

# An IPM Scouting Guide for Common Problems of **Brambles in Kentucky**

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# An IPM Scouting Guide for Common Problems of Brambles in Kentucky

This manual is the result of efforts of the University of Kentucky Fruit Integrated Pest Management team.

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**Cover photo:** Bramble cane death and dieback  
(Daniel Becker, University of Kentucky)

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Long before the term “sustainable” became a household word, farmers were implementing sustainable practices in the form of Integrated Pest Management (IPM) strategies. IPM uses a combination of biological, cultural, physical, and chemical methods to reduce and/or manage pathogen and pest populations. These strategies are used to minimize environmental risks, economic costs, and health hazards. Pathogens and pests are managed (although rarely eliminated entirely) to reduce their negative impact on the crop.

Scouting and monitoring for diseases, insects, weeds, and abiotic disorders helps identify potential problems before serious losses result. This is essential to the IPM approach. The key to effective monitoring is accurate identification. The images included in this guide represent the more common abiotic and biotic problems that occur in Kentucky blackberry and raspberry plantings.

This manual is not all-inclusive, and growers may encounter problems not included here. Growers should contact a local Cooperative Extension Service office for further assistance. Additional information on pathogen and pest identification and management, as well as bramble production, can be found in the resources listed on page 31, available at county Extension offices or online.

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# Diseases

**1 Anthracnose** (*Elsinoe veneta*) is a prevalent fungal disease that is especially severe on canes of black raspberry, but it can also occur on other bramble hosts. Cane symptoms first develop on primocanes during spring. Spots are initially purple, enlarging to sunken ashy-gray lesions with purple borders; diseased tissue eventually cracks. The following year, infected canes are

stunted with reduced fruit production. Leaf spots, which are yellowish at first, become a distinct light gray with red-purple borders, similar to cane lesions; centers of spots eventually drop out (shot-hole). Leaf spots may resemble Septoria or Cercospora leaf spots. The fungus overwinters in infected canes; succulent, rapidly-growing plant parts become infected the following spring.

**Management** — Practice proper sanitation (remove floricanes after harvest; remove all diseased canes; destroy prunings or discard away from plantings). Increase air circulation to encourage drying of plant tissues (pruning, thinning, spacing, and managing weeds). Apply fungicides (especially dormant application). Consider planting tolerant cultivars.



Early season (a) and late season (b) appearance of anthracnose lesions; close-up of older lesions on canes (c); and symptoms on fruit (d).

**2 Cane and leaf rust** (*Kuehneola uredinis*) is a fungal disease of blackberry. Raspberry infections are rare. Symptoms resemble orange rust, but unlike orange rust, cane and leaf rust is not systemic; instead, infections are restricted to plant surfaces. Symptoms begin in mid-April and extend through summer. In spring, floricanes split and release yellow spores. These spores infect floricane leaves, and yellow pustules persist on undersides of leaves from harvest through autumn, infecting other leaves throughout the growing season when conditions are rainy. Defoliation can occur if infections are severe. A different spore type can infect primocanes and leaves. Overwintering occurs in infected canes.

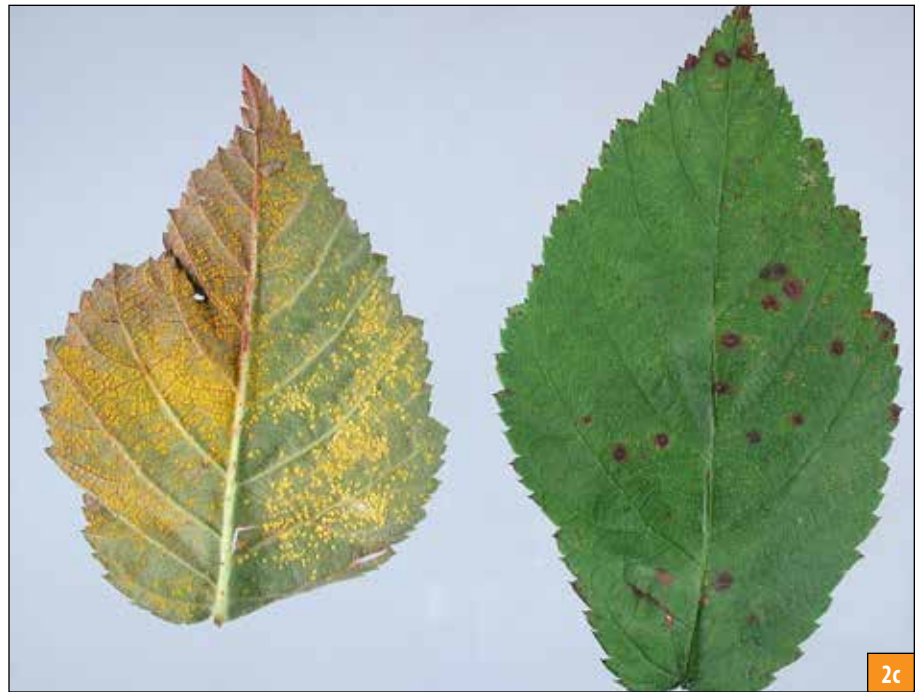
**Management** — Practice proper sanitation (remove floricanes after harvest; remove all diseased canes; destroy prunings or discard away from plantings). Increase air circulation to encourage drying of plant tissues (pruning, thinning, spacing, and managing weeds). Apply fungicides to protect healthy plants.



2a



2b



2c



2d

Cane and leaf rust on blackberry cane (note orange-colored rust pustules) (a); close-up of pustules on a cane. Rust pustules on lower (left) and upper (right) leaf surfaces (c); and on fruit (d).

