

4 Brambles (Raspberries and Blackberries)

For information on cultivar selection, cultural practices, or photographs of pest damage, obtain a copy of the Bramble Production Guide (NRAES-35) from your Cornell Cooperative Extension Office or order on line at: <http://www.nraes.org/publications/nraes55.html>.

For assistance with diagnosing bramble problems, use the Berry Diagnostic Tool at <http://www.hort.cornell.edu/diagnostic> or contact your Cornell Cooperative Extension Office for assistance. To submit samples for disease diagnosis, contact Plant Disease Clinic, Cornell University, Department of Plant Pathology, 334 Plant Science Building, Ithaca, NY 14853-4203, (607) 255-7850, <http://plantclinic.cornell.edu>

To submit samples for insect diagnosis or for phone consultations, contact Insect Diagnostic Laboratory, Cornell University, Department of Entomology, 4140 Comstock Hall, Ithaca, NY 14853-2601, (607) 255-3250, www.entomology.cornell.edu/Extension/DiagnosticLab

All pesticides used for bramble production must be registered with the state and federal governments. Consult Table 12 to determine legal pesticides, their brand names, and any restrictions that may apply. Unless otherwise noted, use 100 gal water per acre.

Table 11. Bramble pests and the associated stage of plant development.

Stage of development:	Scout for:
SUMMER-FRUITING RASPBERRIES AND BLACKBERRIES	
Bud break	Anthracnose, pg. 35 Spur blight (red raspberries), pg. 36 Cane blight, pg. 36
Early prebloom	Raspberry fruitworm, pg. 37 Raspberry sawfly, pg. 37
Late prebloom (just before blossoms open)	Raspberry fruitworm, pg. 38 Raspberry sawfly, pg. 38 Tarnished plant bug, pg. 38 Japanese beetle, pg. 38
Early bloom (5-10% of the blossoms open)	Powdery mildew, pg. 39 Gray mold (Botrytis fruit rot), pg. 40
Full bloom	Gray mold (Botrytis fruit rot), pg. 40 Powdery mildew, pg. 40
Petal fall to fruit ripening	Sap beetle, pg. 41 Tarnished plant bug, pg. 41
PRIMOCANE-FRUITING RASPBERRIES	
When canes are approx 18 inches tall	Japanese beetle, pg. 41
From petal fall through the beginning of harvest	Sap beetle, pg. 42 Tarnished plant bug, pg. 42 Gray mold (Botrytis fruit rot), pg. 42
Special pests	Mosaic virus complex, pg. 42 Crumbly berry (Tomato Ringspot Virus), pg. 42 Verticillium wilt, pg. 43 Orange rust, pg. 43 Raspberry leaf spot, pg. 44 Cane borers/girdlers, pg. 44 Raspberry crown borer, pg. 44 Potato leafhopper, pg. 45 Tree cricket, pg. 45 Twospotted spider mite, pg. 45 Raspberry aphid, pg. 46 Phytophthora root rot, pg. 46

Table 12. Chemical and brand names of labeled pesticides for brambles.*(DTH = days to harvest; REI = Restricted Entry Interval)*

Chemical Name	Brand Name/Formulation	EPA Reg. Number	Restriction
azoxystrobin	Abound 2.08 F	100-1098	DTH = 0, REI = 4 hr
Bacillus thuringiensis (B.t.)	Javelin WG	70051-66	DTH = 0, REI = 4 hr
bifenazate	Acramite 50WS	400-503	DTH = NA, REI = 12 hr
bifenthrin	Brigade WSB	279-3108	DTH = 0, REI = 24 hr
captan/fenhexamid	Captevate 68WDG	66330-48	DTH = 0, REI = 72 HR
carbaryl	Sevin 4F	264-349	DTH = 7, REI = 12 hr
	Sevin 80WSP	264-526	
	Sevin XLR	264-333	
	Carbaryl 80S	19713-50	
	Carbaryl 4L	19713-49	
	Carbaryl 4L	34704-447	DTH = 7, REI = 12 hr
copper hydroxide	Agri Star Nu-Cop 50DF Champ Formula 2	45002-4	(††)DTH = B, PH; REI = 24 hr
	Champ DP	55146-64	
	Champion WP	55146-57	
	Kocide 101 (50WP)	55146-1	
	Kocide DF (40DF)	1812-288	
	Kocide 4.5LF	1812-334	
	Kocide 2000 (35DF)	1812-303	
		1812-358	
copper salts	Tenn-Cop 5E (5.14EL)	1812-381	DTH = 0, REI = 12 hr
basic copper sulfate	Cuprofix Disperss (20DF)	4581-396	(††)DTH = B, PH; REI = 24 hr
cyprodinil/fludioxonil	Switch (62.5WG)	100-953	DTH = 0, REI = 12h
dichlobenil	Casoron 4G	400-168	REI = 12 hr
*disulfoton	*Di-Syston 15G	3125-172	Nursery stock only, REI = 48 hr
fenhexamid	Elevate (50WDG)	66330-35	DTH = 0, REI = 12 hr
fluazifop-butyl	Fusilade DX	100-1070	DTH = 365, REI = 12 hr
fosetyl-al	Aliette WDG (80 WDG)	264-516	DTH = 60, REI = 12 hr
glyphosate	Glyphosate Original	352-607	DTH = 14, REI = 12 hr
hexythiazox	Savey 50 DF	10163-250	DTH = 3, REI = 12 hr
iprodione	Rovral (50 WP)	264-453	DTH = 0, REI = 24 hr
	Rovral 4 Flowable	264-482	DTH = 0, REI = 24 hr
	Iprodione 4 L AG	51036-340	DTH = 0, REI = 24 hr
	Iprodione 50 WP AG	51036-341	DTH = 0, REI = 24 hr
lime sulfur	Miller Lime Sulfur Solution	72-19	REI = 48 hr
	Sulforix (27.5%)	66196-3-72	
malathion	Malathion 57EC	34704-108	DTH = 1, REI = 12 hr
	Malathion 5EC	51036-104	
mefanoxam	Ridomil Gold EC (4EC)	100-801	DTH = 45, REI = 12 hr
	Ridomil Gold 2.5 GR	100-798	

