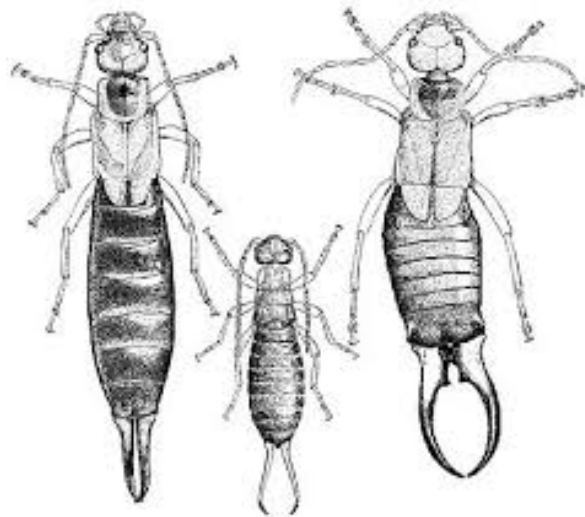


# Squash Bug Management

- Sanitation
- Grow Resistant Varieties
- Rotate Crops
- Timing of Planting
- Home-Made Traps
- Mechanical Destruction (Egg Removal)
- Traps Crops
- Natural Enemies
- Insecticides: pyrethrins, zeta-cypermethrin, permethrin

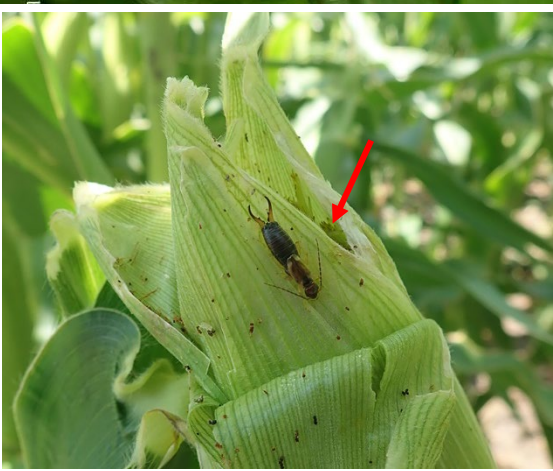
**Squash Bug Management Cards**  
Available at your local USU Extension County Office!





# Earwigs

- Adults are slender with a brown body, red-brown head
- Prominent pair of “pinchers” (cerci) on the rear of the body.
- omnivores, feeding on a diverse diet including plants, fungal spores, small invertebrates, and decaying organic matter.
- Populations tend to build to their highest densities in mid- to late summer.
- 2 or more generations per year. They overwinter as brooding pairs or above ground in aggregations.
- Adults like to hide in dark, tight, and moist places during the daytime and may seek shelter inside buildings.
- Eggs are laid in clusters of 30-40 within nests in the soil.





# Earwigs Management

- Place boards, corrugated cardboard, rolled-up or crumpled moistened newspaper, or bait containers (e.g. tuna can, yogurt container) with smelly oils (e.g. clam oil, bacon grease) in crop areas early spring and monitor weekly.
- Use traps to monitor and reduce numbers.
- Reduce or remove nesting and hiding places.



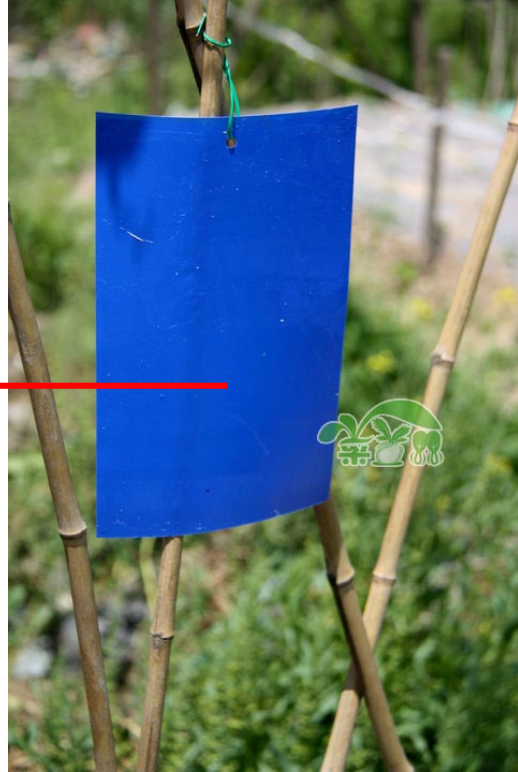
# Thrips

- Adults are minute with elongated yellow or yellow-brown bodies and two pairs fringed (hairy) wings.
- Thrips feeding on the surface of well-developed fruits can cause scarring. An abundance of dark tarspots of thrips frass can contaminate fruits.
- Thrips can vector tomato spotted wilt virus (TSWV) to tomatoes and other solanaceae crops.