**3 Cane blight** (*Leptosphaeria coniothyrium*) is a widespread fungal disease of raspberry, occasionally occurring on blackberry. Dark-colored cankers develop on primocanes near the end of the growing season. Cankers enlarge, spread downward, and girdle canes; lateral shoots eventually die, most noticeably between flowering and fruit ripening. Fungal fruiting bodies are often visible as black specks in centers of cankers. During the second year, infected canes and branches near cankers may suddenly wilt and die. Cankers cause cane cracking and breakage. The fungus overwinters in infected and dead canes. Primocanes that are wounded from cracks, pruning cuts, or insect punctures are susceptible to infection in spring.

**Management** — Practice proper sanitation (remove floricanes after harvest; remove all diseased canes; destroy prunings or discard away from plantings). Increase air circulation to encourage drying of plant tissues (pruning, thinning, spacing, and managing weeds). Avoid unnecessary wounding by mechanical injury or damage by insects; pruning cuts should be sharp and clean. Apply fungicides (including dormant application).



Cane blight lesion (a); close-up of lesion with fungal fruiting bodies evident as black specks (b); and resulting dieback (c).

**4 Cercospora leaf spot** (*Mycosphaerella confusa*) is a frequently occurring fungal disease that infects both blackberry and raspberry. The disease begins as circular, reddish-purple spots on leaf surfaces, later becoming irregular or angular. Centers of spots turn white to gray, while margins remain purple. Spots may drop out, leaving a jagged or shothole appearance to leaves. Leaf spots may resemble anthracnose. In severe infections, leaves can turn yellow and drop. The fungus overwinters in fallen leaves and potentially in other host plants. Young, expanding leaves are susceptible to infections in spring. Secondary infections can occur throughout the growing season if conditions are rainy.

**Management** — Increase air circulation to encourage drying of plant tissues (pruning, thinning, spacing). Manage weeds through herbicide applications, mowing, or soil cultivation. Apply fungicides.



Cercospora leaf spot on blackberry leaves (a); close-up of spotting (b); and fungal reproductive structures as viewed under magnification (c)

**5 Crown gall** (*Agrobacterium tumefaciens* and *Agrobacterium rubi*) is a bacterial disease that affects a wide range of plant hosts, including brambles. Galls girdle canes, causing stunting, low vigor, poor fruit set, and cane dieback. Severe infections lead to plant death. Lumpy round galls develop in late spring and expand throughout the season, turning brown to black. Galls are formed as bacteria enter canes and roots through wounds (pruning cuts, insect punctures, freeze damage). Most severe symptoms occur on plants that are infected when young.

**Management** — Begin with disease-free stock plants. Avoid wounding. Rotate crops if site has a history of disease. Consider planting resistant or tolerant cultivars.

**6 Double blossom** (*Cercospora rubi*), also known as **rosette**, is a common fungal disease of blackberry. It may occur on raspberry, but disease is seldom severe. Emerging shoots appear smaller than normal and stunted, and leaves turn pale to bronze. Witches' broom symptoms develop, and more than one broom can occur on a single cane. Flower buds expand to larger-than-normal and are misshapen; sepals turn into leaves. Fungal spore masses can be visible on flowers; fruit does not develop. The fungus overwinters in infected primocane buds, and symptoms develop the next spring.

**Management** — Consider planting resistant cultivars. Rogue (completely remove) infected plants. Practice bi-annual cropping. Fungicides are not effective.



Crown gall on crown of blackberry



Double blossom affecting leaf and flower development on floricanes (a); affecting blooms (b); witch's broom symptom (c); and sterile blossoms (d).

### 7 Late leaf rust (*Pucciniastrum americanum*)

is a fungal disease that can become serious on some cultivars of red raspberry, especially those with wild-type parentage. Premature defoliation and fruit infections reduce yields. Rust symptoms begin in July as chlorotic or yellow spots on upper sides of mature leaves. Yellow-orange, powdery rust spores form on leaves (undersides), canes, petioles, and fruit. By late summer, severe infections result in leaf spots turning brown and eventual leaf drop. Two different fungal life cycles are possible. Most commonly, fungal spores overwinter in infected canes, and spores are released in spring or throughout the growing season when conditions are rainy. An alternate host, white spruce, can play a role in the disease cycle. Spruce (if present) are infected in autumn and spores are released in spring to infect raspberry tissue.

**Management** — Increase air circulation to encourage drying of plant tissues (pruning, thinning, spacing, and managing weeds). Consider planting resistant cultivars. Apply fungicides.

**8 Orange rust (*Gymnoconia nitens*)** resembles other rust fungi, infecting leaves, buds, and shoots of blackberry and black raspberry. Red



Late leaf rust pustules on undersides of leaves (a) and on raspberry fruit (b).

raspberry is not susceptible. Orange rust is systemic; infection spreads internally to all plant parts. Once a plant is infected, it remains infected for life. Plants become stunted, misshapen, and weakened; little to no fruit is produced. Symptoms become apparent as new growth emerges in spring. By late April and through May, blister-like rust pustules are visible on lower leaf surfaces. Pustules are waxy and erupt with orange, rusty, powdery spores. By June, leaves wither and drop. Rust spores infect leaves, buds, and shoots. Overwintering occurs

as systemic infections in crowns and bases of shoots.

**Management** — Begin with disease-free stock. Avoid proximity to wild bramble populations or old plantings. Consider planting immune species or tolerant cultivars. Increase air circulation to encourage drying of plant tissues (pruning, thinning, spacing, and managing weeds). Rogue (completely remove) and destroy symptomatic plants, including roots. Apply fungicides as protectants.



Orange rust (right) infected shoot compared to healthy (left) (a) and pustules on the undersides of blackberry leaves (b).



