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Southeast Regional Blueberry

INTEGRATED PEST MANAGEMENT GUIDE

2023 Southeast Regional Blueberry Integrated Management Guide

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Pesticide Emergencies

1-800-222-1222

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

Symptoms of Pesticide Exposure

- **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 Safety Data Sheet (MSDS or SDS) 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 min. 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*, but do not contaminate vehicles or expose others if you must take the container 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*, but do not contaminate vehicles or expose others if you must take the container with you.
- If the pesticide was not swallowed, *rinse mouth thoroughly with clean water*. If mouth is burned or irritated, consult a physician.

Pesticide Emergencies (Cont'd)

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*, but do not contaminate vehicles or expose others if you must take the container 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 min 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 and Environmental 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
Alabama	Alabama Highway Patrol - Alabama Department of Environmental Management Alabama Emergency Management Agency	Cell: call *HP - - - - - - - - - - - - - (334) 271-7700 (205) 280-2200
Arkansas	Arkansas Department of Emergency Management	1-800-322-4012
Georgia	Georgia State Patrol	Cell: call *GSP *or* 911
Louisiana	LDAF Emergency Hotline	1-855-452-5323
Mississippi	Mississippi Emergency Management Agency	1-800-222-6362
North Carolina	Regional Response Team (RRT) For spills not on public roadways, 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
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
Alabama	Alabama Department of Environmental Management Alabama Emergency Management Agency Alabama Department of Conservation and Natural Resources	(334) 271-7700 (205) 280-2200 (334) 242-3469
Arkansas	Arkansas Department of Emergency Management	1-800-322-4012
Georgia	Georgia Department of Natural Resources Response Team	1-800-241-4113
Louisiana	LDAF Emergency Hotline	1-855-452-5323
Mississippi	Mississippi Emergency Management Agency	1-800-222-6362
North Carolina	North Carolina Div. of Water Quality	1-800-858-0368
South Carolina	South Carolina DHEC	1-888-481-0125
Tennessee	Tennessee Wildlife Resources Agency	Region 1, West Tennessee: 1-800-372-3928 Region 2, Middle Tennessee: 1-800-624-7406 Region 3, Cumberland Plateau: 1-800-262-6704 Region 4, East Tennessee: 1-800-332-0900
Virginia	Virginia Emergency Operations Center	1-804-674-2400

Pesticide Liability and Stewardship

The **Pesticide Environmental Stewardship** website is located at http://pesticidestewardship.org/Pages/default.aspx. Information on proper pesticide use and handling, calibration of equipment, reading pesticide labels, disposal, handling spills, and other topics are presented.

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 a 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 EPA Worker Protection Standard (WPS) requires applicators to wear the label required PPE and 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)*:** WPS changes continue to be implemented. Growers should consult the EPA website (https://www.epa.gov/pesticide-worker-safety/agricultural-worker-protection-standard-wps) or their local extension service for the most up to date information. 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 pesticides *and* general use pesticides used in agricultural plant production.

Pesticide Liability and Stewardship (cont'd)

***Enclosed Structures*:** Pesticides labeled for field applications may not be allowed for use in enclosed structures or may have additional restrictions. Definitions of enclosed structures differ between states but may include greenhouses and high tunnels. Consult your local Extension service or state Department of Agriculture for guidance and appropriate recommendations. WPS for enclosed structures may also differ than those for field-grown plants.

***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.

***Emergency Preparedness*: 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 MSDSs away from the area where pesticides are stored. Provide copies of product MSDSs to your community first responders. Consult your local Extension Service and insurance company for assistance.

***Pesticide Disposal*: 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.

General Pesticide Information

Mode of Action (MOA)*:** Pesticides affect target pests 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 **Fungicide Resistance Action Committee** (FRAC), **Insecticide Resistance Action Committee** (IRAC) and IRAC Nematode Working Group, and the **Weed Science Society of America** (WSSA) have organized crop protection materials into groups with shared MOAs and given them specific codes, which appear on pesticide labels. Some MOAs may be unknown and given a code with a **U**. *When selecting pesticides, avoid successive applications of materials in the same MOA group to minimize potential resistance development*. MOA categories are listed in this guide to aid in the development of resistance management programs. More information about this topic can be found at www.frac.info, www.irac-online.org, and www.hracglobal.com.

***Organic Materials Review Institute (OMRI; www.omri.org)*:** Products that are listed by OMRI are commonly accepted for use in organically certified production systems. Always consult your organic certifier prior to use. **OMRI-**listed materials are indicated in the comments section.

***Generics*:** Many pesticide active ingredients are available in generic formulations. For brevity, these formulations are not generally listed. Listed trade names are included to aid in identifying products and are not intended to promote the use of these products or to discourage the use of generic products. Generic products generally work similarly to their brand name counterparts, but formulation changes can impact efficacy and plant response. As with any new chemical, read and follow all label instructions. Chemical names are subject to change; please check the active ingredient for all materials.

The **Pesticide Environmental Stewardship** website is located at http://pesticidestewardship.org/Pages/default.aspx. Information on proper pesticide use and handling, calibration of equipment, reading pesticide labels, disposal, handling spills, and other topics are presented.

***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. First determine whether the damage caused by the pest you are controlling is greater than the cost of the pesticide, and also whether any 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 the pesticide MOA between treatments.

General Pesticide Information (cont'd)

***State Registrations*:** Keep in mind that this publication is a regional guide. Every product listed may not be available or registered for use in every state. Before purchasing and applying a product, verify that that product is registered for use in your state. This may be done by visiting one of several online databases (examples provided below) that provide information on the state registration status of various products, by visiting product manufacturer websites, or by contacting your Extension agent or an appropriate state Extension specialist.

Database	Web Address
Agrian Label Database	https://home.agrian.com/
Crop Data Management Systems	http://www.cdms.net/Label-Database
EPA Pesticide Product and Label System	https://iaspub.epa.gov/apex/pesticides/f?p=PPLS:1
Greenbook Data Solutions	https://www.greenbook.net/
Kelly Registration Systems[1]	http://www.kellysolutions.com
National Pesticide Information Retrieval System[2]	http://npirspublic.ceris.purdue.edu/state/

[1]Available for AL, FL, GA, MS, NC, SC, and VA in the southeastern U.S.
[2]Available for AL, AR, FL, KY, LA, TX, and VA in the southeastern U.S.

Pollinator Protection

Before making insecticide applications, monitor insect populations to determine if treatment is needed. If pesticide (fungicide, insecticide, or miticide/acaricide) 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 infield 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. Consider mowing ground cover if plants are flowering prior to pesticide application.
4. Follow label directions to minimize off target movement of pesticides. Do not make pesticide applications when the wind is blowing towards beehives or off-site pollinator habitats.
5. For additional information relative to pesticide hazards to pollinators, see Georgia Pest Management Handbook (https://extension.uga.edu/programs-services/integrated-pest-management/publications/handbooks.html).

CAUTION: Specific rates, application methods, and sometimes target pests vary on product labels containing the same active ingredient and are subject to change at any time. Always refer to and read the pesticide label before making any application!!

Blueberry Integrated Management Guide

For all listed pesticides, specific use rates, application methods, and sometimes target pests vary on product labels containing the same active ingredient and are subject to change at any time. **Always refer to and read the pesticide label before making any application!**

Efficacy Ratings. The efficacy or importance of a management option is indicated by E = excellent, VG = very good, G = good, F = fair, P = poor, NA= not applicable, and UN = unknown or no data. These ratings are benchmarks; actual performance will vary. A superscript 'R' (^{R}) next to the efficacy rating indicates that the product may not be effective if the pathogen is resistant to the fungicide.

Pre-Plant Operations

Nematodes and replant disorder – Nematodes are associated with replant disorder in the Southeast; it is unlikely that they are the only pathogen involved in replant disorder, and broader fumigants may be of potential value in replant sites. The main reason for concern is that nematodes can directly destroy roots, resulting in decreased uptake of nutrients and water, as well as increasing root rot diseases. A combination of September and late-April soil sampling gives the best assessments of significant nematodes of blueberries. 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 mid-November, depending on location.

Viruses – Blueberry red ringspot virus (BRRV), blueberry necrotic ring blotch virus (BNRBV), blueberry mosaic-associated virus (BlMaV), blueberry latent virus (BBLV) and tobacco ringspot virus (TRSV) have been reported in southeastern blueberry fields. Of these, only BRRV and TRSV are commercially significant. BRRV is the most common in North Carolina and is most noticeable on Star, but also can be seen on other cultivars. BRRV reduces yield but not enough to warrant removing established bushes and spread is mostly via propagation from infected plants. BRRV also spreads in the field in NC. The vector is not known. Growers propagating their own plants should scout for BRRV in late summer to avoid taking cuttings from infected plants. Blueberry necrotic ring blotch (BNRBV) has disappeared or declined throughout the southeast in recent years and may not be persistent within plants. Tobacco ringspot virus has a wide host range and is ubiquitous in many common weeds (e.g., dandelions) as well as blackberries in the southeast. In addition to its primary vector, the dagger nematode, the virus is transmitted in high rates by seed and most importantly pollen. If fields are free of the nematode vector, efforts should focus on elimination of alternative hosts as they can act as virus reservoirs and spread the virus in blueberry. Since viruses are most commonly introduced through propagation, clean planting stock is essential. Avoid bringing in any plants that have not been inspected for viruses. Tissue-cultured plants that are tested for harmful viruses should be the preferred planting material.

Crown gall – All blueberries can be affected by crown gall. Canker-like growths or galls 0.25-2.5 in. 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, but crown gall is rare in propagated blueberries. Inspect new shipments for galls, and do not plant if galls are observed.

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.

Pre-Plant Operations, cont.

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 in.). Thorough soil preparation is required, and soil moisture is a critical consideration. If the soil 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. Excessive soil moisture can also prolong desired dissipation from the soil, which forces delay of planting to avoid phytotoxicity. Soil temperatures of 40-80˚F are required for use of Telone. However, 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 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 expose 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	REI	PHI	Comments
Nematodes	**1,3-dichloro-propene** (Telone II)	27 to 35 gallons	E	5 days		**Suggested pre-plant interval:** 4 to 8 weeks, longer when dissipation is slow.
	metam sodium (Vapam, Sectagon 42) **metam- potassium** (K- PAM HL)	75 gallons 62 gallons per treated acre	G G	See label 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 the soil 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.**
	1,3-dichloropropene 37% + chloropicrin 57% (Pic-Clor 60 EC)	19.5 to 44.5 gallons	VG	5 days		**SEE LABEL FOR ADDITIONAL INFORMATION**
Crown gall	Inspection		E			Inspect plants and reject any plants that have galls.

Establishment

Variety selection & plant source

It is important to purchase pathogen/disease-free plants. Plants propagated using tissue culture (rather than cuttings from field-grown plants) are preferred and are far less likely to harbor pathogens. Growers propagating their own plants from cuttings should be aware that viral diseases (red ring spot), bacterial diseases (bacterial leaf scorch), fungal pathogens, and insects (blueberry bud mite) are moved through propagation of infected or infested plants. Disease susceptibility can also vary by cultivar. For example, cultivars 'Rebel' and 'Meadowlark' are highly susceptible to bacterial leaf scorch (*Xylella fastidiosa*) while 'Star' and 'O'Neal' are moderately susceptible.

Plant beds

Root rots in bark beds – Root rots of blueberry can be particularly problematic immediately following transplanting and until plants are well established. Even in well-drained soils, root rots have been observed in bark-amended beds, and root rots are particularly damaging in high-density bark beds. Though cost is an issue, replanting into old bark where root rot has been a problem is not a good practice; disease-causing organisms build up in the bark, making reestablishment more difficult. It is recommended that phosphite-containing materials (Aliette, ProPhyt, K-Phite, etc.) be utilized in non-bearing plants after establishment for bedded and high-density bark plantings. Fully-expanded leaf tissue is required for plant uptake of these materials, as they are foliar-applied. In the initial year of planting, a minimum of four applications (spaced approximately one month apart) would be advisable. In general, phosphite materials are acidic, and they should not be applied with acidifiers or acidic water (pH < 6). Excessive application or application intervals which are less than those dictated by label will result in plant injury. These phosphite materials also suppress Septoria leaf spot and anthracnose, major foliar diseases of young plants. Some of the phosphite materials are labeled for use as drenches or chemigation, but there is currently limited information as to the success of these methods in southern blueberry production.

In high-density bark beds, use of Ridomil Gold SL will also provide good control of Pythium and Phytophthora root rots; use of Ridomil Gold SL in field plantings is very expensive and difficult, since the product must be taken up by the roots for activity. Where possible, rotation of Ridomil Gold SL and phosphites is a good resistance-management practice. Do not exceed label recommendations. Fungicides will not correct problems caused by poor drainage.

Rhizoctonia root rot is also an occasional issue in bark beds and in newly planted fields. Abound is registered for use in blueberry field plantings; when utilized for other diseases of blueberry and applied in sufficient total volume to allow crown/root contact, suppression of Rhizoctonia has also been achieved. Cannonball WP is also registered for management of Rhizoctonia root rot in the field (drench or drip irrigation application).

Botryosphaeria stem blight – Once plants are infected with *Botryosphaeria*, options are generally very limited; therefore, prevention is essential. Tissue cultured plants do not generally have *Botryosphaeria*, but the fungi that cause this disease are found virtually everywhere, meaning that plants can develop the disease after as little as one or two years in the field. Preventing plant stress and injury can be critical for limiting disease establishment. Balanced plant nutrition and water are important. Reduced rates of nitrogen fertilization can make the plant less succulent and therefore less susceptible to this disease. To allow plants to harden off naturally, it is recommended that nitrogen fertilizers not be used after late August or early September (unless clearly needed). *Botryosphaeria* organisms often enter through wounds, so reducing plant injury can reduce the occurrence of this disease. Wounds may occur from various sources including cold injury, mechanical injury, pruning and hedging, and mechanical harvesting.

Crown infections with *Botryosphaeria* are especially difficult and/or impossible to address, and when the infection reaches the crown, the plant will most likely die. For plants where only individual canes are affected, these canes should be cut out to a point 12 in. below the last dead wood. To prevent inoculum carryover on pruning equipment, shears should be sterilized between cuts with 10% bleach. Pruning or hedging when 2-3 days of dry conditions are expected can help reduce the likelihood that the fungus will re-infect the newly wounded tissue. Also, after each day of pruning or hedging, application of a broad-spectrum fungicide, such as Pristine (pyraclostrobin+boscalid) or Switch (cyprodinil+fludioxonil), may help to protect the new wounds. To eliminate residual fungal inoculum found on the removed plant material, prunings should be destroyed as soon as possible, ideally by burning or burying. Alternatively, flail mowing of the pruned material can help speed drying and decomposition. It is important to emphasize that there are no foolproof methods for eliminating *Botryosphaeria* once the disease begins to take hold. Rather, there are only stop-gap measures at best.

Bacterial wilt – Bacterial wilt of blueberry (caused by the soilborne bacterium *Ralstonia solanacearum*) has been reported in the southeastern U.S. Due to its ability to survive in the soil for long periods and its ability to readily move through soil or water transfer, there are few effective strategies for management. Current recommendations for managing bacterial wilt of blueberry rely on exclusion, reducing inoculum, and preventing spread. Host resistance is likely to be important, but limited information exists currently, while the efficacy of chemical controls for management of bacterial wilt of blueberry is largely unproven. Some rabbiteye cultivars may be tolerant or resistant to this disease, while some southern highbush cultivars are known to especially susceptible, including 'Arcadia', 'Avanti', 'Indigocrisp', and 'Keecrisp'. Excluding the bacteria from becoming established on the farm in the first place is critical. The following exclusion practices are recommended: (1) Purchase clean, healthy plant material; (2) Avoid movement of soil and water onto the farm; (3) Do not share equipment between farms, if possible; (4) Sanitize equipment and shoes to prevent the transfer of infested soil; (5) Sanitize tools; hedging and pruning activities may spread the bacterium; and (6) Do not use surface/recycled water for irrigation. In fields where the causal bacterium is present, routine soil drenches with phosphonate materials, such as K-phite, may be of some benefit. These may help protect surrounding plants from infection in fields where other plants are already infected. Unfortunately, soil drenches do not eliminate the pathogen and they are unlikely to be of any benefit for plants that are already infected.