# Thrips Management

- Monitor using blue or yellow sticky traps
- Plow under plant debris after harvest and remove volunteer host plants
- Inspect transplants for thrips infestations (using a 10x hand lens) and discard infested plants
- Use overhead sprinkler irrigation to wash thrips from plants
- Remove weeds near vegetable fields
- Application of insecticides may be needed



# Grasshoppers



Differential Grasshopper



Banded-Wing Grasshopper



Migratory Grasshopper



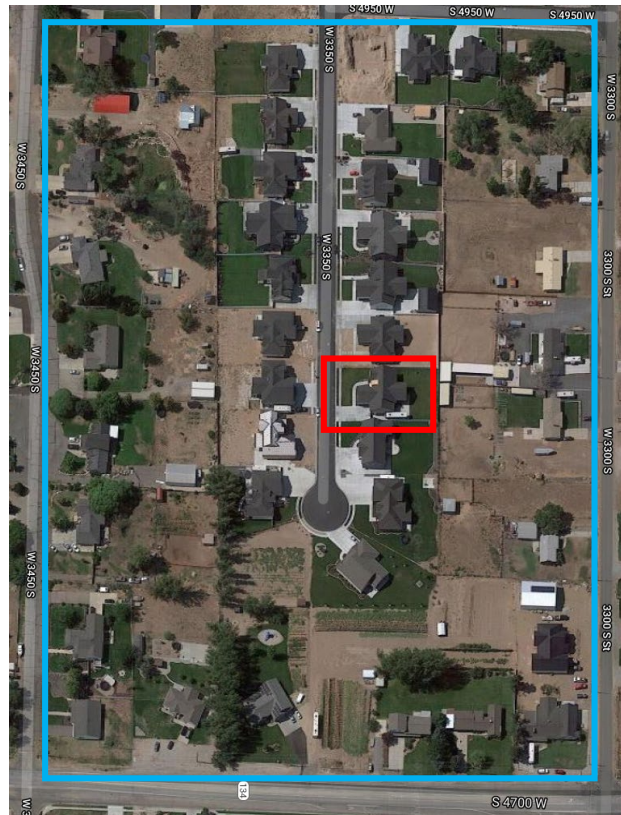
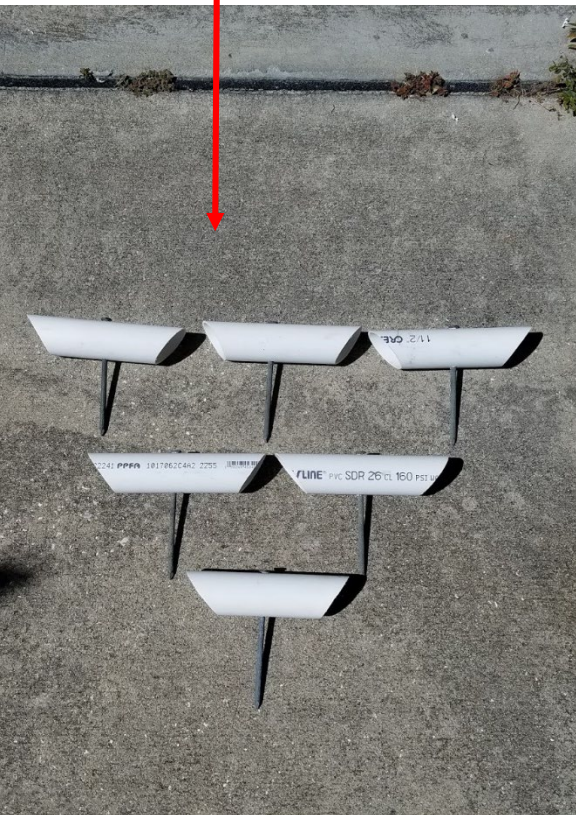
Red-Legged Grasshopper



- **Adults** and **nymphs** have a robust body, hind legs with enlarged femurs for long-distance jumping, and relatively short antennae.
- **Damage Symptoms:** Adults and nymphs feed with chewing mouthparts causing random, ragged holes in leaves, flowers, and sometimes immature pods and fruit.
- Damage occurs starting in early summer after rangeland weeds dry up and may continue all season.
- Eggs hatch from late May to early July.
- Look for nymphs from late May to early July to determine when eggs have hatched.