### 9 *Phytophthora* root rot and crown rot

(*Phytophthora* spp.) is a water mold disease that affects roots and crowns of raspberry, especially red raspberry. The first visible symptoms include wilt of both primocanes and floricanes soon after spring leaf emergence. In less severe situations, slow symptom development occurs with gradual chlorosis, wilting, and dieback during summer. Affected floricanes produce weak lateral shoots that may scorch along leaf margins and between veins. Water-soaked lesions are often visible at bases of affected plants. Scraping off the epidermis (bark) reveals characteristic red discoloration and necrotic (dead) cortical (inner) tissue. Necrosis sometimes expands into crowns. This pathogen favors soils with high moisture content, especially where soil is clay, poorly drained, or rain/irrigation keeps soil saturated for extended periods. Symptoms first appear on plants in low-lying areas and then expand upward or outward. High soil moisture accelerates pathogen reproduction and

rate of infection. Some *Phytophthora* species have broad host ranges and may be present in soils prior to raspberry planting. Other species have more restricted host ranges and are likely introduced into planting sites via infected plant material. Once *Phytophthora* is established in soils, it persists for many years after host plants are removed.

**Management** — Select a growing site with good soil drainage and plant onto raised beds. Begin with disease-free stock plants. Consider selecting resistant cultivars. Rotate with non-susceptible crops, if needed. Apply fungicides to suppress disease if site has a history of disease.

**10 Raspberry leaf spot** (*Sphaerulina rubi*), also known as **Sphaerulina leaf spot**, is a fungal disease that frequently affects raspberry. Symptoms include leaf spots that can lead to defoliation. Spots are small, circular to angular, and develop on surfaces of new leaves. Spots remain small, turn gray to white with age, and

centers drop out to cause a shot-hole effect. Cane lesions look similar to the leaf spots; they develop on bases of young canes. The fungus overwinters in fallen leaves or in cankers. Young, expanding leaves and canes are susceptible to spring infections. This disease is easily confused with Septoria leaf spot, which is specific to blackberry.

**Management** — Increase air circulation to encourage drying of plant tissues (pruning, thinning, spacing, and managing weeds). Practice proper sanitation (remove floricanes after harvest, remove all diseased canes). Apply fungicides.



Phytophthora root and crown rot symptomatic plants (a); infected roots with characteristic red discoloration (c).

Sphaerulina leaf spot (a) and close-up of angular spotting (b).

**11 Septoria leaf spot** (*Sphaerulina westendorpii*, formerly *Septoria rubi*) is a fungal disease of blackberry and black raspberry. Leaf spots are small, circular, and have whitish gray centers with purple borders; fruiting bodies are visible in centers of spots. Leaf spots often resemble anthracnose. Defoliation can occur if disease becomes severe. Canes and petioles develop lesions that resemble the leaf spots. The fungus overwinters in leaf debris or in infected canes. In spring, young, expanding leaves become infected. Secondary infections can occur throughout the growing season if conditions are rainy.

**Management** — Increase air circulation to encourage drying of plant tissues (pruning, thinning, spacing, and managing weeds). Apply fungicides.

**12 Spur blight** (*Didymella applanata*) is a widespread fungal disease of raspberry, especially red raspberry. Cankers develop on canes just below leaf buds, usually near lower portions of stems. Purple cankers expand downward to cover the entire section between leaves. As cankers mature, bark inside cankers split lengthwise, and fruiting bodies can be visible as black specks inside canker centers. The following year, cankers continue to expand. As a result, emerging lateral shoots are weak, fruit production is reduced, and canes wilt. Leaves can become infected; brown wedge-shaped lesions develop. Infected leaves fall while petioles remain intact. The fungus overwinters in infected canes, and spores infect new growth in spring. Secondary infections occur during summer if weather is rainy.

**Management** — Practice proper sanitation (remove floricanes after harvest; remove all diseased canes; discard or destroy prunings away from plantings). Consider planting resistant cultivars. Increase air circulation to encourage drying of plant tissues (pruning, thinning, spacing, and managing weeds). Apply fungicides (especially dormant applications).



Septoria leaf spot early (a) and advanced (b) symptoms.



Early appearance of spur blight lesion on a cane (a); characteristics of an older lesion (b) and resulting splits in bark (circled) (c).



**13 Virus diseases** are caused by a wide range of viruses and virus-like pathogens. Most are transmitted by grafting and vegetative propagation. Further transmission can occur by insect or nematode vectors. Virus symptoms vary according to causal agent, but may include mottling, mosaic blotches, ringspot, chlorosis and yellowing, leaf curl, leaf blister, distortion, dwarfing or stunting, and/or reduced fruit yield. Some virus symptoms can resemble herbicide damage. Susceptibility may vary by bramble species or cultivar. Viruses are systemic, and once a plant is infected, it remains infected for life. **Management** — Begin with disease-free, indexed stock. Consider planting tolerant cultivars. Rogue (completely remove) and destroy symptomatic plants. Manage weeds and potential vector hosts. Avoid planting in proximity to older plantings or wild brambles.



Impatiens necrotic spot virus on blackberry foliage (a) and on fruit (b). Blackberry ringspot virus (c).

# Insects and Other Arthropod Pests

**14 Blackberry psyllid** (*Trioza tripunctata*) is a tiny 1/12- to 1/8-inch long insect and feeds with piercing-sucking mouthparts. Feeding causes distorted, compact growth. Nymphs also contribute to leaf distortion and feed inside curled leaves. Blackberry psyllid overwinters on nearby coniferous trees and migrates to brambles in May.

**Management** — Avoid planting brambles within 250 yards of conifer plantings. Apply insecticide when psyllids are present.

