

2020 Southeast Regional Blueberry Integrated Management Guide

Commodity Editor

Hannah Burrack (North Carolina State University)

Section Editors

Pathology: Jonathan Oliver (University of Georgia), Bill Cline (North Carolina State University), Rebecca Melanson (Mississippi State University), Raj Singh (Louisiana State University)

Entomology: Hannah Burrack (North Carolina State University), Frank Hale (University of Tennessee), Ash Sial (University of Georgia), Doug Pfeiffer (Virginia Tech University)

Weed Science: Mark Czarnota (University of Georgia), Katie Jennings (North Carolina State University)

Vertebrate Management: David Lockwood (University of Tennessee)

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

Senior Editors

Phil Brannen (University of Georgia)

Bill Cline (North Carolina State University)

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

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

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

TABLE OF CONTENTS

<u>Southeastern Region University IPM Contacts</u>	<u>2</u>
<u>Pesticide Emergencies (contacts)</u>	<u>3</u>
<u>Pesticide Liability and Stewardship</u>	<u>5</u>
<u>Resistance Management</u>	<u>6</u>
<u>Pollinator Protection</u>	<u>6</u>
<u>Integrated Management Guide (Insect and Disease Control)</u>	<u>7</u>
<u>Pre-plant operations</u>	<u>7</u>
<u>Establishment</u>	<u>9</u>
<u>Dormant season</u>	<u>10</u>
<u>Prebloom</u>	<u>12</u>
<u>10-20% Bloom until 80-90% Bloom</u>	<u>16</u>
<u>Petal fall</u>	<u>19</u>
<u>Cover sprays</u>	<u>24</u>
<u>Pre harvest through harvest</u>	<u>26</u>
<u>Late season and after harvest foliage management</u>	<u>31</u>
<u>After harvest leaf analysis and soil testing</u>	<u>36</u>
<u>Fungicide Efficacy Comparison</u>	<u>37</u>
<u>Insecticide Efficacy Comparison</u>	<u>38</u>
<u>Fungicide Resistance Management Information</u>	<u>40</u>
<u>Fungicide “At a Glance” Spray Schedule Options</u>	<u>41</u>
<u>Weed Management Guide</u>	<u>42</u>
<u>Non-bearing plants</u>	<u>42</u>
<u>Bearing and non-bearing plants</u>	<u>44</u>
<u>Suggested Herbicide Program</u>	<u>49</u>
<u>Herbicide Efficacy Comparison</u>	<u>52</u>
<u>Wildlife damage prevention in small fruit crops</u>	<u>53</u>

Southeastern Region University Small Fruits IPM Contacts

Auburn University Ed Sikora <i>(Pathology)</i> Alina Coneva <i>(Horticulture)</i> University of Arkansas Aaron Cato <i>(IPM)</i> Amanda McWhirt <i>(Horticulture)</i> Clemson University Guido Schnabel <i>(Pathology)</i> Wayne Mitchem <i>(Weed Science)</i> University of Florida Phil Harmon <i>(Pathology)</i> Natalia Perez <i>(Pathology)</i> Oscar Liburd <i>(Entomology)</i> Jeff Williamson <i>(Horticulture)</i>	University of Georgia Phil Brannen <i>(Pathology)</i> Jonathan Oliver <i>(Pathology)</i> Elizabeth Little <i>(Organic Pathology)</i> Brett Blaauw <i>(Entomology)</i> Ash Sial <i>(Entomology)</i> Wayne Mitchem <i>(Weed Science)</i> Mark Czarnota <i>(Weed Science)</i> Erick Smith <i>(Blueberries, Horticulture)</i> Cain Hickey <i>(Grapes, Horticulture)</i>	University of Kentucky Nicole Gauthier <i>(Pathology)</i> Ric Bessin <i>(Entomology)</i> Daniel Becker <i>(Horticulture)</i> John Strang <i>(Horticulture)</i> Patsy Wilson <i>(Grapes, Horticulture)</i> Shawn Wright <i>(Weeds, Horticulture)</i> Louisiana State University Raghuwinder Singh <i>(Pathology)</i> Mary Helen Ferguson <i>(Pathology)</i> Dennis Ring <i>(Entomology)</i> Ron Strahan <i>(Weed Science)</i> Kathryn Fontenot <i>(Horticulture)</i>	Mississippi State University Rebecca A. Melanson <i>(Pathology)</i> Blake Layton <i>(Entomology)</i> Eric Stafne <i>(Horticulture)</i> North Carolina State University Bill Cline <i>(Pathology)</i> Sara Villani <i>(Pathology)</i> Hannah Burrack <i>(Entomology)</i> Wayne Mitchem <i>(Weed Science)</i> Katie Jennings <i>(Weed Science)</i> Ryan Adams <i>(IPM)</i> Mark Hoffmann <i>(Horticulture)</i>	University of Tennessee Zach Hansen <i>(Pathology)</i> Frank Hale <i>(Entomology)</i> David Lockwood <i>(Horticulture)</i> Virginia Tech Mizuho Nita <i>(Pathology)</i> Chuck Johnson <i>(Pathology)</i> Doug Pfeiffer <i>(Entomology)</i> Jeff Derr <i>(Weed Science)</i> Jayesh Samtani <i>(Horticulture)</i>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