# Grasshopper Management

- Wide host range (vegetable, forage, ornamentals, etc.)
- Adults and nymphs have a robust body, hind legs with enlarged femurs for long-distance jumping, and relatively short antennae.
- **Damage Symptoms:** Adults and nymphs feed with chewing mouthparts causing random, ragged holes in leaves, flowers, and sometimes immature pods and fruit





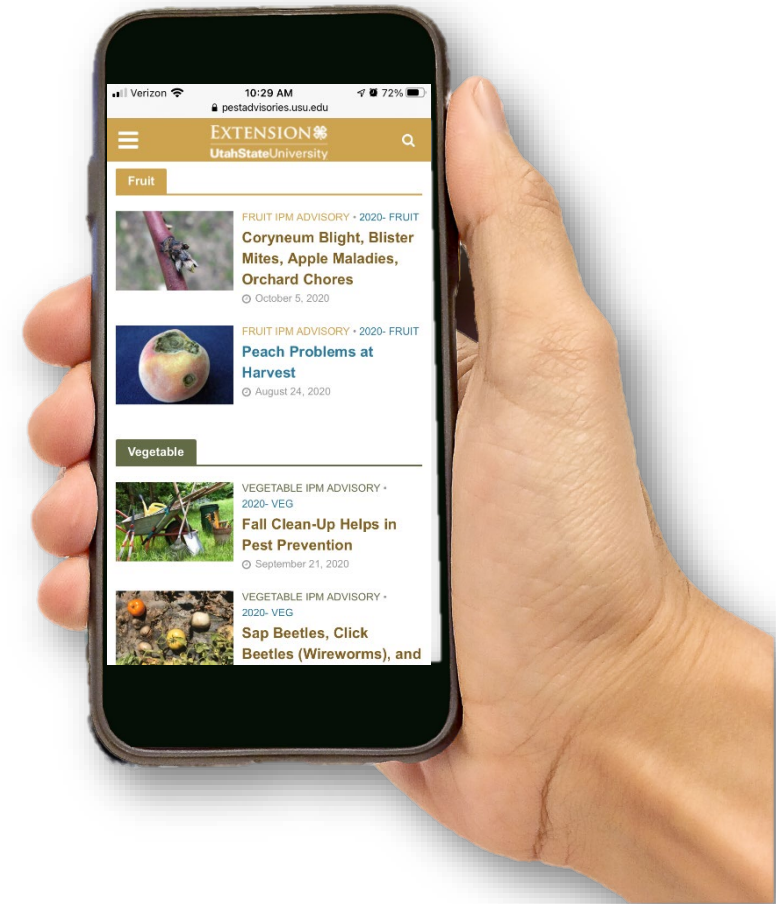
# extension.usu.edu/pests

- Utah Plant Pest Diagnostic Lab
- Educational How-To Videos
- Free Guide eBooks
- Informative Fact Sheets
- Recorded Webinar Presentations

The screenshot shows the homepage of the Utah Pests website. At the top, there is a dark blue header with the Utah State University logo and 'Utah Pests Extension'. Below the header is a navigation bar with links for 'Fact Sheets', 'Books & Guides', 'Utah Pests News', 'Videos & Presentations', and 'Programs', along with a 'SIGN UP' button. The main content area features a large image of a green wasp with the text 'Utah Pests' and a sub-headline 'Utah Pests helps to solve plant pest issues that concern Utah Citizens every day.' Below this is a 'Solve Pest Issues' button. A 'Programs' section follows, listing four programs with icons: 'Integrated Pest Management', 'School Integrated Pest Management', 'Utah Plant Pest Diagnostic Lab', and 'Cooperative Agricultural Pest Survey'. Below that is a 'Topics We Can Help With' section with two boxes: 'IPM Pest Advisories' (describing timely alerts for various crops) and 'Books and Pest Management Guides' (describing free printable books on pest management). On the right side, there is a vertical sidebar with the 'UTAH PESTS' logo and a 'Follow Us/Subscribe' section with social media icons for Facebook, Instagram, and Email.

# Utah Pest Advisories

- [pestadvisories.usu.edu](https://pestadvisories.usu.edu)
- Timely email alerts on insects and diseases to look out for.
  - Fruit Pest Advisories
  - Vegetables Pest Advisories
  - Turf Pest Advisories
  - Landscape Pest Advisories



# Contact

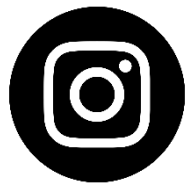
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