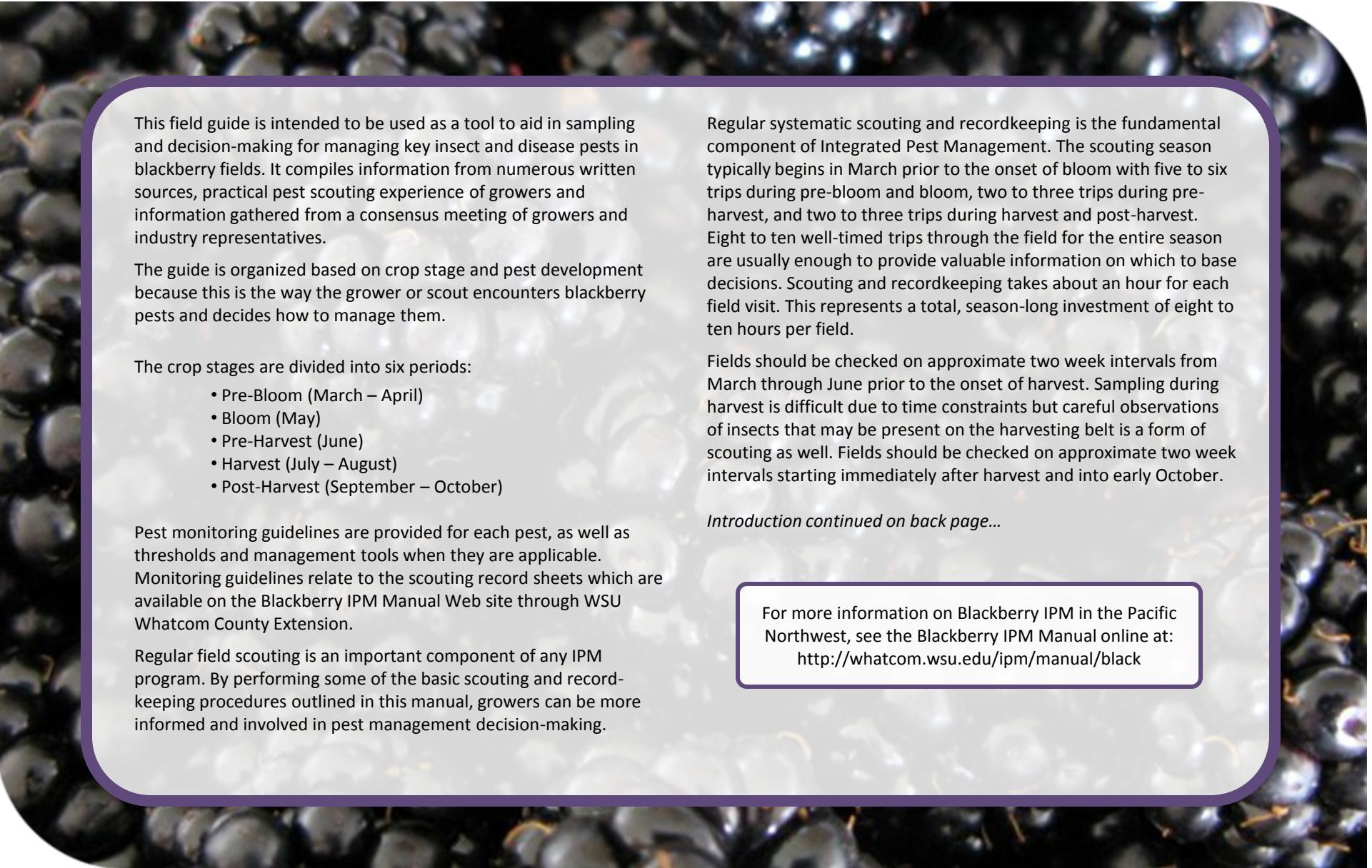


Scouting and Thresholds for Blackberry Pests and Diseases



This field guide is intended to be used as a tool to aid in sampling and decision-making for managing key insect and disease pests in blackberry fields. It compiles information from numerous written sources, practical pest scouting experience of growers and information gathered from a consensus meeting of growers and industry representatives.

The guide is organized based on crop stage and pest development because this is the way the grower or scout encounters blackberry pests and decides how to manage them.