PESTICIDE EMERGENCIES

1-800-222-1222

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

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

Pesticide on Skin

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

Pesticide in Eyes

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

Pesticide in Mouth or Swallowed

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

Pesticide Inhaled

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

Heat Stress

- Move the victim to a cooler area, remove protective clothing, and pour cool water over the person.
- Give cool liquids to drink – ***Do not give liquids to a person who is unconscious or convulsing!***

- **Pesticide poisoning may mimic heat illness!** Get medical attention if the person is unconscious or if the person is not fully recovered within 15 minutes of cooling down and drinking liquids.

Signal Words

- The pesticide signal word will appear on the pesticide label. It provides information about the acute risks of the pesticide to people.
 - **DANGER/POISON:** *Highly toxic* - less than a teaspoon can kill an adult.
 - **DANGER:** *Highly toxic* - pesticide can cause severe eye and/or skin injury.
 - **WARNING:** *Moderately toxic* - two tablespoons or less can kill an adult.
 - **CAUTION:** *Slightly toxic* - an ounce or more is required to kill an adult.

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

PESTICIDE SPILLS OR OTHER EMERGENCIES

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

STATE	AGENCY	PHONE NUMBER
Alabama	Chemtrec (technical assistance 24 hrs. a day for fires, spills, and medical emergencies) Alabama Highway Patrol Post	800-424-9300 (Toll Free) *HP (*47) for mobile phones
Arkansas	Arkansas Department of Emergency Management	800-322-4012
Georgia	Georgia State Patrol	Cell: call *GSP or 911
Louisiana	LDAF Emergency Hotline	855-452-5323
Mississippi	Mississippi Emergency Management Agency	1-800-222-6362
North Carolina	Regional Response Team (RRT) For spills not on public road ways, contact the Pesticide Section of NCDA&CS	911 or your RRT (919) 733-3556 or (800) 662-7956 during non-business hours
South Carolina	South Carolina Highway Patrol ----- South Carolina DHEC Emergency Response Section	Cell: call *HP ----- 888-481-0125 (Toll Free)
Tennessee	Tennessee Emergency Management Agency (TEMA) State Emergency Operations Center	800-262-3300
Virginia	Virginia Emergency Operations Center	804-674-2400

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

STATE	AGENCY	PHONE NUMBER
Alabama	Chemtrec (technical assistance 24 hrs. a day for fires, spills, and medical emergencies) Alabama Department of Environmental Management Alabama Department of Emergency Management	800-424-9300 (Toll Free) 334-271-7700 205-280-2200
Arkansas	Arkansas Department of Emergency Management	800-322-4012 (Toll Free)
Georgia	Georgia Department of Natural Resources Response Team	800-241-4113 (Toll Free)
Louisiana	LDAF Emergency Hotline	855-452-5323 (Toll Free)
Mississippi	Mississippi Emergency Management Agency	1-800-222-6362
North Carolina	North Carolina Div. of Water Quality	800-858-0368 (Toll Free)
South Carolina	South Carolina DHEC	888-481-0125 (Toll Free)
Tennessee	Tennessee Wildlife Resources Agency	Region 1 West Tennessee 800-372-3928 Region 2 Middle Tennessee 800-624-7406 Region 3 Cumberland Plateau 800-262-6704 Region 4 East Tennessee 800-332-0900
Virginia	Virginia Emergency Operations Center	1-804-674-2400

PESTICIDE LIABILITY and STEWARDSHIP

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

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

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

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

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

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

EPA Worker Protection Standard (WPS) 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 *and* general use pesticides used in agricultural plant production.