**15 Green June beetle** (*Cotinis nitida*) adults are about 1 inch long with dull, metallic green wings and bronze to yellow margins on their head and sides; their undersides are shiny green. Larvae are cream-colored, up to 2 inches long, and crescent-shaped. Larvae crawl on their backs and project legs upward when moving. Berries are susceptible to adult beetle feeding as fruit turn color and soften, leading to damage during the harvest period. Green June beetle only feeds on fruit; it does not consume foliage.

**Management** — In backyard and other small plantings, use netting with a mesh size of 1/4 inch or smaller to exclude beetles. For commercial plantings, apply insecticides, as needed, during harvest.



Blackberry psyllid damage to raspberry.



Green June beetle larva (a) and adult (b).



16a



16b

Japanese beetle adults (a) and larva (grub) (b).

**16 Japanese beetle** (*Popillia japonica*) adults are  $\frac{3}{8}$ -inch long metallic green beetles with copper-brown wing covers. Five small white tufts of hairs project from underneath wing covers at the tip of the abdomen. Mature larvae, which feed on roots of grasses, are crescent-shaped grubs about 1 inch long with a brown head and grayish-black end. Hairs on the last body segment (raster) form a V-shape pattern near the anal opening. Beetles act primarily as defoliators, but may also feed on fruit as it begins to color. Feeding on leaf tissue between large veins results in skeletonized leaves near tips of canes.

**Management** — Regularly monitor for Japanese beetle activity from mid-June through August. Control of grubs is ineffective in managing adult numbers. Do not use Japanese beetle traps near brambles. Manage adults with insecticides.

**17 Raspberry cane borer** (*Oberea perspicillata*) is a slender, long-horned (long antennae) beetle measuring about a  $\frac{1}{2}$ -inch long. It is black in color; thorax is yellow-orange with two black dots. Antennae are long, which helps distinguish it from the redneck cane borer. Boring activity can result in wilting cane tips, dieback, and cane death. Damage is readily identified by the presence of two rings of punctures (oviposition rings) about  $\frac{1}{2}$  inch apart and located 4 to 6 inches below growing tips. After puncturing rings in canes, the female lays an egg between these rings. The raspberry cane borer emerges in June. Eggs hatch in July, and larvae begin burrowing towards the base of canes.

**Management** — Examine plantings weekly during June and July for wilted cane tips or rings of punctures near cane tips. Prune infested canes below damage.



17a

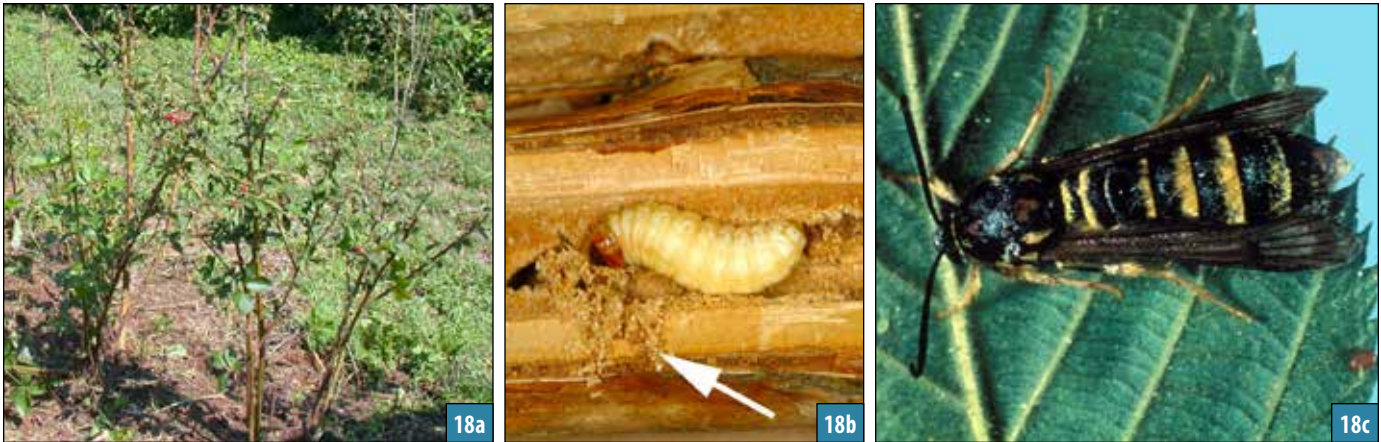


17b



17c

Raspberry cane borer oviposition rings cause damage to canes (a) and result in wilting cane tips (b); adult raspberry cane borer (c).



Weakened canes with poor growth due to raspberry crown borer (a); larva boring into a cane (note frass at arrow) (b); and adult raspberry cane borer (notice its resemblance to a yellowjacket wasp) (c).

**18 Raspberry crown borer** (*Pennisetia marginata*) adults are clearwing moths that resemble yellowjacket wasps; except that raspberry crown borer moths are hairy (wasps do not have hairs). Eggs are laid singly on undersides of leaves in mid- to late summer and hatch 1 to 2 months later. Larvae are white with dark, reddish heads, and reach 1¼ inches long when mature. Emerging larvae crawl down canes to just under the soil line where they tunnel into stems to overwinter; blister-like areas develop at these sites. Damaged roots and crowns result in weak spindly growth,

reduced leaf size, and premature death of canes. Indications of borer activity include sawdust-like frass (insect fecal matter) and/or swelling at the base of infested canes or tunnels in the canes (often noticed while pruning). Crown borer has a 2-year life cycle in Kentucky.

**Management** — Remove wild brambles from the surrounding area. Prune and destroy infested canes. Apply insecticides in September.

