

2016 Southeast Regional Caneberries Integrated Management Guide

Commodity Editor

Phil Brannen (University of Georgia)

Section Editors

Pathology: Guido Schnabel (Clemson University)

Entomology: Hannah Burrack (North Carolina State University), Rick Bessin (University of Kentucky)
and Doug Pfeiffer (Virginia Tech)

Weed Science: Wayne Mitchem and Katie Jennings (North Carolina State University)

Vertebrate Management: David Lockwood (University of Tennessee)

Culture: Gina Fernandez (North Carolina State University)

Pesticide Stewardship and Safety: Ash Sial (University of Georgia)

Senior Editors

Phil Brannen (University of Georgia)

Powell Smith (Clemson University)

Contributions were also made by Ed Sikora (Auburn University), Melanie Ivey (Louisiana State University), Rebecca Melanson (Mississippi State University),
and Eric Stafne (Mississippi State University).

Recommendations are based on information from the manufacturer's label and performance data from research and extension field tests.

Because environmental conditions and grower application methods vary widely, suggested use does not imply that performance of the pesticide will
always conform to the safety and pest control standards indicated by experimental data.

This publication is intended for use only as a guide. Specific rates and applications methods are on the pesticide label, and these are subject
to change at any time. Always refer to and read the pesticide label before making any application! The pesticide label supersedes any information
contained in this guide, and it is the legal document referenced for application standards.

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Pesticide Stewardship and Safety

PESTICIDE EMERGENCIES

1-800-222-1222

This number automatically connects you with a local Poison Control Center from anywhere in the United States.

- **Tightening of the chest, mental confusion, blurred vision, rapid pulse, intense thirst, vomiting, convulsions, and unconsciousness are always serious symptoms! Dial 911!**
- **Pesticides with 'DANGER' or 'DANGER/POISON' on the product label can cause severe injuries or death very quickly, even with small exposures. Take immediate action!**
- ***Other symptoms of pesticide poisoning:* headache, fatigue, weakness, restlessness, nervousness, profuse sweating, tearing and drooling, nausea, diarrhea, or irritation of the skin/ eyes/nose/throat. Consult the product Material Data Safety Sheet (MSDS) for symptoms associated with a particular pesticide**

Pesticide on Skin

- **WASH, WASH, WASH! Immediately wash pesticide from skin as thoroughly as possible with any available water that does not contain pesticides.**
- Quickly remove protective clothing and any contaminated clothing.
- *Rewash* contaminated skin with soap and water as soon as possible.
- If the victim experiences *any* symptom(s) of poisoning, get medical assistance immediately. *Take the pesticide label with you*, but do not contaminate vehicles or expose others if you must take the container with you.

Pesticide in Eyes

- Rinse eye(s) gently with *clean* water for *at least* 15 minutes. Be careful of water temperature.
- **If eye remains irritated or vision is blurry after rinsing, get medical attention right away! Take the pesticide label with you.**

Pesticide in Mouth or Swallowed

- Provide / drink large amounts of water or milk to drink - *Do not give liquids to a person who is unconscious or convulsing!*
- Consult the label BEFORE vomiting is induced – the label may advise against inducing vomiting. Do not induce vomiting with emulsifiable concentrate (E, EC) formulations.
- *Do not induce vomiting if a person is unconscious or is convulsing!*
- **Seek medical attention. Take the pesticide label with you.**
- If the pesticide was not swallowed, *rinse mouth thoroughly with clean water*. If mouth is burned or irritated, consult a physician.

Pesticide Inhaled

- Move victim to fresh air immediately!
- Warn others in the area of the danger.
- Loosen tight clothing.
- Administer artificial respiration if necessary, but try to determine if the person also may have swallowed any pesticide - avoid any pesticide or vomit that may be around the victim's mouth.
- **Seek medical attention. Take the pesticide label with you.**

Heat Stress

- Move the victim to a cooler area, remove protective clothing, and pour cool water over the person.
- Give cool liquids to drink – *Do not give liquids to a person who is unconscious or convulsing!*
- **Pesticide poisoning may mimic heat illness!** Get medical attention if the person is unconscious or if the person is not fully recovered within 15 minutes of cooling down and drinking liquids.

Signal Words

The pesticide signal word will appear on the pesticide label. It provides information about the acute risks of the pesticide to people.

- **DANGER/POISON:** *Highly toxic* - less than a teaspoon can kill an adult.
- **DANGER:** *Highly toxic* - pesticide can cause severe eye and/or skin injury.
- **WARNING:** *Moderately toxic* - two tablespoons or less can kill an adult.
- **CAUTION:** *Slightly toxic* - an ounce or more is required to kill an adult.

Understand that the signal word does *not* provide information about long term pesticide exposure risks (e.g., cancer) or allergic effects. Minimize your exposure to *all* pesticides. The signal word does *not* indicate environmental toxicity or other environmental effects.

PESTICIDE SPILLS OR OTHER EMERGENCIES

Spills on public roads (Usually call the state police/state highway patrol. In many cases you can call CHEMTREK at 1-800-424-9300 or 911.)

STATE	AGENCY	PHONE NUMBER
Georgia	Georgia State Patrol	Cell: call *GSP or 911
North Carolina	Regional Response Team (RRT) For spills not on public road ways, contact the Pesticide Section of NCDA&CS	911 or your RRT (919) 733-3556 or (800) 662-7956 during non-business hours
South Carolina	South Carolina Highway Patrol ----- South Carolina DHEC Emergency Response Section	Cell: call *HP ----- 1-888-481-0125 (Toll Free)
Tennessee	Tennessee Emergency Management Agency (TEMA) State Emergency Operations Center	1-800-262-3300
Virginia	Virginia Emergency Operations Center	1-804-674-2400

Environmental emergencies (contamination of waterways, fish kills, bird kills, etc.)

STATE	AGENCY	PHONE NUMBER
Georgia	Georgia Department of Natural Resources Response Team	1-800-241-4113
North Carolina	North Carolina Div. of Water Quality	1-800-858-0368
South Carolina	South Carolina DHEC	1-888-481-0125 (Toll Free)
Tennessee	Tennessee Wildlife Resources Agency	1-615-781-6643
Virginia	Virginia Emergency Operations Center	1-804-674-2400

PESTICIDE LIABILITY and STEWARDSHIP

Pesticide applicators, supervisors, and business owners may all face severe criminal and/or civil penalties if pesticides are misused – knowingly or accidentally.

The pesticide label. Federal and state laws require pesticide applicators to follow the directions on the pesticide label exactly. Do not exceed maximum label rates, apply a pesticide more frequently than stated on the label, or apply a pesticide to a site that is not indicated on the label. Labels change; review yours regularly.

Restricted Use Pesticides (RUP). These pesticides are clearly labeled “Restricted Use Pesticide” in a box at the top of the front label. Applicators purchasing, applying, or supervising the application of an RUP, must be certified or licensed through their state pesticide regulatory agency. Some states have mandatory licensing for certain pesticide use categories whether or not RUPs are applied.

Personal Protective Equipment (PPE). Anyone handling or applying pesticides must wear the PPE stated on the pesticide label. The Worker Protection Standard requires applicators to wear the label required PPE and requires agricultural employers to supply the label PPE and ensure that the PPE is worn correctly by applicator employees. Do not wear PPE items longer than it has been designed to protect you. Clean, maintain and properly store PPE. Do not store PPE with pesticides.

Reentry Interval (REI). The period of time immediately following the application of a pesticide during which unprotected workers should not enter a field.

Pre-Harvest Interval (PHI). The time between the last pesticide application and harvest of the treated crops.

EPA Worker Protection Standard (WPS; <http://www.epa.gov/agriculture/twor.html>) Growers who employ one or more *non*-family members must comply with the WPS. This standard requires agricultural employers to protect applicator employees and agricultural worker employees from pesticide exposure in the workplace by 1) providing specified pesticide safety training, 2) providing specific information about pesticide applications made on the agricultural operation, 3) providing and ensuring that applicators wear clean and properly maintained label required PPE, 4) providing decontamination facilities for potential pesticide and pesticide residue exposures, and 5) providing timely access to medical assistance in the event of a suspected pesticide exposure. These protections apply to both Restricted Use *and* general use pesticides used in agricultural plant production.

Pesticide Recordkeeping. You must keep records of all RUP applications for at least two years under the Federal (USDA) Pesticide Recordkeeping Requirement if your state does not have its own pesticide recordkeeping requirements. Some states require records be kept for longer than the federal requirement. Maintaining records of all pesticide applications, not just RUP applications, indefinitely, cannot only help troubleshoot application problems, but also allows you to reference successful applications and can help protect against future liability. Consult your [local Extension Service](#) for details.

Be prepared for emergencies. Store pesticides and clean empty containers securely. Develop and provide written plans and training to prepare your employees, and family members, for pesticide fires, spills, and other emergencies. Assign responsibilities to be carried out in the event of pesticide emergencies. Keep copies of the pesticide labels and MSDS away from the area where pesticides are stored. Provide copies of product MSDSs to your community first responders. Consult your local Extension office and insurance company for assistance.

Properly dispose of clean empty pesticide containers and unwanted pesticides as soon as possible. Containers can often be recycled in a pesticide container recycling program. Unwanted pesticides may pose a risk of human exposure and environmental harm if kept for long periods of time. Consult your local Extension office for assistance.

PESTICIDE APPLICATION

Information on pesticide use is available from the Pesticide Environmental Stewardship website (<http://pesticidestewardship.org>) including information on [sprayer calibration](#), [personal protective equipment](#), [recordkeeping](#), and [resistance management](#).

RESISTANCE MANAGEMENT

Insects, weeds, and disease-causing organisms are all capable of developing resistance to pesticides. To minimize the likelihood of resistance development against your material of choice:

1. Only use pesticides when necessary: When the damage caused by the pest you are controlling is greater than the cost of the pesticide and no other, effective options are available.
2. Use the appropriate material for the pest.
3. Use the recommended rate of the material. Do not use a lower rate than listed on the label.
4. If more than one treatment is needed when the same pest is present, rotate pesticide mode of action (MOA) between treatments.

The Fungicide Resistance Action Committee (**FRAC**, www.frac.info), Insecticide Resistance Action Committee (**IRAC**, www.iraac-online.org), and Weed Science Society of America (**WSSA**, <http://www.wssa.net>) have grouped pesticides into MOA categories, which are listed in this guide to aid in the development of resistance management programs.

POLLINATOR PROTECTION

Before making insecticide applications, monitor insect populations to determine if treatment is needed. If insecticide application is necessary:

1. Use selective pesticides to reduce risk to pollinators and other non-target beneficial insects.
2. Read and follow all pesticide label directions and precautions. The label is the Law! EPA now requires the addition of a “Protection of Pollinators” advisory box on certain pesticide labels. Look for the bee hazard icon in the Directions for Use and within crop specific sections for instructions to protect bees and other insect pollinators.
3. Minimize in-field exposure of bees to pesticides by avoiding applications when bees are actively foraging in the crops. Bee flower visitation rate is highest in early morning. Apply pesticides in the late afternoon or early evening to allow for maximum residue degradation before bees return the next morning. Bee foraging activity is also dependent upon time of year (temperature) and stage of crop growth. The greatest risk of bee exposure is during bloom.
4. Minimize off-target movement of pesticide applications by following label directions to minimize off target movement of pesticides. Do not make pesticide applications when the wind is blowing towards bee hives or off-site pollinator habitats.



Pre-Transplant and Transplant Operations

Blackberries and raspberry terminology – In general, though there are exceptions, diseases of raspberries are the same as those of blackberries, and control measures are the same unless otherwise indicated. Flowers and fruit develop on the second year canes, the floricanes with traditional varieties; however fall-bearing varieties are available. A one-year-old cane is called a primocane. Blackberry varieties may be erect, semi-erect, or trailing (procumbent).

General fungicide resistance management recommendations:

- limit the number of times fungicides of the same class are applied in one year. Rovral, Nevado, and Iprodione are dicarboximides and Pristine, Cabrio, Heritage, and Abound contain strobilurins, as examples of fungicide classes (see the Fungicide Classes chart for additional help relative to resistance management programs).
- always tank mix benzimidazoles, hydroxylanilides or dicarboximides with a broad spectrum fungicide such as Captan to control resistant strains.
- apply fungicides of the same class in a block of sprays (1-2 sprays), then alternate to a fungicide of a different class in the next block of sprays.

Nematodes – Little is known about nematodes and brambles in the Southeast, but there are at least three reasons why nematodes can be potentially problematic for brambles: (1) they can directly destroy roots, resulting in decreased uptake of nutrients and water, as well as increasing root rot diseases, (2) nematode damage can increase crown gall, caused by a root and crown-infecting bacterium, and (3) many nematodes spread bramble viruses. September samples give the best assessments of root-knot, root-lesion, dagger and other significant nematodes of brambles. All potential sites should be sampled well ahead of land preparation. Following fumigation, a two-month period is often required before planting. Relatively warm conditions are also required for effective fumigation. Therefore, it is best to fumigate by late October to late November, depending on location.