Dormant (before flower or leaf buds break)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Exobasidium leaf and fruit spot	This disease causes spots on berries. Spots average ¼ in. in diameter. Spots remain green and do not ripen, may be tinged red, and may show sparse white fungal growth. Fruit spots do not rot, but remain firm and green. Similar-sized light green spots occur on the leaves, and affected spots on leaves are white underneath due to dense fungal growth. This disease occurs sporadically but can cause significant yield loss. To see images, visit visit Exobasidium Leaf And Fruit Spot of Blueberry: https://extension.uga.edu/publications/detail.html?number=C1142 Dormant oil applications exacerbate Exobasidium. Current recommendations are to make oil applications as early in the dormant period as possible to allow as long as possible between oil and lime-sulfur applications.					
	Canopy management		E			Observations suggest that this disease is most severe in areas of poor air circulation, where overgrown, dense bushes and surrounding vegetation trap humid air. Pruning to a more open canopy, removal of surrounding vegetation and good field drainage may all be beneficial.
	calcium polysulfide (various)	See label	E	48 hr	0 days	Apply at delayed dormant 1-2 weeks before leaf and/or flower buds begin to break. **Exobasidium is not specifically on most lime sulfur labels.** However, when applied for Phomopsis, suppression of Exobasidium has been observed. Do not use within 14 days of an oil spray or when temperatures are above 85°F. Burning of foliage may occur during periods of warm temperatures. **FRAC M2.**
Mummy berry	Rake mummies to row centers and bury 1" deep		E			Burying mummies helps to prevent primary infections. It is difficult to ensure that all mummies will be buried, so chemical control is also necessary. **Use caution; excessive amounts of dirt mounded on top of blueberry roots and stems can result in injury or plant death.**

Dormant (before flower or leaf buds break), cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Phytophthora root rot	Phytophthora root rot can be very problematic in pine bark beds for southern highbush varieties. Treatment with fungicides is not effective for reversing root rot damage on plants with severe symptoms. Preventative treatments in pine bark beds may be warranted, since the beds are often saturated with water through either irrigation or rainfall.					
	Site selection and preparation		E			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.
	mefenoxam (Ridomil Gold SL)	3.6 pints	G	48 hr	0 days	**Established plantings:** Apply 0.25 pints/1000 linear feet of row (3.6 pints/A broadcast basis) in a 3-ft band over the row before the plants start growth in the spring. **New plantings:** Apply 3.6 pints/A (broadcast rate) at or after the time of planting. An 18-in band over the row is recommended. Do not apply more than 0.9 gallons/A broadcast during the 12 months before bearing harvestable fruit or illegal residues may result. For both new and established plantings, one additional application may be made to coincide with periods most favorable for root rot development. **FRAC 4.**
	oxathiapiprolin (Orondis Gold 200)	4.8 to 9.6 fl oz	G*	4 hr	1 day	**Established Plantings:** Make first application before plants start to grow in the spring. Make a second application a minimum of 7-30* days later, coinciding with a period favorable for root rot development. **New Plantings:** Make first application at planting. Make a second application a minimum of 7-30* days later, coinciding with a period favorable for root rot development. *Although the minimum number of days before treatment is 7-30, a minimum of 30 days before treatment is recommended. Make no more than 2 sequential applications of Orondis Gold 200 (or any other FRAC 49-containing product) before rotating to a fungicide with a different mode of action. Do not make more than 2 applications at the maximum rate per year. *Indicated efficacy rating is tentative based on the performance of similar products and laboratory studies. **FRAC 49.**

Dormant (before flower or leaf buds break), cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Phytophthora root rot, cont.	**oxathiapiprolin** + **mefenoxam** (Orondis Gold)	28 to 55 fl oz	G*	48 hr	1 day	Apply as a drench, or soil directed spray, or through irrigation water (micro-sprinkler or drip). For effective disease control, ensure that the product solution thoroughly wets the target root zone. If the application method does not move the product to the root zone, and rain is not imminent, then follow with irrigation. **Established Plantings:** Make first application before plants start to grow in the spring, and a second at least 30 days later, and coinciding with a period favorable for root rot development. **New Plantings:** Make first application at planting, and a second at least 30 days later, and coinciding with a period favorable for root rot development. See label for additional information. For resistance management: Rotate the use of Orondis Gold or other Groups 49 and 4 fungicides within a growing season sequence with different groups that control the same pathogens. Do not make more than two applications per year. *Indicated efficacy rating is tentative based on the performance of similar products and laboratory studies. **FRAC 49+4.**
Bagworms	Bagworms should not be confused with fall webworms, which are tan, fuzzy caterpillars that feed in groups and cover branches with extensive white silk webbing. Bagworms make a 2-to-4-in. case or "bag" from dried leaves, sticks, and other plant parts, which contain their eggs.					
	Remove and dispose of cases		E			Bagworm cases should be removed prior to April, before eggs hatch.
Scale insects	**Horticultural/ Superior oil** (SunSpray Ultra-Fine Spray Oil) Pre-bloom use only	3% by volume	E	4 hr	0 days	Apply as needed for scale infestations. Do not apply oil during periods of high temperatures with high relative humidity. Do not spray immediately before, during, or following cold weather or freezing temperatures. Effectiveness is reduced at temperatures below 50ºF. Do not use within 14 days of lime-sulfur, captan, chlorothalonil, and dimethoate. For all other fungicides not listed, consult their label for compatibility information. *Note: Dormant oil applications exacerbate Exobasidium. Current recommendations are to make oil applications as early in the dormant period as possible to allow as long as possible between oil and lime-sulfur applications.*
	acetamiprid (Assail 30SG)	4.5 to 5.3 oz	E	12 hr	24 hr	Assail is labeled for blueberry maggot, but it should not be used alone for spotted-wing drosophila (SWD). **IRAC 4A.**

Dormant (before flower or leaf buds break), cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Scale insects cont.	**imidacloprid** (Admire Pro)	1.0 to 1.4 fl oz	E	12 hr	3 days	Allow 7 days between imidacloprid treatments. Imidacloprid is labeled for blueberry maggot, but it should not be used alone for spotted-wing drosophila (SWD). **IRAC 4A.**
	flupyradifurone (Sivanto Prime)	12 to 14 fl oz	E	4 hr	3 days	**IRAC 4D.**
	pyriproxyfen (Knack 0.86EC)	16 fl.oz	VG	12 hr	7 days	Do not make more than 2 *Knack* Insect Growth Regulator applications per growing season. Do not exceed 32 fl oz of *Knack* Insect Growth Regulator per acre per season. Do not apply earlier than 14 days after last *Knack* Insect Growth Regulator treatment. Regardless of formulation do not apply more than 0.218 lb pyriproxyfen per acre per season. **IRAC 7C**
	spirotetramat (Movento)	10 fl oz	G	24 hr	1 day	Limited efficacy data. **IRAC 23.**

Dormant (before flower or leaf buds break), cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Imported fire ant	Ant baits can be applied as needed from late winter to spring and in the fall. Applications should be made on a warm sunny day when grass is dry and ants are actively foraging. Foraging activity can be gauged by placing a food item, such as a potato chip, near the mound for 30 min or disturbing the mound. If ants are feeding on the chip within 30 min, conditions are right to apply baits. Allow 4 weeks to work.					
	pyriproxyfen (Esteem Ant Bait)	1.5 to 2.0 lb (2-4 tbsp/mound)	VG	12 hr	24 hr	**IRAC 7C.**
	methoprene (Extinguish Professional Fire Ant Bait 0.5%)	1 to 1.5 lb (3-5 tbsp/ 1000 sq ft) (3-5 tbsp/mound)	VG	4 hr	0 days	Extinguish Professional Fire Ant Bait (0.5% methoprene) is labeled for use on 'crop land.' **Extinguish Plus baits containing methoprene plus hydramethylnon are not labeled for use on crop land. IRAC 7A.**
Gall midge	**Blueberry gall midge** adults are tiny flies, and larvae are tiny white, carrot-shaped maggots which feed inside flower buds and leaf buds. Blueberry gall midge can be extremely injurious, especially to rabbiteye cultivars. Flies lay eggs in flower buds on warm winter days when bud scales initially begin to separate. **Gall midge sprays should be timed to protect the earliest flower buds which can realistically be expected to survive anticipated spring cold events.** Gall midge sprays also typically provide suppression of pre-bloom thrips population.					
	acetamiprid (Assail 30SG)	4.5 to 5.3 oz	G	12 hr	1 day	**IRAC 4A.**
	spinetoram (Delegate WG)	3 to 6 oz	VG	4 hr	1 day	**IRAC 5.**
	spinosad (Entrust SC) (Entrust 80W)	4 to 6 fl oz 1.25 to 2 oz	G	4 hr	3 days	Entrust is **OMRI** listed. **IRAC 5.**
	diazinon (Diazinon AG500)	1 pint per 100 gallons water	G	5 days	7 days	Only one foliar application is allowed per year. **IRAC 1.**
	flupyradifurone (Sivanto Prime)	12 to 14 fl oz	F	4 hr	3 days	Limited efficacy data. **IRAC 4D.**

Pre-bloom through green tip (leaf buds) and pink bud (flower buds)

Cherry and cranberry fruitworm monitoring – Emergence of adult fruitworm moths can be monitored through the use of pheromone traps. Traps should be placed in the field three to four weeks before anticipated bloom, prior to expected emergence of the pest, and checked at least weekly. Pheromone lures should be changed at least every four weeks.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Mummy berry and twig blight	If mummy berry disease is present, fungicides are very important in pre-bloom sprays (for cultivars or seasons in which leaf bud break occurs before flower bud break). Start spraying when green tip occurs on the leaf buds or 1-5% open bloom occurs on the flower buds, whichever comes first. Continue sprays until all blooms have fallen.					
	fenbuconazole (Indar 2F)	6.0 fl oz	E	12 hr	30 days	Indar alone will actually increase rots like anthracnose (ripe rot), and application of captan (Indar + captan tank mix) is required during bloom applications to alleviate this problem. Do not make more than four applications or apply more than 24 fl oz of Indar 2F (0.38 lb a.i.) per acre per year. Indar belongs to the sterol demethylation inhibitor (DMI) fungicide class. Alternation with fungicides of different classes is recommended. Aerial application is allowed for mummy berry (see label). **Tank mix with captan products during bloom to prevent rots. FRAC 3.**
	propiconazole (Tilt) (Bumper 41.8 EC) (PropiMax EC)	6.0 fl oz	E	24 hr 12 hr 12 hr	30 days	May be applied by either ground or aerial application (See label). Do not apply more than 30 fl oz per acre per season. More effective when allowed to dry ahead of a rain. A tank mix with captan is recommended for resistance management and to provide Botrytis suppression. More effective when allowed to dry ahead of a rain. **FRAC 3.**
	metconazole (Quash)	2.5 oz	E	12 hr	7 days	May be applied by ground (min. 20 GPA) or air (min 10 GPA). Do not apply more than twice in a row, or more than 7.5 oz per season, or more than three times per season. Supplemental label for bushberries. A tank mix with captan is recommended for resistance management and to provide Botrytis suppression. **FRAC 3.**
	prothioconazole (Proline 480 SC)	5.7 fl oz	E	12 hr	7 days	Apply up to two applications per year on a 7-10 day schedule. A tank mix with captan is recommended for resistance management and to provide Botrytis suppression. **FRAC 3.**

Pre-bloom through green tip (leaf buds) and pink bud (flower buds), cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Mummy berry and twig blight, cont.	**azoxystrobin + propiconazole** (Quilt Xcel)	14 to 21 fl oz	E	12 hr	30 days	Do not apply more than 82 fl oz per acre per season. Quilt Xcel may be applied by ground or air (min. of 15 GPA). **FRAC 11+3.**
	mefentrifluconazole (Cevya)	3 to 5 fl oz	E	12 hr	0 days	**Supplemental label for blueberries expires October 30, 2023.** Do not apply more than 15 fl oz per acre per year. **FRAC 3.**
	pyraclostrobin + boscalid (Pristine)	18.5 to 23 oz	VG (mummy berry E (twig blight)	12 hr	0 days	No more than two sequential applications of Pristine should be made before alternating with fungicides that have a different MOA. Do not apply more than four applications of Pristine per acre per crop year. **FRAC 11+7.**
	fluopyram + pyrimethanil (Luna Tranquility)	13.6 to 27 fl oz	VG	12 hr	0 hr	Do not make more than two sequential applications of Luna Tranquility or any Group 7 or Group 9 containing fungicide before rotating with a fungicide from a different Group. Do not apply more than 54.7 fl oz of Luna Tranquility per acre per year. **FRAC 7+9.**
Exobasidium leaf and fruit spot, cont.	**Canopy management**		E			Observations suggest that this disease is most severe in areas of poor air circulation, where overgrown, dense bushes and surrounding vegetation trap humid air. Pruning to a more open canopy, removal of surrounding vegetation and good field drainage to prevent standing water may all be beneficial in managing this disease.
	captan (Captan 50WP) (Captan 4L) (Captan 80 WDG)	5 lb 0.75 to 2.5 quarts 3.12 lb	VG	48 hr	0 days	**Exobasidium is not specifically on the label.** However, when applied for other diseases, suppression of Exobasidium has been observed. Captan is a good resistance management tank mix or rotational partner for FRAC 3 and/or FRAC 11 fungicides. Do not apply more than 70 lb Captan 50WP per acre per crop year. Do not combine with EC or WP formulations unless previous experience has proven them to be compatible and safe to plants. Damage has been observed in blueberries when captan has been applied in tank mixes or immediately before or after EC or oil formulations. **FRAC M4.**

Pre-bloom through green tip (leaf buds) and pink bud (flower buds), cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Exobasidium leaf and fruit spot	**fenbuconazole** (Indar 2F)	6.0 fl oz	G VG (with captan)	12 hr	30 days	**A 2(ee) recommendation is available for Exobasidium in some states.** Indar alone will actually increase rots like anthracnose (ripe rot), and application of captan (Indar + captan tank mix) is required during bloom applications to alleviate this problem. Do not make more than four applications or apply more than 24 fl oz of Indar 2F (0.38 lb a.i.) per acre per year. Indar belongs to the sterol demethylation inhibitor (DMI) fungicide class. Alternation with fungicides of different classes is recommended. **FRAC 3.**
	pyraclostrobin + boscalid (Pristine)	18.5 to 23 oz	F^R	12 hr	0 days	**Exobasidium is not specifically on the label.** However, when applied for other diseases, suppression of Exobasidium has been observed. Where Pristine has been used for a number of years, Exobasidium has developed resistance to the fungicides found in Pristine; be aware that this product alone may not work well in these cases, and should be tank mixed with captan. Tank mixes with other chemicals are not allowed with Pristine. No more than two sequential applications of Pristine should be made before alternating with fungicides that have a different MOA. Do not apply more than four applications of Pristine per acre per crop year. **FRAC 11+7.**
Blueberry gall midge	Same as **DORMANT** recommendations.					
Flower Thrips	Flower thrips can be very damaging to flower buds and blooms, especially in rabbiteye cultivars in Georgia and further south. Thrips numbers often increase dramatically as bloom progresses. Begin sampling bloom clusters for thrips when bud scales noticeably separate and tips of flowers begin to be visible (Stage 3). Sample two to three times a week from Stage 3 up to bloom. Place flower bud clusters in sealed plastic bags and incubate them in a warm room or on a windowsill. Take a minimum of 5 clusters per block each time. Treat if 2 or more thrips per individual bloom are found.					
	spinetoram (Delegate WG)	3 to 6 oz	VG	4 hr	1 day	Addition of an emulsifiable crop oil or methylated crop oil plus organosilicone combination at 0.25 to 0.5% v/v, may improve performance. However, Delegate is a long-residual material which may be toxic to bees. Do not apply within 5-days of first bloom. Delegate (IRAC 5) and Entrust (IRAC 5) are in the same chemical class and mode of action group. **IRAC 5.**
	spinosad (Entrust SC) (Entrust 80W)	4 to 6 fl oz 1.25 to 2 oz	VG	4 hr	3 days	Entrust is toxic to bees until it is thoroughly dry (3 hr) Entrust is **OMRI** listed. **IRAC 5.**
	acetamiprid (Assail 30SG)	4.5 to 5.3 oz	G	12 hr	1 day	Thrips species may differ in susceptibility. If you are unsure of the thrips species present and its susceptibility, use the higher rates. **IRAC 4A.**