Table 12. Chemical and brand names of labeled pesticides for brambles.*(DTH = days to harvest; REI = Restricted Entry Interval)*

Chemical Name	Brand Name/Formulation	EPA Reg. Number	Restriction
myclobutanol	Nova 40W (WSP) Nova 40W (WSP)	707-221 62719-411	DTH = 0, REI = 24 hr
napropamide	Devrinol 50DF Devrinol 10G	70506-36 70506-34	DTH = 42, REI = 12 hr
(†)norflurazon	(†)Solicam 80DF	100-849	REI = 12 hr
oryzalin	Surflan A. S	62719-112	REI = 12 hr
*paraquat	*Gramoxone Max	100-1074	REI = 12 hr
pelargonic acid	Scythe	53219-7	REI = 4 hr
phosphorous acid	Phostrol	55146-83	
pyraclostrobin	Cabrio EG	7969-187	DTH = 0, REI = 24 hr
pyraclostrobin/boscalid	Pristine WG	7969-199	DTH = 0, REI = 24 hr
pyrethrin	Pyrenone Crop Spray 0.15EC	432-1033	DTH = 0, REI = 12 hr
sethoxydim	Poast 1.5EC	7969-58	DTH = 45, REI = 12 hr
simazine	Princep 90WDG Princep 4L	100-603 100-526	REI = 12 hr
spinosad	Spintor 2 SC	62719-294	DTH = 1, REI = 4 hr
sulfur	Microthiol 80WP Millers Lime Sulfur Solution 29% Thiolux 80DF Thiolux Jet 80 DF Wettable Sulfur 90W	4581-373 72-19 100-835 100-1138 5905-289	REI = 24 hr DTH = B, PH, REI = 48 hr REI = 24 hr
terbacil	Sinbar 80WP	352-317	DTH = 70, REI = 12 hr

*Restricted-use pesticide; may be purchased and used only by certified applicators or used by someone under the direct supervision of a certified applicator.

† Not for use in Nassau and Suffolk Counties. Pesticide labels that indicate 'Not for use on Long Island, NY' mean that use is prohibited in Nassau and Suffolk Counties only.

(††)B = do not apply after bloom, PH = post-harvest sprays permitted.

Note: With most pesticides, reentry is not allowed until spray material has dried. Some pesticides have specific reentry intervals. Read the label.

4.1 Insects and Diseases - Time for Concern

Summer Fruiting Raspberries and Blackberries

BUD BREAK (New buds show ¼ to ½” green at tips)

Anthracnose

Symptoms- Small, purple spots scattered over young canes appear in the spring. The spots enlarge to about one eighth inch in diameter, become sunken in the center, and turn gray with a purple border. Many spots can run together to form large sunken diseased areas on the cane. This disease is much more severe on black and purple raspberries than on reds.

MANAGEMENT OPTIONS

GUIDELINE

Scouting/thresholds

None established.

Resistant cultivars

None known.

Cultural management

Prune and burn or remove diseased canes before new canes emerge in the spring. Maintain good air circulation by controlling weeds and narrowing fruiting rows.

Chemical treatment

Apply a delayed dormant spray¹ of lime sulfur or copper. **Note:** On fall-bearing red raspberries, this spray is not necessary if the previous year's canes are mowed and removed from the planting or thoroughly shredded.

- a. **lime sulfur-** Millers Lime Sulfur Solution 29% (6-12 gal/100 gal water) *or* Sulfoxix (3-6 gal/100 gal water) OR
- b. **copper hydroxide-** (several products), e.g., Kocide DF (4 lb/A) *or* Kocide 2000 (3 lb/A) *or* Champ Dry Prill (22/3 lb/A). OR
- c. **copper sulfate-** Cuprofix (5-6 lb/A). OR
- d. **azoxystrobin-** (6.2-15.4 fl oz/A). Treat at disease onset. Do not make more than two sequential applications of Abound before alternating with another product with a different mode of action. Apply no more than four applications of Abound per season. Abound is extremely phytotoxic to certain apple varieties. DO NOT spray Abound where drift may reach apple trees. DO NOT spray when conditions are favor drift beyond the intended area of application. DO NOT sprat apple trees with equipment that has been previously used to spray Abound. OR
- e. **pyraclostrobin-** Cabrio EG (14/oz/A). Do not make more than two sequential applications of Cabrio before alternating with another product with a different mode of action. Apply no more than four applications of Cabrio per season. OR
- f. **pyraclostrobin/boscalid-** Pristine WG (18.5-23 oz/A). Do not make more than two sequential applications of Pristine before alternating with another product with a different mode of action. Apply no more than four applications of Pristine per season.