**19 Rednecked cane borer** (*Agrilus ruficollis*) is a metallic wood-boring beetle that is active in May and June. Adult rednecked cane borer are ¼ inch long, all black except for a coppery red to

golden-colored thorax (neck). It looks similar to the raspberry cane borer; rednecked cane borer has short antennae while the raspberry cane borer has prominent, long antennae. Adults feed on upper leaf surfaces, leaving irregular holes. Females lay eggs on primocanes, and larvae bore into canes, forming irregular swellings or galls. Galls are between 1 to 3 inches in length and often split the bark.

**Management** — Scout for galls during dormant period; remove and burn galled canes. Eliminate wild brambles in surrounding areas. Apply insecticides after bloom, as needed.



Galls caused by rednecked cane borer (a) and adult borer (b).

**20 Spotted wing drosophila** (*Drosophila suzukii*) infests berries with legless, white,  $\frac{1}{8}$ -inch long larvae. Adults are  $\frac{1}{10}$  inch long and yellowish orange with red eyes and clear wings. Adult males have a single dark spot near the tips of each wing and two small but distinct dark bands on each front leg. Spots on the wings may not be apparent on newly emerged males. Females have distinct serrated ovipositors, which are used to insert tiny white eggs underneath intact skins of fruit. Females also have unbroken banding on the abdomen. Two filamentous breathing tubes can be visible in fruit drupelets when larvae are present/developing. Berries are subject to attack as they begin to turn color.

**Management** — Collect overripe, damaged, or rotting fruit in clear bags; leave bags in the sun to kill larvae. Refrigerate harvested berries immediately. In small plantings, use fine screening (less than 1 mm opening) to exclude egg-laying females. Trap for adults beginning 10 days before harvest. Treat crop weekly with insecticides if any adults are detected in traps.



Spotted wing drosophila eggs under the skin of fruit (notice the two visible breathing tubes) (a); larvae (b); and adult (c).



**21 Stink bugs** (*Halyomorpha halys*, *Euschistus* spp., *Chinavia hilare*) are  $\frac{1}{2}$  inch to  $\frac{3}{4}$  inch long and shield-shaped. Several species attack brambles, including brown marmorated stink bug, brown stink bug, one-spotted stink bug, and green stink bug. Nymphs may feed on foliage; adults feed on fruit. Fruit damage results in poor drupelet development and deformed fruit.

**Management** — Monitor activity with pheromone-baited black pyramid traps. Apply insecticides if damage is observed and stink bugs are present.



Brown stink bug on blackberry fruit (a); brown marmorated stink bug nymphs (b); and green stink bug nymph (c).



**22 Two-spotted spider mite** (*Tetranychus urtica*) adults are less than 1/32-inch long (the size of a grain of salt) and can vary from light green to straw-colored. A distinctive dark spot is present on each side of the body. Eggs are clear and spherical. Mites and their eggs are found on undersides of leaves. Spider mites feed with piercing-sucking mouthparts and cause stippling (tiny light-colored spots) on leaves. Feeding damage can reduce plant health and fruit yields. Webbing between plant structures may be noticeable when populations are high.

**Management** — Monitor for mite damage. Use miticides as needed.



Spider mite stippling damage to foliage (a); mites (center, with visible legs) and eggs (round, no legs, at arrows) (b).



# Weeds

**23 Barnyardgrass** (*Echinochloa crus-galli*) is a clump-forming summer annual commonly found on fertile, damp soil. Leaves are 1 to 2 inches wide and 4 to 8 inches long. A distinct vein in centers of leaf blades is characteristic. Plants are shallow-rooted, but roots can develop at the nodes when they contact the soil. Plants are susceptible to frost.

**Management** — Cultivate beds when plants are young. Apply a grass-specific post-emergent herbicide (graminicide).

**24 Bermudagrass** (*Cynodon dactylon*) is a drought-tolerant, warm season, perennial grass that spreads vegetatively by both rhizomes and by stolons. It can also spread by seed. Spikelets on seed heads (typically 3 to 6) are similar to crabgrass and are present from mid-summer through autumn. While extremely vigorous, Bermudagrass growth is favored by warm weather, so it does not become a problem until later in the season.

**Management** — Avoid cultivation, which spreads rhizomes and stolons. Chemical control is recommended and must be repeated, as plants readily regrow from rhizomes and stolons.

**25 Canada thistle** (*Cirsium arvense*) is a difficult-to-manage perennial that spreads by seeds and rhizomes. Leaves are deeply lobed with spines; leaf margins and bases surround stems making stems look spiny as well. Flower heads are usually purple to pink. Root systems may extend more than 10 feet deep.

**Management** — Avoid cultivation, which spreads rhizomes. Cut or mow plants to help reduce root reserves and starve plants. Apply spot applications of herbicides when shoots are at least 10 inches tall and before flowers open (when plants are most susceptible to herbicides).



Barnyardgrass growth habit (a) and reproductive head (b).



Bermudagrass foliage (a) and stolon (b).



Canada thistle seedling (a); foliage (b); and flowers (c).



26a



26b

Dandelion foliage (a); flowers and seedhead (b).

**26 Dandelion** (*Taraxacum officinale*) is a common, yellow-flowered perennial weed that grows as a rosette from a deep taproot. Oval leaves have wavy margins.

**Management** — Dig up individual plants; new shoots can grow from dormant buds on

root pieces remaining in the ground. Apply herbicides as spot applications.

**27 Goosegrass** (*Eleusine indica*) is a summer annual that grows in a flat rosette; centers appear white. Plants with fibrous root systems are typically found in dry, compacted soils.

Plants are frost-sensitive. Seed will not germinate until soil temperatures are above 65°F.

**Management** — Cultivate when plants are young. Apply a grass-specific post-emergent herbicide (graminicide).



27a



27b

Goosegrass growth habit (a) and flowers (b).