Viruses – Bramble viruses are particularly problematic. Once viruses are introduced in a planting, there is no remedy, save for rapid removal of symptomatic plants. Since viruses can be introduced through propagation, clean planting stock is essential. Tissue-cultured plants are more likely to be free of viruses and crown gall. Although it does not guarantee virus-free plants, use of tissue-cultured plants is highly recommended for the Southeast. Destruction of wild blackberries within 100-200 yards of a commercial planting may be of value to reduce potential introduction of viruses and other pathogens from the native populations. Nematode control, especially of dagger nematode, is essential to prevent virus spread; even low levels of dagger are dangerous.

Crown gall – All brambles can be affected. Canker-like growths or galls 0.25-2.5 inches in diameter develop on roots and stems; galls are first greenish-white, turning tan to brown, and then black. Use of tissue-cultured plants will also help to prevent introduction of crown-gall infected plants. As additional insurance against this disease, dip root cuttings in Galltrol or Nogall suspensions. Galltrol contains *Agrobacterium radiobacter* strain K84 and should result in significant reduction in disease. The new strain found in Nogall, K1026, is a derivative of strain K84. One 100g pack of Nogall, when mixed into slurry with 1 gallon of water, treats up to 2,000 cuttings. One container can treat as many as 10,000 root pieces. This biological control bacterium has not controlled all strains of the crown gall bacterium; local data on brambles is not currently available. All brambles are very susceptible, and the causal bacteria persist in soil. Wounds are required for infection, so every effort should be made to avoid wounding roots and lower stems. Allow root pieces to heal prior to planting. Prune when 2-3 days of clear, dry weather is expected. Avoid cultivation by using herbicides for weed control, but also avoid herbicide burn of stems.

Phytophthora root rot – Root rot is generally a problem of low, poorly drained sites. Provisions for adequate drainage must be made prior to planting! Site selection and/or proper bedding operations are essential cultural practices for control of this disease. Treatment with fungicides is not effective for reversing root rot damage on plants with severe symptoms.

Blackberry and Raspberry (continued)
Pre-transplant and Transplant Operations (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Nematodes	1,3-dichloro-propene (Telone II)	27-35 gallons	+++++	5 days		Suggested pre-plant interval: 4 to 8 weeks, longer when dissipation is slow.

Fumigation with Telone products. Telone products are highly toxic. Carefully abide by all label precautions and review the label before each application. Telone II may be used when soil temperatures are from 40-80°F at the prescribed injection depth (a minimum of 12 inches). Thorough soil preparation is required and soil moisture is a critical consideration. If it is too dry, the soil surface will not seal enough to prevent premature dissipation. If the soil is too wet, the product is less effective because it will not move as well in the soil, which will decrease product effectiveness. Excessive soil moisture can also prolong desired dissipation from the soil, which forces delay of planting to avoid phytotoxicity. Though soil temperatures of 40-80°F are required for use of Telone, the product is more active at the upper end of this temperature range. In the Southeast, applications should generally be made in the fall prior to mid-November. October soil temperatures often provide the best opportunity for efficacy, due to adequate soil temperatures. Plants can be easily killed by Telone if planting takes place too soon after application. At a minimum, the 27 GPA rate would require 4 weeks from application to planting, and the 35 GPA rate would require 5 weeks. If soils are wet or they have a clay component, dissipation will be much slower. Plan for at least 6-8 weeks between fumigation and planting. Even more time may be necessary. Before planting, use a post-hole digger or shovel to smell of the soil at the full depth of injection; if the almond-like odor of Telone is present, dissipation is not complete, and it is too early to plant. Cultivation, at a depth not to exceed the depth of Telone application, with subsoil shanks, a middle buster or other implements, will hasten dissipation of Telone. More than one cultivation may be required to get Telone out of the ground pre-plant.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Nematodes (continued)	metam sodium (Vapam, Sectagon 42)	75 gallons	+++	See label		If tarps are used for the application, non-handler entry is prohibited while tarps are being removed. Soil temperature must be 40-90°F for activity. Soil moisture must be adequate, and has to be thoroughly cultivated prior to application. On well-drained soils with light to medium texture planting can begin 14-21 days after treatment. If soils are heavy or high in organic matter, or if the soils remain wet and/or cold (<60°F) following the application, a minimum interval of 21 days is necessary. Dissipation can be increased through cultivation. Plan for at least a 4 week interval between treatment and planting. More time may be required.
	metam-potassium (K-PAM HL)	62 gallons per treated acre	+++	See label		

Blackberry and Raspberry (continued)
Pre-transplant and Transplant Operations (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Nematodes (continued)	Pic-Clor 60 EC (1,3-dichloropropene 37% + choropicrin 57%)	19.5-44.5 gallons	++++	5 days		SEE LABEL FOR ADDITIONAL INFORMATION
Crown gall	<i>Agrobacterium tumefaciens</i> strain K-84 (Galltrol-A)	1 plate/gal water suspension (dip application)	++	12 hrs	not listed	Usually applied as a dip to root cuttings. This biological control bacterium has not controlled all strains of the crown gall bacterium. All brambles are susceptible. Avoid wounding of roots during planting because injury is required for infection.
	<i>Agrobacterium radiobacter</i> strain K1026 (Nogall)	100 g/gal	++	0 hrs	0 days	One 100 g pack of Nogall, when mixed into slurry with 1 gallon of water, treats up to 4,000 seeds, up to 1,000 seedlings and, depending on their size, 100-2,000 cuttings.

Dormant (prior to budbreak)

Cane and leaf rust and Anthracnose – These can be reduced by dormant-season sanitation. Wild blackberries near commercial plantings should be destroyed. Bramble plantings should be pruned to remove old floricanes and any new canes that show signs of disease or insect injury. Remove and burn or bury prunings. Though difficult to accomplish, removal of old floricanes is essential to good sanitation in a bramble planting.

Raspberry cane borer and rednecked cane borer – Infested canes should be either removed from the site or destroyed immediately after harvest; infested canes can also be removed during winter pruning and destroyed. In some blocks, cultural controls will need to be augmented with insecticides later in the production cycle.

Delayed Dormant (swollen buds) to Green Tip

FRAC/IRAC codes – These acronyms refer to industry-sponsored committees addressing resistance to crop protection materials; **Fungicide Resistance and Insecticides Resistance Action Committees**. Pesticides affect their target pest in a variety of ways, and the way a pesticide kills the target organism is called the *mode of action* (MoA). Although pesticides have different names and may have different active ingredients, they may have the same MoA. Over time, pests can become resistant to a pesticide, and typically this resistance applies to all pesticides with the same MoA. When rotating pesticides, it is important to select pesticides with different MoAs. The FRAC/IRAC have grouped crop protection materials into groups with shared MoAs and given them numerical designations, which appear on pesticide labels. The code **UN** means the MoA is unknown. *When selecting pesticides, avoid successive applications of materials in the same MoA group to minimize potential resistance development.* More information about this topic can be found at www.irac-online.org and www.frac.info.

Anthracnose – Most conspicuous on canes: reddish purple spots appear on primocanes in the spring; later, centers turn gray with raised purple margins. Still later, lesions dry out, crack, and can girdle canes. Leaves, flowers, and fruit may be affected. Hosts affected: black raspberry (very susceptible), red raspberry (susceptible), blackberry (tolerant). Among blackberries, thorny blackberries are more susceptible than thornless. Erect blackberries are more susceptible than training (procumbent) types. Erect blackberry varieties listed from more resistant to moderately susceptible are Cherokee, Cheyenne, Comanche, Shawnee, Navaho, Arapaho, Choctaw, Womack, Raven, Brison, Brazos, Rosborough. For Cherokee, dormant sprays have been adequate in most plantings but cover sprays and post-harvest sprays may be used as deemed necessary. Disease control: Prompt removal and destruction of the old floricanes (maybe even primocanes in some cases) after harvest is the key to blackberry disease control. Also, destruction of nearby hosts (wild blackberries) will reduce disease pressure. All steps possible should be taken to improve air circulation within a planting, to allow faster drying of foliage and canes (e.g., weed control, removal of suckers, thinning). Timing of fungicide sprays is critical. Spray at green tip (when plants break dormancy) to the point at which no more than 3/4" green tissue has been formed. Additional applications have been recommended when primocanes are 6" tall and again at 14-day intervals through harvest.

Spur blight – Hosts affected: black and red raspberry. Symptoms: Brown, V-shaped lesions progressing from leaf margins. Infection spreads from leaf to cane, causing a dark chestnut brown lesion centered on the leaf node. Buds at affected nodes fail to grow or produce weak laterals. Disease control: Spur blight is only a problem in certain regions of the southeastern United States. Disease diagnosis is recommended before initiating a fungicide-based control program.

Septoria leaf spot – Hosts affected: blackberry; raspberries are mostly tolerant. Spots with whitish centers and brown borders on leaves and canes; infected leaves drop off. Disease control: Remove floricanes as soon as the fruiting season is complete. Sprays applied for anthracnose, Botrytis gray mold, double blossom, and fruit rots will prevent Septoria infections. Loss impact usually is relatively minor. Heavily infected plants are not as vital, produce less fruit, and may be more susceptible to cold injury. Again, the problem is generally more serious on blackberries.

Raspberry crown borer – Larvae overwinter in silken hibernacula on the roots and crown. In the spring, larvae leave hibernacula to bore into the roots and the crown. The cultural control of **roguing infested canes is very important. Remove and destroy infested canes whenever they are found. In blocks with a history of raspberry crown borer infestations, late fall to early spring insecticide applications**, applied as-needed, provide an insecticide barrier to prevent raspberry crown borer larvae from boring into crowns as they emerge from their hibernacula.

Fire ants – Fire ants are a nuisance pest. Extinguish Professional Fire Ant Bait is labeled for use on crop land. Apply on a warm sunny day when soil moisture is good. Allow 6 to 8 weeks for control. Two applications, spring and fall, work best, but are costly.

*Blackberry and Raspberry (continued)
Delayed Dormant (swollen buds) to Green Tip (continued)*

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Anthracnose Cane blight Spur blight	copper-based products	See specific product label	+	See label	See label	Multiple copper-based materials are available, including copper hydroxide, copper sulfate, and others. Apply prior to ¾ inch shoot stage to avoid leaf burn. For raspberries only: Copper can cause phytotoxicity on black raspberry cultivars if used with formulated phosphorous acid products (e.g. Aliette). It is also an occasional problem on red raspberries. FRAC – MI
	calcium polysulfide (Lime Sulfur)	See specific product label	++	48 hrs	See label	Apply lime-sulfur at delayed dormant, but before shoots are ¾ inch long. Lime sulfur is dangerous to the applicator, so use caution. Any exposed green tissue will likely be burned. A minimum of 200 gallons of diluted spray is recommended per acre. Follow specific label directions for dilutions, and never use in the undiluted form.
Raspberry crown borer	Esfenvalerate (Asana XL)	9.6 fl oz	+++	12 hrs	7 days	Use sufficient spray volume to assure good coverage of the lower portions of canes and crowns. IRAC - 3
	Chlorantraniliprole (Altacor 35WG)	3-4.5 oz	++++	4 hrs	3 days	IRAC-28
	bifenthrin (Brigade and Sniper 2EC) (Brigade 10WSB)	6.4 fl oz (soil drench) 8-16 oz (foliar) 16 oz (soil drench)	++++ ++++	12 hrs 12 hrs	3 days 3 days	See label for application instructions. Rogue infested canes after harvest. Foliar-applied insecticides for crown borer may be applied in July and August, targeting the egg-laying adults, eggs and the first larval stage. Thoroughly wet foliage when employing a late-summer or early-fall application. Drench applications target young larvae, and should be applied in the fall or early spring (late-dormant). Apply in at least 50 gallons of final spray solution per treated acre (use flood nozzles in a continuous band application directed to the base of the plants). IRAC - 3

*Blackberry and Raspberry (continued)
Delayed Dormant (swollen buds) to Green Tip (continued)*

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Fire ants	S-methoprene (Extinguish Professional Fire Ant Bait)	1.0-1.5 lbs/acre 3-5 tbsp/ 1000 sq ft 3-5 tbsp/ mound	++++	4 hrs	0 day	Extinguish Professional Fire Ant Bait (0.5% methoprene) is a slow-acting bait; it will take several weeks for Extinguish Professional Fire Ant Bait to reach full efficacy. Extinguish Professional Fire Ant Bait is legal for use on 'crop land.' Caution, Extinguish bait with methoprene plus hydramethylnon is not labeled for use on crop land. IRAC - 7A
	pyriproxyfen (Esteem Ant Bait)	1.5-2.0 lbs	++++	12 hrs	24 hrs	Esteem Fire Ant Bait will take several weeks to reach full efficacy. IRAC - 7D

Shoots 6 Inches Long and Before Blooms Open

Orange rust – Hosts affected: Navaho blackberry and black raspberry are very susceptible. Multiple spindly shoots that are light green in color, at first developing orange pustules on undersides of leaves only, indicate systemic infection of roots. Normal canes with orange spores indicate first-time infection. Disease control: Inspect planting thoroughly when new canes are 12-18 inches. Remove infected canes, recognized by weak growth and the presence of orange pustules. The varieties Cherokee, Cheyenne, Comanche, Choctaw (erect, thornless), Arapaho (erect, thornless), and Shawnee are considered resistant. The possibility of new races exists, as orange rust has been observed in all varieties. The varieties Darrow, Humble, and Navaho and black raspberries are susceptible. Wild blackberries should be eradicated within 0.25 mile of planting. Preventive fungicide applications are effective; however, once a plant shows symptoms, it has to be removed and destroyed.