10-20% bloom until 80-90% bloom

Pollinator protection - Blueberries are a pollination-sensitive crop; insecticide-related injury to bees can impair pollination and ruin fruit set. **Exercise caution when applying any pesticide during bloom to minimize impact to pollinators.** Bee foraging activity is dependent upon time of year (temperature) and stage of crop growth. The greatest risk of bee exposure is during bloom. **Insecticides should not be applied during bloom.** Read and follow all pesticide label directions and precautions. **The label is the law!**

EPA has recently required the addition of a "Protection of Pollinators" advisory box to 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. Minimize infield exposure of bees to pesticides by avoiding applications when bees are actively foraging in the crops. **All pesticide (including fungicide) applications should be made when bees are not actively foraging and to allow maximum drying time (evening/dusk).** 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. Minimize off-target movement of pesticide applications by following label directions to minimize drift. Do not make pesticide applications when the wind is blowing towards beehives or off-site pollinator habitats.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Exobasidium leaf and fruit spot	Same as **PRE-BLOOM THOUGH GREEN TIP (LEAF BUDS) AND PINK BUD (FLOWER BUDS)** recommendations.					
Mummy berry and twig blight	Same as **PRE-BLOOM THOUGH GREEN TIP (LEAF BUDS) AND PINK BUD (FLOWER BUDS)** recommendations.					
Botrytis flower blight	**cyprodinil + fludioxonil** (Switch 62.5WG)	11 to 14 oz	E	12 hr	0 days	Make the first application during early bloom. Subsequent applications should be made every 7-10 days during bloom. Do not apply more than 56 oz of product per acre per year. Make no more than two sequential applications before using another fungicide with a different MOA. **FRAC 9+12.**
	fenhexamid (Elevate 50WDG)	1.5 lb	E	12 hr	0 days	Begin application at 10% bloom. Applications should be made every seven days when conditions favor disease. Do not make more than two consecutive applications without switching to a fungicide with a different MOA. Do not apply more than 6.0 lb product per acre per year. **FRAC 17.**
	pyraclostrobin + boscalid (Pristine)	18.5 to 23 oz	E	12 hr	0 days	No more than two sequential applications of Pristine should be made before alternating with fungicides that have a different MOA. Do not apply more than four applications of Pristine per acre per crop year. **FRAC 11+7.**
	ziram (Ziram 76DF)	3 lb	F	48 hr	See comments	Do not apply later than 3 weeks after full bloom. **FRAC M3.**
	captan (Captan 50WP) (Captan 4L) (Captan 80 WDG)	5 lb 0.75 to 2.5 quarts 3.12 lb	F	48 hr	0 days	Do not apply more than 70 lb per acre per crop year of Captan 50WP. Do not combine with EC or WP formulations unless previous experience has proven them to be compatible and safe to plants. Damage has been observed in blueberries when captan has been applied in tank mixes or immediately before or after EC or oil formulations. **FRAC M4.**

10-20% bloom until 80-90% bloom, cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Ripe rot (anthracnose) and/or Alternaria rot	**azoxystrobin** (Abound)	6.0 to 15.5 fl oz (See label to confirm rates for other generic formulations)	E^R	4 hr	0 days	Subsequent applications can be made on 7-14 day intervals. Do not apply more than two sequential applications before switching to a fungicide with a different MOA. Do not apply more than 1.44 quarts per acre per season. There are many formulations of azoxystrobin. For trade names other than Abound, see labels to confirm rates. **FRAC 11.**
	cyprodinil + fludioxonil (Switch 62.5WG)	11 to 14 oz	E	12 hr	0 days	Applications can be made on a 7-10 day interval when conditions warrant. Do not apply more than 56 oz of product per acre per year. Make no more than two sequential applications before using another fungicide with a different MOA. **FRAC 9+12.**
	pyraclostrobin + boscalid (Pristine)	18.5 to 23 oz	E^R	12 hr	0 days	No more than two sequential applications of Pristine should be made before alternating with fungicides that have a different MOA. Do not apply more than four applications of Pristine per acre per crop year. **FRAC 11+7.**
	azoxystrobin + propiconazole (Quilt Xcel)	14 to 21 fl oz	E^R	12 hr	30 days	Do not apply more than 82 fl oz per acre per season. Quilt Xcel may be applied by ground or air (min. of 15 GPA). **FRAC 11+3.**
	metconazole (Quash)	2.5 oz	E	12 hr	7 days	May be applied by ground (min. 20 GPA) or air (min 10 GPA). Do not apply more than twice in a row, more than 7.5 oz per season, or more than three times per season. **FRAC 3.**
	pydiflumetofen + fludioxonil (Miravis Prime)	9 to 13.4 fl oz	E	12 hr	0 days	Do not make more than two consecutive applications of Miravis Prime or other Group 7 and 12 fungicides before alternation with a fungicide that is not in Group 7 or 12. Apply at least 7 days apart. **FRAC 7+12.**
	fluazinam (Omega 500F)	1.25 pints	G	12 hr	30 days	Do not use more than 7.5 pints per acre per season. **FRAC 29.**
	captan (Captan 50WP) (Captan 4L) (Captan 80 WDG)	5 lb 0.75 to 2.5 quarts 3.12 lb	G	48 hr	0 days	Captan is a good resistance management tank mix or rotational partner for FRAC 9 and/or FRAC 11 fungicides. Do not apply more than 70 lb per acre per crop year of Captan 50WP. **FRAC M4.**
	ziram (Ziram 76DF)	3 lb	F	48 hr	See comments	Do not apply later than 3 weeks after full bloom. **FRAC M3.**

Petal fall until one month after bloom, cont.

Septoria and anthracnose leaf spots – Septoria and anthracnose leaf spot pathogens can cause premature defoliation, resulting in poor bud development and subsequent loss of yield the following year. Fungicide timing for leaf spots varies across the Southeastern region. For example, North Carolina blueberries generally require leaf spot control as soon as green leaves have unfolded (10-14 days after bloom), whereas in Georgia, infections do not occur until mid-May or early June, without regard to the stage of leaf development. Materials applied for rot control will also often have leaf spot activity. Consult with your local county agent for recommendations in your area.

Blueberry stunt – Blueberry stunt is caused by a phytoplasma vectored by sharpnosed leafhoppers; fungicides will not be effective against this disease. Bushes infected with this disease become visible when leaves mature in May in North Carolina. Stunt is a devastating disease of blueberry in North and South Carolina and has been reported from Arkansas. Symptoms include shortened internodes, small, cupped leaves and loss of productivity. Control relies on removal of infected bushes (including roots) and control of the insect vector. Stunt is rarely seen on rabbiteye cultivars but is common on highbush and Southern highbush cultivars in southeastern North Carolina. Stunt also occurs in northern states (MI and NJ) where blueberries are grown.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Ripe rot (anthracnose) and/or Alternaria rots	Same as **10-20% BLOOM UNTIL 80-90% BLOOM** recommendations.					
Exobasidium leaf and fruit spot	Same as **PRE-BLOOM THOUGH GREEN TIP (LEAF BUDS) AND PINK BUD (FLOWER BUDS)** recommendations.					
Blueberry rust	Rust is predominantly a problem in the extreme southern blueberry production areas such as southern Georgia. However, rust does occur in the Carolinas and other locations. On susceptible varieties, rust can prematurely defoliate plants by late August. Some cultivars may require additional sprays for rust control, but in general, fungicides applied for other diseases throughout the season will adequately control or suppress rust (see fungicide efficacy table).					
	prothioconazole (Proline 480 SC)	5.7 fl oz	E	12 hr	7 days	Apply up to two applications per year on a 7-10 day schedule. A tank mix with captan is recommended for resistance management and to provide Botrytis suppression. **FRAC 3.**
	azoxystrobin + propiconazole (Quilt Xcel)	14 to 21 fl oz	E	12 hr	30 days	Do not apply more than 82 fl oz per acre per season. Quilt Xcel may be applied by ground or air (min. of 15 GPA). **FRAC 11+3.**
	metconazole (Quash)	2.5 oz	VG	12 hr	7 days	May be applied by ground (min. 20 GPA) or air (min 10 GPA). Do not apply more than twice in a row, or more than 7.5 oz per season, or more than three times per season. Supplemental label for bushberries. A tank mix with captan is recommended for resistance management and to provide Botrytis suppression. **FRAC 3.**

Petal fall until one month after bloom, cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Blueberry rust, cont.	**fenbuconazole** (Indar 2F)	6.0 fl oz	G	12 hr	30 days	Indar alone will actually increase rots like anthracnose (ripe rot), and application of captan (Indar + captan tank mix) is required during bloom applications to alleviate this problem. Do not make more than four applications or apply more than 24 fl oz of Indar 2F (0.38 lb a.i.) per acre per year. Indar belongs to the sterol demethylation inhibitor (DMI) fungicide class. Alternation with fungicides of different classes is recommended. Tank mix with captan products during bloom to prevent rots. **FRAC 3.**
	propiconazole (Tilt) (Bumper 41.8 EC) (PropiMax EC)	6.0 fl oz	G	24 hr 12 hr 12 hr	30 days	May be applied by either ground or aerial application (see label). Do not apply more than 30 fl oz per acre per season. More effective when allowed to dry ahead of a rain. A tank mix with captan is recommended for resistance management and to provide Botrytis suppression. **FRAC 3.**
	azoxystrobin (Abound)	6.0 to 15.5 fl oz (See label to confirm rates for other generic formulations)	G	4 hr	0 days	Subsequent applications can be made on 7–14-day intervals. Do not apply more than two sequential applications before switching to a fungicide with another MOA. Do not apply more than 1.44 quarts per acre per season. **Blueberry rust is not specifically on the label.** However, when applied for other diseases, suppression of rust has been observed. **FRAC 11.**
	pyraclostrobin + boscalid (Pristine)	18.5 to 23 oz	F	12 hr	0 days	No more than two sequential applications of Pristine should be made before alternating with fungicides that have a different MOA. Do not apply more than four applications of Pristine per acre per crop year. Suppression only for rust. **FRAC 11+7.**
Phytophthora root rot	**potassium phosphite** (ProPhyt and generic formulations)	4 pints	VG	4 hr	0 hr	Apply as a foliar spray for Phytophthora and Pythium after leaf emergence. Also effective against Septoria and Anthracnose leaf spots. **Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank- mixing this product with others, test the mix on a small area to make sure that phytotoxicity does not occur. FRAC P07.**

Petal fall until one month after bloom, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Phytophthora root rot, cont.	**mono- and di-potassium salts of phosphorous acid** (K-Phite and other formulations)	1 to 3 quarts	VG	4 hr	0 hr	Check labels for rates and use recommendations for formulations other than K-Phite. Apply as a foliar spray for Phytophthora and Pythium after leaf emergence. Also effective against Septoria and Anthracnose leaf spots. **Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank- mixing this product with others, test the mix on a small area to make sure that phytotoxicity does not occur.** K-Phite and some other formulations are also labelled for applications through drip irrigation systems. Note that limited efficacy data exists regarding drip applications for control of Phytophthora root rot. **FRAC P07.**
	fosetyl-Al (Aliette WDG)	5 lb	G	12 hr	12 hr	Apply Aliette as a foliar spray after leaf emergence. Subsequent applications can be made on 14-21 day intervals. Do not exceed four applications per acre per year. **Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank- mixing this product with others, test the mix on a small area to make sure that phytotoxicity does not occur. FRAC P07.**
	mefenoxam (Ridomil Gold SL)	3.6 pints	G	48 hr	0 days	**Established plantings:** Apply 0.25 pints/1000 linear feet of row (3.6 pints/A broadcast basis) in a 3-ft band over the row before the plants start growth in the spring. **New plantings:** Apply 3.6 pints/A (broadcast rate) at or after the time of planting. An 18-in band over the row is recommended. Do not apply more than 0.9 gallons/A broadcast during the 12 months before bearing harvestable fruit or illegal residues may result. For both new and established plantings, one additional application may be made to coincide with periods most favorable for root rot development. **FRAC 4.**
	oxathiapiprolin (Orondis Gold 200)	4.8 to 9.6 fl oz	G*	4 hr	1 day	**Established Plantings:** Make first application before plants start to grow in the spring. Make a second application a minimum of 7-30* days later, coinciding with a period favorable for root rot development. **New Plantings:** Make first application at planting. Make a second application a minimum of 7-30* days later, coinciding with a period favorable for root rot development. *Although the minimum number of days before treatment is 7-30, a minimum of 30 days before treatment is recommended. Make no more than 2 sequential applications of Orondis Gold 200 (or any other FRAC 49-containing product) before rotating to a fungicide with a different mode of action. Do not make more than 2 applications at the maximum rate per year. *Indicated efficacy rating is tentative based on the performance of similar products and laboratory studies. **FRAC 49.**

Petal fall until one month after bloom, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Phytophthora root rot, cont.	**oxathiapiprolin** + **mefenoxam** (Orondis Gold)	28 to 55 fl oz	G*	48 hr	1 day	Apply as a drench, or soil directed spray, or through irrigation water (micro-sprinkler or drip). For effective disease control, ensure that the product solution thoroughly wets the target root zone. If the application method does not move the product to the root zone, and rain is not imminent, then follow with irrigation. **Established Plantings:** Make first application before plants start to grow in the spring, and a second at least 30 days later, and coinciding with a period favorable for root rot development. **New Plantings:** Make first application at planting, and a second at least 30 days later, and coinciding with a period favorable for root rot development. See label for additional information. For resistance management: Rotate the use of Orondis Gold or other Groups 49 and 4 fungicides within a growing season sequence with different groups that control the same pathogens. Do not make more than two applications per year. *Indicated efficacy rating is tentative based on the performance of similar products and laboratory studies. **FRAC 49+4.**
Cranberry and Cherry fruitworms	Check for fruitworm adults in pheromone traps twice a week from full bloom until four weeks after petal fall. See **Prebloom** recommendations for trapping information. Fruitworm treatments should be timed to egg hatch, which begins approximately one week after pheromone trap captures begin. Examine fruit clusters for eggs on calyxes of berries. Early varieties are normally infested first. Treatments applied when larvae are observed in fruit are too late.					
	chlorantraniliprole (Altacor)	3.0 to 4.5 fl oz	E	4 hr	1 day	Altacor also has activity against plum curculio. **IRAC 28.**
	cyclaniliprole (Verdepryn 100SL)	8.2 to 11 fl oz	VG	4 hr	1 day	Limited efficacy data. Do not apply Verdepryn 100SL insecticide or other Group 28 insecticide more than 3 times within a single generation of an insect pest on a crop. **IRAC 28.**
	indoxacarb (Avaunt)	3.5 to 6 oz	E	12 hr	7 days	Avaunt also has activity against plum curculio. **IRAC 22.**
	methoxyfenozide (Intrepid 2F)	16 fl oz	VG	4 hr	7 days	**IRAC 18.**
	novaluron (Rimon 0.83EC)	20 to 30 fl oz	G	12 hr	8 days	**IRAC 15.**
	acetamiprid (Assail 30SG)	4.5 to 5.3 oz	G	12 hr	1 day	**IRAC 4A.**