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

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

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

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.

PESTICIDE APPLICATION

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

RESISTANCE MANAGEMENT

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

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

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

POLLINATOR PROTECTION

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

1. Use selective pesticides to reduce risk to pollinators and other non-target beneficial insects.
2. Read and follow all pesticide label directions and precautions. The label is the Law! EPA now requires the addition of a “Protection of Pollinators” advisory box on certain pesticide labels. Look for the bee hazard icon in the Directions for Use and within crop specific sections for instructions to protect bees and other insect pollinators.
3. Minimize 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.
4. Minimize off-target movement of pesticide applications by following label directions to minimize off target movement of pesticides. Do not make pesticide applications when the wind is blowing towards bee hives or off-site pollinator habitats.



Blueberry Integrated Management Guide

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 (BRRSV), blueberry necrotic ring blotch virus (BNRBV), blueberry mosaic-associated virus (BIMaV), and blueberry latent virus (BILV) have been reported in southeastern blueberry fields. Of these, only BRRSV is commercially significant. It is the most common in North Carolina and is most noticeable on Star, but also can be seen on other cultivars. BRRSV reduces yield but not enough to warrant removing established bushes and is spread is mostly via propagation 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. 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 are more likely to be free of viruses.

Crown gall – All blueberries can be affected by crown gall. Canker-like growths or galls 0.25-2.5 inches in diameter develop on roots and stems; galls are first greenish-white, turning tan to brown, and then black. Use of tissue-cultured plants will also help to prevent introduction of crown gall-infected plants, 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.

Fumigation with Telone products – Telone products are highly toxic. Carefully abide by all label precautions and review the label before each application. Telone II may be used when soil temperatures are from 40-80°F at the prescribed injection depth (a minimum of 12 inches). Thorough soil preparation is required and soil moisture is a critical consideration. If 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 smell the soil at the full depth of injection; if the almond-like odor of Telone is present, dissipation is not complete, and it is too early to plant. Cultivation, at a depth not to exceed the depth of Telone application, with subsoil shanks, a middle buster, or other implements, will hasten dissipation of Telone. More than one cultivation may be required to get Telone out of the ground pre-plant.

The efficacy or importance of a management options is indicated by E = excellent, VG = very good, G = good, F = fair, and P = poor. These ratings are benchmarks, actual performance will vary.

Pre-Plant Operations, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments (FRAC/IRAC Code)
Nematodes	1,3-dichloro-propene (Telone II)	27-35 gallons	E	5 days		Suggested pre-plant interval: 4 to 8 weeks, longer when dissipation is slow.
	metam sodium (Vapam, Sectagon 42)	75 gallons	G	See label		If tarps are used for the application, non-handler entry is prohibited while tarps are being removed. Soil temperature must be 40°-90°F for activity. Soil moisture must be adequate, and has to be thoroughly cultivated prior to application. On well-drained soils with light to medium texture planting can begin 14-21 days after treatment. If soils are heavy or high in organic matter, or if the soils remain wet and/or cold (<60°F) following the application, a minimum interval of 21 days is necessary. Dissipation can be increased through cultivation. Plan for at least a 4 week interval between treatment and planting. More time may be required.
	metam-potassium (K-PAM HL)	62 gallons per treated acre	G	See label		
	Pic-Clor 60 EC (1,3-dichloropropene 37% + chloropicrin 57%)	19.5-44.5 gallons	VG	5 days		SEE LABEL FOR ADDITIONAL INFORMATION
	Trifecta (DMDS 55% + chloropicrin 25% + 1,3-dichloropropene 20%)	350 lb (weight is 10.74 lb/gallon)	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 disease-free plants. Plants propagated using tissue culture (rather than cuttings from field-grown plants) are preferred, and are far less likely to harbor disease. 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. Always use plants of known status. Disease susceptibility can also vary by variety. For example, the cultivar V1 is highly susceptible to bacterial leaf scorch (*Xylella fastidiosa*) while Star and O'Neal are moderately susceptible.

