

Scouting and Thresholds for Raspberry 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, mite, and disease pests in raspberry fields. It compiles information from numerous written sources, practical pest scouting experience of growers in Whatcom County, and information gathered from a consensus meeting of growers and industry representatives in February, 2008.

The guide is organized based on crop stage and pest development because this is the way the grower or scout encounters raspberry pests and decides how to manage them. The crop stages are divided into six periods:

- Dormant / Pre-Bloom (March)
- Pre-Bloom (April - mid May)
- Bloom (Mid - late May)
- Pre-Harvest (June)
- Harvest (July - early August)
- Post-Harvest (August - September)

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 Raspberry 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 more 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 late March or early April with an assessment of cutworm damage to developing buds and ends in early September with nematode sampling. 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 late March through late June (six to seven visits) 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 September (two to three visits).

Introduction continued on back page...

For more information on Raspberry IPM in Northwest Washington, see the Raspberry IPM Manual online at:
http://whatcom.wsu.edu/ipm/small_fruit.html

Scouting and Thresholds for Raspberry Pests and Diseases

Dormant/Pre-Bloom

March

General Guidelines for Scouting in Raspberry 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.

Climbing Cutworm

- Examine 5 buds and new shoots at each hill
- Record # of buds/shoots damaged by cutworms or weevils
- Where damage is found, search base of plant during day to identify the pest. If not found, check at night with a flashlight when worms are active.
- Worm is up to 1 ½" long with pale brown to ashy gray body
- Low tolerance for this pest; few insects can cause yield loss



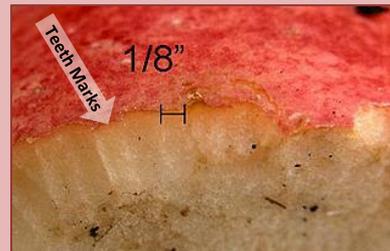
Weevils

- Check soil around base of plants for weevil larvae
- Examine buds and new laterals for signs of damage from the clay colored weevil
- Record # of buds/shoots damaged by cutworms or weevils
- Plan on summer treatments if weevils are commonly found



Voles

- 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 % 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" PVC pipe filled with bait. *For further details:* <http://whatcom.wsu.edu/ipm>



Raspberry Crown Borer

- Monitoring is difficult because it is hidden in crowns and canes
- Pay particular attention to weak areas in the field which have smaller, spindly canes or canes that break at the base when tying up to the wire in the winter and spring
- Train pruning crew to report suspect canes
- Examine lower canes and crown area for this insect. Record incidence of pest
- First year caterpillars are white about ¼" long. Second year caterpillars are white, up to 1" long
- Treatments are made post-harvest



Spur Blight (Cane Disease)

- Examine canes at each site for cracked gray areas around buds
- Tiny black pimples form in affected areas
- Record % of hills infected

Management:

- Cultural practices can impact incidence of spur blight. To reduce disease pressure:
 - Keep weeds controlled around plants
 - Reduce the number of primocanes
 - Remove and destroy old fruiting canes after harvest
 - Avoid overhead irrigation
- A suggested threshold is to consider treatment if 10% of hills infected after harvest the previous season
- Disease is initially managed by a delayed dormant lime-sulfur application, followed by 2 to 3 early summer fungicide applications



Cane Blight (Cane Disease)

- Examine canes at catcher plate height by scraping bark away to see vascular tissue
- Infected tissue appears as reddish lesion up the cane from a wound site
- Record % of hills infected

Management:

- Cultural practices that increase prevalence of cane disease include:
 - High levels of N fertilizer
 - High cane densities increase humidity and mechanical injury
 - Over-irrigation increases relative humidity to promote disease occurrence
- Damage by machine harvesters is a key entry point for cane blight. To reduce this impact:
 - Line up hills in the row
 - Ensure catch plates swing easily
 - Train drivers to drive straight
- If 1-3% of canes are infected, consider treatment
- Time fungicide applications immediately after harvest, inspection during the dormant and pre-bloom period confirms presence of the disease



Phytophthora Root Rot

- Note any low areas which remain wet, particularly after winters of heavy rainfall
- Return to these areas in June with onset of hot weather to evaluate root rot symptoms

Management:

- Cultural practices can impact incidence of root rot. To reduce disease pressure, consider:
 - Use higher raised beds
 - Reduce compaction in these areas of the field
 - Avoid over irrigating
- Soil-applied fungicides should not be used as a preventative unless *Phytophthora* symptoms are present and the disease-causing organism has been identified through laboratory analysis of root and crown tissue
- Soil-applied fungicides for *Phytophthora* are not effective against other root rot causing organisms. They only reduce symptoms of the disease and do not kill the pathogen itself.

Scouting and Thresholds for Raspberry Pests and Diseases

Pre-Bloom

(April – Mid-May)

General Guidelines for Scouting in Raspberry 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.