Petal fall until one month after bloom, cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effective-ness**	**REI**	**PHI**	**Comments**
Cranberry and Cherry fruitworms, cont.	**spinetoram** (Delegate WG)	3 to 6 oz	G	4 hr	1 day	**IRAC 5.**
	spinosad (Entrust SC) (Entrust 80W)	4 to 6 fl oz 1.25 to 2 oz	G	4 hr	3 days	Entrust is **OMRI** listed. **IRAC 5.**
	tebufenozide (Confirm 2F)	16 fl oz	G	4 hr	14 days	Confirm needs to be ingested to be effective; therefore, timing is critical. Apply Confirm before fruitworm larvae have tunneled into fruit. Confirm is not effective against plum curculio. **IRAC 18.**
	***Chromobacterium substugae* strain PRAA4-1^T and spent fermentation media** (Grandevo WDG)	1-3 lb	F	4 hr	0 day	Grandevo is **OMRI** listed biological insecticide. **IRAC UN.** For control of spanworm and cranberry fruitworm apply Grandevo WDG at 1-2 lb per acre when newly hatched larvae are observed.
	pyrethrins (Pyganic 5.0) (Pyganic 1.4)	4.5 to 15.61 fl oz 16 to 64 fl oz	F F	0 hr 0 hr	0.5 day 0.5 day	Pyganic is **OMRI** listed. **IRAC 3A.**
	non-viable Burkholderia spp. strain A396 (Venerate XC)	1-2 lb	F	4 hr	0 day	Venerate is **OMRI** listed biological insecticide. **IRAC UNB.** For control of cranberry fruitworm, cherry fruitworm and leafrollers apply Venerate XC at 1-2 quarts per acre when newly hatched larvae are first observed. The use of a spreader-sticker is recommended. Repeat applications at an interval sufficient to maintain control, usually 3-10 days depending upon plant growth rate, insect activity and other factors. There are no tank-mix restriction.
Sharpnosed, Glassy-winged sharpshooter, and other leafhoppers	In blueberries, leafhopper feeding is seldom significant. However, sharpnosed leafhoppers are vectors of blueberry stunt, and other leafhopper species vector the bacterial leaf scorch pathogen of blueberry (*Xylella fastidiosa*). In southern highbush, bacterial leaf scorch is very injurious in some locations and cultivars. Research is currently underway, but, in southern highbush insecticidal suppression of leafhoppers may be warranted in areas where bacterial leaf scorch is present.					
	acetamiprid (Assail 30SG)	4.5 to 5.3 oz	VG	12 hr	1 day	**IRAC 4A.**
	spirotetramat (Movento)	10 fl oz	(intentionally left blank)	24 hr	7 days	Suppression only. Limited efficacy data. **IRAC 23.**

Petal fall until one month after bloom, cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Sharpnosed, Glassy-winged sharpshooter, and other leafhoppers, cont.	**imidacloprid** (Admire Pro 4.6F)	1.0 to 1.4 fl oz (foliar application rate)	VG	12 hr	3 days	Allow 7 days between imidacloprid treatments. **IRAC 4A.**
	thiamethoxam (Actara)	3 to 4 oz	VG	12 hr	3 days	Allow 7 days between Actara applications. Maximum of 12 oz per acre per season can be used. **IRAC 4A.**
	esfenvalerate (Asana XL 0.66EC)	9.6 fl oz	G	12 hr	14 days	Note that there are residue concerns for some Group 3A materials on fruit intended for export. **IRAC 3A.**
Plum curculio	Plum curculio is an infrequent pest of southeastern blueberries. Fields with a history of plum curculio infestation should be treated at least twice on a 7-14 day interval, beginning at petal fall, or when plum curculio or injury appears.					
	phosmet (Imidan 70W)	1.3 lb	E	24 hr	3 days	Imidan is effective against plum curculio but is very toxic to pollinators. Do not make treatments if pollinators are active. **IRAC 1B.**
	indoxacarb (Avaunt)	6 oz	VG	12 hr	7 days	Do not apply more than 24 oz per acre of Avaunt per year. Do not use adjuvants. **IRAC 22.**
	bifenthrin (Brigade WSB) (Sniper)	16 oz 6.4 fl oz	G	12 hr	1 day	Note that there are residue concerns for some Group 3A materials on fruit intended for export. Non-EC formulations may be preferred to reduce phytotoxicity risk. **IRAC 3A.**
	chlorantranili- prole (Altacor)	3.0 to 4.5 oz	G	4 hr	1 day	**IRAC 28.**
	esfenvalerate (Asana XL 0.66EC)	9.6 fl oz	G	12 hr	14 days	Note that there are residue concerns for some Group 3A materials on fruit intended for export. **IRAC 3A.**
	fenpropathrin (Danitol 2.4EC)	16 fl oz	G	24 hr	3 days	Note that there are residue concerns for some Group 3A materials on fruit intended for export. **IRAC 3A.**
	kaolin clay (Surround WP)	25 to 50 lb	F	4 hr	0 days	Surround acts like a barrier and masks fruit from pest recognition. Because of this barrier, fruit may need to be washed after harvest, and Surround may be more appropriate for processing fruit. **OMRI** listed. **IRAC UN.**

Cover Sprays (from one month after bloom until Pre-Harvest)						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Ripe rot (anthracnose) and/or Alternaria rots	Same as **10-20% BLOOM UNTIL 80-90% BLOOM** recommendations.					
Exobasidium leaf and fruit spot	Same as **10-20% BLOOM UNTIL 80-90% BLOOM** recommendations.					
Blueberry rust	Same as **10-20% BLOOM UNTIL 80-90% BLOOM** recommendations.					
Leafhopper/ sharpshooter suppression	Same as **PETAL FALL** recommendations.					
Periodical cicadas	Large periodical cicada emerges are expected in areas of the southeast during 2024 brood XIX (a 13-year brood) and 2025 (a 17-year brood). You can track anticipated emerges at www.cicadamania.com and via the Cicada Safari App. Young bushes are particularly susceptible to damage. Mesh netting (0.25 in mesh) can effectively prevent damage. Check your local Extension resources for information on emergence in your area.					
Flea beetle	Flea beetles are small and metallic blue or green. Flea beetle feeding produces shot-hole damage on foliage and is often clustered on terminals. Healthy, mature rabbiteye bushes can normally lose up to 20% of leaf surface before yield is affected. Young southern highbush and less vigorous rabbiteye cultivars may be more easily damaged by flea beetles, and shoot tip damage can cause excessive branching. When beetles are abundant, repeat applications may be needed. Insecticides recommended for spotted-wing drosophila (SWD) and blueberry maggot (BBM) are also effective against flea beetle, so additional applications for flea beetle management are not necessary if these products are in use.					
	carbaryl (Sevin 80S)	2.5 lb	G	12 hr	7 days	**IRAC 1A.**
	acetamiprid (Assail 30SG)	4.5 to 5.3 oz	G	12 hr	24 hr	**IRAC 4A.**
	imidacloprid (Admire 4.6F)	7 to 14 fl oz (soil application rate) 1.0 to 1.4 fl oz (foliar application rate)	VG	12 hr	7 days 3 days	Soil applied imidacloprid products have longer residual and provide more effective flea beetle control. **IRAC 4A.**
	thiamethoxam (Actara 25WDG)	4 oz	G	12 hr	3 days	**IRAC 4A.**
	spinosad (Entrust SC) (Entrust 80W)	4 to 6 fl oz 1.25 to 2 oz	VG	4 hr	3 days	Entrust is **OMRI** listed. **IRAC 5.**
	spinetoram (Delegate WG)	3 to 6 oz	VG	4 hr	1 day	**IRAC 5.**

Cover Sprays (from one month after bloom until Pre-Harvest), cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Japanese beetle	Foliar feeding by Japanese beetle rarely requires treatment in southeastern blueberries, but if present during harvest, they can contaminate machine picked fruit. Consult local extension personnel before making treatment decisions.					
	phosmet (Imidan 70W)	1.3 lb	E	24 hr	3 days	**IRAC 1B.**
	imidacloprid (Admire 4.6F)	1.0 to 1.4 fl oz (foliar application rate)	E	12 hr	3 days	**IRAC 4A.**
	acetamiprid (Assail 30SG)	4.5 to 5.3 oz	G	12 hr	24 hr	**IRAC 4A.**
	carbaryl (Sevin 80S, Sevin 80WSP)	2.5 lb	G	12 hr	7 days	If populations justify treatment, control may require multiple applications. Do not apply more than 12.5 lb of Sevin 80 S or Sevin 80 WSP per acre per crop. Repeat applications as necessary up to a total of 5 times but not more often than once every 7 days. **IRAC 1A.**
	esfenvalerate (Asana XL 0.66EC)	9.6 fl oz	G	12 hr	14 days	Note that there are residue concerns for some Group 3A materials on fruit intended for export. **IRAC 3A.**
	azadiractin + clarified neem extract (Neemix + Trilogy)	7 to 16 fl oz + 2% v/v	G	4 hr	0 days	**OMRI-Listed.** More effective when applied when populations are small. May cause issues with fruit finish. **IRAC UN.**

Pre-Harvest through Harvest

Fruit rots – Fungicides alone do not provide adequate control; proper harvesting and handling is essential. Pre- and post-harvest rots can be greatly reduced by timely, complete harvest of all ripe fruit on the bush, followed by rapid post-harvest cooling. DO NOT HANDLE FRUIT WHEN WET as this will greatly increase post-harvest rots. For hand-harvested highbush and southern highbush cultivars, harvest all ripe berries on the bush every 4-7 days or more frequently. Rabbiteye cultivars should be clean-harvested every 7-10 days. When harvesting by machine for the fresh market, use a short harvest interval to avoid overripe fruit. The presence of overripe fruit greatly increases the incidence of fruit rot and postharvest decay. Post-harvest cooling is critical and is best accomplished through the use of partial-vacuum or forced-air systems that use fans to pull cold air through stacks of palletized fruit.

Blueberry maggot – Blueberry maggot (BBM) flies are established in some southeastern blueberry fields. If present, BBM is a serious mid-and late-season fruit pest. BBM may go undetected at harvest and may contaminate fruit. Monitor all fields by hanging yellow sticky traps baited with ammonium bicarbonate or ammonium carbonate in at least each cultivar block. Trap catches indicate when adult blueberry maggot flies are present. **Traps should be hung in plantings before fruit begin to ripen. If BBM adults are trapped, treat within 7 days of trap capture and again 7 days after the first treatment**. If no additional flies are captured, treatments may stop until flies are again caught. **Exported fruit protected by systems-approach pest management protocols must comply with appropriate guidelines for scouting, spraying and post-harvest inspection of berries for the presence of maggot larvae in berries. Consult your marketer before beginning a BBM management program.**

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Ripe rot and Alternaria rot	See comments above on fruit rots, fruit handling, and postharvest cooling. Same as **10-20% BLOOM UNTIL 80-90% BLOOM** recommendations. *Note that fungicides with PHIs longer than 14 days (such as Quilt Xcel and Omega 500F) are inappropriate for use this close to harvest. Therefore, their use is NOT recommended at this time period.*					
Japanese beetle	Same as **COVER SPRAY** recommendations.					
Red imported fire ants	Same as **DORMANT** recommendations.					
Flea beetles and leaf beetles	Same as **COVER SPRAY** recommendations.					
Sharpnosed leafhoppers and other leafhoppers	Same as **PETAL FALL UNTIL ONE MONTH AFTER BLOOM** recommendations.					
Blueberry stem borer	Blueberry stem borer*, Oberea myops*, is a longhorn beetle and also attacks rhododendron and azalea. This pest can be minimized by pruning out and removing the infested portion of canes, well below brown hollowed out sections, as soon as larvae are detected in the summer. Promptly destroy each wilted cane containing a larva. This ensures that the larva does not migrate into the crown of the plant.					

Pre-Harvest through Harvest, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Blueberry maggot	Many insecticides effective against BBM are also effective against spotted-wing drosophila (SWD). If BBM and SWD are being treated at the same time, select materials that will control both.					
	bifenthrin (Brigade 10WBS) (Sniper)	16 oz 6.4 fl oz	E	12 hr	1 day	No more than 5 applications per season. Do not reapply for at least 7 days. **IRAC 3A.**
	phosmet (Imidan 70W)	1.3 lb	E	24 hr	3 days	Do not apply more than 2 times. **IRAC 1B.**
	acetamiprid (Assail 30SG)	4.5 to 5.3 oz	VG	12 hr	24 hr	Assail is labeled for blueberry maggot, but it should not be used alone for spotted-wing drosophila (SWD). **IRAC 4A.**
	imidacloprid (Admire Pro)	1.0 to 1.4 fl oz	VG	12 hr	3 days	Allow 7 days between imidacloprid treatments. Imidacloprid is labeled for blueberry maggot, but it should not be used alone for spotted-wing drosophila (SWD). **IRAC 4A.**
	spinetoram (Delegate WG)	3 to 6 oz	VG	4 hr	1 day	**IRAC 5.**
	cyclaniliprole (Verdepryn 100SL)	8.2 to 11 fl oz	VG	4 hr	1 day	Limited efficacy data. Do not apply Verdepryn 100SL Insecticide or other Group 28 insecticide more than 3 times within a single generation of an insect pest on a crop. **IRAC 28.**
	malathion (Malathion ULV)	10 fl oz	G	12 hr	1 day	3 applications per season of Malathion ULV are currently allowed. The minimum retreatment interval for Malathion ULV is 10 days. **IRAC 1B.**
	(Malathion 57EC)	1.5 to 2 pints				3 applications per season of Malathion 57EC are currently allowed. EC formulations may be associated with phytotoxicity. **IRAC 1B.**
	(Malathion 8F)	1.25 to 2.5 pints				2 applications per season of Malathion 8F are currently allowed Flowable formulations may have fewer phytotoxicity issues than EC formulations. **IRAC 1B.**
	spirotetramat (Movento)	10 fl oz	G	24 hr	1 day	Limited efficacy data. Movento is labeled for blueberry maggot, but it should not be used alone for spotted-wing drosophila (SWD). **IRAC 23.**
	fenpropathrin (Danitol 2.4EC)	16 fl oz	G	24 hr	3 days	**IRAC 3A.**
	zeta-cypermethrin (Mustang 1.5EC) (Mustang Maxx 0.8EC)	1.3 fl oz 4.0 fl oz	G	12 hr	24 hr	No more than 6 applications allowed per season. Do not reapply for at least 7 days. Note that there are residue concerns for some Group 3A materials on fruit intended for export. **IRAC 3A.**

Pre-Harvest through Harvest, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Spotted-wing drosophila	Spotted-wing drosophila (SWD, *Drosophila suzukii*) is an invasive pest of soft skinned fruit in the United States and has been detected throughout the southeast. Blueberries are susceptible. SWD damage is similar to blueberry maggot. Female flies lay their eggs in ripening and ripe fruit, and larvae develop internally. SWD larvae are much smaller than blueberry maggot larvae, and unlike blueberry maggot, SWD can have multiple, overlapping generations during blueberry harvest. Therefore, risk of SWD may be higher than blueberry maggot. Adult male SWD can be distinguished from native, non pest *Drosophila* spp. by a single spot on the end of both wings. Risk of fruit infestation increases as the season progresses. Females can be distinguished by their relatively large and heavily serrated ovipositor. Traps may indicate SWD presence on your farm, but do not predict fruit infestation. If SWD has been found on or near your farm, preventative insecticide applications are recommended beginning when fruit begins to color through the end of harvest. Insecticides should be applied at least weekly and reapplied after rain events. Insecticide classes should be rotated with each application to reduce the likelihood of resistance development. Many management tools used for blueberry maggot are also effective against SWD, and blueberry maggot and SWD management strategies should be integrated as much as possible.					
	phosmet (Imidan 70W)	1.3 lb	E	24 hr	3 days	Do not apply more than 2 times per season. **IRAC 1B.**
	fenpropathrin (Danitol 2.4EC)	16 fl oz	E	24 hr	3 days	No more than 2 applications per season. **IRAC 3A.**
	bifenthrin (Brigade 10WBS) (Sniper)	16 oz 6.4 fl oz	E	12 hr	1 day	No more than 5 applications per season. Do not reapply for at least 7 days. **IRAC 3A.**
	zeta-cypermethrin (Mustang 1.5EC, (Mustang Max 0.8EC)	4.3 fl oz 4.0 fl oz	E	12 hr	24 hr	No more than 6 applications allowed per season. Do not reapply for at least 7 days. Note that there are residue concerns for some Group 3A materials on fruit intended for export. **IRAC 3A.**
	spinetoram (Delegate WG)	3-6 oz	E	4 hr	1 day	**IRAC 5.**
	methomyl (Lannate LV 2.4EC)	12 to 24 fl oz	VG	48 hr	3 days	Lannate is highly toxic. Applicators, loaders, field workers & others must be warned of its use and supervised to ensure diligent adherence to all label precautions. No more than 4 applications per season allowed. **IRAC 1A.**
	cyantraniliprole (Exirel)	13.5 to 20.5 fl oz	VG	12 hr	3 days	Minimum application interval 5 days. Up to 4 applications at 13.5 fl oz per acre can be made per season. **IRAC 28.**
	cyclaniliprole (Verdepryn 100SL)	8.2 to 11 fl oz	VG	4 hr	1 day	Limited efficacy data. Do not apply Verdepryn 100SL Insecticide or other Group 28 insecticide more than 3 times within a single generation of an insect pest on a crop. **IRAC 28.**