The crop stages are divided into six periods:

- Pre-Bloom (March – April)
- Bloom (May)
- Pre-Harvest (June)
- Harvest (July – August)
- Post-Harvest (September – October)

Pest monitoring guidelines are provided for each pest, as well as thresholds and management tools when they are applicable.

Monitoring guidelines relate to the scouting record sheets which are available on the Blackberry IPM Manual Web site through WSU Whatcom County Extension.

Regular field scouting is an important component of any IPM program. By performing some of the basic scouting and record-keeping procedures outlined in this manual, growers can be more informed and involved in pest management decision-making.

Regular systematic scouting and recordkeeping is the fundamental component of Integrated Pest Management. The scouting season typically begins in March prior to the onset of bloom with five to six trips during pre-bloom and bloom, two to three trips during pre-harvest, and two to three trips during harvest and post-harvest. Eight to ten well-timed trips through the field for the entire season are usually enough to provide valuable information on which to base decisions. Scouting and recordkeeping takes about an hour for each field visit. This represents a total, season-long investment of eight to ten hours per field.

Fields should be checked on approximate two week intervals from March through June prior to the onset of harvest. Sampling during harvest is difficult due to time constraints but careful observations of insects that may be present on the harvesting belt is a form of scouting as well. Fields should be checked on approximate two week intervals starting immediately after harvest and into early October.

Introduction continued on back page...

For more information on Blackberry IPM in the Pacific Northwest, see the Blackberry IPM Manual online at:
<http://whatcom.wsu.edu/ipm/manual/black>

Scouting and Thresholds for Blackberry Pests and Diseases

Pre-Bloom

General Guidelines for Scouting in Blackberry Fields

Visit three to five sites in each block (field or portion) depending on block size. Sites should be distributed throughout the block and effort should be made to return to those approximate areas for each visit.

Blackberry Rust

- Defoliating disease found on evergreen blackberries
- Conduct a visual search at each site for symptoms associated with blackberry rust and rate infection level on a scale of 0-3.
- During dormancy, scout field for overwintering black pustules residing on leaves attached to canes or trapped in cane bundles.
- As buds begin to develop, begin looking for new infections occurring as purplish spots on the upper leaf surface.

Management:

- Cultural tactics (cultivating to cover fallen debris) and dormant season lime sulfur can reduce initial inoculum sources.
- Chemical tactics focus on protection of young, healthy plant tissues and should begin at bud break if rust is a problem in your field.



Voles

- Spring monitoring is done to assess winter mortality and new populations.
- Set-up monitoring stations: cover runway or tunnel entrance with a shelter made of roofing shingle or PVC piping (4-8 stations per acre).
- Place apple wedge bait under shelter; check apple bait daily for 2-3 days for feeding damage.
- Record percentage of stations positive for feeding damage.
- Monitor again 2-3 weeks after treatment to determine efficacy.

Management:

- Treatment threshold: 40% positive from monitoring station.
- Remove debris piles, regularly mow field margins, keep large weeds under control
- Pelletized baits can be broadcast, but degrade quickly.
- Bait stations can be made by making a "T" out of 2-3 inch PVC pipe filled with bait.

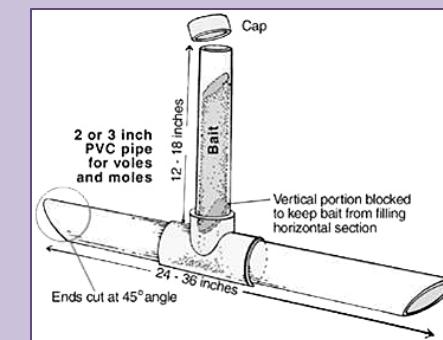
At each site, visit 10 to 20 hills spaced 3-5 hills apart and on both sides of the row. At each plant, follow the monitoring guidelines. Scouting should occur during regularly planned scouting trips as well as during general trips to the field.

Cane Botrytis

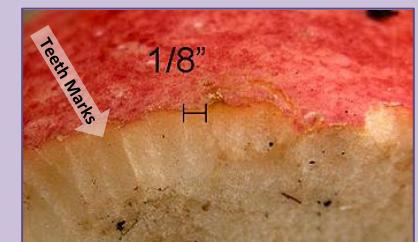
- The pathogen overwinters as minute, black, fungal bodies (sclerotia) on bleached canes or as mycelium in leaves and mummified berries.
- In early spring, begin inspecting for overwintering black fungal bodies on canes and rate infection level on a scale of 0-3.