Leaf and cane rust – Hosts affected: blackberry. Symptoms: floricanes has yellow spores erupting in fissures on canes and as leaf spots; primocane has similar yellow spores on canes and leaves. Infected floricanes are stunted and delayed in development; can cause serious defoliation. Disease control: Remove floricanes immediately after harvest to limit primocane infection. Apply sprays at green tip and prior to bloom and resume after harvest until floricanes are removed. After floricanes removal, delay sprays until scouting indicates new infections of primocanes.

Powdery mildew – Hosts affected: black and red raspberries; rarely on blackberries. Light green blotches on upper leaf surface with white mycelium growth immediately beneath these blotches. In cases where infection is sparse, mottled appearance could be mistaken for virus symptoms. Disease control: This disease is usually not a problem, but some western varieties are very susceptible if grown in the East. Powdery mildew fungicide treatments should begin at the first sign of disease and continue at 10-14 day intervals.

Clipper (strawberry weevil) – This is a small 3/16 inch (3 mm) long reddish brown weevil with bluish black wing covers. Clippers lay their eggs into flower buds and sever stems just below the flower buds, leaving the clipped buds to dangle. Eggs are inserted into the dangling flower buds. Larvae develop within the buds, which typically fall to the ground. Apply insecticides when clippers and damage are present. Keep records to help refine scouting efforts and to improve the timing if preventative sprays are opted for fields with a history of clipper injury.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Strawberry clipper (weevil)	carbaryl (Sevin 80WSP)	1.25-2.5 lbs	+++	12 hours	7 days	IRAC - 1A
	bifenthrin (Brigade 2EC)	3.2-6.4 fl oz	++++	12 hours	3 days	IRAC - 3
	(Brigade 10WSB)	8-16 oz				

*Blackberry and Raspberry (continued)
Shoots 6 Inches Long and Before Blooms Open (continued)*

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/TRAC Code)
Strawberry clipper (weevil) (continued)	fenpropathrin (Danitol 2.4EC)	10.66-16 fl oz	+++	24 hours	3 days	IRAC - 3
Cane and leaf rust, orange rust, and yellow rust	myclobutanil (Rally 40WSP)	1.25-2.5 oz	+++++	24 hrs	1 day	Rally is registered for use on blackberry and raspberry. It is also active against powdery mildew. Begin applications as early as bud break, and continue applications on a 10-14 day schedule, depending on disease(s) and disease severity. Do not apply more than 10 oz per acre per growing season. FRAC - 3
	propiconazole (Orbit 3.6EC, Tilt 3.6EC)	6 fl oz	+++++	12 hrs	30 days	When applied for Septoria leaf and cane spot control, propiconazole has been shown to have activity against rust diseases as well. FRAC - 3
	pyraclostrobin (Cabrio EG)	14 oz	+++++	12 hrs	0 days	No more than 2 sequential applications of Cabrio should be made before alternating with fungicides that have a different mode of action. Make no more than 4 applications of Cabrio or other strobilurins per season. FRAC - 11
	azoxystrobin (Abound FL)	6.2-15.4 fl oz	+++++	4 hrs	0 days	No more than 2 sequential applications of azoxystrobin should be made before alternating with fungicides of different mode of action. Make no more than 4 applications of azoxystrobin or other strobilurins per season. FRAC - 11
	pyraclostrobin and boscalid (Pristine WG)	18.5-23 oz	+++++	12 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Make no more than 4 applications of Pristine or other strobilurins per season. FRAC - 11 and FRAC - 7
	azoxystrobin + propiconazole (Quilt Xcel)	14-21 fl oz	+++++	12 hrs	30 days	Application should begin prior to disease development and continue on a 14 day schedule. No more than 2 sequential applications of Quilt Xcel should be made before alternating with fungicides that have a different mode of action. Make no more than 3 applications of Quilt Xcel or other group 11 fungicides per season. FRAC - 11 and FRAC - 3

Blackberry and Raspberry (continued)
Shoots 6 Inches Long and Before Blooms Open (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/TRAC Code)
Powdery mildew	sulfur-based products	See label	+++	24 hrs	not listed	Multiple formulations of sulfur are available. Kumulus is labeled for all brambles. Repeat at 10 day intervals as necessary. FRAC – M2
	myclobutanil (Rally 40WSP)	1.25-2.5 oz	+++++	24 hrs	1 day	Rally is registered for use on blackberry and raspberry. It is also active against cane and leaf rust, orange rust and yellow rust. Begin applications as early as bud break, and continue applications on a 10-14 day schedule, depending on disease(s) and disease severity. Do not apply more than 10 oz per acre per season. FRAC - 3
	pyraclostrobin (Cabrio EG)	14 oz	+++++	12 hrs	0 days	No more than 2 sequential applications of Cabrio should be made before alternating with fungicides of different mode of action. Make no more than 4 applications of Cabrio or other strobilurins per season. FRAC - 11
	azoxystrobin (Abound FL)	6.2-15.4 fl oz	+++++	4 hrs	0 days	No more than 2 sequential applications of azoxystrobin should be made before alternating with fungicides of different mode of action. Make no more than 4 applications of azoxystrobin or other strobilurins per season. FRAC - 11
	pyraclostrobin and boscalid (Pristine WG)	18.5-23 oz	+++++	12 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Make no more than 4 applications of Pristine or other strobilurins per season. FRAC – 11 and FRAC - 7
	azoxystrobin + propiconazole (Quilt Xcel)	14-21 fl oz	+++++	12 hrs	30 days	Application should begin prior to disease development and continue on a 14 day schedule. No more than 2 sequential applications of Quilt Xcel should be made before alternating with fungicides that have a different mode of action. Make no more than 3 applications of Quilt Xcel or other group 11 fungicides per season. FRAC – 11 and FRAC - 3

Blackberry and Raspberry (continued)
Shoots 6 Inches Long and Before Blooms Open (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Anthracnose cane blight, spur blight, and leaf spots	pyraclostrobin (Cabrio EG)	14 oz	+++++	12 hrs	0 days	No more than 2 sequential applications of Cabrio should be made before alternating with fungicides of different mode of action. Make no more than 4 applications of Cabrio or other strobilurins per season. FRAC - 11
	azoxystrobin (Abound FL)	6.2-15.4 fl oz	+++++	4 hrs	0 days	No more than 2 sequential applications of azoxystrobin should be made before alternating with fungicides of a different mode of action. Make no more than 4 applications of azoxystrobin or other strobilurins per season. FRAC - 11
	pyraclostrobin and boscalid (Pristine WG)	18.5-23 oz	+++++	12 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides of a different mode of action. Make no more than 4 applications of Pristine or other strobilurins per season. FRAC - 11 and FRAC - 7
	azoxystrobin + propiconazole (Quilt Xcel)	14-21 fl oz	+++++	12 hrs	30 days	Application should begin prior to disease development and continue on a 14 day schedule. No more than 2 sequential applications of Quilt Xcel should be made before alternating with fungicides that have a different mode of action. Make no more than 3 applications of Quilt Xcel or other group 11 fungicides per season. FRAC - 11 and FRAC - 3
	Captan (Captan 80WDG Captec 4L Captan 50W)	See specific product label	++	72 hrs	3 days	See specific labels for maximum product use/season FRAC - M4
	copper-based products	See specific product label	+	See label	See label	Multiple copper-based materials are available, including copper hydroxide, copper sulfate and others. Apply prior to 3 per 4 inch shoot stage to avoid leaf burn. For raspberries only: Copper can cause phytotoxicity on black raspberry cultivars if used with formulated phosphorous acid products (e.g. Aliette). It is also an occasional problem on red raspberries. FRAC - MI

Blackberry and Raspberry (continued)
Shoots 6 Inches Long and Before Blooms Open (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Phytophthora root rot	mefenoxam (Ridomil Gold SL)	0.25 pt/1000 linear feet in a 3 ft band	++++	48 hrs	45 days	Ridomil is labeled only for raspberries and can be applied anytime during the spring. FRAC - 4
	Phosphorous acid-based products (e.g. Aliette WDG)	See specific label rates	++++	See label	See label	Apply the first foliar application after bud break with at least 1-3 inches of new growth. Apply in the fall at least 30 days prior to leaf drop. When applied prior to or after copper, the pH of the phosphorous acid-based product should be raised to 6 or above. Do not use adjuvants which enhance pesticide penetration. For raspberries only: Phosphorous acid-based products can cause phytotoxicity on black raspberry cultivars and occasionally on red raspberries if used with copper products or foliar fertilizers. For raspberries and blackberries: Due to the acidic nature of phosphorous acid-based products do not use acidifying type compatibility agents. If spray adjuvants are used, test them before use to confirm compatibility. Use of these products with acidic water has been shown to cause damage in some commodities; water pH should be 6 or higher. FRAC - 33

Pre-Bloom (when flower buds show white)

Flower thrips – Flower thrips are small, cigar-shaped insects that are often quite abundant during bloom. Flower thrips may vector some plant viruses of brambles.

Blackberry gall midge – This is a small fly. Females lay eggs in developing flower buds as bud scale separation begins to occur. Larval stage gall midges feed inside the developing buds, causing injury that is easily mistaken for cold injury. Fields with a history of gall midge should receive two pre-bloom insecticide applications.

Leafrollers and leaf tiers – These are active, green caterpillars that feed on and either roll or tie together leaves. Treat if caterpillars and damage are seen.

Tarnished plant bugs – Abundant plant bugs can abort blooms or cause berries to be seedy or misshapen. Treat if plant bugs are numerous, at least one plant bug per two flower clusters.

Brown marmorated stink bug – Brown marmorated stink bug has been a sporadic problem in Virginia; however, it may expand its range and become more problematic in other southeastern states. Monitor plants for presence of stink bugs before deciding to apply insecticides. May be present on caneberries depending on local conditions.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Strawberry clipper (weevil), blackberry gall midge, leafroller or leaf tier, tarnished plant bug	Same as Shoots Six Inches Long and Before Blooms Open					
Flower thrips	spinosad (Entrust 80WP)	1.25-2 oz	+++	4 hrs	1 day	After Entrust dries it is of low risk to pollinators. If applied in the evening after bee foraging has stopped, Entrust may be safely applied up to first bloom. Apply as-needed the day before bloom. Entrust is a good choice for flower thrips and may be effective against gall midge and leaf tiers. IRAC - 5

*Blackberry and Raspberry (continued)
Pre-Bloom (when flower buds show white) (continued)*

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Flower thrips (continued)	spinetoram (Delegate 25WG)	3-6 oz	+++	4 hrs	1 day	IRAC - 5
	acetamiprid (Assail 30SG)	4.5-5.3 oz	+++	12 hrs	1 day	IRAC - 4A
Brown marmorated stink bug	bifenthrin (Brigade 2EC)	3.2-6.4 fl oz	++++	12 hrs	3 days	IRAC-3A. Brown marmorated stink bug has been a sporadic problem in Virginia; however, it may expand its range and become more problematic in other southeastern states. Monitor plants for presence of stink bugs before deciding to apply insecticides. May be present on caneberries depending on local conditions.
	(Brigade 10WSB)	8-16 oz				
	Numerous generics	See labels				
	acetamiprid (Assail 30SG)	4.5-5.3 oz	+++	12 hrs	1 day	IRAC - 4A
	Thiamethoxam (Actara 25 WDG)	3 oz	+++	12 hrs	3 days	IRAC-4A
	Pyrethrins + azadirachtin (Azero)	2-3 pt	++	12 hrs	0 day	IRAC - 3A and IRAC - Unknown but multiple modes of action. OMRI-approved
Anthracnose, cane blight, spur blight, and leaf spots	Same as Shoots Six Inches Long and Before Blooms Open					
Cane and leaf rust, orange rust, and yellow rust	Same as Shoots Six Inches Long and Before Blooms Open					

Early Bloom (5-10%)

Do Not Apply Insecticides During Bloom

Botrytis gray mold – Gray mold spores are gray in color and form aerial structures that can be seen with a hand lens on flowers and ripening fruit. Hosts affected: Black and Red Raspberry (highly susceptible); some blackberry varieties are somewhat tolerant. Disease control: Blossom blight occurs in bloom and can spread rapidly on ripening fruit (gray mold). Apply fungicides at early bloom, full bloom and pre-harvest to protect flowers and ripening fruit. Postbloom and pre-harvest sprays for gray mold control are generally not required in blackberry unless weather is cool and wet. **The gray mold fungus has developed resistance to multiple fungicides, which makes resistance management imperative.**

Rosette (double blossom) – Hosts affected: Blackberries. A proliferation of shoots (witches-broom) forms from a single bud, usually after normal bloom time. Pistils and ovaries of most flowers are replaced with spores. Some flowers in witches-brooms develop normally. Disease control: If you have a problem with double blossom, start sprays when rosettes are blooming and primocanes begin to grow. Clip out witches-brooms as they develop and before they flower. (Estimated labor to do this, if done regularly each year on the Shawnee variety, is 40 hr/ac.) Remove and destroy floricanes promptly after harvest. If disease pressure is very high, cut all canes to 12-18 inches after harvest, fertilize heavily, and irrigate regularly to produce an adequate crop of canes. This procedure will reduce yields somewhat. The varieties Apache, Navaho, and Humble are largely resistant. Arapaho, Kiowa, Hull, Chester, Rosborough, and Loch Ness are moderately susceptible to this disease. Highly susceptible cultivars include Shawnee, Choctaw, Chickasaw and Black Satin.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Cane and leaf rust, orange rust, and yellow rust	Same as Shoots Six Inches Long and Before Blooms Open					
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Botrytis gray mold	Iprodione (Rovral 4F; Nevado 4F; Iprodione 4L AG)	1-2 pt	+++	24 hrs	0 days	Iprodione-based products must be mixed with a protectant fungicide such as captan in a minimum of 100 gallons per acre. Do not make more than 4 applications per season. Do not make more than 2 consecutive applications before switching to a chemical with a different mode of action. FRAC - 2