Pre-Harvest through Harvest, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Spotted-wing drosophila, cont.	**malathion** (Malathion ULV)	10 fl oz	G	12 hr	1 day	3 applications per season of Malathion ULV are currently allowed. The minimum retreatment interval for Malathion ULV is 10 days. **IRAC 1B.**
	(Malathion 57EC)	1.5 to 2 pints	G	12 hr	1 day	3 applications per season of Malathion 57EC are currently allowed. EC formulations may be associated with phytotoxicity. **IRAC 1B.**
	(Malathion 8F)	1.25 to 2.5 pints	G	12 hr	1 day	2 applications per season of Malathion 8F are currently allowed Flowable formulations may have fewer phytotoxicity issues than EC formulations. **IRAC 1B.**
	spinosad (Entrust 2SC) (Entrust 80W)	 4 to 6 fl oz 1.25 to 2 oz	G	4 hr	3 days	Entrust is **OMRI** listed. **IRAC 5.**
	GS-omega/kappa-Hxtx-Hv1a (Spear-T)	3 gallons	G	4 hr	1 day	**IRAC UNP.**
	***Chromobacterium substugae* strain PRAA4-1^T and spent fermentation media** (Grandevo WDG)	1-3 lb	F	4 hr	0 day	Grandevo is **OMRI** listed biological insecticide. **IRAC UN.** For control of spotted-wing drosophila, apply Grandevo WDG at 3 lb per acre at a maximum 7-day interval when adult flies are first observed. Depending upon insect pressure, applications can be made on a shorter interval and Grandevo WDG can be tank-mixed or rotated with other insecticides active against SWD. The addition of a spreader-sticker is recommended and a pH of 6-8 is recommended. There are no tank-mix restrictions.
	pyrethrins (Pyganic 5.0) (Pyganic 1.4)	 4.5 to 15.61 fl oz 16 to 64 fl oz	 F F	 0 hr 0 hr	 0.5 day 0.5 day	Pyganic is **OMRI** listed. **IRAC 3A.**
	non-viable Burkholderia spp. strain A396 (Venerate XC)	1-2 lb	F	4 hr	0 day	Venerate is **OMRI** listed biological insecticide. **IRAC UNB.**

Pre-Harvest through Harvest, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Spotted-wing drosophila, cont.	**hydrogen peroxide and peroxyacetic acid** (Jet-Ag)	3.9-7.8 fl oz per 5 gallons of water	F	4 hr	0 day	Keep unprotected persons from treated area until sprays have dried. Jet-Ag controls yeast which is a food source for spotted wing drosophila, thereby significantly reducing populations of spotted wing drosophila. Thoroughly wet all surfaces of plant, upper and lower foliage, including stems, branches and stalks to ensure full contact with plant tissue. Apply as needed. Jet-Ag can be tank-mixed with Grandevo WDG at 2 lb/acre for enhanced control of SWD. **IRAC UN**
Yellownecked caterpillar, spanworms, azalea caterpillar, red humped caterpillar	Late season caterpillars are often localized on a few bushes. If insecticides are used, spot treatments are often adequate to control populations and are preferable to treating whole fields.					
	Hand removal		E			Hand removal is often sufficient to control populations.
	Bacillus thuringiensis [BT] (Dipel DF)	0.5 to 1.0 lb	F	4 hr	0 days	Apply to small, early-stage caterpillars. **OMRI** listed. **IRAC 11A.**
	chlorantraniliprole (Altacor)	3.0 to 4.5 oz	VG	4 hr	1 day	**IRAC 28.**
	esfenvalerate (Asana 0.66 EC) (Adjourn 0.66 EC)	4.8 to 16 oz 4.8 to 9.6 fl oz	VG	12 hr	14 days	Esfenvalerate can be used for medium to large caterpillars. Note that there are residue concerns for some Group 3A materials on fruit intended for export. **IRAC 3A.**

Late season and after harvest

During fruit maturation and/or immediately following harvest, fungicide applications may be warranted for control of leaf spots and suppression of dieback diseases and root rots. Start applications based on cultivar susceptibility and prior history of disease, ideally before leaf spots are first observed.

Dieback diseases of southern highbush varieties – Most southern highbush varieties are hedged immediately after harvest. Hedging cuts can serve as an entry point for many stem pathogens. At the end of each day of hedging, application of broad-spectrum fungicides may be beneficial.

Scale insects – Scale insects are not typically pests in blueberries but their populations may be affected by the use of broad spectrum insecticides against SWD and BBM earlier in the growing season. Scale insects can be managed with post-harvest cover sprays or with dormant season oil treatments (See **Dormant** recommendations for oil materials) Materials used as cover sprays against leafhoppers are also effective against scale insects.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Sharpnosed and other leafhoppers	Same as **PETAL FALL UNTIL ONE MONTH AFTER BLOOM** recommendations.					
Phytophthora root rot	Same as **PETAL FALL UNTIL ONE MONTH AFTER BLOOM** recommendations.					
Phyllosticta leaf spot	Phyllosticta is a common leaf spot in Florida on certain cultivars, such as Jewel. Occasionally a serious problem in Georgia. See controls below for other leaf spots.					
Blueberry bud mite	This tiny eriophyid mite, best visible with a microscope at 40x magnification, infests flower buds in late summer and fall and feeds inside the buds over the winter. In spring, infestations are diagnosed only after damage has occurred and reddening/rosetting of emerging flower buds become evident. Cultivar susceptibility and field history are the best means of determining whether treatment is warranted. Use high volume (300 gallons/A), high pressure (200 psi) applications of a post-harvest insecticide/miticide and horticultural oils. Pruning and removing or destroying old blueberry canes will reduce bud mite populations. **Never propagate from bud mite-infested blocks**.					
	Variety selection		VG			Most highly susceptible blueberry varieties are no longer grown. Bud mite can occur on O'Neal and Legacy. Bud mite is generally only a problem on high bush varieties.
	Summer hedging		VG			Summer topping or hedging immediately after harvest controls bud mite by removing old, infested fruiting twigs and is the control method of choice for early-ripening cultivars.
	Horticultural/ Superior oil (SunSpray Ultra-Fine Spray Oil) Pre-bloom use only	2% by volume	E	4 hr	0 days	Apply as needed for scale infestations. Do not apply oil during periods of high temperatures with high relative humidity. Do not spray immediately before, during, or following cold weather or freezing temperatures. Effectiveness is reduced at temperature below 50ºF. Do not use within 14 days of lime-sulfur, captan, chlorothalonil, and dimethoate. For all other fungicides not listed, consult their label for capability information. Dormant oil applications exacerbate Exobasidium. Current recommendations are to make oil applications as early in the dormant period as possible to allow as long as possible between oil and sulfur applications.

Late season and after harvest, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Chilli thrips	Chilli thrips are an invasive species found in Georgia and Florida. Monitor weekly by scouting blueberry planting. If more than 5% of the field has thrips and injury present, insecticide applications may be warranted.					
	acetamiprid (Assail 30SG)	4.5 to 5.3 oz	E	12 hr	24 hr	**IRAC 4A.**
	spinetoram (Delegate WG)	3 to 6 oz	VG	4 hr	1 day	**IRAC 5.**
	imidacloprid (Admire Pro)	1.0 to 1.4 fl oz	VG	12 hr	3 days	Allow 7 days between imidacloprid treatments. **IRAC 4A.**
	spinosad (Entrust 2SC) (Entrust 80W)	4 to 6 fl oz 1.25 to 2 oz	G	4 hr	3 days	Entrust is **OMRI** listed. **IRAC 5.**
	flupyradifurone (Sivanto Prime)	12 to 14 fl oz	G	4 hr	3 days	Limited efficacy data in blueberries. **IRAC 4D.**
	spirotetramat (Movento)	10 fl oz	G	24 hr	1 day	Limited efficacy data in blueberries. **IRAC 23.**
Scale insects	**Horticultural/ Superior oil** (SunSpray Ultra- Fine Spray Oil) Pre-bloom use only	2% by volume	E	4 hr	0 days	Apply as needed for scale infestations. Do not apply oil during periods of high temperatures with high relative humidity. Do not spray immediately before, during, or following cold weather or freezing temperatures. Effectiveness is reduced at temperature below 50ºF. Do not use within 14 days of lime-sulfur, captan, chlorothalonil, and dimethoate. For all other fungicides not listed, consult their label for capability information. *Note: Dormant oil applications exacerbate Exobasidium. Current recommendations are to make oil applications as early in the dormant period as possible to allow as long as possible between oil and sulfur applications.*
	flupyradifurone (Sivanto Prime)	12 to 14 fl oz	G	4 hr	3 days	**IRAC 4D.**
	spirotetramat (Movento)	10 fl oz	G	24 hr	1 day	Limited efficacy data. **IRAC 23.**
	acetamiprid (Assail 30SG)	4.5 to 5.3 oz	E	12 hr	24 hr	Assail is labeled for blueberry maggot, but it should not be used alone for spotted-wing drosophila (SWD). **IRAC 4A.**
	imidacloprid (Admire Pro)	1.0 to 1.4 fl oz	E	12 hr	3 days	Allow 7 days between imidacloprid treatments. Imidacloprid is labeled for blueberry maggot, but it should not be used alone for spotted-wing drosophila (SWD). **IRAC 4A.**

Late season and after harvest, cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Scale insects cont.	**pyriproxyfen** (Knack 0.86EC)	16 fl.oz	VG	12 hr	7 days	Do not make more than 2 *Knack* Insect Growth Regulator applications per growing season. Do not exceed 32 fl oz of *Knack* Insect Growth Regulator per acre per season. Do not apply earlier than 14 days after last *Knack* Insect Growth Regulator treatment. Regardless of formulation do not apply more than 0.218 lb pyriproxyfen per acre per season. **IRAC 7C**
Septoria and Anthracnose leaf spots	**fenbuconazole** (Indar 2F)	6.0 fl oz	E	12 hr	30 days	Do not make more than four applications or apply more than 24 fl oz of Indar 2F (0.38 lb a.i.) per acre per year. Indar belongs to the sterol demethylation inhibitor (DMI) class of fungicides or target site of action fungicides. Alternation with fungicides of different classes is recommended. **FRAC 3.**
	pyraclostrobin + boscalid (Pristine)	18.5 to 23 oz	E	12 hr	0 days	No more than two sequential applications of Pristine should be made before alternating with fungicides that have a different MOA. Do not apply more than four applications of Pristine per acre per crop year. **FRAC 11+7.**
	metconazole (Quash)	2.5 oz	E	12 hr	7 days	May be applied by ground (min. 20 GPA) or air (min 10 GPA). Do not apply more than twice in a row, or more than 7.5 oz per season, or more than three times per season. Supplemental label for Anthracnose leaf spot (Gloeosporium minus) for bushberries. **FRAC 3.**
	azoxystrobin + propiconazole (Quilt Xcel)	14 to 21 fl oz	E	12 hr	30 days	Do not apply more than 82 fl oz per acre per season. Quilt Xcel may be applied by ground or air (min. of 15 GPA). **FRAC 11+3.**
	chlorothalonil (Bravo Weather Stik)	3 to 4 pints	VG	12 hr to 6.5 days	42 days	Apply only as a postharvest fungicide for Septoria and rust. Do not combine with other pesticides, surfactant or fertilizers. Short REI (12 hr) with restrictions; REI is 6.5 days without restrictions. **FRAC M5.**
	azoxystrobin (Abound)	6.0 to 15.5 fl oz (See label to confirm rates for other generic formulations)	VG	4 hr	0 days	Subsequent applications can be made on 14-day intervals. Apply immediately following harvest. Two or three fungicide applications following harvest are generally sufficient to prevent major outbreaks of Septoria leaf spot. When hedging is conducted immediately following harvest, this is a good time to consider an application. Do not exceed 1.44 quarts per acre per season, and do not apply more than two sequential applications of Abound before switching to a fungicide with another MOA. **FRAC 11.**

Late season and after harvest, cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Septoria and Anthracnose leaf spots, continued	**mono- and di-potassium salts of phosphorous acid** (K-Phite and other formulations)	1 to 3 quarts	VG	4 hr	0 hr	K-Phite as a foliar spray is also effective against Phytophthora. **Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank-mixing this product with others, test the mix on a small area to make sure that phytotoxicity does not occur. FRAC P07.**
	fosetyl-al (Aliette WDG)	5 lb	VG	12 hr	12 hr	Aliette as a foliar spray is also effective against Phytophthora and Pythium root rots. Subsequent applications can be made on 14-21 day intervals. Two or three fungicide applications following harvest are generally sufficient to prevent major outbreaks of Septoria leaf spot. Assuming that hedging is conducted immediately following harvest, this is a good time to consider an application. Do not exceed four applications per acre per year. **Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank-mixing this product, test the mix on a small area to make sure that phytotoxicity does not occur. FRAC P07.**
	potassium phosphite (ProPhyt and generic formulations)	4 pints	VG	4 hr	0 hr	ProPhyt as a foliar spray is also effective against Phytophthora. **Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank-mixing this product with others, test the mix on a small area to make sure that phytotoxicity does not occur.** Plant injury may occur. **FRAC P07.**
	cyprodinil + fludioxonil (Switch 62.5WG)	11 to 14 oz	G	12 hr	0 days	Applications can be made on 7-10 day intervals when conditions warrant. Do not apply more than 56 oz of product per acre per year. Make no more than two sequential applications before using another fungicide with a different MOA. **FRAC 9+12.**

Late season and after harvest, cont.						
Pest/Problem	**Management Options**	**Amount of Formulation per Acre**	**Effectiveness**	**REI**	**PHI**	**Comments**
Septoria leaf spot only	**propiconazole** (Tilt) (Bumper 41.8 EC) (PropiMax EC)	6.0 fl oz	VG	24 hr 12 hr 12 hr	30 days	Some DMI fungicides, may be applied by either ground or aerial application (see label). Do not apply more than 30 fl oz per acre per season. More effective when allowed to dry ahead of a rain. **FRAC 3.**
	prothioconazole (Proline 480 SC)	5.7 fl oz	G	12 hr	7 days	Apply up to two applications per year on a 7-10 day schedule. A tank mix with captan is recommended for resistance management and to provide Botrytis suppression. **FRAC 3.**
Blueberry rust	**prothioconazole** (Proline 480 SC)	5.7 fl oz	E	12 hr	7 days	Apply up to two applications per year on a 7-10 day schedule. A tank mix with captan is recommended for resistance management and to provide Botrytis suppression. **FRAC 3.**
	azoxystrobin + propiconazole (Quilt Xcel)	14 to 21 fl oz	E	12 hr	30 days	Do not apply more than 82 fl oz per acre per season. Quilt Xcel may be applied by ground or air (min. of 15 GPA). **FRAC 11+3.**
	metconazole (Quash)	2.5 oz	VG	12 hr	7 days	May be applied by ground (min. 20 GPA) or air (min 10 GPA). Do not apply more than twice in a row, or more than 7.5 oz per season, or more than three times per season. Supplemental label for bushberries. **FRAC 3.**
	fenbuconazole (Indar 2F)	6.0 fl oz	G	12 hr	30 days	Do not make more than four applications or apply more than 24 fl oz of Indar 2F (0.38 lb a.i.) per acre per year. Indar belongs to the sterol demethylation inhibitor (DMI) class of fungicides or target site of action fungicides. Alternation with fungicides of different classes is recommended. **FRAC 3.**
	propiconazole (Tilt) (Bumper 41.8 EC) (PropiMax EC)	6.0 fl oz	G	24 hr 12 hr 12 hr	30 days	Some DMI fungicides, may be applied by either ground or aerial application (see label). Do not apply more than 30 fl oz per acre per season. More effective when allowed to dry ahead of a rain. **FRAC 3.**

Late season and after harvest, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Blueberry rust, cont.	**azoxystrobin** (Abound)	6.0 to 15.5 fl oz (See label to confirm rates for other generic formulations)	G	4 hr	0 days	Subsequent applications can be made on 14-day intervals. Do not exceed 1.44 quarts per acre per season, and do not apply more than two sequential applications of Abound before switching to a fungicide with another MOA. **FRAC 11.**
	chlorothalonil (Bravo Weather Stik)	3 to 4 pints	G	12 hr to 6.5 days	42 days	Apply only as a postharvest fungicide for Septoria and rust. Do not combine with other pesticides, surfactants or fertilizers. Short REI (12 hr) with restrictions; REI is 6.5 days without restrictions. **FRAC M5.**
	pyraclostrobin + boscalid (Pristine)	18.5 to 23 oz	F	12 hr	0 days	No more than two sequential applications of Pristine should be made before alternating with fungicides that have a different MOA. Do not apply more than four applications of Pristine per acre per crop year. **FRAC 11+7.**

After harvest leaf analysis and soil testing

The preferred time for leaf analysis in blueberries is the first two weeks after harvest. Soil testing is also important. See the Southeast Regional Blueberry Horticulture and Growth Regulator Guide at www.smallfruits.org for additional details.