Plant beds

Phytophthora root rot – Root rot is generally a problem of low, poorly drained sites. Provisions for adequate drainage must be made prior to planting! 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.

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. There are residue concerns for phosphites for export to the European Union. Consult with your purchaser before using these materials.

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 has to 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 dying from *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 two years in the field. Preventing plant stress and injury can be critical for limiting disease establishment. Balanced plant nutrition and water are important. Slowed 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 inches 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 full-proof methods for eliminating *Botryosphaeria* once the disease begins to take hold. Rather, there are only stop-gap measures at best.

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 averaging ¼ inch 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 The North Carolina Blueberry Journal: http://bit.ly/13NODOp					
	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.					
	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.
	Lime sulfur	5 gallons per acre in 50-70 gallons of total spray volume	E	48 hrs	0 days	Apply at delayed dormant 1-2 weeks before leaf and/or flower buds begin to break. Exobasidium is not specifically on the label. However, when applied for Phomopsis, suppression of Exobasidium has been observed.
Bagworm	Calcium polysulfide FRAC M2 (Sulfurix)	1 to 2 gallons per acre in 100-150 gallon total spray volume	E	48 hrs	0 days	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. Sulfurix is NOT approved for organic use.
	Remove and dispose of cases		E			Bagworm cases should be removed prior to April, before eggs hatch.

Dormant (before flower or leaf buds break)						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
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.
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 <i>FRAC 4</i> (Ridomil Gold SL)	3.6 pt	G	48 hrs	0 days	Established plantings: Apply 0.25 pt/1000 linear feet of row (3.6 pt/A broadcast basis) in a 3-ft band over the row before the plants start growth in the spring. New plantings: Apply 3.6 pt/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 gal/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.

Dormant (before flower or leaf buds break)						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Scale insects	Horticultural/ Superior oil (various) Pre-bloom use only	1 to 3%	E	4 hrs	0 days	Oil may be applied dormant or delayed dormant. Apply as needed for scale infestations. Reduce to 1% rate just before bloom. Do not apply oil when temperatures are expected to be higher than 65°F or lower than 30°F within 24 hours. Do not use within 14 days of lime-sulfur or Captan. 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.
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 minutes or disturbing the mound. If ants are feeding on the chip within 30 minutes, conditions are right to apply baits. Allow 4 weeks to work.					
	pyriproxyfen <i>IRAC 7C</i> (Esteem Ant Bait)	1.5 to 2.0 lb (2-4 tbsp/mound)	VG	12 hrs	24 hrs	
Imported fire ant, cont.	methoprene <i>IRAC 7A</i> (Extinguish Professional Fire Ant Bait 0.5%)	1 to 1.5 lb (3-5 tbsp/ 1000 sq ft) (3-5 tbsp/mound)	G	4 hrs	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.
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 <i>IRAC 4A</i> (Assail 30SG)	4.5 to 5.3 oz	G	12 hrs	1 day	
	spinetoram <i>IRAC 5</i> (Delegate WG)	3 to 6 oz	VG	4 hrs	1 day	

Dormant (before flower or leaf buds break)						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Gall midge , cont.	spinosad <i>IRAC 5</i> (Entrust SC) (Entrust 80W)	4-6 fl oz 1.25 to 2 oz	G	4 hrs	3 days	Entrust is OMRI listed.
	diazinon <i>IRAC 1</i> (Diazinon AG500)	1 pt per 100 gallons water	G	5 days	7 days	Only one foliar application is allowed per year.
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	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 (stage 6) occurs on the flower buds, whichever comes first. Continue sprays until all blooms have fallen.					
Mummy berry	pyraclostrobin + boscalid <i>FRAC 11 + 7</i> (Pristine)	18.5 to 23 oz	VG	12 hrs	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.
	fenbuconazole <i>FRAC 3</i> (Indar 2F)	6.0 fl oz	E	12 hrs	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) class of fungicides or target site of action fungicides. Alternation with fungicides of different classes is recommended. Aerial application is allowed for mummy berry applications (see label).