Management:

- Maintain a narrow row by burning back early primocanes and controlling weeds. Promote air circulation and proper drying of plant tissue through pruning and trellising to open plant canopy.



For further details:
<http://whatcom.wsu.edu/ipm>



Scouting and Thresholds for Blackberry Pests and Diseases

Bloom

General Guidelines for Scouting in Blackberry Fields

Visit three to five sites in each block (field or portion) depending on block size. Sites should be distributed throughout the block and effort should be made to return to those approximate areas for each visit.

Beating Tray Sampling Method:

Use beating tray to *survey the canopy* for several insect pests that can directly damage fruit or may pose problems as harvest contaminants as well as for beneficial insects. At each site, take ten tray *samples* and record the total number of each pest and beneficial insect dislodged from foliage. Hold tray one foot below trellis wire within canopy and shake foliage by grasping wire and shaking, or striking top wire three times with rubber sprayer hose to dislodge insects. Alternate samples between rows and check about every ten feet down the row.

Botrytis Fruit Rot and Cane Botrytis

- Disease develops when conditions are warm and moist , or when temperatures are cooler and the foliage remains wet for a long period.
- Spores can infect leaves, resulting in primocane infections through petioles, and flowers.
- Infected flowers turn brown and shrivel when dry conditions exist. Under moist conditions, grey tufts of fungus can be seen on blighted blossoms.
- Inspect bloom, leaves and canes during wet conditions and/or in fields containing heavy foliage for disease development and rate infection level on a scale of 0-3.

Management:

- If using overhead irrigation, adjust watering schedule to prevent plants from being wet for extended periods of time .
- If chemical treatment is required, apply fungicides as a protectant spray at 7-14 day intervals from early bloom up to harvest.



Voles

- Continue monitoring using monitoring stations with apple baits.
- Check apple bait daily for 2-3 days for feeding damage.
- Record percentage of stations positive for feeding damage.
- Monitor again 2-3 weeks after treatment to determine efficacy.

Management:

- Treatment threshold: 40% positive from monitoring station.
- Remove debris piles, regularly mow field margins, keep large weeds under control.



Black Vine Weevils

- Expect to start seeing adult BVW in beating tray samples in late May with numbers increasing into June.
- Record the amount of weevils found on the beating tray.

Management:

- Fields can rapidly become infested in a short time, controls should be applied to even lightly infested fields to prevent an increase in infestation.

Threshold:

- A pre-harvest spray is advisable if beating tray sampling results in 1-2 weevils per ten samples.



Blackberry Rust

- Aecia and uredinia reproductive spores can both be found during bloom.
 - Infected leaves show purple leaf spots on the surface with corresponding yellow pustules on the underside.
 - When the yellow pustules sporulate, they can infect flower buds, leaves, and stems of primocanes and floricanes.
 - Conduct a search at each site for symptoms and rate infection level on a scale of 0-3.
 - Prolong leaf wetness (>6 hours) with mean daily temperatures between 49°F and 64°F favor disease development. Yellow spores rely on wind to disperse to other plants.

Management:

- If this rust is a problem in your field, chemical protection needs to start at bud break and continue through green fruit development .
 - Fungicides are used as a protectant and will not eradicate the disease after it has been established.

Orange Tortrix (OT)

Monitoring OT larvae

- Examine a maximum of 5 shoot tips per hill for presence of caterpillars.
 - Record number of infested hills for each site.
 - Larvae can also be detected using the beating tray sampling method.



OT Pheromone Traps

- Monitor pheromone traps weekly to determine peak flight in order to predict the onset of a second generation which may be a harvest contaminant.
 - Check traps regularly by removing, counting, and recording the number of OT moths.

Threshold:

- Chemical treatment may be necessary if 10% or more hills are infested.
 - Check with buyer for their recommended threshold.
 - Effective treatment relies on timing applications to newly hatched larvae and good coverage.



Aecia

Uredinia

Uredinia

Raspberry Crown Borer

- By mid-May most of the first year larvae have bored into canes and started working their way into the crown of the plant to feed. Second year larvae are feeding in the roots and crown.
 - First year caterpillars are white and about $\frac{1}{4}$ inch long. Second year caterpillars are white and up to 1inch long.
 - Feeding causes swelling or galls to form at or below soil surface.
 - Examine lower canes and crown for signs of boring (holes with sawdust-like frass).
 - Remove collapsed and dead canes from the soil and inspect crown and root structure for signs of larvae feeding.
 - Record percent infested hills

Threshold:

- Chemical controls are recommended if more than 5% of the plants have damage.