Johnsongrass growth habit (a) and flower heads (b)

**28 Johnsongrass** (*Sorghum halepense*) is an aggressive perennial that is common in agronomic fields, along roadways and waterways, and in low lying areas that are prone to flooding. Mature leaf blades are 5 to 20 inches long with obvious white ribs down the centers. Plants reproduce by seed and by perennial rhizomes, making control difficult. Rhizomes are stout compared to other grasses and can develop in as little as one month from seed germination  
**Management** — Apply pre-emergent herbicides to help prevent or reduce seedling establishment. Post-emergent herbicides selective for grasses can be applied when plants are seedlings, but these are less effective once rhizomes have formed. Avoid cultivation, which spreads plants.



**29 Lambsquarters** (*Chenopodium album*) is a rapidly-growing summer annual that can reach 6 feet in height. Erect stems branch freely and are often reddish or striped with pink, purple, or yellow. It is adaptable to most environmental conditions.

**Management** — Mulch. Apply pre-emergent herbicides to prevent seed germination. Shallow till once plants emerge. Apply post-emergent herbicides.



Lambsquarter seedling (a); growth habit (b) and close-up of foliage (c).





Marestalk growth habit top view (a) and side view of growth habit (b); and flowers (c).

**30 Marestalk or horseweed** (*Conyza canadensis*) is a biennial broadleaf that can reach heights of 3 to 6 feet. Seeds germinate throughout spring and early summer; plants mature and set seed the same year. Late-season plants overwinter in the rosette stage. One plant may release 20,000 seeds; seeds disperse by wind.

**Management** — Shallow cultivation. Apply pre-emergent herbicides to prevent seed germination. Burn-down herbicides during seedling or rosette stages destroy young plants. Glyphosate-resistant marestalk is becoming more common. Herbicide-resistant populations should be confirmed by a county Extension agent or the Weed Science Society of America.

**31 Morning glories** (*Ipomoea* spp.) are common vines; most Kentucky species are annuals. Vines can readily smother desired plants and interfere with pesticide applications and harvest. Seed can remain dormant for decades.

**Management** — Physical removal of seedlings using hoes or string trimmers is effective if plants are cut below the cotyledons. Most herbicides are only moderately effective; spot applications of burndown herbicides may be effective.



Morning glory flower variations (a & b).



Pigweed growth habit.



Poison ivy.

**32 Pigweeds** (*Amaranthus* spp.) are native annual plants that are associated with sites where the soil has been disturbed. Leaves are simple and oval- to lance-shaped with an alternate leaf arrangement. Pigweeds germinate readily from late spring through early autumn, produce numerous seeds, and grow quickly. Seeds of weedy species are small and black. Plants have a primary taproot.

**Management** — Cultivate when weeds are less than 4 inches tall; cultivation is not effective with larger plants. Apply pre-emergent herbicides and spot spray with post-emergent herbicides. Some pigweed populations have herbicide resistance. Herbicide resistant populations should be confirmed by a county Extension agent or the Weed Science Society of America.

**33 Poison ivy** (*Toxicodendron radicans*) is a climbing or straggling perennial vine with three leaflets per leaf and alternate leaf arrangement. Leaves are often shiny when young. All plant parts contain an oil that can lead to a severe rash for hours to a few days after contact.

**Management** — Apply glyphosate to leaves in late summer to early autumn. A tank mix with a surfactant or ammonium sulfate may increase performance.



Pokeweed growth habit (a) and fruit (b).

**34 Pokeweed** (*Phytolacca americana*) is a broad-leaved perennial weed distinguished by its red stem. Purple-black berries reach over ¼-inch diameter. It is a favorite among birds, which readily spread the seed after eating the berries. Pokeweed can grow to over 10 feet tall.

**Management** — Mechanically remove or cut plants at the seedling stage. Older plants require herbicide applications (apply glyphosate to cut stems).



Quackgrass growth habit (a) and close-up of auricle (b).

**35 Quackgrass** (*Agropyron repens*) is a perennial grass that spreads by seeds and rhizomes. Seed heads are 2- to 7-inch long spikes. Leaves are 4 to 8 inches long and about  $\frac{3}{4}$  inch wide. Narrow projections (auricles) from leaf blades encircle stems. Quackgrass tolerates mowing and usually remains green even when dormant.

**Management** — Avoid cultivation, which spreads rhizomes. Chemical control is difficult because rhizome buds may remain dormant, therefore, unaffected by systemic herbicides. Repeat applications are often necessary.

**36 Ragweed** (*Ambrosia artemisiifolia*) is a broad-leaved, branched annual weed with compound leaves (divided into leaflets on a single leaf). Leaves are arranged alternately in plant tops, but lower leaves have an opposite arrangement.

**Management** — Early control is important. Shallow cultivation early in the season. Apply pre-emergent herbicides.



Ragweed growth habit (a) and plant in bloom (b).

**37 Virginia creeper** (*Parthenocissus quinquefolia*) is a deciduous, perennial woody vine with five leaflets per leaf and dark blue berries. It can entwine to cover bramble plantings, interfering with harvest and horticultural tasks.

**Management** — Cut stems and coat stubs with glyphosate.

**38 Wild brambles** (*Rubus* spp.) are perennial natives to Kentucky and easily spread to managed plantings by wildlife that feed on the fruit. Because of visual similarities between cultivated and wild brambles, it can be difficult to distinguish between them. It is important to control these native invaders because they will

not have the characteristics that the grower is looking for and can harbor disease pathogens, such as viruses.

**Management** — Cut stems and follow with an application of glyphosate when plants are young and before they form root grafts with the planted brambles.