¹ This “delayed dormant” application has always been the most important spray for the control of the major cane diseases. Thorough coverage is essential for control; therefore, this spray should be applied on a calm day and in a sufficient amount of water to soak the canes completely. Sprays applied after half inch green-tip may burn the leaves, particularly in warm weather.

Spur Blight

Symptoms- Chocolate brown or purple blotches centered around individual buds appear on canes in mid to late summer. Buds within the discolored areas either fail to grow or produce weak shoots the following year. The disease is more of a problem on red raspberries than on blacks.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established.
Resistant cultivars	No known resistant cultivars. Less susceptible cultivars are 'Brandywine', 'Killarny', 'Latham', and 'Newburgh'. Particularly susceptible cultivars are 'Royalty', 'Titan', 'Canby', 'Skeena', 'Willamette', 'Reveille', and 'Sentry'.
Cultural management	<ol style="list-style-type: none"> Prune and burn or remove diseased canes before new canes emerge in the spring. Maintain good air circulation by controlling weeds and narrowing fruiting rows.
Chemical treatment	<p>Apply a delayed dormant spray¹ of lime sulfur or copper.</p> <ol style="list-style-type: none"> lime sulfur- Millers Lime Sulfur Solution 29% (6-12 gal/100 gal water) <i>or</i> Sulforix (3-6 gal/100 gal water) OR azoxystrobin- Abound (6.2-15.4 fl oz/A). Treat at disease onset. Do not make more than two sequential applications of Abound before alternating with another product with a different mode of action. Apply no more than four applications of Abound per season. Abound is extremely phytotoxic to certain apple varieties. DO NOT spray Abound where drift may reach apple trees. DO NOT spray when conditions are favor drift beyond the intended area of application. DO NOT sprat apple trees with equipment that has been previously used to spray Abound. OR pyraclostrobin- Cabrio EG (14/oz/A). Do not make more than two sequential applications of Cabrio before alternating with another product with a different mode of action. Apply no more than four applications of Cabrio per season. OR pyraclostrobin/boscalid- Pristine WG (18.5-23 oz/A). Do not make more than two sequential applications of Pristine before alternating with another product with a different mode of action. Apply no more than four applications of Pristine per season.

¹ This “delayed dormant” application has always been the most important spray for the control of the major cane diseases. Thorough coverage is essential for control; therefore, this spray should be applied on a calm day and in a sufficient amount of water to soak the canes completely. Sprays applied after half inch green-tip may burn the leaves, particularly in warm weather.

Note: On fall-bearing red raspberries, this spray is not necessary if the previous year’s canes are mowed and removed from the planting or thoroughly shredded.

Cane Blight

Symptoms- The disease causes weak growth of some or all of the fruiting laterals, followed by wilting of the leaves above the blighted area. Dark brown or purple cankers appear on the main cane or the branches below the wilted branches, often extending several inches along the cane. Cane tissue in the infected region is weak and bends easily. Infection sites are usually associated with pruning wounds or other injuries, although these are not always obvious. Cane blight is more likely than spur blight to involve whole stems and is not as definitively confined to the areas surrounding buds. It is most common in black and purple raspberries because of tipping practices, although red raspberries appear equally susceptible.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established.
Resistant cultivars	None known

Cane Blight

- Cultural management**
- Prune and burn or remove diseased canes before new canes emerge in the spring.
 - Maintain good air circulation by controlling weeds and narrowing fruiting rows.
 - Time pruning and tipping operations to allow 4-5 days of healing before a rain.
 - If the disease appears on red varieties, determine and try to eliminate the source of injury.

Chemical treatment

Apply a delayed dormant spray¹ of lime sulfur.

- lime sulfur**- Millers Lime Sulfur Solution 29% (2-4 gal/100 gal water) on blackberry, (1-3.5 gal/100gal on raspberry) *or* Sulforix (3-6 gal/100 gal water).

¹ This “delayed dormant” application has always been the most important spray for the control of the major cane diseases. Thorough coverage is essential for control; therefore, this spray should be applied on a calm day and in a sufficient amount of water to soak the canes completely. Sprays applied after half inch green-tip may burn the leaves, particularly in warm weather.

Note: On fall-bearing red raspberries, this spray is not necessary if the previous year’s canes are mowed and removed from the planting or thoroughly shredded.

EARLY PREBLOOM

Anthracnose, Spur Blight and Cane Blight

Refer to information given under *bud break* (pg. 35), but note additional chemical option.

MANAGEMENT OPTIONS	GUIDELINE
Chemical treatment	If these diseases are historically a problem, treatment with lime sulfur can be considered when shoots are 8-12” long. <ol style="list-style-type: none"> lime sulfur- Sulforix (2 qt/gal water) is labeled for both anthracnose and cane blight on blackberries and raspberries at this time and Millers Lime Sulfur Solution 29% (0.5 gal/100gal water) is labeled for anthracnose on blackberries. captan/fenhexamid- Captevate 68WDG (3.5 lb/A) is labeled for anthracnose and spur blight on raspberries, starting at 8-10 inches shoot growth. Do not apply more than two sequential applications or more than 17.5 lb/A of Captevate per season.

Raspberry Fruitworm, Raspberry Sawfly

Symptoms- In early May fruitworm adults feed on the buds and young leaves, skeletonizing the foliage and hindering fruit development. The small larvae feed inside the flower buds and then bore into the young fruits, which may then dry up or decay and fall off. The fruitworm adult is a small, light brown beetle. The full-grown larva is yellowish white and quarter inch long. Fruitworms are mostly a problem in weedy fields. The sawfly larva is a quarter inch long, pale green worm that usually feeds on the outer edges of the leaves, later chewing out irregular holes or in severe cases, skeletonizing the foliage. This insect also appears in May.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established
Resistant cultivars	None known
Cultural management	None established

Raspberry Fruitworm, Raspberry Sawfly

Chemical treatment An insecticide should be applied when the insects or their damage is first noticed in the spring (just before blossoms open).