SCM frass

Strawberry Crown Moth

- Larvae are still actively feeding in May before pupating in the crowns in late May and June.
 - Mature larvae are about $\frac{3}{4}$ inches long, white with a dark brown head.
 - Watch for weakened areas in the field containing brittle or collapsed canes.
 - Examine the crown and lower canes for signs of boring (sawdust like frass) and record percent infested hills.
 - Place pheromone traps in the field by early June and check weekly to monitor for emergence. Record number of adults trapped.

Scouting and Thresholds for Blackberry Pests and Diseases

Pre-Harvest

General Guidelines for Scouting in Blackberry Fields

Visit three to five sites in each block (field or portion) depending on block size. Sites should be distributed throughout the block and effort should be made to return to those approximate areas for each visit.

Beating Tray Sampling Method:

Use beating tray to *survey the canopy* for several insect pests that can directly damage fruit or may pose problems as harvest contaminants as well as for beneficial insects. At each site, take ten tray samples and record the total number of each pest and beneficial insect dislodged from foliage. Hold tray one foot below trellis wire within canopy and shake foliage by grasping wire and shaking, or striking top wire three times with rubber sprayer hose to dislodge insects. Alternate samples between rows and check about every ten feet down the row.

Harvest Contaminants

- Continue beating tray samples to monitor weevils and miscellaneous harvest contaminants.
- The best time to use a beating tray is early in the morning before weevils move down from the canopy, or on cool cloudy days.

Black Vine Weevils

- Black Vine weevil counts increase in mid to late June.
- Most of the feeding damage from BVW is in the center of the canopy around the wire.
- Take extra samples near field borders, particularly if near a woodlot or a older strawberry field.
- Record # of weevils collected per site from beating tray.

Threshold:

- Typically 1-2 weevils/ 10 tray samples indicates a pre-harvest spray is needed. Harvest contaminant thresholds will vary according to end product usage and processor. Scout field soon after treatment to verify effectiveness.



Dryberry Mite

- Mites can be found feeding on leaves and fruit.
- Watch for affected drupelets that become red, dry and die. Symptoms are similar to sun scalded damage.
- Search within the fruit or at the base of drupelets where mites are feeding using a 20x hand lens. Record percentage infested hills.

Management:

- If found a severe levels, a dormant application in early spring (prior to bud break) and/or a summer application as soon as flower buds form is advised the following crop year.



Strawberry Crown Moth

- Place pheromone traps in the field by early June and check weekly to monitor for emergence. Record number of adults trapped.
- Hang traps in the field on the lower wire of the trellis, as SCM are low fliers.



Orange Tortrix (OT)

Monitoring OT larvae

- Examine a maximum of 5 shoot tips per hill for presence of caterpillars.
- Record number of infested hills for each site.



OT Pheromone Traps

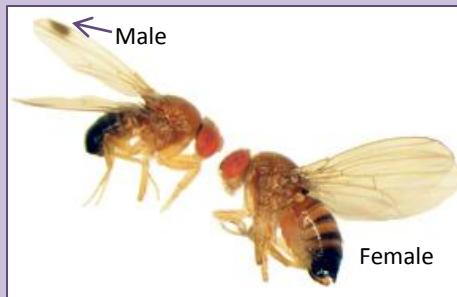
- Continue checking traps weekly by removing, counting, and recording the number of OT moths.

Threshold:

- Chemical treatment may be necessary if 10% or more hills are infested.

Spotted Wing Drosophila

- Male SWD flies have a small dark spot on the front edge near the tip of each forewing.
 - Set-up 16oz plastic cup traps containing about $\frac{1}{2}$ inch apple cider vinegar. Place traps in the field. Monitor traps at least once per week, twice per week when fruit is ripening and look for adults in the traps.
 - Also monitor for small puncture (oviposition scar) wounds on fruit and soft fruit. Adults are attracted to ripe or ripening fruit.
 - This pest is new; thresholds and management are not established; current threshold is detection.