**39 Woody plants** (various) can grow within bramble plantings, complicating production and interfering with growth. Birds resting on trellises or canes tend to defecate seeds of unwanted woody species (e.g., mulberry or hackberry) into bramble plantings.

**Management** — Cut stems of unwanted plants and coat stubs with glyphosate.

**40 Yellow foxtail** (*Setaria pumila*, previously *S. glauca*) is a summer annual that is easily recognized by its yellow-tan bristly seedheads.

These yellow seedheads distinguish it from green foxtail and giant foxtail; the latter have green seedheads. Yellow foxtail is tolerant of a wide range of soil conditions. A prolific seed producer, it can be difficult to control if allowed to set seed. Populations of this species resistant to ALS-herbicides and photosystem II-inhibitors have been reported in the United States.

**Management** — Mow before seed set. Cultivation is difficult because of the extensive, fibrous root system. Apply pre-emergent herbicides or herbicides selective for grasses.



Virginia creeper vegetative growth (a) and fruit (b).



Wild thorny brambles (lighter-colored leaves) growing in a planting of cultivated thornless blackberries (darker leaves).



Hackberry growing within a bramble planting.



Yellow foxtail with seedheads.

# Wildlife

**41 Birds**, including wild turkeys, eat fruit as they ripen. Depending upon which birds are present, damage may range from pecking injury to absence of fruit. Birds usually visit plantings during daytime hours, so identifying species may be possible. Bird species can often be identified by watching the crop for short intervals, but presence of tracks and scat may be the only identifiers for some species. Proper identification will determine management strategies.

**Management** — Use netting over plants to help limit bird access and feeding. For smaller bird species, fake snakes, balloons, auditory distress tapes, and propane cannons may be successful at limiting damage or protecting crops during the harvest period. Larger species (e.g., turkeys) may require propane cannons or auditory distress tapes. Use multiple deterrents in combination or back-to-back to improve success rate.

**42 Black bear** damage occurs when fruit is ripe or near-ripe. Bears eat fruit directly off plants; they are likely to break canes or crush plant parts during feeding activity. Black bears are large animals and capable climbers. Look for tracks or scat around plants or large numbers of broken/damaged plants close together.

**Management** — Protect blackberries using electric fencing with at least 8,000 volts. Use propane cannons, activated when fruit is almost ripe, to deter bears from the area during period of harvest.



41a



41b



41c

Typical bird damage to bramble fruit (a); wild turkey (b) and turkey tracks (c).



42a



42b

Black bear 9 (a) and tracks (b).



**43 Rabbits** and **groundhogs** can cause damage to plants year round. Rabbits, in particular, feed on plants when food is scarce (winter or early spring). Rabbits and groundhogs feed on ripe berries by removing the entire fruit from plants. They may also cause damage

to roots by making burrows (softball- to basketball-sized holes) in the ground within bramble patches. Look for freshly exposed soil from burrows, tracks, scat, or plants damaged by chewing (clean cut close to the ground).

**Management** — Trap or shoot. Use large cage traps placed near burrows or under plants and baited with apples or eared corn. Install metal fencing to deter rabbits in small scale production settings. Fencing is ineffective for groundhogs since they are capable of climbing.



43a



43b



43c

Rabbit damage to bramble canes (circled) (a) and eastern cottontail rabbit (b); groundhog (c).

**44 Raccoons, skunks, and opossums** cause damage when berries begin to ripen. These pests either eat fruit directly off plants and rip fruit from plants, resulting in missing berries and torn plants. Look for tracks or scat in or around plants to identify species. Because they are nocturnal, these animals generally cause damage at night.

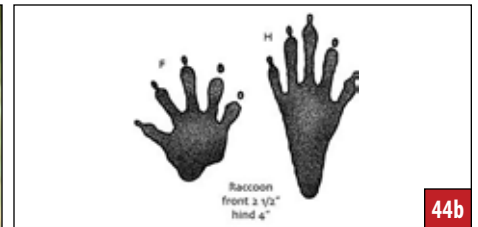
**Management** — Install metal fencing in small-scale operations to reduce opossum and skunk damage; metal fencing is not effective for raccoons. Electric fencing is effective for these animals when a live wire is kept at nose level (about 4 to 6 inches off the ground). Trapping or shooting individuals is also effective. Set cage traps baited with tuna fish or cat food.

**45 Voles and mice** are small rodents that consume fruit directly. They can also cause damage by chewing on stems; voles chew on root systems during winter. Complete girdling of stems and roots is possible, especially during harsh winters. Look for golf ball-sized tunnels or the actual runway paths used by the animals.

**Management** — Place snap traps at openings of vole tunnels or around bases of plants (small production systems); use zinc phosphide bait during late autumn to reduce overwinter populations and risks of winter plant damage (larger systems).



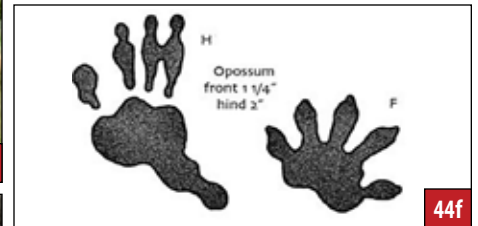
44a



44b



44d



44f



44c



44e

Raccoons (a) and tracks (b); striped skunk (c) and tracks (d); opossum (e) and tracks (f).

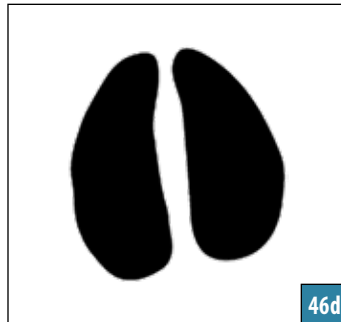


45a



45b

Vole (a) and vole tunnel entrance (b).