- a. **carbaryl-** Sevin 80WSP (2-2.25 lb/A).

LATE PREBLOOM

Raspberry Fruitworm, Raspberry Sawfly

Refer to information given under *early prebloom* (pg. 37), but note additional chemical option.

MANAGEMENT OPTIONS	GUIDELINE
Chemical treatment	An insecticide should be applied when the insects or their damage is first noticed in the spring.
	a. carbaryl- Sevin 80WSP (2-2.25 lb/A) OR
	b. pyrethrin- Pyrenone Crop Spray 0.5 EC (2-12 oz)

Tarnished Plant Bug

Symptoms- These insects appear when fruit buds form and plants begin to bloom. Their feeding on buds, blossoms, and developing berries results in deformed and crumbly fruit.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	For effective tarnished plant bug control, scout for nymphs after petal fall. Suggested threshold = 10-20% of canes infested.
Resistant cultivars	None known.
Cultural management	Minimize proximity to preferred habitat. Tarnished plant bug pressure is often highest in weedy fields or in fields bordered by woody shrubs.
Chemical treatment¹	a. carbaryl- Sevin 80 WSP (2-2.25 lb/A). OR
	b. pyrethrin- Pyrenone Crop Spray 0.5EC (2-12 oz).

¹ Malathion is labeled for Japanese beetle only, although it will provide some control of tarnished plant bug. If spraying for Japanese beetle, a high rate of malathion is recommended in tarnished plant bug problem fields.

Japanese Beetle

Symptoms- Beetle larvae are serious pests of lawns, vegetables, and nursery stock. Adult beetles chew holes in the fruit, making the fruit susceptible to infection. Beetles can cause significant leaf damage, which appears as skeletonization.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established
Resistant cultivars	None known. Japanese beetles prefer 'Festival', 'Ruby', 'Heritage', 'Reveille', 'Liberty', 'Latham', 'Newburgh', 'Southland', 'Fallgold', and 'Skeena' over other cultivars.
Cultural management	None established.

Japanese Beetle

Chemical treatment

A chemical spray may be needed in late prebloom, just before the blossoms open or when primocanes of fall-bearing varieties are 18 inches long.

- a. **carbaryl**- Sevin 80WSP (2-2.25 lb/A) OR
- b. **malathion**- Malathion 57EC (1.5 pt) *or* Malathion 5EC (2-12 oz) OR
- c. **pyrethrin**-Pyrenone Crop Spray 0.5EC (2-12 oz.).

EARLY BLOOM (5-10% of blossoms open)

Powdery Mildew

Symptoms- Infected leaves are covered with a white powdery growth, usually on their undersides, and may curl upwards. Some cultivars simply develop light green blotches on the leaf surfaces. Infected shoots may be long and spindly and have dwarfed leaves.

MANAGEMENT OPTIONS

GUIDELINE

Scouting/thresholds

None established

Resistant cultivars

None known. Susceptible red cultivars are ‘Royalty’, ‘Reveille’, ‘Latham’, and ‘Hilton’. Susceptible black cultivars are ‘Dundee’ and ‘Logan’.

Cultural management

Maintain good air circulation around the plantings and remove late-developing primocanes that may be infected.

Chemical treatment¹

Fungicidal treatment is generally not necessary. However, fungicides are labeled for use if needed:

- a. **myclobutanil**- Nova 40W (1.25-2.5 oz/A). If using Nova do not exceed 10 oz/A per year. Nova has not yet been widely tested in New York OR
- b. **azoxystrobin**- Abound (6.2-15. fl oz/A). Do not make more than two sequential applications of Abound before alternating with another product with a different mode of action. Apply no more than four applications of Abound per season. Abound is extremely phytotoxic to certain apple varieties. DO NOT spray Abound where drift may reach apple trees. DO NOT spray when conditions are favor drift beyond the intended area of application. DO NOT sprat apple trees with equipment that has been previously used to spray Abound. OR
- c. **sulfur**²- various products, read labels for rates. OR
- d. **pyraclostrobin**- Cabrio EG (14/oz/A). Do not make more than two sequential applications of Cabrio before alternating with another product with a different mode of action. Apply no more than four applications of Cabrio per season. OR
- e. **pyraclostrobin/boscalid**- Pristine WG (18.5-23 oz/A). Do not make more than two sequential applications of Pristine before alternating with another product with a different mode of action. Apply no more than four applications of Pristine per season.

¹ Specific sprays for powdery mildew are not usually required but may help on highly susceptible cultivars. This spray gives some protection against gray mold, but is not as effective as the recommended iprodione. It may also provide some additional protection against cane diseases in problem situations or where the guidelines listed for anthracnose, spur blight, and cane blight have not been followed.

² On blackberry, most sulfur product labels specify to begin applications before blossoms open. Read the label.

Botrytis Fruit Rot (Gray Mold)

Symptoms- Ripening fruit becomes moldy, and some or all of the individual fruitlets are covered with a gray mass of fungus spores.