For further trap details:
<http://whatcom.wsu.edu/ipm/swd>

Blackberry Rust

- Aecia and uredinia reproductive spore types are both present during this time.
 - Infected leaves will show purple leaf spots on the surface with corresponding yellow pustules on the underside.
 - When the yellow pustules sporulate, they can infect flower buds, leaves, and stems of primocanes and floricanes.
 - Conduct a visual search at each site for symptoms and record a rate infection level on a scale of 0-3.
 - Prolong leaf wetness (>6 hours) with mean daily temperatures between 49°F and 64°F favor disease development. Yellow spores rely on wind to disperse.

Management:

- For troublesome fields, chemical treatment should end during green fruit development or when weather turns dry.
 - Fungicides only act as a protectant; follow up with field renovation practices in the fall.

Raspberry Crown Borer

- First year larvae can be found feeding within the crown the plant. Second year larvae, which have been feeding in the roots and crown become full grown in late June to July. Pupation occurs in a period of two to three weeks.
 - Larvae are white with brown heads and have six short legs. First year larvae are about $\frac{1}{4}$ inch long. Second year mature larvae range from 1 to $1\frac{1}{2}$ inches long.
 - Insect stressed or wilted plants. Examine lower canes and crown for boring (holes, sawdust-like frass) and record percent infested hills.

Threshold:

- Spring or fall chemical applications are recommended if more than 5% of the plants have damage.



Fruit Rot Botrytis

- Inspect bloom, leaves and canes during wet conditions and/or in fields containing heavy foliage for disease development and rate infection level on a scale of 0-3.
 - Infected flowers turn brown and shrivel when dry conditions exist. Under moist conditions, grey tufts of fungus can be seen on blighted blossoms. Fruit infections generally remain dormant until fruit is nearly ripe or after harvest.

Management:

- Adjust irrigation to prevent plants from being wet for extended periods of time



A close-up photograph of a green leaf with several brown, circular spots, characteristic of fungal infection or disease.

Dry Cell Syndrome

- Symptoms are most often found in years when spring rains are long and frequent.
 - Berries will become shriveled, dry and hard. Some fruit may have small dry, scabby looking lesions on green, red and black drupelets.
 - Symptoms may be scattered across the berry or clustered in patches.
 - Examine hills for dry, hard and shriveled berries and rate infection level on a scale of 0-3.

Management:

- No single organisms is responsible, therefore focus on controlling diseases that are associated with the problem especially after long wet springs.



Scouting and Thresholds for Blackberry Pests and Diseases

Harvest

General Guidelines for Scouting in Blackberry Fields

Visit three to five sites in each block (field or portion) depending on block size. Sites should be distributed throughout the block and effort should be made to return to those approximate areas for each visit.

Beating Tray Sampling Method:

Use beating tray to *survey the canopy* for several insect pests that can directly damage fruit or may pose problems as harvest contaminants as well as for beneficial insects. At each site, take ten tray *samples and record* the total number of each pest and beneficial insect dislodged from foliage. Hold tray one foot below trellis wire within canopy and shake foliage by grasping wire and shaking, or striking top wire three times with rubber sprayer hose to dislodge insects. Alternate samples between rows and check about every ten feet down the row.

Harvest Contaminants

- Harvesting machines are one of the best insect monitoring tools.
- Ride the harvester to see what insect contaminants are coming across the belt. This is one of the best ways to evaluate the effectiveness of your pre-harvest clean up spray.
- Train workers on harvesting machines to communicate presence of harvest contaminants.
- Keep a container for workers to deposit contaminants.
- Many insects can be removed from the sorting belt by hand.
- Continue to use beating trays every two weeks or so to assist with observations from harvester.
- Make sure to check pre-harvest intervals closely on any pesticides used during the harvest period.



Orange Tortrix (OT)

- Check traps weekly; remove, count and record number of OT moths.
- Look for OT worms in new growth. Record # infested hills.

Management:

- *Bacillus thuringiensis (B.t.)* is effective if timed properly and it has a short PHI.

Threshold:

- Treatment thresholds vary according to end product usage and processor. Check with buyer for their recommended threshold. A good starting threshold is 10% or more infested hills.

Strawberry Crown Moth

- Adults are still emerging throughout the month of July.
- Continue checking pheromone traps weekly and record number of adults trapped.
- At each site, watch for weakened areas containing brittle or collapsed canes. Examine the crown and at the base of small roots for feeding. Record the percentage of infested hills.