Blackberry and Raspberry (continued)
Early bloom (5-10%) (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Botrytis gray mold (continued)	Fenhexamid (Elevate 50WDG)	1.5 lb	+++++	12 hrs	0 days	Begin application at 10% bloom and continue through harvest. Avoid making more than two consecutive applications of Elevate before switching to a fungicide with another mode of action. Do not apply more than 6.0 lb of material per acre per year. Resistance to fenhexamid is an issue in many southeastern states and resistance monitoring is recommended. Fenhexamid should always be applied with a protectant fungicide such as captan. FRAC - 17
	pyraclostrobin and boscalid (Pristine WG)	18.5-23 oz	+++++	24 hrs	0 days	Make no more than 2 sequential applications of Pristine before alternating with fungicides that have a different mode of action. Make no more than 4 applications of strobilurins per season. Resistance to pyraclostrobin and boscalid is an issue in the Southeast, and resistance monitoring is recommended. FRAC - 11 and FRAC - 7
	Polyoxin D zinc salt (Ph-D WDG)	6.2 oz	++	4 hrs	0 days	Do not apply more than 3 applications of Ph-D (2.1 oz ai/A) per season. Use in alternation with fungicides with a different mode of action. FRAC - 19
	cyprodinil and fludioxonil (Switch 62.5WG)	11-14 oz	+++++	12 hrs	0 days	Begin application at early bloom. Do not exceed 56 oz of product per acre per year. Make no more than two sequential applications before using another mode-of-action fungicide. FRAC - 9 and FRAC - 12
	Captan 80WDG	2.5 lb	++	72 hrs	3 days	Do not apply more than 12.5 lb per acre per season. FRAC - M4
	Captec 4L	0.75-1 qt	++	72 hrs	3 days	Do not apply more than 10 lb per acre per season.
	Captan 50W	4 lb	++	72 hrs	3 days	Do not apply more than 20 lb per acre per season.
Rosette (Double blossom)	Bordeaux mixture 4-4-50 (see note below for directions)	See note	+++	24 hrs	1 day	Bordeaux mixture will cause leaf burn if applied on hot days or combined with insecticides.

Blackberry and Raspberry (continued)
Early bloom (5-10%) (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/TRAC Code)
Rosette (Double blossom) (continued)	azoxystrobin (Abound FL)	6.2-15.4 fl oz	+++++	4 hrs	0 days	No more than 2 sequential applications of azoxystrobin should be made before alternating with fungicides of a different mode of action. Make no more than 4 applications of azoxystrobin or other strobilurins per season. FRAC - 11
	pyraclostrobin and boscalid (Pristine WG)	18.5-23 oz	+++++	24 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than 4 applications of Pristine or other strobilurins per season. FRAC - 11 and FRAC - 7
	azoxystrobin + propiconazole (Quilt Xcel)	14-21 fl oz	+++++	12 hrs	30 days	Application should begin prior to disease development and continue on a 14 day schedule. No more than 2 sequential applications of Quilt Xcel should be made before alternating with fungicides that have a different mode of action. Make no more than 3 applications of Quilt Xcel or other group 11 fungicides per season. FRAC - 11 and FRAC - 3
	cyprodinil and fludioxonil (Switch 62.5WG)	11-14 oz	+++++	12 hrs	0 days	Begin application at early bloom. Do not exceed 56 oz of product/acre/ year. Make no more than two sequential applications before using a fungicide with another mode of action. FRAC - 9 and FRAC - 12
Anthracnose, cane blight, spur blight, and leaf spots	pyraclostrobin (Cabrio EG)	14 oz	+++++	12 hrs	0 days	No more than 2 sequential applications of Cabrio should be made before alternating with fungicides of a different mode of action. Make no more than 4 applications of Cabrio or other strobilurins per season. FRAC - 11
	azoxystrobin (Abound FL)	6.2-15.4 fl oz	+++++	4 hrs	0 days	No more than 2 sequential applications of azoxystrobin should be made before alternating with fungicides of different mode of action. Make no more than 4 applications of azoxystrobin or other strobilurins per season. FRAC - 11

Blackberry and Raspberry (continued)
Early bloom (5-10%) (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/TRAC Code)
Anthracnose, cane blight, spur blight, and leaf spots (continued)	Pyraclostrobin and boscalid (Pristine WG)	18.5-23 oz	+++++	12 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Make no more than 4 applications of Pristine or other strobilurins per season. FRAC - 11 and FRAC - 7
	azoxystrobin + propiconazole (Quilt Xcel)	14-21 fl oz	+++++	12 hrs	30 days	Application should begin prior to disease development and continue on a 14 day schedule. No more than 2 sequential applications of Quilt Xcel should be made before alternating with fungicides that have a different mode of action. Make no more than 3 applications of Quilt Xcel or other group 11 fungicides per season. FRAC - 11 and FRAC - 3
	Captan (Captan 80WDG Captec 4L Captan 50W)	See specific product label	++	72 hrs	3 days	See specific labels for maximum product use/season. FRAC - M4

Powdery mildew **Same as Shoots Six Inches Long and Before Blooms Open**

Bordeaux recipe – **1.** Fill spray tank to one-half the desired volume of water. **2.** Turn on the agitator. **3.** Dissolve powdered bluestone (copper sulfate) in the spray tank at a rate of 4 lb bluestone/ 50 gallons water. **4.** Make a “milk of lime” suspension by dissolving 4 lb of hydrated lime (calcium hydroxide) in 5 gallons of water in a container, for a rate of 4 lb hydrated lime/ 50 gallons water. **5.** Slowly add the “milk of lime” suspension into the spray tank. **6.** Fill the spray tank to the desired volume of water. **7.** Maintain constant agitation and apply immediately. Do not mix with Topsin-M or Sevin. Bordeaux mixture will cause severe leaf burn if applied on very hot days or if combined with insecticides. Slight phytotoxicity will have relatively minor impact.

Full Bloom **Do Not Apply Insecticides During Bloom**

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Rosette (Double blossom)	Same as Early Bloom (5-10%)					
Botrytis gray mold	Same as Early Bloom (5-10%)					
Anthracnose, cane blight, spur blight, and leaf spots	Same as Early Bloom (5-10%)					
Cane and leaf rust, orange rust, and yellow rust	Same as Shoots Six Inches Long and Before Blooms Open					
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Powdery mildew	myclobutanil (Rally 40WSP)	1.25-2.5 oz	+++++	24 hrs	1 day	Rally is registered for use on blackberry and raspberry. It is also active against cane and leaf rust, orange rust and yellow rust. Begin applications as early as bud break, and continue applications on a 10-14 day schedule, depending on disease(s) and disease severity. Do not apply more than 10 oz per acre per growing season. FRAC - 3
	pyraclostrobin (Cabrio EG)	14 oz	+++++	12 hrs	0 days	No more than 2 sequential applications of Cabrio should be made before alternating with fungicides of different mode of action. Make no more than 4 applications of Cabrio or other strobilurins per season. FRAC - II
	azoxystrobin (Abound FL)	6.2-15.4 fl oz	+++++	4 hrs	0 days	No more than 2 sequential applications of azoxystrobin should be made before alternating with fungicides of a different mode of action. Make no more than 4 applications of azoxystrobin or other strobilurins per season. FRAC - II

*Blackberry and Raspberry (continued)
Full bloom*

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Powdery mildew (continued)	azoxystrobin + propiconazole (Quilt Xcel)	14-21 fl oz	+++++	12 hrs	30 days	Application should begin prior to disease development and continue on a 14 day schedule. No more than 2 sequential applications of Quilt Xcel should be made before alternating with fungicides that have a different mode of action. Make no more than 3 applications of Quilt Xcel or other group 11 fungicides per season. FRAC – 11 and FRAC – 3
	pyraclostrobin and boscalid (Pristine WG)	18.5-23 oz	+++++	12 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides of a different mode of action. Make no more than 4 applications of Pristine or other strobilurins per season. FRAC – 11 and FRAC – 7

Petal Fall

Tarnished plant bugs and stink bugs – Tarnished plant bugs are 1/4 inch long, mottled and yellow-brown in color. Stink bugs of several species are occasional pests of brambles. Stink bugs are medium to large, shield-shaped insects. Both plant bugs and stink bugs have piercing and sucking mouthparts. They feed on the flower buds and developing fruits of many plant species.

Red necked cane borer – The red necked cane borer is a 1/4 inch long beetle with a black head and wing covers, and a reddish thorax. Adults are typically present in brambles from May until June. Larval stage red necked cane borers tunnel within canes in a spiral fashion, producing 3” long swollen, galled areas. Galled canes should be rogued out and destroyed whenever they are found. Insecticide applications are only effective on the adults. In blocks with a history of red necked cane borer injury, scout for adults in May. Application of insecticides at petal fall and again in 10 to 14 days typically provides good control of red necked cane borer. Keep records to help refine pest management efforts in subsequent years.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Plant bugs and stink bugs	esfenvalerate (Asana XL)	4.8-9.6 fl oz	+++	12 hrs	7 days	IRAC – 3
	Thiamethoxam (Actara 25 WDG)	3 oz	+++	12 hrs	3 days	IRAC – 4A
Brown marmorated stink bug	Same as Pre-bloom (when flower buds show white)					
Red necked cane borer	Remove galled canes		*****			Galled canes should be removed in the spring/summer and during winter pruning.
	bifenthrin (Brigade 2EC)	3.2-6.4 fl oz	++++	12 hrs	3 days	IRAC – 3
	(Brigade 10WSB)	8-16 oz				
	Numerous generics	See labels				
Aphids only (Aphids are infrequent pests in southeastern caneberries)	acetamiprid (Assail 30SG)	2.5-5.3 oz	++++	12 hrs	1 day	IRAC – 4A

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Aphids only (Aphids are infrequent pests in southeastern caneberries) (Continued)	thiamethoxam (Actara 25WG)	2-3 oz	+++++	12 hrs	3 days	IRAC – 4A
	imidacloprid (Admire Pro)	7-14 fl oz (soil application only)	+++++	12 hrs	7 day	Do not apply pre-bloom or at bloom. Admire Pro can be applied to the soil or as a foliar treatment. Read the label carefully and exercise caution when making soil applications via irrigation. IRAC – 4A
		2.8 fl oz (foliar application)				
insecticidal soap (M-Pede)	2% solution	++	12 hrs	0 days		
Rose scale	imidacloprid (Admire Pro)	7-14 fl oz (soil application only)	+++++	12 hrs	7 day	Sporadic problem in Virginia. Do not apply pre-bloom or at bloom. Admire Pro can be applied to the soil or as a foliar treatment. Read the label carefully and exercise caution when making soil applications via irrigation. Foliar applications timed to crawler emergence give best control. IRAC – 4A
		2.8 fl oz (foliar application)				
	acetamiprid (Assail 30SG)	4.0-5.3 oz	+++	12 hrs	1 day	Foliar applications timed to crawler emergence give best control. IRAC – 4A
Botrytis gray mold	Same as Early Bloom (5-10%)					
Anthracnose, cane blight, spur blight, and leaf spots	Same as Early Bloom (5-10%)					
Cane and leaf rust, orange rust, and yellow rust	Same as Shoots Six Inches Long and Before Blooms Open					
Powdery mildew	Same as Full Bloom					
Rosette (Double blossom)	Same as Early Bloom (5-10%)					

Cover Sprays

Blackberry psyllid – This is a tiny, cicada-like insect. Psyllid injury is similar to that caused by heavy aphid infestations. New growth can be severely malformed and misshapen. Blackberry psyllid overwinters on conifers such as pine, red cedar or white cedar. Avoidance is an excellent management tool. Blackberries one mile or more from conifers seldom have psyllid infestations. If possible, avoid planting brambles within 250 yards of conifers. Timing varies with geography and site, but psyllids often move from conifers to brambles from early- to mid-April. Foliar distortion is seen within 7 to 10 days. Treat when psyllids and injury are first observed, and note the date and stage of development in your field to begin developing a personalized IPM calendar for your bramble production.

Japanese beetles – Japanese beetles have metallic green wing covers, coppery undersides and a series of white tufts along the outside of the abdomen. Japanese beetles are social foliage and fruit feeders. They can be abundant following rains, which promote large, synchronous emergences of adults. Defoliation is of modest concern until 10% of the leaf area has been consumed. However, the difficulty of controlling large numbers of beetles favors controlling Japanese beetles before they become too abundant.