MANAGEMENT OPTIONS	GUIDELINE
Resistant cultivars	Black raspberries are generally more resistant than reds.
Cultural management	<p>Gray mold can cause extensive crop losses in years when wet warm and humid weather prevails during the harvest period.</p> <ol style="list-style-type: none"> Harvest all ripe fruit promptly. Use training practices that promote air circulation around the berries and minimize disease spread.
Chemical treatment	<p>Because initial infections often occur during bloom, it is recommended that growers apply protective sprays if the weather is wet during bloom or fruit rot has been common. Treatment is most important on red and purple raspberries, particularly if air circulation is limited. Make the first application at early bloom (5-10%) and again at full bloom. Two additional sprays may be applied at 14-day intervals or as required.</p> <ol style="list-style-type: none"> fenhexamid- Elevate (1.5 lb/A). Do not make more than two sequential applications of Elevate before alternating with another product with a different mode of action. Apply no more than four applications of Elevate per season. Do not apply more than 6 lbs/A of Elevate per season. OR cyprodinil/fludioxonil- Switch (11-14 oz/A). Do not make more than two sequential applications of Switch before alternating with another product with a different mode of action. Apply no more than four applications of Switch per season. Do not apply more than 56 oz/A of Switch per season. OR iprodione- Rovral 50WP (1-2 lb/A) <i>or</i> Iprodione 50WP AG (1-2 lb/A) <i>or</i> Rovral 4F (1-2 pt/A) <i>or</i> Iprodione 4L AG (1-2 pt/A). Do not make more than two sequential applications of iprodione before alternating with another product with a different mode of action. Apply no more than four applications of iprodione per season. OR pyraclostrobin- Cabrio EG (14 oz/A). Do not make more than two sequential applications of Cabrio before alternating with another product with a different mode of action. Apply no more than four applications of Cabrio per season. OR pyraclostrobin/boscalid- Pristine WG (18.5-23 oz/A). Do not make more than two sequential applications of Pristine before alternating with another product with a different mode of action. Apply no more than four applications of Pristine per season. OR captan/fenhexamid- Captevate 68WDG (3.5 lb/A). Do not apply more than two sequential applications or more than 17.5 lb/A of Captevate per season. Note: Captevate is not labeled for use on blackberry.

FULL BLOOM

Botrytis Fruit Rot (Gray Mold)

Refer to information given under *Early bloom* (pg. 40).

Powdery Mildew

Refer to information given under *Early bloom* (pg. 39).

PETAL FALL TO FRUIT RIPENING

Sap Beetle

Symptoms- There are two species of sap beetles that may be present in raspberry plantings with ripe fruit: picnic beetle and strawberry sap beetle. The picnic beetle is black and orange or white and is the more obvious of the two species. The strawberry sap beetle is smaller, and brown in color. Adults of both species feed on ripening or injured berries.

MANAGEMENT OPTIONS	GUIDELINE
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Scouting/thresholds	None established
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Resistant cultivars	None known.
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Cultural management	Control other damaging insects and promptly harvest ripe berries.
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Chemical treatment	a. malathion- Malathion 57EC (1.5-2 pt/A)
	b. pyrethrin- Pyrenone Crop Spray 0.5EC (2-12 oz).

Tarnished Plant Bug

Symptoms- These insects appear when fruit buds form and plants begin to bloom. Their feeding on buds, blossoms, and developing berries results in deformed fruit.

MANAGEMENT OPTIONS	GUIDELINE
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Scouting/thresholds	10-20% of canes infested.
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Resistant cultivars	None known.
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Cultural management	Minimize proximity to preferred habitat. Tarnished plant bug pressure is often highest in weedy fields or in fields bordered by woody shrubs.
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Chemical treatment	Apply sprays in the evening.
	a. pyrethrin- Pyrenone Crop Spray 0.5EC (2-12 oz) OR b. carbaryl- Sevin 80 WSP (2-2.25 lb/A). Note: Sevin is labeled for tarnished plant bug but not sap beetle.

Primocane-Fruiting Raspberries (Fall Bearing)

WHEN CANES ARE APPROX. 18" TALL

Japanese Beetle

Refer to information given under *Late prebloom*, pg. 38

FROM PETAL FALL THROUGH THE BEGINNING OF HARVEST

Sap Beetle

Refer to information given under *Petal fall to fruit ripening*, pg. 41

Tarnished Plant Bug

Refer to information given under *Petal fall to fruit ripening*, pg. 41

Gray Mold (Botrytis Fruit Rot)

Refer to information given under *Early bloom*, pg. 39

SPECIAL PESTS

Mosaic Virus Complex

Symptoms- Signs of infection are variable, depending on which virus or mixture of viruses is involved. The disease is generally severe only on black raspberries. The leaves are mottled, with yellowish or light green blotches on a darker green background; they are also usually smaller than normal and are frequently deformed or cupped. Leaf symptoms are most apparent in the spring, but become masked by high summer temperatures. On black and purple raspberries, the young shoot tips sometimes die, becoming black and bent. Infected plants are gradually stunted and produce dry, poor-quality fruit.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established.
Resistant cultivars	'Royalty' purple raspberry is immune to the aphid that transmits the disease and is not likely to become infected.
Cultural management	<ol style="list-style-type: none"> Plant only nursery stock derived from virus-indexed sources; plants propagated in the laboratory and greenhouse by tissue-culture techniques (i.e., those that have never been grown in the field) is most likely to be free of harmful viruses. Isolate new plantings from old raspberries or wild brambles. Remove and destroy obviously infected plants as they appear.
Chemical treatment	None established. Aggressively control aphids, which spread the disease. See Raspberry Aphid (pg. 46)