Weevils

- Detection of weevils on the belt indicates that either sprays were not effective or adult weevils are continuing to emerge.

Management:

- A spray should be applied to control adult weevils if they are contaminating fruit so they can be controlled before egg-laying.



Redberry Mite

- The redberry mite feeds at the core, stem and base of drupelets and while doing so injects a toxin that prevents proper drupelet development.
 - Affected drupelets usually remain hard, green, or bright red and result in unmarketable fruit. Some fruit may be partially affected resulting in only part of the berry ripening.
 - Watch for fruit that never ripens and remains hard.
 - Inspect susceptible fruit at the base of drupelets with a 20X hand lens to verify mite presence.
 - Record the percentage of infested hills.

Management:

- A program of preventative dormant sulfur applications should be implemented the following early spring if mites are found at significant levels.
Monitor that year's developing fruit to assess efficacy of preventative sprays.



A close-up photograph of a blackberry bush showing several clusters of berries at various stages of ripeness. Some berries are still green, while others are red or black. The berries are surrounded by green leaves and stems.

Dryberry Mite

- Mites can be found feeding on leaves and fruit. Symptoms are easily confused with various fungal diseases and poor pollination.
 - Watch for affected drupelets that become red, dry and die.
 - The entire berry may be affected or only individual drupelets.
 - Search within the fruit or at the base of drupelets where they are feeding with a 20X hand lens. Record percentage of infested hills.

Threshold-

- Threshold will vary according to the end product usage and processor. Check with your buyer for their suggested threshold.

Fruit Rot Botrytis

- Infections generally remain dormant until fruit is nearly ripe or after harvest.
 - Fruit infections usually appear as soft, light brown, rapidly enlarging areas.
 - Berries become shriveled and covered with grey tufts when fruit matures.
 - Scout each site checking fruit for over ripeness, which may be showing beginning stages of infection. Rate infection level on a scale of 0-3.
 - Inspect harvested fruit for signs of fruit rot.

Management:

- Pick fruit before reaching full maturity to prevent postharvest fruit rot.
 - Pick fruit often, early and move to cold storage as soon as possible.



Spotted Wing Drosophila

- Male SWD flies have a small dark spot on the front edge near the tip of each forewing.
 - Set-up container traps containing $\frac{1}{2}$ inch apple cider vinegar. Place traps in the field. Monitor traps at least once per week, twice per week when fruit is ripening and look for adults in the traps.
 - Also monitor for small puncture (oviposition scar) wounds on fruit and soft fruit. Adults are attracted to ripe or ripening fruit.
 - This pest is new; thresholds and management are not established; current threshold is detection.

Dry Cell Syndrome

- Individual drupelets become shriveled, dry and hard. Some fruit may also have small dry, scabby looking lesions on green, red and black drupelets.
 - Examine hills for dry, hard and shriveled berries on the plant and rate infection level on a scale of 0-3.
 - Inspect harvested fruit for affected drupelets.

Management:

- No one specific organism produces this symptom; focus on controlling the various diseases associated with the problem paying special attention to those that have historically been troublesome.



Threshold:

- Thresholds vary according to the end product usage and processor. Check with your buyer for their suggested threshold.

Scouting and Thresholds for Blackberry Pests and Diseases

Post-Harvest

General Guidelines for Scouting in Blackberry Fields

Visit three to five sites in each block (field or portion) depending on block size. Sites should be distributed throughout the block and effort should be made to return to those approximate areas for each visit.

At each site, visit 10 to 20 hills spaced 3-5 hills apart and on both sides of the row. At each plant, follow the monitoring guidelines. Scouting should occur during regularly planned scouting trips as well as during general trips to the field.

Voles

- Fall monitoring is done to determine populations before winter when crop damage can occur.
- Set-up monitoring stations: cover runway or tunnel entrance with a shelter made of roofing shingle or PVC piping (4-8 stations per acre).
- Place apple wedge as bait under shelter; check apple bait every day for 2-3 days for damage.
- Record % of stations positive for feeding damage.
- Monitor again 2-3 weeks after treatment to determine efficacy.

Management:

- Treatment threshold: 20-40% positive from monitoring station.
- Remove debris piles, regularly mow field margins, keep large weeds under control.
- Pelletized baits can be broadcast, but degrade quickly.
- Bait stations can be made by making a "T" out of 2-3 inches PVC pipe filled with bait.