Spider mites – Spider mites can be significant pests of caneberries. However, they typically do not reach damaging densities unless plants have previously been treated with broad spectrum (IRAC 1A or 3) insecticides which can flare existing mite populations. They are favored by hot, dry weather. Spider mites are small, spider-like relatives of insects. Spider mites feed, normally on the underside of leaves, by puncturing leaves with needle-like stylets; this wounding process releases cellular fluids which the mite consumes. Feeding produces clear or whitish stippling. If mites are very abundant, leaves may take on a bronze to silvered appearance. Spider mites will often spin webbing on the underside of leaves when they are very abundant.

Fire ants – These can be nuisance pests in vineyards. **Optimal fire ant control programs for fruit make use of spring and fall broadcast bait applications.** Twice-a-year bait applications may be best in year-one of a program to thoroughly suppress the ant population. In subsequent years, a single bait application 8 to 10 weeks before harvest may provide adequate ant control. Ant baits work best when soil is moist, but not wet. Active ant foraging is essential. Ideally, temperatures should be warm and sunny. Avoid application of ant baits when conditions are expected to be cold, overcast, rainy or very hot. **Treatment of individual mounds is often a necessary complement to broadcast bait use if the goal is to obtain short-term elimination of fire ants.** Extinguish Professional Fire Ant Bait and Seduce are very effective, but slow acting options (8-10 weeks for colony elimination). Mound drenches with malathion (REI 12 hrs/PHI 24 hrs), or foliar application of malathion to get ants off of the plants immediately pre-harvest, should be modestly effective. Insecticide mound drenches are most effective when 1 to 2 gallons of dilute material are slowly applied per mound. Do not disturb mounds or place bait directly on top of mounds.

Spotted wing drosophila (SWD) – This is a recently detected invasive pest of soft skinned fruit in the southeast. SWD females preferentially lay their eggs in ripening and ripe fruit, and larvae (maggots) develop internally. SWD adults can be monitored with apple cider vinegar or yeast and sugar slurry traps. In sites where SWD are present, weekly insecticide applications should be made beginning when fruit begins to ripen and should be made more frequently in the even in rain. Fruit should be sampled on a weekly basis to check for larval presence as adult sampling may not predict fruit infestations and pesticide treatments may not necessarily prevent infestation, depending on environmental conditions and application methods. **Start insecticide applications for SWD when you observe SWD or when your fruit starts to color (green turning to red), whichever comes first.**

*Blackberry and Raspberry (continued)
Cover Sprays (continued)*

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Botrytis gray mold	Same as Early Bloom (5-10%)					
Anthracnose, cane blight, spur blight, and leaf spots	Same as Early Bloom (5-10%)					
Cane and leaf rust, orange rust, and yellow rust	Same as Shoots Six Inches Long and Before Blooms Open					
Powdery mildew	Same as Full Bloom					
Rosette (Double blossom)	Same as Full Bloom					
Botrytis gray mold	Same as Early Bloom (5-10%)					
Blackberry psyllids and Japanese beetles	malathion (Malathion 57EC)	1.5-3 pt	+++	12 hrs	1 day	IRAC – 1B
	(Malathion 8F)	2 pt	+++	12 hrs	1 day	
	carbaryl (Sevin 80WSP)	1.25-2.5 lb	+++	12 hrs	7 days	IRAC – 1A
Stink bugs, strawberry clipper, and red necked cane borer	Same as Petal Fall					
Brown marmorated stink bug	Same as Pre-bloom (when flower buds show white)					
Spotted wing drosophila	Bifenthrin (Brigade 2EC)	3.2 – 6.4 fl oz	+++++	12 hrs	3 days	IRAC – 3 Maximum number of applications is two.
	malathion (Malathion 57EC)	2-4 pt	+++	12 hrs	1 day	IRAC – 1B Maximum number of applications is four for the 8F only; this is allowed under a 24C label that expires 12/31/17. Under hot conditions, the 8F formulation is less likely to result in phytotoxicity.
	(Malathion 8F)	2 pt	+++	12 hrs	1 day	

*Blackberry and Raspberry (continued)
Cover Sprays (continued)*

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
(continued)	Spinosad (Entrust 80WP)	1.24 to 2 oz	++	4 hrs	1 day	IRAC – 5 Maximum number of applications is six or 9 oz of product.
	Spinetoram (Delegate 25WG)	3-6 oz	++++	4 hrs	1 day	IRAC – 5 Maximum number of applications is six or 19.5 oz of product.
	Fenpropathrin (Danitol 2.4EC)	10.66-16 fl oz	+++++	24 hrs	3 days	IRAC – 3 Maximum number of applications is two.
	Zeta-cypermethrin (Mustang) (Mustang Max)	4.3 fl oz 4 fl oz	+++++	12 hrs	1 day	IRAC – 3A Maximum number of applications is six.
Mites	hexythiazox (Savey 50DF)	4-6 oz	+++	12 hrs	3 days	Savey is best used on low mite populations that are building or as a preventative. Savey is a preventative miticide that primarily controls eggs, it has a long residual, but it is slow acting. Allow 10 days to see a clear reduction in mite numbers. IRAC - 3
	light, summer-weight horticultural oils	1-2 % by volume	++	4 hrs	0 days	Summer oils are effective in moderating low mite populations pre-harvest. Do not allow oil sprays on adjacent crops to drift onto crops which have been or will shortly be treated with Captan, Sevin or sulfur. DO NOT use oils within 14 days of using Captan, Sevin or any sulfur containing material because of potential for fruit finish or phytotoxicity issues.
	bifenazate (Acramite 50WS)	0.75-1.0 lb	+++++	12 hours	1 day	Acramite targets eggs, larvae, and adults. IRAC - UN

Pre-Harvest (14 days before anticipated first harvest)

SAP BEETLES, sometimes called picnic beetles, are strongly attracted to ripening fruit. Sanitation, in the form of conscientiously picking all ripe fruit on a daily basis, is the most important management option for controlling sap beetles. Bait buckets filled with overripe fruit may be used on the perimeter of fields to attract sap beetles and other ripe fruit pests. If several days of rain preclude picking, it may be necessary to send laborers into fields in advance of pick-your-own customers to remove overripe fruit.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Japanese beetles, Stink bugs	Same as Cover Sprays					
Sap beetles	Bait Buckets		+++			Sap beetles: Bait buckets, and prompt removal of overripe fruit, should be used to provide cultural suppression to augment as-needed insecticide. Place overripe fruit in bucket around the perimeter of fields to attract sap beetles. Dispose of baits outside of fields.
Brown marmorated stink bug	Same as Pre-bloom (when flower buds show white)					Pay careful attention to both REI and PHI of the materials used in the pre-harvest timeframe.
Mites	Same as Cover Sprays					

Spotted wing drosophila (SWD) – This is a recently detected invasive pest of soft skinned fruit in the southeast. SWD females preferentially lay their eggs in ripening and ripe fruit, and larvae (maggots) develop internally. SWD adults can be monitored with apple cider vinegar or yeast and sugar slurry traps. In sites where SWD are present, weekly insecticide applications should be made beginning when fruit begins to ripen and should be made more frequently in the event of rain. Fruit should be sampled on a weekly basis to check for larval presence, as adult sampling may not predict fruit infestations, and pesticide treatments may not necessarily prevent infestation, depending on environmental conditions and application methods. **Start insecticide applications for SWD when you observe SWD or when your fruit starts to color.**

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Spotted wing drosophila	Same as Cover Sprays					
Botrytis gray mold	Same as Early Bloom (5-10%)					
Anthraxnose cane blight, Spur blight, and leaf	Same as Early Bloom (5-10%)					

Blackberry and Raspberry (continued)
Pre_Harvest (14 days before anticipated first harvest) (continued)

spots	
Cane and leaf rust, orange rust, and yellow rust	Same as Shoots Six Inches Long and Before Blooms Open
Powdery mildew	Same as Full Bloom
Rosette (Double blossom)	Same as Full Bloom

Harvest

Botrytis gray mold	Same as Early Bloom (5-10%)
Anthraxnose cane blight, spur blight, and leaf spots	Same as Early Bloom (5-10%)
Cane and leaf rust, orange rust, and yellow rust	Same as Shoots Six Inches Long and Before Blooms Open
Powdery mildew	Same as Full Bloom
Rosette (Double blossom)	Same as Full Bloom
Phytophthora root rot	Same as Shoots Six Inches Long and Before Blooms Open

Raspberry cane borer – The planting should be examined weekly during June and July. The existence of wilting tips characterized by two girdling rings identify attack by raspberry cane borer. Control is obtained by pruning out the infested canes by cutting a few inches below the bottom ring or below the larval tunnel.

After-Harvest (after fruit has been harvested)

Cane blight – Cane blight can be a major disease of blackberry in the Southeast, resulting in severe losses – sometimes resulting in the complete destruction of fruiting canes in any given year. It is generally not reported in other states as a major disease of blackberries, except when winter injury occurs on thornless blackberries, and most of the reports are associated with raspberry. However, wet, humid conditions observed in Georgia and other southeastern states allow for significant losses following pruning or other injuries to the primocane. Avoid wounding the primocanes whenever possible. However, pruning is necessary for blackberry production, so wounding will occur through pruning operations. Pruning wounds are the primary site of infection, especially following prolonged rains, such as those observed in tropical storms and hurricanes. Rainfall or overhead irrigation will disperse fungal spores to fresh wound sites and create favorable conditions for infection. Always check the weather forecast before pruning operations. If at all possible, prune when at least four days of dry weather is expected. During the summer, “pinch off” or “tip” tender primocanes when they reach the desired height, as opposed to cutting. Practices which promote quick drying of the canopy will help to decrease infection. A weed-free strip under the canopy will also aid drying and air movement. Strobilurin fungicides (Pristine, Cabrio, Abound) should be applied immediately after each pruning to provide a protective barrier on the wound site until healing can occur. Rally, a DMI fungicide, has also shown efficacy when applied to pruning wounds for cane blight. Alternation of Rally and strobilurins would provide a good method of resistance management for this pathogen. See <http://www.smallfruits.org/bramble/pestinformation/caneblightfactsheetii.pdf> for additional information.

Orange felt (orange cane blotch) – Orange felt is especially prevalent on blackberries grown in very hot, wet, and humid environments, such as those encountered in much of the Coastal Plain areas of the Southeast. Where colony formation (i.e. the degree of coverage of the cane) is limited, it has been stated that this alga does not limit blackberry production. Where ideal environmental conditions occur, this alga may girdle canes or exacerbate other cane diseases, causing subsequent decline and death. Practices which promote quick drying of the canopy will help to decrease infection. A weed-free strip under the canopy will also aid in drying and air movement. Where producers have bedded and installed black plastic and drip-tape irrigation systems, orange felt has been reduced substantially. Avoid stressing plants, making sure that all nutrient and water requirements are met. Soil and tissue samples allow for accurate fertilization and pH assessments. Avoid planting in poorly drained sites. Phosponate fungicides, such as Prophyt, are the only materials which consistently suppress this disease on blackberries. Copper products, though recommended on other commodities for similar algal diseases, do not show consistent or sufficient management of this disease.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Leaf spots (Cercospora, Pseudocercospora, and Septoria)	propiconazole (Orbit 3.6EC, Tilt 3.6EC)	6 fl oz	++++	12 hrs	30 days	When applied for Septoria leaf and cane spot control, propiconazole has been shown to have activity against rust diseases as well. FRAC - 3

Blackberry and Raspberry (continued)
After Harvest (after fruit has been harvested) (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Leaf spots (Cercospora, Pseudocercospora, and Septoria) (continued)	pyraclostrobin (Cabrio EG)	14 oz	++++	12 hrs	0 days	No more than 2 sequential applications of Cabrio should be made before alternating with fungicides that have a different mode of action. Make no more than 4 applications of Cabrio or other strobilurins per season. FRAC - 11
	azoxystrobin (Abound FL)	6.2-15.4 fl oz	++++	4 hrs	0 days	No more than 2 sequential applications of azoxystrobin should be made before alternating with fungicides that have a different mode of action. Make no more than 4 applications of azoxystrobin or other strobilurins per season. FRAC - 11
	azoxystrobin + propiconazole (Quilt Xcel)	14-21 fl oz	+++++	12 hrs	30 days	Application should begin prior to disease development and continue on a 14 day schedule. No more than 2 sequential applications of Quilt Xcel should be made before alternating with fungicides that have a different mode of action. Make no more than 3 applications of Quilt Xcel or other group 11 fungicides per season. FRAC - 11 and FRAC 3
	Pyraclostrobin and boscalid (Pristine WG)	18.5-23 oz	++++	12 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Make no more than 4 applications of Pristine or other strobilurins per season. FRAC - 11 and FRAC 7
Orange cane blotch	Potassium phosphite (Prophyt)	4 pt	+++	4 hrs	0 days	Use a minimum of 40-50 gal/acre total spray volume. Follow all label directions, as plant damage can potentially occur if not utilized correctly. FRAC - 33
Cane blight	See information box above.					