Crumbly Berry (Tomato Ringspot Virus)

Symptoms- This disease occurs only on red raspberries. Infected plants appear normal but produce small, crumbly berries that fall apart when picked. Infected plants occur in circles or groups that expand over time.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established.
Resistant cultivars	None known.
Cultural management	<ol style="list-style-type: none"> Plant only virus-indexed nursery stock. Do not replant sites from which crumbly berry plants have been removed. Analyze new planting sites or suspected problem sites for the dagger nematode, which transmits the virus that causes the disease. If detected, fumigate for its control before planting.
Chemical treatment	None established for the virus. Control the dagger nematode vector, if found in high numbers in soil nematode analysis, with fumigant (See Table 2).

Verticillium Wilt

Symptoms- Leaves wilt, turn yellow, and fall off, starting from the bottom of the cane and progressing toward the top. Symptoms frequently appear on only one side of a cane or on only one or two canes out of several in a hill. This disease is much more severe on black raspberries than on reds.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established.
Resistant cultivars	Red raspberries are more resistant than black raspberries.
Cultural management	<ol style="list-style-type: none"> The disease is caused by a soilborne fungus which also attacks a number of other crops, most particularly potato, tomato, eggplant, and pepper. Strawberry, cherry, squash, and cucumber are also common hosts. Before planting raspberries on sites where these crops have been grown, nonhost crops such as wheat or corn should be grown for at least 2 years prior to plant establishment. Many weeds, particularly nightshade, horse nettle, ground-cherry, redroot pigweed, and lambsquarters, are hosts of the Verticillium fungus. These weeds should be strictly controlled in current and future planting sites to keep the Verticillium population low.
Chemical treatment	Soil should be treated before planting with a broad-spectrum fumigant (See Table 2) only if rotations and cover crops have failed to suppress the disease.

Orange Rust

Symptoms- This disease occurs only on black and purple raspberries and blackberries. New canes arising from infected plants in the spring are weak, spindly, and thornless and have misshapen, pale leaves. They usually arise in bunches rather than singly, in contrast with new canes arising from a healthy plant. The lower surfaces of new leaves are covered first with orange pustules that erupt, several weeks after the leaves unfold, with a powdery mass of orange-colored spores.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established.
Resistant cultivars	Red raspberries are resistant.
Cultural management	<ol style="list-style-type: none"> Do not establish new plantings next to wooded areas or fence rows unless wild brambles are eradicated first. Examine new plants about one month after planting, and check them each succeeding year when new canes are 12-18 inches tall. It is important to identify infected plants before infectious spores are discharged from the orange pustules on the undersides of the leaves. Dig up and burn all infected plants immediately, taking care to remove the roots as well.
Chemical treatment	<ol style="list-style-type: none"> myclobutanil- Nova 40W (1.25-2.5 oz/A). Do not exceed 10 oz/A per growing season. OR pyraclostrobin- Cabrio EG (14 oz/A). Do not make more than two sequential applications of Cabrio before alternating with another product with a different mode of action. Apply no more than four applications of Cabrio per season. OR pyraclostrobin/boscalid- Pristine WG (18.5-23 oz/A). Do not make more than two sequential applications of Pristine before alternating with another product with a different mode of action. Apply no more than four applications of Pristine per season.

Raspberry Leaf Spot

Symptoms- Circular brown spots, often less than one sixteenth inch in diameter, appear on the leaves in summer. The spots enlarge and coalesce during the season. Defoliation can occur in extreme cases.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established.
Resistant cultivars	Black raspberries are generally more resistant than reds. Red cultivars exhibiting less susceptibility include 'Latham', 'Heritage', 'September', 'Fallgold', and 'Redwing'. 'Reveille', 'Canby', and 'Boyne' are susceptible. 'Taylor' and 'Sentry' are particularly susceptible.
Cultural management	Maintain good air circulation in the planting.
Chemical treatment	a. myclobutanil - Nova 40W (1.25 to 2.5 oz/A). Do not exceed 10 oz/A per growing season.

Borers/Cane Girdlers

Symptoms- A number of borers burrows through the canes of brambles; their presence may be indicated by a generally symmetrical swelling in the cane, from 1 to 3 inches long and usually a few inches, but as much as 4 feet, above the ground. Some canes may wither and die; in other cases, the affected area is broken off or severed in the region of the swelling. With other borer species, no swelling is evident but the tips of new canes may wilt and blacken (cane girdler).

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established.
Resistant cultivars	None known. A very susceptible cultivar is 'Heritage'.
Cultural management	a. As a preventive measure, canes with swellings should be removed and burned during the dormant season. b. Canes showing withered tips should be clipped several inches below the affected portion and the damaged tissue destroyed.
Chemical treatment	No pesticides are labeled for borers in raspberries.

Raspberry Crown Borer

Symptoms- The first indication of injury is wilting and dying foliage on the affected cane. Several canes of a bush can be weakened by the activity of a single larva in the crown, and the entire bush may be killed. The insects appear in early August and are present during most of September. The adult of this species is an attractive clear-winged moth.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established.
Resistant cultivars	None known.
Cultural management	a. During the growing season, destroy dying canes, including the crown, and those showing evidence of infestation. b. Eradicate wild brambles in the area, because they may harbor the pest.
Chemical treatment	No pesticides are labeled for control of raspberry crown borer.