For further details:

<http://whatcom.wsu.edu/ipm/manual/black>

Blackberry Rust

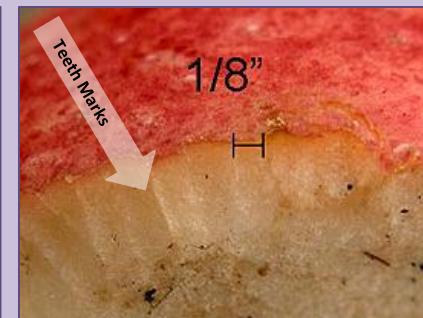
- Black pustules will begin developing among the yellowish-orange pustules in late summer and early fall on infected leaves. These black pustules are responsible for continuing the disease cycle the following spring.
- Conduct a visual search at each site for symptoms associated with blackberry rust and rate infection level on a scale of 0-3.

Management:

- Field renovation practices that destroy previously diseased plant parts will contribute to the effectiveness of chemical control program the following spring. Remove fruiting canes as soon as possible and cultivate to cover sources of inoculum.



Black overwintering spores among yellowish pustules



Strawberry Crown Moth (SCM)

- SCM is in larvae form and begins feeding on the outer crown and root surface before boring deeper into the crown. Larvae feed in the crown until early October and then spin a cocoon to overwinter.
 - This can cause economic damage by girdling canes causing plants to become stunted and have poor vigor resulting in decreased yields.
 - Mature larvae are about $\frac{3}{4}$ inch long, white, with a dark brown head.
 - There is one generation each year.
 - Inspect the lower area of canes and crown material closely in weak areas for signs of feeding or entrance holes.
 - Record the percentage of infested hills.

Management:

- Unlike strawberries, SCM larvae feed on the outer crown and root surface of caneberries. Therefore they are susceptible to insecticide drenches.
 - The same fall or spring drench used to control raspberry crown borer will also control SCM.



Raspberry Crown Borer (RCB)

- RCB may be found as eggs, caterpillars or as adults at this time of the year. First year larvae can be found around the crown or at the base of canes. Second year larvae overwinter in the roots or in tunnels bore into the crown.
 - The larvae are white with brown heads and have six short legs. First year caterpillars are about $\frac{1}{4}$ inch long while second year caterpillars are 1 inch long.
 - The day flying adult is a clear-winged moth resembling a yellow jacket wasp in color and size. It has a wingspan of about 1 inch and has a long, black body with four yellow horizontal stripes on the abdomen as well as stripes on the thorax. The legs are yellow, and the feathery antennae, unlike the short antennae of a yellow jacket wasp, curve outward from the head.
 - Inspect the lower area of canes and crown material closely in weak areas for signs of feeding or entrance holes.
 - Record the percentage of infested hills.

Threshold:

- Chemical controls are recommended if more than 5% of the plants have damage.

Management:

- Fall is a good time for treating infested fields.
 - Insecticide application must be carefully timed and thorough. Follow treatment with irrigation or preceding a rain to thoroughly drench the soil.
 - Because of the two year life cycle of the insect, it may be necessary to treat in the spring and fall for two or more successive years in order to obtain complete control.



Natural Enemies

Natural enemies of pests are often present in the landscape and can assist with pest control. To conserve beneficial insects, select pesticides cautiously; avoid pesticides that will kill beneficial insects. Scout for natural enemies as well as pests to understand relationships between the two in a field; often beneficial insects can keep a pest population in check.

Predatory Mites (*Amblyseius fallacis*):

- This naturally occurring predator mite feeds on spider mites.
- Only visible using 10X hand lens.
- Predatory mites are much faster moving than plant-feeding mites.
- Rates of 1 predatory mite : 10 spider mites has been shown to give good control.



Spider Mite Destroyer (*Stethorus punctillum*)

- Adult is a small lady beetle (1/10 inch long) and a very effective spider mite predator.
- Larvae are 1/8 inch long



Minute Pirate Bug:

- This small adult bug (1/16 inch long) feeds on spider mites, aphids, and thrips.
- Minute pirate bug nymph stage (4th instar). Front part of body is usually more orange than appears here.



Lady Beetles

- Both adults and larvae feed on aphids, with some feeding on spider mites.
- Adults are about 3/16 inch long and larvae are 5/16 inch long when mature.