Blackberry and Raspberry (continued)
After Harvest (after fruit has been harvested) (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Fire ants	Same as Delayed Dormant stage					
Raspberry crown borer	bifenthrin (Brigade and Sniper 2EC)	6.4 fl oz (soil drench)	++++	12 hrs	3 days	See label for application instructions. Rogue infested canes after harvest. Foliar-applied insecticides for crown borer may be applied in July and August, targeting the egg-laying adults, eggs and the first larval stage. Thoroughly wet foliage when employing a late-summer or early-fall application. Drench applications target young crown borer larvae, and should be applied in the fall or early spring (late-dormant). IRAC - 3
	(Brigade 10WSB)	8-16 oz (foliar) 16 oz (soil drench)	++++	12 hrs	3 days	

Seasonal 'at a glance' fungicide spray schedule options for brambles

Developmental Stage	Delayed Dormant	Shoots 6" long till Pre-Bloom	Early bloom (5-10%)	Full Bloom ^a	Petal Fall	Cover Sprays	Pre-Harvest	Harvest	After Harvest
Disease (Registered fungicide)	Anthracnose, Spur Blight, Cane Blight (Lime Sulfur or Copper)	Anthracnose, Cane Blight, Spur Blight, and Leaf Spots (Copper, Cabrio, Abound, Pristine, and Captan) Rusts (Rally, Abound, Cabrio, Pristine, Orbit, Tilt) Powdery Mildew (Sulfur, Rally, Cabrio, Abound, Pristine) Phytophthora Root Rot (Ridomil, phosphorous acid-based products)	Botrytis (Rovral, Nevado, Iprodione, Elevate, Switch, Pristine, Ph-D and Captan) Rosette (Switch, Abound, Pristine) Powdery Mildew (Rally, Cabrio, Abound, Pristine) Rusts (Rally, Abound, Cabrio, Pristine, Orbit, Tilt) Anthracnose, Cane Blight, Spur Blight, and Leaf Spots (Cabrio, Abound, Pristine, and Captan)	Botrytis (Rovral, Nevado, Iprodione, Elevate, Switch, Pristine, Ph-D and Captan) Rosette (Switch, Abound, Pristine) Powdery Mildew (Rally, Cabrio, Abound, Pristine) Rusts (Rally, Abound, Cabrio, Pristine, Orbit, Tilt) Anthracnose, Cane Blight, Spur Blight, and Leaf Spots (Cabrio, Abound, Pristine, and Captan)	Botrytis (Rovral, Nevado, Iprodione, Elevate, Switch, Pristine, Ph-D and Captan) Rosette (Switch, Abound, Pristine) Powdery Mildew (Rally, Cabrio, Abound, Pristine) Rusts (Rally, Abound, Cabrio, Pristine, Orbit, Tilt) Anthracnose, Cane Blight, Spur Blight, and Leaf Spots (Cabrio, Abound, Pristine, and Captan)	Botrytis (Rovral, Nevado, Iprodione, Elevate, Switch, Pristine, Ph-D and Captan) Rosette (Switch, Abound, Pristine) Powdery Mildew (Rally, Cabrio, Abound, Pristine) Rusts (Rally, Abound, Cabrio, Pristine) Anthracnose, Cane Blight, Spur Blight, and Leaf Spots (Cabrio, Abound, Pristine, and Captan)	Botrytis (Rovral, Nevado, Iprodione, Elevate, Switch, Pristine, Ph-D and Captan) Rosette (Switch, Abound, Pristine) Powdery Mildew (Rally, Cabrio, Abound, Pristine) Rusts (Rally, Abound, Cabrio, Pristine, Orbit, Tilt) Anthracnose, Cane Blight, Spur Blight, and Leaf Spots (Cabrio, Abound, Pristine, and Captan)	Botrytis (Rovral, Nevado, Iprodione, Elevate, Switch, Pristine, Ph-D and Captan) Rosette (Switch, Abound, Pristine) Powdery Mildew (Rally, Cabrio, Abound, Pristine) Rusts (Rally, Abound, Cabrio, Pristine, Orbit, Tilt) Anthracnose, Cane Blight, Spur Blight, and Leaf Spots (Cabrio, Abound, Pristine, and Captan) Cane Blight (see notes)	Phytophthora Root Rot (Ridomil, phosphorous acid-based products [Prophyt, etc.]) Cane Blight (see notes) Orange Cane Blotch (Prophyt) Powdery Mildew (Rally, Cabrio, Abound, Pristine) Rusts (Rally, Abound, Cabrio, Pristine, Orbit, Tilt) Anthracnose, Cane Blight, Spur Blight, and Leaf Spots (Rally, Cabrio, Abound, Pristine, and Captan) Leaf Spots (Orbit, Tilt, Abound, Cabrio, Quilt Xcel, Pristine)

^aBramble bloom periods are protracted, so bloom and cover spray can be difficult to define clearly. Do not exceed label rates or spray intervals, but make sure that the pathogens indicated above are addressed with a thorough fungicide program as defined by the variety.

Fungicide classes with high risk of resistance development (generally single site of action)

Anilinopyrimidines (FRAC code 9)	Switch (cyprodinil; one component of a two-part mixture)
Carboximides (FRAC code 7)	Pristine (boscalid; one component of a two-part mixture)
Sterol Demethylation Inhibitors (DMIs) or Sterol Biosynthesis Inhibitors (FRAC code 3)	Rally (myclobutanil) Orbit and Tilt (propiconazole)
Dicarboximides (FRAC code 2)	Rovral (iprodione)
Hydroxyanilides (FRAC code 17)	Elevate (fenhexamid)
Phenylamides (FRAC code 4)	Ridomil Gold (mefanoxam)
PhenylPyrroles (FRAC code 12)	Switch (fludioxonil; one component of a two-part mixture)
Polyoxins (FRAC code 19)	Ph-D (polyoxin D zinc salt)
Strobilurins or QoIs (Quinone outside inhibitors; FRAC code 11)	Abound (azoxystrobin) Pristine (pyraclostrobin; one component of a two-part mixture) Cabrio (pyraclostrobin)

Fungicide classes with low risk of resistance development (generally multiple sites of action)

Several Classes	Captan (Captan; FRAC code M4) Coppers (numerous formulations; FRAC code M1) Sulfurs (numerous formulations; FRAC code M2)
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Seasonal 'at a glance' insecticide spray schedule options for brambles

Developmental Stage	Delayed Dormant	Shoots 6" long	Pre-Bloom	Petal Fall	Cover Sprays	Pre-Harvest through Harvest	After Harvest
Insects Controlled (Insecticides & Miticides)	Raspberry Crown Borer (Altacor, Asana, Brigade) Fire Ants (Extinguish Professional Fire Ant Bait, Esteem Fire Ant Bait)	Strawberry Clipper (Brigade, Sevin, Danitol)	Strawberry Clipper (Brigade) Flower Thrips (Entrust, Delegate, Assail)	Flower Thrips, Tarnished Plant Bug, Stink Bugs (Asana) Strawberry Clipper, Red Necked Cane Borer (Brigade)	Strawberry Clipper, Red Necked Cane Borer, Blackberry Psyllid, Japanese Beetle, Stink bugs (Malathion, Sevin) Stink Bugs (Brigade, Actara) Spider Mites (Savey, Acramite, Light Summer Oils) Spotted Wing Drosophila (Brigade, Malathion, Entrust, Delegate, Danitol, Mustang, Mustang Max)	Japanese Beetle, Stink Bug (Sevin, Brigade, Malathion, Neemix + Trilogy) Sap Beetle (Bait Buckets) Spider Mites (Savey, Acramite, Light Summer Oils) Spotted Wing Drosophila (Brigade, Malathion, Entrust, Delegate, Danitol, Mustang, Mustang Max)	Red necked cane borer, Raspberry crown borer (Brigade) Fire ants (Extinguish Professional Fire Ant Bait)

Insect and mite management – The pest management options recommended in this guide should provide a reliable template for planning and carrying out IPM tactics. It is by no means definitive and will certainly need to be modified and fine tuned to fit pest patterns and pressures on your farm. Insect and mite pests of brambles vary considerably in their significance from year to year, from one block to the next, and certainly within the southeastern states. As experience dictates, gradually modify your farm IPM plan, determining which sprays are essential and which should be reserved for as-needed use. Cultural practices such as roguing out borer-infested canes, destroying wild brambles near cultivated fields or planting brambles away from conifers will lower pest pressures. Insecticides and miticides are toxins. They should be used with caution, with strict adherence to pesticide label cautions. Develop a bramble insect and mite plan of action well before the season begins. Study the seasonality of pest pressures and make plans for monitoring to assure seeing pests before they become damaging. Study the strengths and weaknesses of each insecticide or miticide. In general, the organophosphate malathion is a good broad spectrum insecticide, which should seldom promote flare-ups of secondary pests such as mites. The carbamate carbaryl (Sevin) is also a reliable broad spectrum insecticide, and it is a safe material to use. Carbaryl use sometimes encourages mite problems. The pyrethroid insecticides esfenvalerate (Asana) and bifenthrin (Brigade) are also broad spectrum materials. Pyrethroids are quite prone to developing resistance problems. Pyrethroids are especially good against caterpillars, and they are generally good against plant bugs and stink bugs.

Weed Management

Weeds compete with caneberry plants for water, as well as nutrients. In order to maximize growth and survivability of young plants, weed control is essential from planting until cane growth stops in the fall. Research has shown that weeds are very competitive, even with mature canes, and they will reduce crop yields and reduce primocane number as well as development. The presence of weeds also inhibits worker efficiency during processes such as harvest, pruning, and florican removal.

In order to prevent competition, caneberry plants must be grown in a weed-free strip. Research has shown that the width of that strip needs to be 4 feet wide or greater. The utilization of preemergence (PRE) and postemergence (POST) herbicides provides the most effective and economical means for controlling weeds, thus preventing economic losses associated with revenue loss due to weed competition. Caneberry growers are fortunate in that a number of herbicide have been cleared for use in caneberry plantings within the past few years.

Herbicide Resistance Management

The development of herbicide-resistant weed species has increased significantly across the Southeast during the past few years. Lately, weed resistance to glyphosate has been the most common resistance development, largely related to the widespread planting of glyphosate-resistant crops. The utilization of herbicides that have differing modes of action (MOA) during the growing season or tank-mixing herbicides with differing MOA are strategies utilized to prevent herbicide-resistant weed development. As a means to assist growers with identifying herbicides having like MOA's, a number system, identifying herbicides by MOA, has been developed and is being utilized. In the table below there is an MOA number for each herbicide active ingredient; this should aide growers in making management decisions that will prevent the development of herbicide resistance or address options for managing a known resistant weed population that may be in or near the fruit planting.

Growers are encouraged to find at least two herbicide programs containing different herbicides to rotate on an annual basis. By rotating herbicide programs, growers not only minimize the risk of herbicide resistance development, they also minimize the likelihood of selecting for weeds that one herbicide program may not effectively control.

Blackberry and Raspberry Herbicides

Weed/Timing	Material	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
PREPLANT/ SITE PREPARATION	Glyphosate, MOA 9 Various formulations and brands	See label for rate (1 to 2 lb ai/A)	Apply 30 days prior to planting	12	Use to kill strips through vineyard prior to planting. Generic formulations may require the addition of a surfactant. See label for details on controlling specific perennial weeds.
PREEMERGENCE Annual grasses and small seeded broadleaf weeds	Napropamide, MOA 15 Devrinol 50 WDG	8 lb	Newly planted (once soil has settled after transplanting) and established plantings.	12	Soil surface should be free of weeds and plant residue. Rainfall or overhead irrigation within 1 to 2 days of application is needed for activation.
	Oryzalin, MOA 3 Surflan 4 AS or Oryzalin 4 AS	2 to 6 qt	Newly planted (once soil has settled after transplanting) and established plantings.	12	Oryzalin may be tank mixed with paraquat for postemergence weed control. In established plantings tank mix with simazine for broad spectrum residual weed control. Total use rate cannot exceed 12 qts/A per year. Oryzalin may be applied sequentially so long as there is 2.5 months between applications.
	Norflurazon, MOA 12 Solicam 80 DF	1.25 to 5 lb	Plantings established at least 1 year or more.	12	Apply to dormant blackberry and raspberry. Tank mix with paraquat for control of emerged weeds. Residual control is expanded when Solicam is tank mixed with simazine. Do not apply within 60 days of harvest. In areas prone to soil movement injury to ground cover planted in the row middles can occur.
	S-metolachlor, MOA 15 Dual Magnum	1 to 2 pt	Newly planted (once soil has settled after transplanting) and established plantings	24	Use no more than 1 pt/A on new plantings. Make no more than 1 application per year. The PHI for Dual Magnum in caneberry is 28 days. Dual Magnum will provided limited residual control of yellow nutsedge. THIS IS REGISTERED FOR USE IN NORTH CAROLINA ONLY!
PREEMERGENCE Broadleaf weeds	Isoxaben, MOA 21 Trellis	0.66 to 1.33 lb	Newly planted or non-bearing plantings.	12	Apply in at least 10 gallons per acre. Tank mix with oryzalin for broad spectrum residual control.