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.

Clay Colored Weevils

- Inspect 5 buds or shoots per plant and look for leaf flagging, bud damage, and leaf notching
- Record # of buds or shoots with damage
- If you suspect this insect is present at damaging levels, sample at night using a beating tray to confirm
- Consider summer treatment with detection of 1 weevil / 10 beating trays
- Check soil around base of plants for weevil larvae to determine life stage present



Climbing Cutworm

- Pay attention to areas with less shoot growth
- Examine several buds and new growth at each hill
- Where damage is found, search base of plant during day to identify the pest. If not found, check at night with a flashlight when worms are active
- Worm is up to 1 ½" long with pale brown to ashy gray body
- Raspberries have the ability to suffer some damage from this pest, but moderate counts can cause significant damage. Monitor weekly to determine acceptable level of damage.



Western Raspberry Fruitworm or Raspberry Beetle

- Record the number of adults from beating tray samples
- Pay attention to interveinal feeding damage on new primocanes
- Consider treating adult beetles prior to bloom if detected at most sites. Tolerances vary with processing type.
- Monitor adult flight activity with white sticky traps, such as the Rebell Bianco®. Locate traps along field edges.
- Check traps weekly and record # of beetles per trap
- Consider treatment if average beetles per trap are above 2 for IQF and above 5 for other processed fruit
- Record # of raspberry beetles in beating tray samples



Voles

- 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 % of stations positive for feeding damage
- Monitor again 2-3 weeks after treatment to determine efficacy

Management:

- Treatment threshold: 20-40% positive monitoring stations
- 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" PVC pipe filled with bait. *For further details:* <http://whatcom.wsu.edu/ipm>



Scouting and Thresholds for Raspberry Pests and Diseases

Bloom

Mid to Late-May

General Guidelines for Scouting in Raspberry Fields

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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.

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.

Black Vine Weevils

- Expect to start seeing adult BVW in beating tray samples in late May with numbers increasing into June
- Record # and type of weevils from beating tray
- If there is no feeding damage or weevils in beating trays, a treatment may not be necessary



Spider Mites

- Spider mites can begin to increase at this time of year
- Collect ten leaflets per site
- Examine leaves using a 10X hand lens for presence of mites, eggs, and mite predators
- Count the number of spider mites and mite predators and record information at each site
- Factors influencing thresholds include spider mite density, abundance of predators, population trends, damage to foliage, weather conditions, and miticide per-harvest interval



Voles

- Continue monitoring using monitoring stations with apple baits
- Record % of stations with positive feeding damage



Western Raspberry Fruitworm or Raspberry Beetle

- Record the number of adults from beating tray samples
- Pay attention to interveinal feeding damage to leaves
- Monitor adult flight activity with white sticky traps, such as the Rebell Bianco®. Locate traps along field edges.
- Check traps weekly and record # of beetles per trap
- Consider treatment prior to introducing bees if:
 - Average beetles per trap are above 2 for IQF and above 5 for other processed fruit
 - Or adults are detected at most sites
- Decision varies with processing type



Scouting and Thresholds for Raspberry Pests and Diseases

Pre-Harvest

June

General Guidelines for Scouting in Raspberry 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.

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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 cutworms
- 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

Weevils

- Black Vine weevil counts increase in mid to late June
- Rough Strawberry weevil is found foraging canopy foliage at night; adults are found by sifting soil around crown during day. At each location, inspect debris at base of plants for adults.
- 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 there is a woodlot, older strawberry field, or rhododendron planting at the border
- Record # of weevils collected per site from beating tray
- A treatment may be needed if a few weevils are found at each site. If there is no feeding damage and weevils are not detected using beating trays, a specific weevil spray may not be necessary.



Climbing Cutworm

- Pay close attention to miscellaneous cutworm larvae in beating tray at this time
- A few small worms occasionally detected in a field may indicate a major hatch coming



Leafrollers: Obliquebanded (OBLR) and Orange Tortrix (OT) Pheromone Traps

- Check traps regularly by removing, counting, and recording the number moths
- At about 10 days after peak trap catch, it is time to monitor OBLR caterpillars in the field. For OT, all stages are present at all times; use traps to determine peak adult flight and general population sizes.

OBLR larva and adult



OT larva and adult



Monitoring Larvae

- Examine a maximum of 5 shoot tips per hill for caterpillar presence
- Record number of infested hills for each site that you sample
- Larvae can also be detected using the beating tray sampling method. Record # of leafrollers found on beating tray.

Scouting and Thresholds for Raspberry Pests and Diseases

Harvest

July – Early August

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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.