Lacewing

- Adult lacewings are $\frac{1}{2}$ to $\frac{3}{4}$ inches long and feed on honeydew from aphids.
 - Lacewing eggs are pale green and found singly on long stalks attached to plant foliage.
 - Lacewing larvae are $\frac{1}{3}$ inch long when mature and resemble mini-alligators. They feed on aphids, spider mites, and immature plant bugs.



Syrphid Fly

- Adult syrphid fly is about $\frac{1}{2}$ inch long. They fly quickly, hover over plants, and feed on pollen, nectar or honeydew.
 - Larvae are about $\frac{1}{2}$ inch long, usually brown or green with body narrowing toward the head. They feed on aphids.



Ground beetle:

- Adults are about 5/8 inch long. They feed at night on a variety of insect pests including cutworms and adult weevils.
 - These require shelter in a grassy bank or similar refuge.



Stink bug:

- Adults are about $\frac{1}{2}$ inch long. Here it is feeding on a small looper.
 - Note the extended, beak mouthpart at work.



Damsel Bug:

- Adult damsel bug. Slender body about $\frac{1}{2}$ inch long.
 - Note the beak-like mouthpart and enlarged front legs for grasping prey.



Photo Credits

Dan Coyne
John Davis
D. Gillespie
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Tom Peerbolt
Carolyn Teasdale

Others associated with: University of California, Oregon State University, Washington State University, and University of Kentucky.

Scouting involves performing usually two or three tasks at each of three to five sites in a field. A minimum of three sites should be checked in small fields (<10 acres) and five sites are usually adequate in larger fields (20 acres or more). Sampling in several sites rather than just in a spot or two will illustrate the range or variation of pest abundance found across a field. Recording information on a site by site basis allows the sampler to return at a later time to determine trends in pest population. Use existing knowledge about the field's history or variations which exist within a field to determine sampling site locations. Sites should be distributed throughout a field and the scout should return to those approximate areas for each visit.

Scouting equipment should include:

- Magnifying Hand Lens (10X power)*
- Scouting Report Forms*
- Traps for Key Pests*
- Digital Camera*
- Beating Tray*

A **beating tray** is an 16 X 16 inch canvas or cloth covered tray and is very useful for sampling numerous beneficial and pest insects which reside in the canopy. One such tray has a frame and handle built of $\frac{1}{2}$ inch PVC pipe and a black and white sided cover made of a material called "Sunbrella". Similar trays can be constructed with other locally available materials as well.

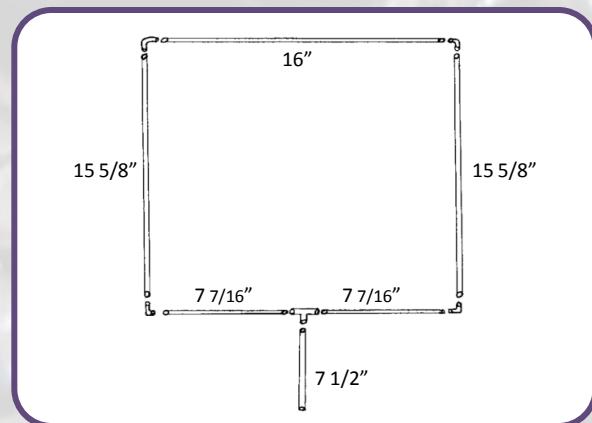
To use the beating tray: hold tray one foot below trellis wire within canopy and shake foliage by grasping wire and shaking, or striking top wire three times with rubber sprayer hose to dislodge insects.

Treatment thresholds for pests in this guide come from published thresholds and those agreed on at a consensus meeting of growers, researchers, and industry representatives in 2008.

Pest and disease treatment thresholds differ between growers, fields, and years; they depend on age of crop, weather, other pest pressures, fruit processing type, price of treatment product, and expected price of fruit. For many of the pests

listed in this guide, growers must make decisions based on current scouting information and information from years past. Treatment decisions should include consultation with the processor or buyer.

For some diseases, thresholds are difficult to determine for a single disease, but a threshold for overall disease occurrence can be made. Accurate record keeping of scouting records, treatments made, and results of treatments will help a grower to determine if treatments made in the past were effective and should be used again.



For more information on Blackberry IPM in Pacific Northwest, see the Blackberry IPM Manual online at:
<http://whatcom.wsu.edu/ipm/manual/black>

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