Efficacy of selected fungicides against diseases of blueberry (E = excellent, VG = very good, G = good, F = fair, P = poor, NA = not recommended, UN = control unknown) These ratings are benchmarks, actual performance will vary.

Fungicide		FRAC MOA	Exobasidium leaf & fruit spot	Mummy Berry	Phomopsis twig blight	Botrytis (gray mold)	Alternaria rot	Ripe rot (Anthracnose)	Septoria leaf spot	Anthracnose leaf spot	Rust	Phytophthora root rot
calcium polysulfide **(Sulforix, Lime Sulfur Ultra)**		M2	**E**	NA	NA	NA	NA	NA	NA	NA	NA	NA
ziram **(Ziram)**		M3	UN	P	G	F	F	F	UN	F	UN	NA
captan **(Captan 50WP, 4L, 80WDG)**		M4	**VG**	F	F	F	G	G	F	G	NA	NA
chlorothalonil (**Bravo**)* ***DO NOT USE prior to harvest because of potential to damage fruit**		M5	UN	NA	NA	NA	NA	NA	**VG*** **Post harvest only**	**VG*** **Post harvest only**	G* **Post harvest only**	NA
fosetyl-Al **(Aliette WDG)**		P07	NA	NA	P	NA	NA	P	**VG**	**VG**	NA	G
mono and di-potassium salts of phosphorous acid **(K-Phite)** or potassium phosphite (**ProPhyt)** ***injury may occur***		P07	UN	NA	NA	NA	NA	NA	**VG**	**VG**	NA	**VG**
DMIs	fenbuconazole **(Indar)*** ***Tank mix with captan products during bloom to prevent rots**	3	G **VG (with captan)**	**E**	**E**	NA	NA	NA*	**E**	**E**	G	NA
DMIs	mefentrifluconazole (**Cevya**)	3	UN	**E**	UN	UN	UN	UN	UN	UN	UN	UN
DMIs	metconazole **(Quash)**	3	UN	**E**	**E**	UN	**E**	**E**	**E**	**E**	**VG**	NA
DMIs	propiconazole **(Tilt, Bumper, PropiMax)**	3	UN	**E**	**E**	NA	NA	NA	**VG**	UN	G	NA
DMIs	prothioconazole **(Proline)**	3	UN	**E**	**E**	NA	NA	UN	G	UN	**E**	NA
mefenoxam **(Ridomil Gold)**		4	NA	NA	NA	NA	NA	NA	NA	NA	NA	G
fluopyram + pyrimethanil (**Luna Tranquility**)		7+9	NA	**VG**	NA	NA	NA	NA	NA	NA	NA	NA
pydiflumetofen + fludioxonil (**Miravis Prime**)		7+12	NA	UN	UN	UN	UN	**E**	NA	NA	NA	NA
cyprodinil + fludioxonil **(Switch)**		9+12	UN	F	G	**E**	**E**	**E**	G	G	NA	NA
Strobilurins (QoIs)	azoxystrobin (**Abound**)	11	UN	F	F	NA	**E**	**E^R**	**VG**	**VG**	G	NA
Strobilurins (QoIs)	azoxystrobin + propiconazole **(Quilt Xcel)**	11+3	NA	**E**	**E**	NA	**E**	**E^R**	**E**	**E**	**E**	NA
Strobilurins (QoIs)	pyraclostrobin + boscalid **(Pristine)**	11+7	F^R	VG	**E**	**E**	**E**	**E^R**	**E**	**E**	F	NA
fenhexamid **(Elevate)**		17	UN	F	NA	**E**	NA	NA	NA	NA	NA	NA
fluazinam **(Omega 500F)**		29	UN	NA	G	F	G	G	NA	NA	NA	NA
oxathiapiprolin (**Orondis Gold 200**)		49	NA	NA	NA	NA	NA	NA	NA	NA	NA	G
oxathiapiprolin + mefenoxam (**Orondis Gold**)		49+4	NA	NA	NA	NA	NA	NA	NA	NA	NA	G

^{R}Isolates of this pathogen with resistance to this fungicide have been identified in the southeastern U.S. If pathogen with resistance to this fungicide is present, this fungicide will not be effective.

Efficacy of selected insecticides against blueberry insects (E = excellent, VG = very good, G = good, F = fair, P = poor, NA = not recommended, UN = control unknown) These ratings are benchmarks, actual performance will vary.

Common Name	IRAC MOA	Trade Name(s)	Fire Ants	Armored scale	Soft scale	Blue-berry gall midge	Flower thrips	Glassy-winged sharp-shooter	Sharp-nosed leaf-hopper	Fruit worms	Plum curculio	Blue-berry maggot	Spotted-wing drosophila	Japanese beetle/ Green June beetle	Blue-berry bud mite	Foliar feeding cater-pillars
carbaryl	1A	Sevin 80S Sevin 80WSP	NA	NA	NA	NA	NA	**F**	**F**	**F**	**F**	**F**	**G**	**G**	NA	**G**
methomyl	1A	Lannate LV	NA	NA	NA	NA	NA	**VG**	**VG**	**VG**	NA	**E**	**VG**	NA	NA	**VG**
diazinon	1B	Diazinon AG500	NA	NA	NA	**G**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
malathion	1B	Many formulations	NA	NA	NA	**P**	**G**	**G**	**G**	**G**	**P**	**VG**	**VG**	**F**	NA	**G**
phosmet	1B	Imidan 70W	NA	**F**	**G**	**G**	NA	**G**	**G**	**VG**	**VG**	**VG**	**E**	**VG**	NA	**E**
bifenthrin	3A	Brigade Sniper	NA	NA	NA	NA	NA	NA	NA	NA	NA	**E**	**E**	NA	NA	NA
esfenvalerate	3A	Adjourn 0.66EC Asana XL 0.66EC	NA	NA	NA	NA	NA	**VG**	**VG**	**E**	**F**	**VG**	NA	**VG**	NA	**E**
fenpropathrin	3A	Danitol 2.4EC	NA	NA	NA	NA	NA	**VG**	**VG**	**E**	**G**	**G**	**E**	**E**	NA	**E**
zeta-cypermethrin	3A	Mustang Mustang Max	NA	NA	NA	NA	NA	**G**	**G**	**VG**	**VG**	**VG**	**E**	**E**	NA	**E**
acetamiprid	4A	Assail 30SG	NA	**E**	**E**	NA	**G**	**VG**	**VG**	**F**	**P**	**VG**	**F**	**VG**	NA	**F**
imidacloprid	4A	Many trade names	NA	**E**	**E**	NA	NA	**VG**	**VG**	NA	NA	**F**	NA	**G**	NA	NA
flupyradifurone	4D	Sivanto Prime	NA	**E**	**E**	**F**	NA	NA	NA	NA	NA	**G**	NA	NA	NA	NA
spinetoram	5	Delegate WG	NA	NA	NA	**F**	**E**	NA	NA	**VG**	NA	UN	**E**	NA	NA	**E**
spinosad	5	Entrust 80W, Entrust SC	**G**	NA	NA	**P**	**VG**	NA	NA	**G**	NA	UN	**VG**	NA	NA	**VG**

Efficacy of selected insecticides against blueberry insects (E = excellent, VG = very good, G = good, F = fair, P = poor, NA = not recommended, UN = control unknown) These ratings are benchmarks, actual performance will vary.

Common Name	IRAC MOA	Trade Name(s)	Fire Ants	Armored scale	Soft scale	Blue-berry gall midge	Flower thrips	Glassy-winged sharp-shooter	Sharp-nosed leaf-hopper	Fruit worms	Plum curculio	Blue-berry maggot	Spotted-wing drosophila	Japanese beetle/ Green June beetle	Blue-berry bud mite	Foliar feeding cater-pillars
spinosad fruit fly bait	5	GF-120 NF Naturalyte Fruit Fly Bait	NA	NA	NA	NA	NA	NA	NA	NA	NA	**VG**	NA	NA	NA	NA
methoprene	7A	Extinguish Professional Fire Ant Bait 0.5%	**E**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pyriproxyfen	7D	Knack 0.86 EC	NA	**VG**	**VG**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pyriproxyfen	7D	Esteem Ant Bait	**E**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bt	11A	Dipel DF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**VG**
methoxy-fenozide	18	Intrepid 2F	NA	NA	NA	NA	NA	NA	NA	**VG**	NA	NA	NA	NA	NA	**E**
tebufenozide	18A	Confirm 2F	NA	NA	NA	NA	NA	NA	NA	**VG**	NA	NA	NA	NA	NA	**E**
indoxacarb	22	Avaunt	NA	NA	NA	NA	NA	NA	NA	**E**	**E**	NA	NA	NA	NA	**E**
spirotetramat	23	Movento	NA	**G**	**G**	NA	NA	NA	NA	NA	NA	**G**	NA	NA	NA	NA
cyantraniliprole	28	Exirel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**E**	NA	NA	NA
chlorantranilipr ole	28	Altacor	NA	NA	NA	NA	NA	NA	NA	**E**	NA	NA	NA	NA	NA	NA
cyclaniliprole	28	Verdepryn	NA	NA	NA	NA	NA	NA	NA	**VG**	NA	**VG**	**VG**	NA	NA	NA
Cultural control	NA	Methods vary	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**E**	**E**
Chromobacterium substugae	UN	Grandevo WDG	NA	NA	NA	NA	NA	NA	NA	**F**	NA	NA	**F**	NA	NA	NA
Burkholderia spp.	UNB	Venerate XC	NA	NA	NA	NA	NA	NA	NA	**F**	NA	NA	**F**	NA	NA	NA
pyrethrins	3A	Pyganic	NA	NA	NA	NA	NA	NA	NA	**F**	NA	NA	**F**	NA	NA	NA
horticultural oil	UN	Superior Oil JMS Stylet Oil Stoller® Golden Pest Spray Oil	NA	**G**	**G**	NA	NA	NA	NA	NA	NA	NA	NA	NA	**VG**	NA
kaolin clay	NA	Surround	NA	NA	NA	NA	NA	NA	NA	**G**	**G**	NA	NA	NA	NA	NA

Fungicide groups with moderate/high risk of resistance development (generally single-site of action)		
FRAC Code	**Fungicide Group**	**Trade Name (active ingredient)**
3	Demethylation Inhibitors (DMIs) or Sterol Inhibitors (3)	Indar (fenbuconazole) Cevya (mefentrifluconazole) Proline (prothioconazole) Quash (metconazole) Quilt Xcel (propiconazole; one component of a two-part mixture) Tilt, Bumper 41.8 EC, PropiMax EC (propiconazole)
4	Phenylamides (4)	Ridomil Gold (mefenoxam) Orondis Gold (mefenoxam; one component of a two-part mixture)
7	Succinate Dehydrogenase Inhibitors (SDHIs) (7)	Pristine (boscalid; one component of a two-part mixture) Luna Tranquility (fluopyram; one component of a two-part mixture) Miravis Prime (pydiflumetofen; one component of a two-part mixture)
9	Anilopyrimidines (9)	Switch (cyprodinil; one component of a two-part mixture) Luna Tranquility (pyrimethanil; one component of a two-part mixture)
11	Strobilurins or QoI (Quinone outside Inhibitors) (11)	Abound (azoxystrobin) Pristine (pyraclostrobin; one component of a two-part mixture) Quilt Xcel (azoxystrobin; one component of a two-part mixture)
12	Phenylpyrroles (12)	Cannonball WP (fludioxonil) Switch (fludioxonil; one component of a two-part mixture) Miravis Prime (fludioxonil; one component of a two-part mixture)
17	Hydroxyanelides (17)	Elevate (fenhexamid)
29	2,6-dinitro-anilines (29)	Omega (fluazinam)
49	Piperidinyl-thiazoleisoxazolines	Orondis Gold 200 (oxathiapiprolin) Orondis Gold (oxathiapiprolin; one component of a two-part mixture)
Fungicide groups with low risk of resistance development (generally multiple sites of action)		
FRAC Code	**Fungicide Group**	**Trade Name (active ingredient)**
M1	Coppers (M1)	Coppers (numerous formulations)
M2	Sulfurs (M2)	Sulfurs (numerous formulations)
M3	Dithiocarbamates (M3)	Ziram (ziram)
M4	Phthalimides (M4)	Captan 50WP, or 4L, or 80 WDG (captan)
M5	Phthalonitriles (M5)	Bravo (chlorothalonil)
P07	Phosphonates (P07)	Aliette (fosetyl-Al) K-Phite (mono and di-potassium salts of phosphorous acid) ProPhyt (potassium phosphite)

Seasonal 'at a glance' fungicidal spray schedule options for blueberry

Developmental Stage	Late Dormant	Green tip	Bloom (2-3 applications)[b]	Petal Fall	10 to 14 Days after Petal Fall	20 to 24 Days after Petal Fall	Pre-Harvest[g]	After Harvest
Disease (Fungicides)	**Exobasidium** (Lime Sulfur, Sulforix or Lime Sulfur Ultra)[a]	**Twig Blight** (Pristine or Indar)	**Alternaria and Ripe Rot** (Abound, Pristine, Switch, Captan, Miravis Prime, Omega, or Quilt Xcel)[c]	**Alternaria and Ripe Rot** (Abound, Pristine, Switch, Captan, Miravis Prime, Omega, or Quilt Xcel)	**Alternaria and Ripe Rot** (Abound, Pristine, Switch, Captan, Miravis Prime, Omega, or Quilt Xcel)	**Alternaria and Ripe Rot** (Abound, Pristine, Switch, Captan, Miravis Prime, Omega, or Quilt Xcel)	**Alternaria and Ripe Rot** (Abound, Pristine, Switch, Captan, Miravis Prime)	**Anthracnose Leaf Spot** (Abound, Pristine, Switch, Aliette, ProPhyt, K-Phite, Quash, Quilt Xcel, Indar, or Bravo)
		Mummy Berry and Twig Blight (Pristine, Indar, Tilt, Quash, Proline, Quilt Xcel, Cevya, or Luna Tranquility)	**Mummy Berry and Twig Blight** (Pristine, Indar[d] + Captan, Tilt, Quash, Proline, Quilt Xcel, Cevya, or Luna Tranquility)	**Septoria Leaf Spot** (Abound, Pristine, Switch, Aliette, ProPhyt, K-Phite, Quash, Quilt Xcel, Tilt, Indar or Proline)[e]	**Septoria Leaf Spot** (Abound, Pristine, Switch, Aliette, ProPhyt, K-Phite, Quash, Quilt Xcel, Tilt, Indar or Proline)[e]	**Septoria Leaf Spot** (Abound, Pristine, Switch, Aliette, ProPhyt, K-Phite, Quash, Quilt Xcel, Tilt, Indar or Proline)[e]		**Septoria Leaf Spot** (Abound, Pristine, Switch, Aliette, ProPhyt, K-Phite, Quash, Quilt Xcel, Tilt, Indar, Proline, or Bravo)[e]
			For serious **Botrytis** problems, add (Elevate, Pristine, or Switch)	**Rust** (Proline, Quash, Tilt, Indar, or Quilt Xcel)[f]	**Rust** (Proline, Quash, Tilt, Indar or Quilt Xcel)[f]			**Rust** (Proline, Quash, Tilt, Indar, Quilt Xcel, or Bravo)[f]
	Phytophthora Root Rot (Ridomil, Orondis Gold, Orondis Gold 200)			**Phytophthora Root Rot** (Ridomil, Orondis Gold, Orondis Gold 200, Aliette, ProPhyt, or K-Phite)				**Phytophthora Root Rot** (Ridomil, Orondis Gold, Orondis Gold 200, Aliette, ProPhyt, or K-Phite)
		If **Exobasidium** has been a problem, add Captan	If **Exobasidium** has been a problem, add Captan	If **Exobasidium** has been a problem, add Captan	If **Exobasidium** has been a problem, add Captan	If **Exobasidium** has been a problem, add Captan		

[a]Exobasidium is not specifically on the label. However, when applied for other diseases, suppression of Exobasidium has been observed.