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 a pre-harvest clean up spray
- Train harvest 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 to assist with harvester observations
- Check pre-harvest intervals closely on any pesticides used during harvest period

Leafrollers: Obliquebanded (OBLR) and Orange Tortrix (OT)

- Check traps weekly by removing, counting and recording # of OBLR and OT moths
- If flight is delayed until just prior to or after harvest, inspect hills for leafrollers
- Look for worms in new growth. Record # infested hills.
- Treatment threshold is 10% or more infested hills or thresholds vary according to end usage and processor
- Bacillus thuringiensis* (B.t.) is effective if timed properly and has a short PHI



Weevils

- Detection of weevils on the belt indicates that either sprays were not effective or adult weevils are continuing to emerge
- A spray should be applied to control adult weevils if they are contaminating fruit so they can be controlled before egg-laying



Armyworms and Cutworms

- If too numerous to be removed from the sorting belt, treatment may be necessary for cutworms and leafrollers. This is most common at the end of the harvest period.



Raspberry Beetle / Raspberry Fruitworm

- Most will be in larval stage at this time
- Examine fruit for feeding damage in the field or on harvesting belt to determine if pest will be a problem in following year
- Tolerances depend on processing type
- Management should be done when adult is present, at around 5% bloom; not at this time

Scouting and Thresholds for Raspberry Pests and Diseases

Post-Harvest

August - September

General Guidelines for Scouting in Raspberry 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.



Spider Mites

- Populations can increase rapidly in August
- Examine 10 leaflets at each site using a 10X hand lens beginning early May. Record # spider mites and mite predators found.
- Predators can become quite numerous late in the season. If predator to pest mite populations are 1:10 or higher, predators should keep spider mites in check.
- Treatment considered unnecessary unless populations reach 25 mites per leaflet by September 1

Spotted Wing Drosophila

- This pest is new and thresholds and management have not been developed
- Management recommendations include good harvest and sanitation practices. Dropping fruit to rot or leaving incompletely harvested fruit in the field is strongly discouraged.
- Adults are attracted to dropped and decaying fruit and will feed on it



Raspberry Crown Borer

- Adult, egg, and caterpillar stages may be present at this time
- Check lower canes and crowns for presence of caterpillars
- Pay particular attention to weak areas in the field which have smaller, spindly canes or canes that break at the base when tying up to the wire in the winter and spring. Train pruning crew to report suspect canes and their locations.
- No threshold is established. If plants are found with hollow canes caused by borer feeding, consider chemical treatment during October.
- If damage is present, treat for 2 consecutive years to obtain control



Plant Parasitic Nematodes

- Microscopic wormlike organisms feed on and damage roots
- In September, soil and root samples from good vs. poor areas in a field should be sent to a laboratory and analyzed for population size and makeup
- Each sample should represent approximately 10 plants scattered throughout sample area
- Using a shovel and pruners, collect soil and feeder roots from top foot of each plant sampled
- Thresholds are similar to those in blueberries. See thresholds in the online Blueberry IPM Manual (<http://whatcom.wsu.edu/ipm/manual/blue>)



Raspberry

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.

Many beneficial insects thrive in areas with a diversity of plant species; they often use plants for pollen and nectar sources and for shelter. Consider providing these types of plants, especially those with several small flowers and a diversity so that flowers are available all season.

Predatory Mites (*Amblyseius fallacis*):

- This naturally occurring predator mite feeds on damaging 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 " long) and a very effective spider mite predator
- Larvae are 1/8" long



Minute Pirate Bug:

- This small adult bug (1/16" 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" long and larvae are 5/16" long when mature



Photo by Carolyn Teasdale (larva)



Photo by Carolyn Teasdale (pupa)



Photo by Carolyn Teasdale

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:

- A *Magnifying Hand Lens (10X power)*
- Scouting report forms*
- Traps for key pests*
- A digital camera*
- A Beating Tray*

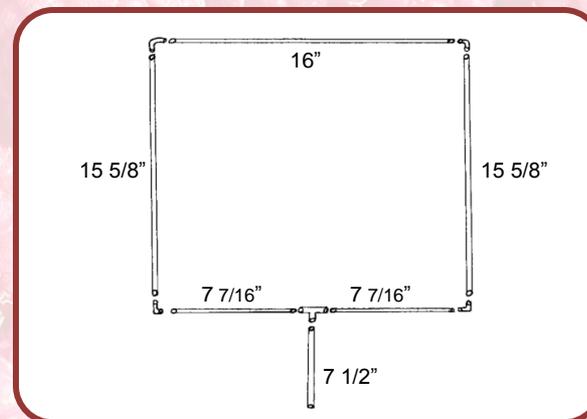
A beating tray is an 16 X16" canvas or cloth covered tray and is very useful for sampling numerous beneficial and pest insects which reside in the canopy. One such tray has a frame and handle built of ½" PVC pipe and a black and white sided cover made of a material called "Sunbrella". Similar trays can 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 Raspberry IPM in Northwest Washington, see the Raspberry IPM Manual online at: http://whatcom.wsu.edu/ipm/small_fruit.html

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