Blackberry and Raspberry (continued)
Weed Management (continued)

Weed/Timing	Material	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
PREEMERGENCE Broadleaf weeds (continued)	Mesotrione, MOA 27 Callisto	3 to 6 fl. oz	Plantings established 1 year or more.	12	Apply pre-bloom as a directed spray in raspberry or blackberry. Callisto has PRE and POST activity. Callisto may be applied at a rate up to 6 fl. oz./A. Sequential applications of 3 fl. oz/A may be applied so long there is at least 14 days or more between applications. The addition of COC at 1% v/v (1 gal per 100 gal of spray solution) is necessary for POST weed control. Care must be taken to make sure the adjuvant is not one that may injure caneberry leaves.
PREEMERGENCE Annual weeds and some perennial weeds	Dichlobenil, MOA 20 Casoron 4G Casoron CS	100 lb 1.4 to 2.8 gal	Plantings established at least one year.	12	Apply in January or February for best results. Warm temperatures increase volatilization therefore overhead irrigation may be use for activation when applied in early spring. The liquid formulation can be applied when high temperatures are 70 °F or less. Best results are achieved when applied to moist soil followed by overhead irrigation. DO NOT apply when shoot emergence is occurring. Liquid formulation may be tank mixed with other registered herbicides.
PREEMERGENCE Broadleaf weeds and some annual grasses	Simazine, MOA 5 Princep 4 L or Princep Cal 90 or various generic formulations	2 to 4 qt 2.2 to 4.4 lb	Newly planted (use half rate and apply after transplanting once soil has settled) and established plantings.	12	Tank mix with paraquat for postemergence weed control. The addition of oryzalin (Surflan) or norflurazon (Solicam) with simazine will extend residual grass control several weeks. Rate is soil texture dependent. DO NOT apply after fruit set.
	Terbacil, MOA 5 Sinbar 80 WP or 80 WDG	1 to 2 lb	Plantings established 1 year or more.	12	Apply as directed spray in early fall or spring before fruit set. Do not contact foliage. Do not apply within 70 days of harvest. Do not use loamy sand or sandy soils. Do not use on soils having less than 1 % organic matter. When tank mixed with paraquat, Sinbar will provide postemergence control of 1 to 2" tall horseweed.

Blackberry and Raspberry (continued)
Weed Management (continued)

Weed/Timing	Material	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
PREEMERGENCE AND POSTEMERGENCE Annual broadleaf and grass weeds. Yellow nutsedge	Sulfentrazone + Carfentrazone, MOA 14 Zeus Prime XC	7.7 to 15.2 fl. oz	Plantings established 2 years or more	12	Apply as directed spray to caneberries that have been established 2 years or longer. If applying in a band and 50% or less of the area is treated Zeus may be applied twice with in a 12 month period. Allow at least 60 days between applications. Zeus has a 3 day PHI. Spray water must have a pH from 5.0 to 9.0 for optimum herbicide performance. Tank mix with paraquat for non-selective POST weed control. Sequential applications of Zeus are the most effective on yellow nutsedge. See label for details. For broad spectrum residual control of annual grasses tank mix with oryzalin. Zeus has no postemergence activity on grass weeds.
PREEMERGENCE AND POSTEMERGENCE Annual broadleaf and grass weeds	Rimsulfuron, MOA 2 Solida	4 oz	Plantings established 1 year or longer	4	Rimsulfuron has POST and PRE activity on broadleaf and some grass weeds. For broad spectrum residual control, tank mix rimsulfuron with oryzalin, or diuron. For nonselective POST weed control, tank mix rimsulfuron with paraquat. Do not treat caneberries established less than 1 year. Rainfall for herbicide activation is necessary within 2 to 3 weeks of application. Do not apply within 14 days of harvest. The pH of spray solution should be in the range of 4 to 8. Rimsulfuron may be applied as a sequential application so long as total use rate does not exceed 4 oz/A per year and application is made in band to less than 50% of the row spacing. Allow a minimum of 30 days between sequential applications. Solida is the ONLY rimsulfuron formulation cleared for use on caneberry in the Southeastern United States.

Blackberry and Raspberry (continued)
Weed Management (continued)

Weed/Timing	Material	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
POSTEMERGENCE Non-selective control	Glyphosate, MOA 9 Various formulations and brands	Read product label for application rate (0.75 to 1.0 lb a.i./A)	Plantings established 1 year or more.	12	EXTREME care must be taken to avoid glyphosate contact with the crop to prevent death or injury. Brambles are least susceptible to injury when dormant or in early spring. Applications during bloom and through fall are likely to be more injurious if poorly done. Apply as a directed, shielded spray to the base of crop. Wiper applications may be used as well. Do not apply within 14 days of harvest. Some generic formulations require additional surfactant. Roundup WeatherMax is not registered on raspberries.
	Paraquat, MOA 22 Firestorm 3 SL Parazone Paraquat Concentrate Gramoxone SL	1.3 to 2.7 pt 2.0 to 4.0 pt	Newly planted (shielded) and established plantings	12	Do not allow herbicide to contact desirable foliage or green canes. Young plants must be shielded. The addition of a non-ionic surfactant at 0.25 % v/v (1qt per 100 gal. of spray solution) is necessary for adequate control. Tank mix with preemergence herbicides for residual control. DO NOT make more than 5 applications per year.

Blackberry and Raspberry (continued)
Weed Management (continued)

Weed/Timing	Material	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
POSTEMERGENCE Selected broadleaf weeds like pigweed, morningglory, lambsquater, purslane, nightshade, tropical spiderwort, and smartweed	Carfentrazone, MOA 14 Aim 2EC	0.8 to 2.0 oz 6.4 oz (for primocane suppression)	Newly planted (must use shielded/hooded application equipment) and established plantings	12	Aim may be tank mixed with other herbicides registered in caneberries. Do not allow spray solution to contact desirable vegetation, flowers/bloom, or fruit. Every precaution should be taken to avoid herbicide injury related to herbicide drift. Use rate should not exceed 25 oz/A per year and there must be at least a 14 day interval between applications. The addition of a non-ionic surfactant at 0.25% v/v (1 qt/100 gal. of spray solution) or crop oil concentrate at 1 to 2% v/v (1 to 2 gal/100 gal of spray solution) is necessary for optimum herbicide performance. Aim has a 15 day PHI.
POSTEMERGENCE Annual and perennial grasses	Clethodim, MOA 1 Select 2EC or Select Max or Intensity One	6 to 8 oz 12 to 16 oz	Newly planted and established plantings	12	Low rates are for annual grass weeds. High rates and sequential applications are for perennial grasses (bermudagrass or johnsongrass). The addition of a non-ionic surfactant at 0.25 % v/v (1 qt/100 gal. of spray solution) is required. The Select Max formulation is labeled for bearing caneberries and can be applied up to within 7 days of harvest . All other clethodim formulations can only be used on non-bearing caneberries.
	Fluazifop, MOA 1 Fusilade DX	12 to 24 oz	Newly planted and non-bearing plantings	12	Sequential applications will be necessary for perennial grass control. Add a non-ionic surfactant (1 qt/100 gal of water) or crop oil concentrate (1 gal./100 gal. of water).
POSTEMERGENCE Annual and perennial grasses (continued)	Sethoxydim, MOA 1 Poast	1 to 2.5 pt	Newly planted and established plantings	12	Sequential applications will be necessary for perennial grass control. The addition of a non-ionic surfactant (1 qt/100 gal of water) or crop oil concentrate (1 gal/100 gal. of water) is necessary. Do not apply within 50 days of harvest . Total use cannot exceed 5 pt/A per year.

Suggested Herbicide Programs (Blackberry and Raspberry)

Crop Age	Fall (Oct/Nov)	Winter (February)	Spring (April/May)	Summer (As Needed)
Newly Planted	Glyphosate (preplant)		Oryzalin (Once soil settles after transplanting)	Oryzalin + Paraquat (May or June); Fusilade, or Poast, or Clethodim (as needed).
	Glyphosate (preplant)		Simazine (half rate) + Oryzalin	Paraquat or Aim (multiple applications as needed); Fusilade, Poast, or Clethodim (as needed)
	Glyphosate (preplant)		Devrinol (Once soil settles after transplanting, irrigation or rainfall needed for activation within 24 hrs of application.)	Paraquat or Aim (multiple applications as needed); Fusilade, Poast, or Clethodim (as needed)
	Glyphosate (preplant)		Trellis + Oryzalin	Paraquat or Aim (multiple applications as needed); Fusilade, Poast, or Clethodim (as needed)
Blackberry and Raspberry Established 1 or more years	Simazine + Paraquat		Sinbar + Paraquat or Zeus Prime* + Oryzalin + Paraquat or Solida + Oryzalin + Paraquat	Paraquat or Aim (multiple applications as needed); Select Max (as needed)
		Solida or Sinbar or Callisto + Paraquat	Simazine or Zeus Prime* + Oryzalin + Paraquat	Paraquat or Aim (multiple applications as needed); Select Max (as needed)
	Sinbar + Paraquat		Simazine + Oryzalin + Paraquat or Zeus Prime* + Oryzalin + Paraquat or Solida + Oryzalin + Paraquat	Paraquat or Aim (multiple applications as needed); Select Max (as needed)
		Zeus Prime* + Oryzalin + Paraquat	Zeus Prime* + Oryzalin + Paraquat	Paraquat (as needed); Select Max (as needed)
	Paraquat	Casoron		Paraquat or Aim (multiple applications as needed); Select Max (as needed)

*Zeus Prime XC can only be used on planting established 2 years or longer.

Weed Response to Blackberry and Raspberry Herbicides

Herbicides	Annual Grasses					Annual Broadleaf Weeds															Perennial Weeds								
	Crabgrass	Foxtails	Goosegrass	Panicum, Fall	Ryegrass, Annual	Chickweed	Dock	Galinsoga	Geranium, Carolina	Groundsel, Common	Henbit	Horseweed	Lambsquarters	Mornigglory, Annual	Nightshades	Pigweed	Radish, Wild	Ragweed	Sida, Prickly	Smartweed	Spotted Spurge	Bermudagrass	Dandelion	Johnsongrass	Nutsedge, Yellow	Virginia Creeper			
Preemergence																													
Callisto	F					E		E				E	E			E		E		E									
Casoron	G	G	G	G	G	G	G	F	G	G	G	G	G	F	F	G	G	G		G	G	N	G			N	N		
Trellis	N	N	N	N	N	E	F	G	G	G	E	G	E	F	E	E	E	E	G	G	G	N	G	N	N	N	N		
Oryzalin	E	E	E	G	G	G	N	N		F	F		E	F	P	E	P	P	P	P	F	N	P			N	N		
Simazine	F	G	G	F	G	G		G	F	F	G	G	E	F	G	G	E	G	F	G	P	N	P			N	N		
Sinbar	G	G	G	G	G	E	G	G	G	G	G	E	E	G	G	G	G	G	G	G	E	P	F	P	F	F	N		
Solicam	E	E	E	E	G	E		G		F	G	G	F	F	G	P	G	G	E	G	F	P	G			P	N		
Solida	F	G		F		G				G	E	G	G	F	F	E	G				G	N	F	N	F				
Zeus Prime	G	G	G	G		G	G	G		G	E		E	G	E	E	G		E	G	E	N		N	G	N			
Postemergence																													
Aim	N	N	N	N	N								P	G	E	G	G	F			G		N	N	N	N	N		
Callisto						E	F																						
Clethodim	E	E	E	E	E	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	E	N	G	N	N		
Fusilade	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	E	N	G	N	N			
Glyphosate	E	E	E	E	E	E	G	G	G	E	F	E	E	G	E	E	G	E	G	F	G	F	G	G	F	F	G		
Paraquat	G	G	G	G	G	G		G	F	F	F	P	G	G	G	G	F	G	G	G	G	P	P	P	P	P	P		
Poast	E	E	E	E	G	N	F	N	N	N	N	N	N	N	N	N	N	N	N	N	N	E	N	G	N	N			
Sandea	N	N	N	N	N	N		G		N		N	N	P		G	G	E	F	F		N		N	E				

E = excellent, G = good, F = fair, P = poor, N = no activity

Postemergence Control of Bermudagrass and Johnsongrass

Perennial grasses like bermudagrass and Johnsongrass can be controlled with Poast, Fusilade, and clethodim. Successful use of grass-specific herbicides (Poast, Fusilade DX, clethodim) depends on several factors however the most critical is application timing relative to weed growth stage. Application timing varies with grass species and somewhat with the herbicide choice which is outlined in **Table 2**. Additional factors influencing the performance of these herbicides on perennial grasses include spray volume and soil moisture. Graminicides are systemic herbicides, they enter the plant and move through the vascular system to their targeted site of action. Systemic herbicides need to be applied in spray volumes that do not exceed 25 gal. of spray solution per acre. Higher volumes dilute the herbicide and may reduce their effectiveness. Weeds free of stress (drought, etc.) also respond best to systemic herbicides because the herbicide moves into plant and through its vascular system more readily. All of these herbicides require a second application for them to be effective. It is important that the second application be timed appropriately and when the weed has regrown from the initial herbicide application. The time between the first and second application can vary depending upon environmental conditions so this requires monitoring in order to get the second application applied timely.

Table 2. Appropriate Application Time for Perennial Grass Control

Herbicide	Bermudagrass		Johnsongrass	
	1 st Application	2 nd Application	1 st Application	2 nd Application
Poast	6 inches	4 inches	25 inches	12 inches
Clethodim	3-6 inches	3-6 inches	12-24 inches	6-18 inches
Fusilade	4-8 inches	4-8 inches	8-16 inches	6-12 inches

Refer to product label for spray additive recommendations.

If you have questions regarding the use of these products in fruit crops contact your local agent with Cooperative Extension Service. Complete herbicides labels and supplemental labels can be viewed online at www.cdms.net or <http://agrian.com/home/> if you desire to obtain more information before choosing a herbicide.