[b]Bloom times vary, due to varietal differences and the environment, and as a result the number of applications may vary from 1-3. Bloom sprays should provide protection against the primary pathogens of blooms for the entire bloom period.

[c]Many of the fungicides which are registered for rot control may also have activity against twig dieback organisms, such as *Phomopsis* species.

[d]When using Indar during bloom, always tank-mix with Captan. Captan provides some control of mummy berry, twig blight, Botrytis, and fruit rots. However, it is mainly of value for resistance management and to prevent increased rots due to use of Indar.

[e]Septoria leaf spot is generally controlled with 2-4 fungicide applications. This disease is more problematic on highbush blueberry varieties, but some rabbiteye varieties may experience premature defoliation from Septoria as well. For leaf spot, Aliette and other phosphites (ProPhyt, K-Phite, etc.) are best utilized after harvest, since they are not as efficacious against the fruit rots, and they serve as a resistance management tool.

[f]Rust is problematic on some blueberry varieties, especially in far southern areas such as south Georgia, and it can result in complete, premature defoliation on susceptible varieties. Scout for rust in mid to late July. Applications of fungicides (2-3) from August to mid-September will generally result in good rust management. Some varieties may require yearly rust control.

[g]In wet years, pre-harvest and post-harvest rots may be a potential problem. Under these conditions, 1-2 applications of a pre-harvest material may be necessary for rot control.

Pre-emergence Herbicides for Blueberries

All pre-emergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5-1" of water within 72 hours of application). If no rain event occurs and no supplemental overhead watering is provided after a pre-emergent herbicide application, weed control may be extremely poor. Most pre-emergent herbicides will only control germinating weed seed. Generally, pre-emergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most pre-emergent herbicides will not control weeds coming from vegetative structures (i.e., yellow and purple nutsedge). As long as the treated area remains undisturbed, most pre-emergent herbicides will provide weed control for 2-4 months in most growing mediums.

Herbicide	MOA	Broadcast Rate / Acre		PHI	REI	Remarks and Precautions
		Amount of Formulation	lb Active Ingredient			
dichlobenil Casoron 4G	20	100 lb	4 to 6	14 days	4 to 12 hr	Apply between November and February (air temperature 60º F or less) for best results. Warm temperature increases volatility. Overhead irrigation may be use for activation when applied in early spring. Controls Florida betony (Stachys floridiana) and non-seed bearing plants (i.e Ferns).
diuron Direx 4L Karmex 80 DF Various generic formulations	2	1.2 to 1.6 quarts 1.5 to 2 lb	1.2 to 1.6	0 days	12 hr	Diuron is registered for use in AR, GA, MS, NC, and SC only. Apply as a directed spray in the fall and repeat application in the spring if needed. Do not apply to soils having less than 2% organic matter. Do not use on loamy sand or sand soils. Tank mix with glyphosate, paraquat (see comments on rabbiteye), or glufosinate for postemergence control.
flumioxazin Chateau 51WDG	14	6 to 12 oz/A	0.375 to 0.75	7 days	12 hr	Avoid application when plants are in heavy flower. Dust from treated soil can damage young fruit and flowers. Pre harvest interval is 7 days. Do not apply to blueberries established less than 2 years unless they are protected from spray contact by non-porous wrap, grow tubes or waxed containers. Do not apply more than 12 oz/A during a 12-month period. Do not make a sequential application within 30 days of the first application. Do not apply more than 6 oz per acre per application to bushes less than 3 years old on soils having a sand plus gravel content greater than 80%. Apply at the base of the bush. Residual weed control will be reduced if emerged vegetation prevents Chateau from reaching the soil surface.

Pre-emergence Herbicides for Blueberries, cont.

Herbicide	MOA	Broadcast Rate / Acre		PHI	REI	Remarks and Precautions
		Amount of Formulation	lb Active Ingredient			
hexazinone Velpar 80DF	5	1.3 to 2.6 lb	1 to 2	90 days	24 hr	**Apply to highbush blueberry plant that have been established at least 3 years.** Apply in spring before lower leaves of the blueberry plant have fully expanded. Use lower rates on poorly drained soils. Due to variability in soil type limit initial use to a small area. Do not use on sand, loamy sand, or sandy loam soils. Do not use on soils having less than 3% organic matter. Most blueberry soils in Georgia have less than 3% organic matter. Preharvest interval for Velpar 2 SL is 50 days. Preharvest interval for Velpar 80 WDG is 90 days.
Imdaziflam Alion 1.67L	29	3.5 to 5 oz	0.045 to 0.097	14 days	12 hr	Excellent pre-emergence herbicide, use at 3.5-5 oz/A if soil organic matter is ≤ 1% and 5-10 oz/A if soil organic matter is ≥ 1%. Only apply Alion to dormant plant before bud swell in the fall. Do not allow spray to contact green stems, leaves, flowers, and berries.
Isoxaben Trellis 4.16 SC Trellis 75 DF	21	16 to 31 fl oz 0.66 to 1.33 lb	0.5 to 1.0 0.5 to 1.0	60 days	12 hr	Trellis should be tank mixed with oryzalin for PRE control of annual grass weeds. Do not apply more than twice per crop year and total use rate cannot exceed 1 lb ai/A. For non-selective POST weed control tank mix with glyphosate, glufosinate or paraquat. Excellent herbicide for new transplants.
Metolachlor Dual Magnum 7.64 EC	15	0.637 to 1.3 pints	0.6 to 1.24	28 days	24 hr	**USE ONLY ALLOWED IN STATES WITH APPROVED SECTION 24C.** Provides good preemergence weed control of many small seeded broadleaf and grass weeds. Maximum of 1.3 pints/A/year. Needs a tank mix partner for better annual broadleaf weed control (i.e., Gallery).

Pre-emergence Herbicides for Blueberries, cont.

Herbicide	MOA	Broadcast Rate / Acre		PHI	REI	Remarks and Precautions
		Amount of Formulation	lb Active Ingredient			
mesotrione Callisto 4L	27	3 to 6 oz	0.094 to 0.19	14 days	12 hr	Callisto may be applied at a rate up to 6 oz/A or may be applied as a split application of 3 oz/A followed by 3 oz/A. If two applications are made do not apply less than 14 days apart. Do not apply more than 6 oz/A per year. Do not apply after the onset of bloom stage. A crop oil concentrate at 1% v/v is recommended.
napropamide Devrinol 50 DF Devrinol 2 L	15	8 lb 2 gallons	4 4	60 days	24 hr	Soil surface should be relatively free of weeds and plant residue. Rainfall or overhead irrigation within 1 to 2 days (summer) and 7 days (fall or spring) of application is needed for activation.
norflurazon Solicam 80WDG	12	2.5 to 5 lb	2 to 4	60 days	12 hr	Apply as a directed spray from fall to early spring when the crop is dormant and before weeds emerge. Application of Solicam may result in temporary leaf bleaching or chlorosis. Tank mix with paraquat or glufosinate to control emerged weeds. Tank mix with simazine or diuron for expanded residual control.
oryzalin Surflan 4AS Oryzalin 4AS Surflan 85 DF	3	2 to 6 quarts 2.4 to 7.1 lb	2 to 6	28 days	24 hr	Controls annual grasses and small seeded annual broadleaf weeds. Use low rate for short-term control (1- 2 months); high rate for long-term control (2-3 months). DO NOT apply to newly established plantings until the soil has settled and no cracks are present. Apply before annual weeds emerge or add Gramoxone or glyphosate for control of emerged weeds. Benefits highly from a tank mix partner like Simazine or Trellis.
pronamide Kerb 50W	3	2 to 4 lb	1 to 2	2 days	24 days	Apply as a directed spray in established blueberries only for early postemergence control of susceptible winter annual weeds, perennial grasses, and chickweed and for preemergence control of these and other weeds. Optimal activity occurs under cool temperature conditions and followed by rainfall or overhead irrigation. Do not exceed maximum rate listed per year. Apply only in late fall or winter.

Pre-emergence Herbicides for Blueberries, cont.

Herbicide	MOA	Broadcast Rate / Acre		PHI	REI	Remarks and Precautions
		Amount of Formulation	lb Active Ingredient			
rimsulfuron Matrix 75SG	2	4 oz	0.25 lb	14 days	4 hr	Better as a pre-herbicide, but can provide post control of many weeds after germination and to difficult weeds such as yellow and purple nutsedge (Cyperus esculentus and C. rotundus). Can be applied 2 times a year, 30 days between application, no more than 4 oz product in a calendar year. DO NOT apply 21 days before harvest or to soil classified as sand.
simazine Princep, Simazine 90DG Princep, Simazine 4F and other generic formulations	5	2.2 to 4.4 lb 2 to 4 quarts	2 to 4	14 days	12 hr	Tank mix with glyphosate, paraquat (see comments on rabbiteye), or glufosinate for postemergence weed control. The addition of oryzalin or norflurazon with simazine will extend residual grass control several weeks. Rate is soil texture dependent. Do not apply when fruit is present. **Do not apply to blueberry planted less than 6 months in bark production system.**
sulfentrazone Zeus XC 4L	14	6 to 12 oz	0.1875 to 0.375	15 days	12 hr	Excellent pre-emergence weed control (8-12 weeks) that rivals Chateau (flumioxazin), but with the ability to control yellow nutsedge (Cyperus esculentus) without the damage of Sedgehammer (halosulfuron). Sequential applications (6 oz pr/A – twice) are the most effective on yellow nutsedge. See label for details.
sulfentrazone + *carfentrazone* Zeus Prime XC	14	7.7 to 15.2 fl oz	0.19 + 0.02 to 0.37 + 0.04	15 days	12 hr	Zeus Prime XC may be applied twice per year so long as the total use rate does not exceed 15 fl oz/A on a broadcast basis. Allow at least 60 days between applications. 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.

Pre-emergence Herbicides for Blueberries, cont.

Herbicide	MOA	Broadcast Rate / Acre		PHI	REI	Remarks and Precautions
		Amount of Formulation	lb Active Ingredient			
terbacil Sinbar 80WDG	5	0.5 to 3 lb	0.4 to 2.4	90 days	12 hr	Apply as directed spray in early fall or spring before fruit set. Do not contact foliage. Do not use on loamy sand or sandy soils. Do not use on soils having less than 3% organic matter. This herbicide can be very active, but injurious on blueberry plants. It is advised to try this herbicide on small acreage, and determine acceptability on your soils before large scale use. Also, when used with an adjuvant terbacil can provide early postemergence weed control of many grass and broadleaf weeds.

Herbicides for Young Non-Bearing Plants

Preemergence Herbicides for Non-Bearing Plants

HERBICIDE	MOA	Broadcast Rate / Acre		PHI	REI	Remarks and Precautions
		Amount of Formulation	lb Active Ingredient			
In Southeast Georgia (South of Macon), it is recommended that you make herbicide applications 6 times a year (containerized blueberries). If a herbicide program is started in January, applications should be made every 2 months for the remainder of the year (Jan, Mar, May, July, Sept, and Nov). Plants should be well rooted at the time of first herbicide application.						
benefin (1%) *oryzalin (1%)* **XL 2 G**	15 3	100 to 300 lb	1.0 to 3.0 lb (each)	1 year	24 hr	**NON-BEARING PLANTS ONLY**. No post-emergent activity. Excellent product for containers and small in-ground operations. Controls a wide array of annual broadleaf and grass weeds.
dithiopyr **Dimension 1 SL** **Dimension 40 WP**	3	 2 quarts 20 oz	 0.5 0.5	1 year	12 hr	**NON-BEARING PLANTS ONLY.** Provides pre-emergent control of most annual grasses and small seed broadleaf weeds. Also provides early post- emergent control of some annual grasses up to 3 tillers. Use on 1-year old plants.

Herbicides for Young Non-Bearing Plants

Preemergence Herbicides for Non-Bearing Plants, Cont.

HERBICIDE	MOA	Broadcast Rate / Acre		PHI	REI	Remarks and Precautions
		Amount of Formulation	lb Active Ingredient			
isoxaben / dithiopyr **Crew 0.75 G** **Fortress 0.75 G**	21/3	100 to 200 lb	0.5 to 1.0 0.25 to 0.5	1 year	12 hr	**NON-BEARING PLANTS ONLY.** Provides good pre-emergent control of most annual grasses and small seed broadleaf weeds. Also provides early post-emergent control of some annual grasses up to 3 tillers. Use on transplant after soil in containers is settled.
flumioxazin **Broadstar 0.25 GR** **Sureguard 51 WDG**	14	150 lb 6 to 12 oz	0.375 0.375 to 0.75	1 year	12 hr	**NON-BEARING PLANTS ONLY.** Excellent pre-emergence weed control. Use 10 to 12 oz rate for extended control (3 plus months). Broadstar is excellent for containers and small in-ground operations. Controls a wide array of annual broadleaf and grass weeds (some early post-emergent activity).
Flumioxazin (0.125%) *Prodiamine (0.75%)* **Fuerte 0.875 GR**	14 3	100 lb	0.25 0.75	1 year	12 hr	**NON-BEARING PLANTS ONLY.** Excellent pre-emergence weed control. Excellent for containers and small in-ground operations. Controls a wide array of annual broadleaf and grass weeds (some early post-emergent activity).
indaziflam **Marengo 0.622 lb/gallon** **0.224 GR**	29	7.5 to15 oz 100 to 200 lb pr	0.0387 to 0.0775 0.0224 to 0.0448	1 year	12 hr	**NON-BEARING PLANTS ONLY.** Controls a wide range of annual weeds from seed in containerized blueberries. Provides one of the longest pre-emergence weed control windows of any pre-emergence herbicide. DO NOT apply more than 200 lb pr/A (granular) or 15 oz pr/A (liquid) in a 12-month period. Active ingredient is the same as Alion but liquid formulations (lb/gallon) are different. Irrigate treated containers with at least 0.5" of water after herbicide application. Avoid MARENGO applications when plants are breaking bud.

Herbicides for Young Non-Bearing Plants, cont.

Preemergence Herbicides for Non-Bearing Plants, Cont.