Potato Leafhopper

Symptoms- Upper leaves curl upwards; growth is reduced.

MANAGEMENT OPTIONS	GUIDELINE
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Scouting/thresholds	None established.
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Resistant cultivars	None known.
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Cultural management	None established
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Chemical treatment	Apply as insects appear. a. carbaryl- Sevin 80WSP (2-2.25 lb/A).
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Tree Cricket

Symptoms- In late summer, adults often lay eggs in the canes, leaving long rows of punctures and greatly weakening the cane above

MANAGEMENT OPTIONS	GUIDELINE
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Scouting/thresholds	None established.
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Resistant cultivars	None known.
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Cultural management	a. Remove and burn infested canes. b. Eliminate wild brambles from the immediate area.
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Chemical treatment	An application of an insecticide in late August to mid September may be effective. a. carbaryl- Sevin XLR (1-2 qt/A) <i>or</i> Sevin 80WSP (1.25-2.5 lb/A) <i>or</i> Sevin 4F (1-2 qt/A).
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Twospotted Spider Mite

Symptoms- Mites feed on the undersides of leaves, which may result in white speckling on the upper leaf surfaces. Later, discolored blotches develop. Damage is first seen and is most prevalent in dry areas of a field. Mild growing areas in New York (Hudson Valley and Long Island) experience problems with mites most frequently.

MANAGEMENT OPTIONS	GUIDELINE
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Scouting/thresholds	None established.
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Resistant cultivars	None known.
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Cultural management	AVOID high rates of fertilization. It encourages mites.
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Chemical treatment	a. hexythiazox- Savey 50DF has recently been registered in New York for control of spider mites on caneberrries and strawberries. Recommended rates are 3-6 oz /A. In our area, the lower rates should be sufficient. This product needs to go on early in the infestation (2-3 mites per leaf) to be effective since it is primarily toxic to eggs and immature stages of the mites. Because of this, it is most suitable for plantings with a chronic spider mite problem. You are only allowed one application per season. Savey is not very hard on beneficial predatory mites. OR b. bifenazate- Acramite 50WS (0.75-1.0 lb/A) has been labeled for non-bearing brambles (1 spray per year).
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Raspberry Aphid

Symptoms- Curling of leaves and reduction of plant growth. Aphids can transmit viruses.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established.
Resistant cultivars	‘Royalty’ is immune to the raspberry aphid.
Cultural management	None established.
Chemical treatment	<ol style="list-style-type: none"> *disulfoton- *Di-Syston 15G (53.3 lb/A) For disulfoton, apply in a 24-inch band over row in mid June and mid August; work into soil if possible. This compound is registered only for nursery. OR malathion- Malathion 57EC (3 pints/A).

Phytophthora Root Rot

Symptoms- Infected plants frequently produce few canes, most of which are weak and stunted. Leaves on the canes may be small, turn yellow, or scorch along the edges and between the veins. Infected plants may wilt and collapse just before harvest or during the heat of summer. If spring weather is excessively wet, emerging canes may wilt and die, showing dark “water-soaked” tissue near the soil line. When dug up and examined, many of the roots and (or) most of the crown appear to be dead. Plants in low or poorly drained sections of a field are frequently infected. This disease has often been misdiagnosed as “wet feet” or winter injury. However, primocane emergence following winter injury is usually vigorous, whereas primocane emergence is poor from plants infected with root rot.

MANAGEMENT OPTIONS	GUIDELINE
Scouting/thresholds	None established.
Resistant cultivars	The relative susceptibility of many raspberry cultivars is still uncertain. Black raspberry cultivars are generally least susceptible to this disease. Red raspberries ‘Latham’, ‘Boyne’, ‘Killarney’, ‘Prelude’, ‘Autumn Bliss’, ‘Josephine’, and ‘Caroline’ appear to be the most resistant red cultivars. ‘Brandywine’ and ‘Royalty’ purple raspberries appear less susceptible. Extremely susceptible cultivars are ‘Titan’, ‘Lauren’, ‘Ruby’, ‘Canby’, ‘Josephine’, ‘Dinkum’, and ‘Encore’. The extremely susceptible cultivars should be planted <i>only</i> on very well drained sites.
Cultural management	<ol style="list-style-type: none"> The disease is caused by a group of soilborne fungi that show significant activity only during very wet conditions. Therefore, planting only on well-drained sites and providing good supplemental drainage are crucial components of a management program. Similarly, recent experience has shown that establishing raspberries on beds raised 10-14 inches high is extremely effective for minimizing this disease. Chemical treatment can provide additional benefit, but is most effective when used in combination with site selection/modification for good drainage and proper selection of cultivars. Highly susceptible cultivars should not be planted on sites where drainage is inadequate during some seasons or periods of the year; they are likely to die in such cases, even with raised beds and Ridomil Gold applications.
Chemical treatment	Chemical treatment is most effective in combination with cultural management. <ol style="list-style-type: none"> mefanoxam- Ridomil Gold EC, (0.25 pt/1,000 ft of row) <i>or</i> Ridomil Gold 2.5GR, (5 lb/1,000 ft of row). Ridomil Gold, an effective chemical treatment, is recommended where the disease has been diagnosed or is suspected; it is also recommended as a preventive treatment for new ‘Titan’ plantings on all but the very best soils. Growers should be aware of the limitations of this chemical, however, and realize that it will provide unacceptable results if raspberries are planted in inappropriate (very wet) sites, particularly with the more susceptible cultivars. Ridomil Gold should be applied to the soil in a 3-foot wide band over the row in early spring as growth begins, then repeat in early fall. Do not apply within 45