Yellow Nutsedge Control

Yellow nutsedge has become an increasing problem and is difficult to control. Since the loss of the Sandea label, the most effective option for controlling yellow nutsedge is to utilize a herbicide program that incorporates Zeus Prime XC. Zeus Prime contains sulfentrazone, which is known to provide excellent control of yellow nutsedge and to reduce tuber viability. In addition to Zeus Prime, Solida has some POST activity on nutsedge as well. In order to maximize Solida activity on yellow nutsedge, sequential applications will be necessary. Refer to the Solida label specific to conditions that allow for sequential applications.

If you have questions regarding the use of these products in fruit crops, contact your local county agent with the Cooperative Extension Service. Complete herbicides labels and supplemental labels can be viewed online at www.cdms.net or <http://agrian.com/home/> if you desire to obtain more information before choosing a herbicide.

Managing Wild Blackberry in Non-Cropland Areas Near Commercial Caneberry Plantings

Blackberry is a native species throughout the United States and thrives in non-cropland areas like ditch banks, abandoned fields, fence rows, field borders or cutover timber areas. Wild blackberries adjacent to commercial caneberry plantings need to be controlled because they are host plants for viral diseases vectored by insects and nematodes that can limit the commercial viability of a commercial caneberry planting. In addition to viral diseases, blackberries harbor fungal diseases like orange rust. Several herbicides effectively control wild blackberry however **EXTREME** caution must be taken to prevent drift, movement, or contact with the commercial planting. Failure to do so will result in severe crop damage or death. The two most available and effective herbicide options for killing weedy blackberry and other *Rubus* species are glyphosate (Roundup and other trade names) and triclopyr amine (Garlon 3A). Prior to using these products applicators must read and follow all label directions and restrictions.

Glyphosate (Various Brands and formulations).

Glyphosate is non-selective and will kill grass weeds as well as broadleaf and woody perennial plants. Blackberry is most susceptible when treated in late summer and fall with a 1.5% solution (2 fl. oz. of glyphosate per gallon of spray solution). Applications as late as Thanksgiving have been effective (90% control) in western North Carolina.

Triclopyr (Garlon 3A).

Wild blackberries can be controlled with Garlon 3A when applied to blackberries in the spring after leaves have fully expanded through late summer (mid September). The use rate for Garlon 3A as a spot spray is a 1% solution (1.3 fl. oz. of Garlon 3A per gallon of spray solution). Triclopyr will not control grass weeds. It is effective on multiple species of woody perennial plants and vines including grapes. There are multiple herbicides that contain triclopyr some of which contain other herbicides like 2,4-D ester that are prone to volatilize and increases the likelihood of herbicide movement onto desirable plants. These products should not be used around commercial blackberry plantings. **DO NOT** use triclopyr near water used for irrigation or along ditch banks that drain into irrigation water reservoirs. Application equipment should be cleaned thoroughly using ammonia water before using the sprayer around other plants. Broadleaf crops (grapes, blackberry, blueberry, soybeans, cotton, clover, and vegetables) are very sensitive to triclopyr so extreme care must be taken to avoid herbicide movement if these plants are being grown in close proximity to the application area.

Blackberry Dormex Use to Enhance Fruit Ripening and Yield of Certain Cultivars (Georgia Label)

For Use Only in the State of Georgia

- Response:** If properly used, Dormex can stimulate more rapid and uniform bud break of marginally high chilling blackberry varieties such as ‘Apache’ and ‘Navaho’ in South Georgia. Other high chilling cultivars have not been tested and should only be treated on a trial basis. A yield increase was also observed in 2002-2003 after a high chilling winter, probably due to improved bud break in the low part of the canopy.
- Material:** Dormex-50% hydrogen cyanamide
- Timing: Note:** Timing of Dormex applications is extremely important in order to achieve the desired response and avoid plant injury. Apply during the dormant season after significant winter chilling has been received, but before obvious bud swell. Application at least 35 days before normal bud break is recommended. Generally late January has been a good application period, but plants must be examined for their stage of development. If obvious bud swell has occurred, chemical injury to the buds is highly possible.
- Rate of Material:** Apply 3% Dormex with 0.5% non-ionic surfactant in 50 gallons of water per acre. This rate is 1.5 gallons of Dormex plus one quart of non-ionic surfactant in 50 gallons of water.
- Remarks:**
1. Dormex is a toxic material and registered for application only with closed cab tractors. Before use read all Dormex label sections carefully.
 2. Do not consume alcoholic beverages prior to, during, and following (24 hours) handling the product. Do not enter or allow entry into treated areas during the restricted entry interval (REI) of 72 hours.
 3. Dormex is highly corrosive to equipment. Clean up thoroughly after application.
 4. Avoid drift. Dormex may be toxic to green plants such as winter vegetable crops, shrubs, pets, cattle, etc. Use a spray pressure of 50 psi to reduce drift.
 5. Apply during dry weather, when temperatures are moderate (neither freezing nor hot). Make application at least 24 hours before expected rainfall.
 6. Dormex may advance bud break and flowering by several days, slightly increasing the risk of freeze damage.
 7. Moderate chilling cultivars such as ‘Kiowa’ and ‘Arapaho’ will probably need Dormex only in very low chilling winters (less than 500 hours).
 8. Do not apply within 14 days of an oil spray or 30 days of copper fungicide.

Information Developed by Gerard Krewer and James Jacobs (University of Georgia)

Wildlife Damage Prevention

Pest/Problem

Management Options

Efforts to control birds and other wildlife that damage fruit crops should be focused on the perimeter of the planting first, especially on the side(s) facing favorable wildlife habitat. This is where the first damage will be observed and, in some cases, it may be sufficient to head off the problem. However, don't discontinue monitoring for wildlife damage throughout the planting.

Birds

Crop losses to birds appear to be increasing in small fruit crops. Not only do birds consume fruit, but the damage they cause can result in increased problems with fruit rots and other pests such as bees and yellow jackets. Several different types of birds can cause problems. Robins, starlings and mockingbirds are among the more common ones, but orioles, cedar waxwings and finches may also feed on small fruit crops.

Feeding pressure will be heavier in fields that are close to roosting or nesting sites such as woodlands, hedgerows, grassy fields, power lines and individual trees. Birds may feed, fly to these resting sites, and then return to the crop later in the day. While birds can and do fly fairly long distances to feed, the farther they have to fly, the more apt they are to not find the fruit crop or to be distracted by another food source. The presence of a pond, creek or other water source nearby is another factor that may lead to increased feeding pressure. Typically, bird damage tends to be more severe in the earlier parts of the growing season, and damage lessens as the season progresses.

There are several control techniques which may be of value in decreasing losses to birds. They include visual, auditory and chemical repellents and exclusion (netting). For any method to be successful, it must be instituted before birds establish a feeding pattern, which generally means that they should be in place and operating at the time that color change occurs in the fruit. With the exception of exclusion, no one method should be relied on for control.

Auditory repellants

Auditory scare devices such as propane cannons, noise makers or distress calls may offer temporary relief for some types of birds. Regardless of which one or ones is/are used, the following points should be considered to attain the best results:

- Assess the potential for objections to the noise from your neighbors.
- Start before birds establish a feeding pattern.
- Operate control devices beginning shortly before sunrise and continuing until just after sunset as early and late in the day may be the most intense feeding times.
- Vary the frequency, the direction and the timing in which auditory devices are operated. Propane cannons should not be fired at intervals closer than 3 minutes.
- Consider using more than one type of auditory device and possibly combine them with visual repellents.
- If using distress calls, it is essential to identify the type(s) of birds you want to discourage and get distress calls specific to them.
- Reinforce the sense of danger by shooting (if allowed).

Visual repellants

Visual repellents include such things as scare eyes suspended above the crop, mylar tape on the canopy of the crop, aluminum pie pans, plastic owls and plastic snakes. These range from ineffective to moderately effective for a short period of time.

Pest/Problem	Management Options
<p>Birds (continued)</p>	<p>Birds will get used to them quickly if they are not moved around or if another type of repellent is not used along with it. Yellow scare eyes suspended above the crop and allowed to move freely have been reported to have some impact on blackbirds, however, robins do not seem to be affected.</p> <p>Chemical repellants Methyl anthranilate is registered as a bird repellent. While it is sometimes advertised as a taste repellent, this is not exactly correct. When sprayed on a crop, it causes an unpleasant sensation in the bird's mouth. Methyl anthranilate is a naturally occurring material used in the food service industry. Early reports have been inconsistent in regards to its effectiveness. It has also been reported to impart an undesirable foxy flavor to certain grape varieties. Methyl anthranilate has a short residual, so frequent reapplication will be necessary to achieve lasting results. Results may vary depending on the type of birds. Combining with another type of deterrent may result in greater effect than when used alone. As with other types of deterrents, applications need to start before birds establish feeding patterns.</p> <p>Exclusion Exclusion (netting) is the only consistently effective method of reducing bird damage. Netting is more expensive than other types of deterrents and can require fair amounts of labor, so it may not be an economically viable alternative in all situations. Nets are either laid on the canopy of the crop or suspended from a framework over the crop. The fruiting area of the plant needs to be completely protected. Birds will enter the canopy of the plant from below the net if it is open under the plant. If used with care, nets can be maintained for use over several years. For crops requiring multiple harvests such as blueberry, suspending the netting over the crop and around the sides of the field will allow easier access to the crop. If nets are placed directly on the crop canopy, birds can perch on it and feed on berries below them.</p> <p>Wild turkeys are becoming more of a problem in many areas of the country. While there is no doubt that they do consume some fruit, some research has shown that the turkeys are often after insects instead of the fruit. They do not appear to like loud and/or distressing sounds. While netting will work, turkeys can tear holes in it for access to the fruit.</p>
<p>Deer</p>	<p>Deer can damage small fruit plantings by foraging on succulent new growth during the growing season or by eating fruit. In fall, bucks can damage plants by rubbing. This is more of a problem in tree fruits than small fruits. Deer can also puncture plastic mulch and possibly the irrigation tape underneath, resulting in loss of weed control. Deer numbers are increasing and, incidents of deer damaging crops are also increasing. Deer populations vary from year to year as a result of weather conditions, food supply and, possibly, hunting pressure.</p> <p>Locating the planting away from favorable habitat for deer will help to lessen losses. However, this is not always possible. Several control options do exist. Determining which one or ones to use depends on the deer population, availability of other food sources, location of favorable habitat, the duration for which protection is needed, and the value of the crop to be protected.</p>

Pest/Problem	Management Options
Deer (continued)	<p>Repellants Both taste and smell repellents exist. Smell repellents include commercially available products or materials such as tankage, blood, putrified egg solids, certain soaps and human hair. Repellants will not provide long-term control and will not provide control when populations are high or alternate food sources are scarce.</p> <p>Exclusion Exclusion (fencing) is the only truly effective long-term control for deer damage prevention. Fences can be electrified or not. Deer will try to go under a fence, through a fence, or over it. For non-electrified fences, the lowest wire needs to be within 10 inches or less of the lowest point in the ground around the fruit crop planting and tight enough to prevent deer from pushing under it. Do not neglect ditches or other low spots in the ground around the field, because the deer will find them. The fence needs to be at least 8 feet high or higher, as deer can easily clear this height. Wire mesh fences are more desirable than multiple strands of barbed wire.</p> <p>For electric fences, several different designs have been used and, under certain conditions, each can be effective. The simplest and least expensive electric fence uses a single high-tensile wire at about 30 inches above ground level. A solar charger can be used if access to electricity is not an option. Peanut butter can either be smeared on the wire or on aluminum foil strips which are then draped over the wire. Plastic flagging may also be tied to the fence to make it more visible to the deer. Deer are curious animals and will investigate the fence if they are not being chased. Touching the fence results in getting shocked and turning the deer away from the field being protected. The single-wire, baited fence is relatively inexpensive, easy to construct and often adequate to protect the crop. With high deer populations, when available alternate food sources are scarce or when deer have already established a feeding pattern in the area being protected, this fence may not be adequate.</p> <p>More substantial electric fences for deer control have multiple wires with the alternate wires being electrified. One design uses 5 wires and is constructed at a 45 degree angle facing away from the area to be protected. The bottom wire is within 10 inches of the ground and is electrified to keep deer from going under the fence. The middle wire is also electrified to prevent deer from going through the fence and the top wire, which may be only about 5 feet above ground is electrified to keep deer from going over the fence. A fence constructed in this manner presents a barrier to the deer that has height and depth, a combination that generally will discourage the deer from trying to enter the field. Poly Tape electric fence often used to contain cattle and horses works well for deer fences.</p> <p>Numerous other fence designs exist including a non-electrified mesh fence with a hot wire on top. If electric fences are used, it is important to keep weeds, grasses and other materials away from the fence to prevent it from shorting out and to increase its visibility.</p>

The University of Georgia and Ft. Valley State University, the U.S. Department of Agriculture and counties of the state cooperating. The Cooperative Extension Service offers educational programs, assistance and materials to all people without regard to race, color, national origin, age, sex or disability.

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Bulletin 47

June 2006

Issued in furtherance of Cooperative Extension work, Acts of May 18 and June 30, 1914, The University of Georgia College of Agricultural and Environmental Sciences and the U.S. Department of Agriculture cooperating.

J. Scott Angle, Dean and Director