**46 White-tailed deer** and **elk** consume shoots and fruit, depending on the time of year. During winter, deer and elk clip ends of canes, leaving behind distinctive teeth marks. During spring and summer, deer and elk feed on new plant growth, including leaves. They also consume fruit when they ripen.

**Management** — Protect plants using 8-foot high metal fencing for deer and elk; where elk are not present, a plastic 8-foot fencing will keep deer from plants. Off-set electric fence designs are also effective at preventing access to plantings. Reduce the overall deer population on the property through hunting.

White-tailed deer (a) and tracks (b); elk (c) and tracks (d).

# Abiotic Disorders

**47 Double Berry** occurs primarily on primocane fruiting blackberry cultivars and is associated with high temperatures before or during flowering. This disorder is not common in Kentucky.

**Management** — Avoid susceptible varieties such as Prime-Ark® 45 and Prime-Ark® Freedom. Prime-Ark® Traveler is tolerant.

**48 Excessive nitrogen** applications or high levels of soil organic matter leads to extensive cane growth and susceptibility to winter injury. This also increases need for frequent pruning and training requirements.

**Management** — Monitor cane growth and submit soil samples for testing. Apply nitrogen fertilizer in spring only. Nitrogen levels need to be lower in autumn in preparation for winter hardiness development.

**49 Glyphosate (e.g. Roundup) injury** symptoms may be visible the same season following a spring application or the next spring following a late summer application. Developing leaves become curled along their margins and may have a reddish tint. Foliage may also appear chlorotic (yellowed) and distorted. Brambles are much more susceptible to injury when drift or

herbicide contact occurs after mid-July because glyphosate moves down to the roots in autumn and is translocated up to new growth in spring. Glyphosate slows or inhibits winter hardiness development, making plants more susceptible to winter injury. Thus, a late summer application of glyphosate may result in failure of plants to regrow in spring.

**Management** — Avoid contact with bramble leaves or canes. Minimize drift (shield sprayers or low pressure spray and applying only on calm days). If a cane is inadvertently sprayed, prune the cane to prevent herbicide from being translocated to other portions of the plant.



47

Double berry.



48

Extensive cane growth due to excessive nitrogen use.



49a

Glyphosate injury following an early season application (a); failure of blackberry canes to regrow following a late-season glyphosate application (b).



49b



Red cell regression evident in harvested berries.



**50 Red cell regression** is a post-harvest condition that occurs when blackberry fruit drupelets turn red in storage. It can result when berries are harvested in hot weather and then are rapidly cooled. There is no loss in sugar content or quality with this disorder, but discoloration may affect fresh market sales.

**Management** — Harvest early in the morning while fruit are still cool. Keep berries shaded while harvesting. Cool berries to room temperature before moving into a cooler. Consider planting resistant or tolerant cultivars.

**51 Sunscald** or **sunburn** injury to fruit is often associated with high temperatures (above 90°F) and intense sunlight. It often occurs when humid, cloudy days are followed by hot sunny conditions. Drupelets of affected berries become bleached or tan, and they may be shriveled. Damage is typically found on berries exposed to direct sunlight and can occur on both immature and mature fruit.

**Management** — Harvest frequently. Grow blackberries on a shift trellis so that fruit are shaded on the north side of the trellis to substantially reduce sunscald. Consider overhead irrigation during hot days to cool canopy.



Sunscald to fruit in planting (a) and on harvested fruit (b).

**52 White drupelet** occurs when humidity is low and there is insufficient moisture in the air to protect berries from UV radiation. Individual drupelets turn white and then brown. White drupelet is more prevalent early in the season. **Management** — Select resistant or tolerant cultivars. Avoid the susceptible cultivar Apache.

**53 Winter injury** occurs in thornless blackberries when temperatures drop below 0°F. It has been estimated that 10 percent of a crop is lost for every degree that temperatures

drop below 0°F. Low temperatures kill floricanes, but not bramble root systems. Winter injured canes are often colonized by fungal pathogens (diseases). Thorny blackberries and raspberries are considerably hardier than thornless blackberries.

**Management** — Select cold hardy cultivars (many new cultivars available). Mulch heavily around floricanes to insulate brambles; this is not practical on a large scale. Apply nitrogen in spring; avoid excessive amounts, which delay winter hardiness development.



White drupelet.



Longitudinal section of a cane with winter injury (right) compared to healthy cane (left) and cross-section of winter-injured cane (right) with healthy (left).

## Additional Resources

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### **An IPM Scouting Guide for Common Problems of Brambles in Kentucky** (for mobile devices)

Bramble Scout

<http://bramblescout.ca.uky.edu>

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### **Department Extension Publications Websites**

Plant Pathology Extension Publications

<http://plantpathology.ca.uky.edu/extension/publications>

Entomology Extension Publications

<https://entomology.ca.uky.edu/entfacts/>

Horticulture Extension Publications

<http://www.uky.edu/hort/>

Wildlife Extension Publications

<http://forestry.ca.uky.edu/wildlife-pubs>

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### **For Commercial Producers**

Commercial Fruit Pest Management Guide (ID-232)

[http://www2.ca.uky.edu/agcollege/plantpathology/ext\\_files/PPFShtml/ID-232.pdf](http://www2.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/ID-232.pdf)

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### **For Small Scale and Residential Growers**

Backyard Berry Disease Management Using Cultural Practices (with Low Spray, No Spray & Organic Options) (PPFS-FR-S-25)

<http://plantpathology.ca.uky.edu/files/ppfs-fr-s-25.pdf>

Disease and Insect Control Program for Home Grown Fruit in Kentucky including Organic Alternatives (ID-21)

<http://www.ca.uky.edu/agc/pubs/id/id21/id21.pdf>

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