Phytophthora Root Rot

- days of harvest. The root rot fungus is perennial in the soil, thus, fungicide applications must be repeated each year to maintain control. However, some experience suggests that the fall application may be omitted once a good level of control has been achieved. OR
- b. **fosetyl-AI-** Aliette 80WP (5 lb/A) *or* Phostrol (4.5 pt/A). Aliette and Phostrol also are labeled for control of Phytophthora root rot on raspberries. Experience with these chemicals in New York is limited; however, results from here and other regions suggest they maybe somewhat less effective than Ridomil on raspberries. Apply Aliette or Phostrol as a foliar spray after approx. three inches of new growth in spring, then repeat every 45-60 days [maximum 4 applications/yr] if soil conditions remain wet. Do not apply less than 30 days before leaf drop [less effective].

4.2 Weed Management

Mulches (straw and plastic) can be used for weed management in the planting year on sites that are not at risk for Phytophthora, but they are not recommended for mature plantings because they interfere with primocane emergence and increase the risk of Phytophthora.

Cultivation can be used to control weeds, although grassy row middles will minimize weeds within the continued planting. See the Bramble Production Guide (NRAES- 35) for appropriate ground covers for bramble plantings.

Herbicides should be selected on the basis of particular weed problems (Tables 7 and 13). Not all herbicides are appropriate for all fields. Purple raspberries are sensitive to high rates of herbicides, as are tissue-cultured plants in the first few weeks after planting.

Table 13. Herbicides registered for use on brambles in New York State.

Herbicide	Formulation	Amount of product per sprayed acre	Lb active ingredient
Preemergent			
dichlobenil	Casoron 4G	100 lb	4
	Casoron 2E	2 gal	
Apply in late fall when the temperature is under 45 F or late winter before basal buds open. For new plantings, apply 4 wks after transplanting and incorporate immediately. Uniform application is essential. Must use a device specifically designed for spreading Casoron, or apply by hand-held shaker.			
napropamide	Devrinol 50DF	8 lb	4
	Devrinol 10G	40 lb	
	Devrinol 2E	2 gal	
Apply in late fall or early spring before seedling weeds emerge. Incorporate within 24 hours of application with cultivation or water.			
(†)norflurazon	Solicam 80DF	2.5-5 lb	2-4
Apply as a directed spray from fall to early spring before weeds emerge and when plants are dormant. Make only 1 application per year. Do not use on plantings less than 12 months old. Certain varieties are sensitive to Solicam. Do not use on lighter soils.			
oryzalin	Surflan A.S	2-6 qt	2-4
Apply late fall or early spring before weed emergence. Do not apply to newly transplanted bushes. Not recommended on highly organic soils. One inch of water is required within 21 days of application. May be tank mixed with Gramoxone, Princep or Solicam.			
simazine	Princep 90WDG	2.2-4.4 lb	2-4
	Princep 4L	2-4 qt	

Apply in fall or spring before weed emergence. Use lower rate on plantings less than 6 months old. For quackgrass suppression, apply lower rate in fall and spring, or high rate in fall. Not recommended for use on Royalty or on first-year tissue-cultured plants.

Table 13. Herbicides registered for use on brambles in New York State.

Herbicide	Formulation	Amount of product per sprayed acre	Lb active ingredient
terbacil	Sinbar 80WP	1-2.2 lb	0.8-1.6
Apply in fall or early spring in at least 20 gal/A. Spray under bushes established 1 year or longer. Spray will burn opened berry leaves. With fall-bearing cultivars, apply only in autumn.			
Postemergent			
fluazifop-butyl	Fusilade 2L + 1% crop oil concentrate	16-24 oz 0.25-0.375	0.25-0.375
Apply to actively growing grasses less than 8 inches tall. Do not apply to plants that will be harvested within one year.			
glyphosate	Roundup 4L	1-3 qt	0.25 – 0.75
For site preparation, may use repeat applications but no more that 8 qt/yr. May use a wiper application in established plantings. Avoid contact with green foliage or canes			
*paraquat	Gramoxone 2.5L	2-3 pt	0.6 – 0.9
Spray on emerged weeds in 50 gal/A, with added nonionic surfactant. Apply in early spring before new canes emerge.			
pelargonic acid	Scythe	3-5% solution for annuals 5-7% solution for perennials 7-10% solution for maximum burn down	2.25-20 gal
To avoid damage to bramble foliage, apply before new canes emerge in spring or after they become woody. Do not contact foliage unless excessive cane growth is to be controlled, and then application should be applied when new canes are 4 to 6 inches tall. Use highest rate for primocane suppression.			
sethoxydim	Poast 1.5EC+ oil concentrate	0.75-2.5 pt 2 pt.	0.14 – 0.47

For perennial grasses, apply higher rates in spring when grasses are 6 inch tall. Cultivation between 14 and 21 days after application will aid in control. A second application may be necessary if regrowth occurs. Do not mix with other chemicals. Do not use more than 5 pts per season.

*Restricted-use pesticide; may be purchased and used only by certified applicators or used by someone under the direct supervision of a certified applicator.

† Not for use in Nassau and Suffolk Counties. Pesticide labels that indicate 'Not for use on Long Island, NY' mean that use is prohibited in Nassau and Suffolk Counties only.

Note: Herbicides are usually sprayed in a 3-4 foot band under the plants. Read the label.