HERBICIDE	MOA	Broadcast Rate / Acre		PHI	REI	Remarks and Precautions
		Amount of Formulation	lb Active Ingredient			
isoxaben **Gallery T/V 75 DF** **Trellis 75 DF** **Trellis SC 4.16 SC**	21	0.66 to 1.33 lb 23 to 31 oz	0.5 to 1		12 hr	**CAN BE USED ON BEARING PLANTS.** Provides excellent pre-emergent weed control of many small seeded broadleaf weeds. Maximum of 1 lb ai/year. Needs a tank mix partner for annual grass control (i.e., Pennant or Dual Magnum).
S-metolachlor **Pennant Magnum 7.62 L**	15	1.3 to 2.6 pints	1.24 to 2.45	1 year	24 hr	**NON-BEARING PLANTS ONLY.** Provides good pre-emergent weed control of many small seeded broadleaf and grass weeds. Maximum of 4.2 pints/A/year. Needs a tank mix partner for better annual broadleaf weed control (i.e., Gallery).
oxadiazon **Regalstar 2G**	14	100 to 200 lb	2 to 4	1 year	12 hr	**USE ON NON-BEARING PLANTS ONLY.** Provides good pre-emergent weed control on a large spectrum of grass and broadleaf weeds. Works well on many winter annuals (e.g., Bittercress, Oxalis, etc.). Excellent product for containers and small in-ground operations. Label recommends using on small acreage to confirm safety before large-scale use.
trifluralin (2%) *isoxaben (0.5)* **Snapshot 2.5 TG**	3 21	100 to 200 lb	2.0 to 4.0 0.5 to 1.0	1 year	12 hr	**USE ON NON-BEARING PLANTS ONLY.** No post-emergent activity. Excellent product for containers and small in-ground operations. Control a wide array of annual broadleaf and grass weeds.
oxyfluorfen *prodiamine* **Biathlon 2.75 GR**	14 3	100 lb	2.75	1 year	24 hr	**NON-BEARING PLANTS ONLY.** Good herbicide for controlling a broad spectrum of annual grasses and broadleaf weeds from seed. Do not apply to wet foliage.

Pre-plant / Site Preparation for Blueberries

Herbicide	MOA	Broadcast Rate / Acre		PHI	REI	Remarks and Precautions
		Amount of Formulation	lb Active Ingredient			
glyphosate Roundup and other generic formulations	9	See label	See label	Apply 30 days prior to planting.	4 to 12 hr	Use to kill strips through blueberry fields prior to planting. Generic formulations may require the addition of a surfactant. See label for details on controlling specific perennial weeds.

Post-emergence Herbicides for Blueberries

Carfentrazone-ethyl Aim 2 EC	14	1 to 2 oz	0.0156 to 0.031	0 days	12 hr	Apply as a hooded spray application equipment designed to prevent spray deposition on green stems, leaf tissues, flowers or fruit. May be used alone or tank-mixed with other herbicides; see label for mixing instructions. Aim Include crop oil concentrate at 1% v/v (1 gallon/100 gallons of spray solution) or a nonionic surfactant at 0.25% v/v (1quart/100 gallons of spray solution).
glufosinate Rely 280 2.34L Cheetah 2.34L Reckon 280 2.34L	10	3 to 5 quarts 48 to 82 oz 1.5 to 4 oz/gallon	0.75 to 1.25	14 days	12 hr	Do not allow spray solution to contact desirable foliage or green, uncallused bark. Use a minimum spray volume of 20 gallons/A. Do not apply within 14 days of harvest or exceed 12 quarts in 1 year. May be tank mixed with preemergence herbicides.
glyphosate Various trade names and formulations	9	See label	See label	14 days	4 to 12 hr	Leaf, stem, or exposed root contact with spray can kill or injure crop. Rainfall or irrigation after application in bark bed production systems can result in glyphosate root uptake and crop injury. Apply as a directed or shielded spray, or with a wiper applicator. Do not apply within 14 days of harvest. Generic formulations may require additional surfactant
halosulfuron Sandea 75DF Other formulations	2	0.5 to 1 oz	0.375 to 0.75	14 days	12 hr	Apply as a directed treatment to avoid contact with the crop. Occasional injury may occur. For nutsedge control, apply postemergence to the nutsedge (see label for further instructions).

Post-emergence Herbicides for Blueberries, cont.

Herbicide	MOA	Broadcast Rate / Acre		PHI	REI	Remarks and Precautions
		Amount of Formulation	lb Active Ingredient			
paraquat Gramoxone 2SL Firestorm 2SL Paraquat 2 SL Parazone 3 SL	22	2 to 4 pints 1.3 to 2.7 pints	0.5 to 1.0	7 days	12 hr	Do not allow herbicide to contact desirable foliage or uncallused bark. Young plants must be shielded. The addition of a nonionic surfactant at 0.25 % v/v (1 quart per 100 gallons of spray solution) is necessary for adequate control. Tank mix with preemergence herbicides for residual control. Use of paraquat in rabbiteye blueberry can increase incidence of stem blight if herbicide contacts green stems. Rabbiteye producers should consider other non-selective postemergence options.
quinclorac QuinStar 4L	4	12 oz	0.375	30 days	12 hr	Quinclorac provides postemergence control of barnyardgrass, crabgrass, hemp sesbania, morninglories, small alligatorweed, yellow nutsedge, and other difficult weeds. Do not apply more that 12 oz/A per application. DO NOT make second application before 30 days. Apply with crop oil at 2 pints per acre or non-ionic surfactant at labeled rates. Make directed applications to established blueberries greater than 18-24 in. DO NOT apply 30 days before harvest.

Post-emergence Grass Herbicides for Blueberries

clethodim SelectMax 0.97EC	1	9 to 16 fl oz	0.068 to 0.121	14 days	24 hr	Low rates are for annual grass weeds. High rates and sequential applications are for perennial grasses (bermudagrass or johnsongrass). Do not apply within 1 year of harvest. The addition of a nonionic surfactant at 0.25 % v/v (1 quart/100 gallons of spray solution) is required. Best results occur when applications are made to actively growing grasses. If using Arrow, avoid contact with the blueberry plant as much as possible, leaf twisting, and deformed buds and stems have been observed in Georgia.
fluazifop Fusilade DX 2L	1	24 oz	0.375	14 days	12 hr	Sequential applications will be necessary for perennial grass control. The addition of a nonionic surfactant or crop oil concentrate at label recommended rates.
sethoxydim Poast 1.5EC	1	1.5 to 2.5 pints	0.18 to 0.47	30 days	12 hr	Sequential applications will be necessary for perennial grass control. The addition of a nonionic surfactant (1 quart/100 gallons of water) or crop oil concentrate (1 gallon/100 gallons of water) is necessary for optimum results. Do not apply within 30 days of harvest. Total use rate per season cannot exceed 5 pints/A.

Suggested Blueberry Herbicide Programs

Crop Age	Fall	Winter	Spring	Summer
Blueberries Established Less than 1 Year				
Program 1	Preplant-glyphosate (when applied in fall or winter wait at least 30 days prior to planting)		Princep + Trellis Existing weeds can be removed with glufosinate, glyphosate, paraquat, halosulfuron (sedge control), or grass herbicides for emerged grasses.	Princep + Dual Magnum Existing weeds can be removed with glufosinate, glyphosate, paraquat, halosulfuron (sedge control), or grass herbicides for emerged grasses.
Program 2	Preplant-glyphosate (when applied in fall or winter wait at least 30 days prior to planting)		Princep + Devrinol Existing weeds can be removed with glufosinate, glyphosate, paraquat, halosulfuron (sedge control), or grass herbicides for emerged grasses.	Callisto + Trellis Existing weeds can be removed with glufosinate, glyphosate, paraquat, halosulfuron (sedge control), or grass herbicides for emerged grasses.
Blueberries Established 1 to 2 Years				
Program 1	Existing annual weeds can be removed with separate glufosinate, glyphosate, paraquat, halosulfuron for sedge control, or grass herbicides for emerged grasses.		Princep + Dual Magnum Existing weeds can be removed with glufosinate, glyphosate, paraquat, halosulfuron (sedge control), or grass herbicides for emerged grasses.	Chateau (8 to 10 oz/A). Existing weeds can be removed with glufosinate, glyphosate, paraquat, halosulfuron (sedge control), or grass herbicides for emerged grasses.
Program 2	Princep + Dual Magnum Existing annual weeds can be removed with separate glufosinate, glyphosate, paraquat, halosulfuron for sedge control, or grass herbicides for emerged grasses.		Princep + Trellis Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.	Solicam. Existing weeds can be removed with glufosinate, glyphosate, paraquat, halosulfuron (sedge control), or grass herbicides for emerged grasses.

Program 3	Princep + Trellis Existing weeds can be removed with glufosinate, glyphosate, paraquat, halosulfuron (sedge control), or grass herbicides for emerged grasses.		Chateau Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.	Diuron Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.
Blueberries Established for 2 or More Years				
Program 1	Alion Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.	Velpar (follow all label precautions and restrictions-only for high organic matter soils)	Chateau Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.	Diuron Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.
Program 2	Diuron Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.		Chateau Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.	Norflurazon Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.
Program 3	Alion Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.		Chateau Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.	Norflurazon Existing weeds can be removed with glufosinate, glyphosate, paraquat, or halosulfuron (sedge control), or grass herbicides for emerged grasses.

Weed Response to Herbicides used in Blueberry

	Annual Grasses					Annual Broadleaf Weeds																Perennial Weeds				
Herbicides	Crabgrass	Foxtail	Goosegrass	Panicum, Fall	Ryegrass, Annual	Chickweed	Dock	Galinsoga	Geranium, Carolina	Groundsel, Common	Henbit	Jimsonweed	Lambsquarters	Morninnglory, Annual	Nightshade	Pigweed	Radish, Wild	Ragweed	Sida, Prickly	Smartweed	Spotted Spurge	Bermudagrass	Dandelion	Nutsedge, Yellow	Smilax	Virginia Creeper
Preemergence																										
Callisto	F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	G	**E**	F	**E**	**E**	NA	F	NA	**E**	NA	NA	NA	P	NA	NA
Casoron	G	G	G	G	G	G	G	F	G	G	G	G	G	F	F	G	G	G	NA	G	G	NA	G	NA	NA	NA
Chateau	G	G	G	G	G	G	NA	G	G	NA	**E**	G	**E**	G	G	**E**	G	G	**E**	G	E	NA	G	NA	NA	NA
Dacthal	G	G	G	G	P	F	P	NA	NA	NA	F	P	G	NA	NA	F	NA	NA	NA	NA	G	NA	P	NA	NA	NA
Devrinol	G	G	G	G	G	G	NA	P	NA	G	P	NA	F	NA	NA	G	NA	NA	P	P	NA	NA	P	NA	NA	NA
Diuron	G	G	G	F	G	G	NA	G	F	NA	G	G	G	G	G	G	G	G	G	G	NA	NA	NA	NA	NA	NA
Dual Magnum	**E**	**E**	**E**	**E**	**E**	G	NA	G	NA	NA	NA	NA	G	NA	**E**	**E**	NA	P	NA	NA	G	NA	NA	**E**	NA	NA
Gallery	P	P	P	P	P	G	F	G	G	G	G	G	G	F	G	G	G	G	G	G	G	NA	G	NA	NA	NA
Kerb	G	G	G	G	G	G	NA	P	NA	NA	G	P	F	F	F	P	F	F	NA	F	NA	NA	P	P	NA	NA
Oryzalin	**E**	**E**	**E**	G	G	G	NA	NA	NA	F	F	NA	**E**	F	P	**E**	P	P	P	P	F	NA	P	NA	NA	NA
Simazine	F	G	G	F	G	G	NA	G	F	F	G	G	E	F	G	G	**E**	G	F	G	P	NA	P	NA	NA	NA
Sinbar	G	G	G	G	G	**E**	G	G	**E**	F	F	**E**	**E**	G	G	G	**E**	**E**	**E**	G	**E**	NA	F	P	NA	NA
Solicam	**E**	**E**	**E**	**E**	G	**E**	NA	G	NA	F	G	G	F	F	G	P	G	G	E	G	F	P	G	P	NA	NA
Velpar	**E**	**E**	**E**	**E**	**E**	**E**	F	NA	**E**	**E**	F	G	**E**	G	NA	**E**	G	**E**	NA	G	G	F	F	NA	NA	NA
Postemergence																										
Basagran	NA	NA	NA	NA	NA	NA	NA	G	NA	G	NA	**E**	F	F	G	F	P	G	G	**E**	NA	NA	NA	G	NA	NA
SelectMax	**E**	**E**	**E**	**E**	**E**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**E**	NA	NA	NA	NA
Fusilade	G	G	G	G	G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**E**	NA	NA	NA	NA
Glufosinate	F	G	G	G	G	G	NA	F	F	F	F	G	G	**E**	G	G	G	G	F	G	G	F	G	F	P	P
Glyphosate	**E**	**E**	**E**	**E**	**E**	**E**	G	G	G	**E**	F	**E**	**E**	G	**E**	**E**	G	**E**	G	F	G	F	G	F	G	G
Paraquat	G	G	G	G	G	G	NA	G	F	F	F	G	G	G	G	G	F	G	G	G	G	P	P	P	P	P
Poast	**E**	**E**	**E**	**E**	G	NA	F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**E**	NA	NA	NA	NA

E = excellent, G = good, F = fair, P = poor, NA = not recommended

Organic mulches. Since blueberries are acid loving plants, in-row mulching with organic materials, such as pine bark, pine needles, or leaves will help maintain the low pH. If the soil pH correction is not needed, mulching can also be done with hay composed of grasses and legumes. Mulch helps control weeds and helps keep soil cool, loose, and uniformly moist. Mulch should be 4 to 6 in. deep and should cover a 4-ft band centered on the plant row for established plantings. Replenish the mulch as it deteriorates over time. Deteriorating mulch adds organic matter to the soil and creates a favorable environment for root growth, but it can cause root exposure if not replenished.

Row middles can be seeded with perennial grass types such as orchard grass, ryegrass, or turf-type fescues as soon as planting operation is completed, to facilitate equipment access, human traffic at the farm, decrease weed invasion into planting and minimize soil erosion. Perennial weeds that emerge in the row middles can be hand pulled or spot sprayed carefully with Roundup (avoid crop exposure to Roundup) or Poast™ (controls grasses only). Herbicides such as glufosinate could also be integrated with organic mulches to achieve better weed control.

Landscape fabric mats. These mats are great for blueberry crop establishment and if applied correctly, they can provide in-row weed control for up to 10 years. Weeds can emerge on the mat through small holes or tears in the mat and need to be spot sprayed. Landscape fabric mats may provide better and more economic weed control over organic mulch, but daytime soil temperatures under the landscape fabric mats are higher, relative to the mulch.

Wildlife Damage Prevention in Small Fruit Crops

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. For species problem species, population reduction through lethal control may be necessary. Consult with State Wildlife Extension Specialist and/or State Wildlife Resource Agency prior to conducting lethal control. Permits or licenses will be required. Failure to obtain appropriate permits could result in substantial penalties and criminal liability. In general, birds are federally protected and cannot be harmed or harassed without federal and state permits.	
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 further 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. Birds are federally protected and lethal control methods are not generally available to growers. Non-lethal methods such as exclusion (netting) are often sufficient when properly installed. Visual deterrents are usually ineffective as birds quickly learn to ignore these stimuli. Auditory distress calls and chemical repellents can be more effective. Chemical repellents can impart an off-flavor to the fruit crop. **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 min. - 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).

Wildlife Damage Prevention in Small Fruit Crops

Pest/Problem	Management Options
Birds, cont.	**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. 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. **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. **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. 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.
Deer	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 their antlers on stems and stalks. 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 are increasing across most of their range. Hunting on neighboring properties can reduce local damage but neighboring hunting clubs may be actively working to increase deer populations. Locating the planting away from favorable habitat for deer will help to lessen losses. However, this is not generally possible; deer travel 1 to 1.5 miles and it is highly unlikely that anyone can locate plantings sufficiently far from suitable habitat. 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. **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 in. or less of the lowest

Wildlife Damage Prevention in Small Fruit Crops	
Pest/Problem	**Management Options**
Deer, cont.	**Exclusion, cont.** 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. While some deer can easily clear an 8-ft fence, generally 6 ft will be sufficient to deter most deer. Wire mesh fences are more desirable than multiple strands of barbed wire. Wire mesh fence up to 5-ft high with the addition of three single-strand wires for a total of 8 ft will reduce costs. **Repellants** Both taste and smell repellents exist. Smell repellents include commercially available products or materials such as tankage, blood, putrefied egg solids, and certain soaps. Repellants will not provide long-term control and will not provide control when populations are high or alternate food sources are scarce. Repellents can be applied to plants and some can be broadcast as bands around the planting area. Repellents degrade in sunlight and wash away with rain and irrigation. Repellents must be applied prior to damage and again at regular intervals and after irrigation or rain events. Use of repellents in the face of high deer density will provide little to no protection.

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