Pre-bloom through green tip (leaf buds) and pink bud (flower buds)						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
	propiconazole <i>FRAC 3</i> (Tilt, Bumper 41.8 EC, PropiMax EC)	6.0 fl oz	E	12 hrs	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 is recommended for resistance management and to provide Botrytis suppression.
	metconazole <i>FRAC 3</i> (Quash)	2.5 oz	E	12 hrs	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.
	azoxystrobin + propiconazole <i>FRAC 11+3</i> (Quilt Xcel)	14 to 21 fl oz	E	12 hrs	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).
	prothioconazole <i>FRAC 3</i> (Proline 480 SC)	5.7 fl oz	E	12 hrs	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.
Exobasidium leaf and fruit spot	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.

	pyraclostrobin + boscalid <i>FRAC 11 + 7</i> (Pristine)	18.5 to 23 oz	F	12 hrs	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.
	captan <i>FRAC M4</i> (Captan 50WP)	5 lb	VG	48 hrs	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.

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, cont.	fenbuconazole <i>FRAC 3</i> (Indar 2F) (tank mix with captan products during bloom to prevent rots)	6.0 fl oz	G VG (with Captan)	12 hrs	30 days	A 2(ee) label 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.
Blueberry gall midge	See 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 at 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 <i>IRAC 5</i> (Delegate WG)	3 to 6 oz	VG	4 hrs	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.
spinosad <i>IRAC 5</i> (Entrust SC Entrust 80W)	4 to 6 fl oz 1.25 to 2 oz	VG	4 hrs	3 days	Entrust is toxic to bees until it is thoroughly dry (3 hrs) Entrust is OMRI listed.
acetamiprid <i>IRAC 4A</i> (Assail 30SG)	4.5 to 5.3 oz	G	12 hrs	1 day	Thrips species may differ in susceptibility. If you are unsure of the thrips species present and its susceptibility, use the higher rates.

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 bee hives or off-site pollinator habitats.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Botrytis flower blight	cyprodinil + fludioxonil <i>FRAC 9 + 12</i> (Switch 62.5WG)	11 to 14 oz	E	12 hrs	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.
	fenhexamid <i>FRAC 17</i> (Elevate 50WDG)	1.5 lb	E	12 hrs	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.
	fenhexamid + captan <i>FRAC 17 + M4</i> (CaptEstate 68WDG)	3.5 to 4.7 lb	E	48 hrs	0 days	CaptEstate is a combination product of captan plus Elevate. Do not make more than two consecutive applications before switching to a fungicide with a different MOA. Do not apply more than 21.0 lb per acre per season.
	pyraclostrobin + boscalid <i>FRAC 11 + 7</i> (Pristine)	18.5 to 23 oz	E	12 hrs	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.

10-20% bloom until 80-90% bloom, cont.						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Botrytis flower blight, cont.	ziram <i>FRAC M3</i> (Ziram 76DF)	3 lb	F	48 hrs	See comments	Do not apply later than 3 weeks after full bloom.
	captan <i>FRAC M4</i> (Captan 50WP)	5 lb	F	48 hrs	0 days	Do not apply more than 70 lb per acre per crop year of Captan 50WP.
Mummy berry (blossom infection stage) and Twig blight	pyraclostrobin + boscalid <i>FRAC 11 + 7</i> (Pristine)	18.5 to 23 oz	E	12 hrs	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.
	azoxystrobin + propiconazole <i>FRAC 11+3</i> (Quilt Xcel)	14 to 21 fl oz	E	12 hrs	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).
	fenbuconazole <i>FRAC 3</i> (Indar 2F) (tank mix with captan products during bloom to prevent rots)	6.0 fl oz	E	12 hrs	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.
	propiconazole <i>FRAC 3</i> (Tilt, Bumper 41.8 EC, PropiMax EC)	6.0 fl oz	E	24 hrs	30 days	These 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.
	prothioconazole <i>FRAC 3</i> (Proline 480 SC)	5.7 fl oz	E	12 hrs	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.

10-20% bloom until 80-90% bloom, cont.						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Mummy berry (blossom infection stage) and Twig blight, cont.	metconazole <i>FRAC 3</i> (Quash)	2.5 oz	E	12 hrs	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.
Ripe rot (anthracnose) and/or Alternaria rot	azoxystrobin <i>FRAC 11</i> (Abound)	6.0 to 15.5 fl oz	E	4 hrs	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 qt per acre per season.
	cyprodinil + fludioxonil <i>FRAC 9 + 12</i> (Switch 62.5WG)	11 to 14 oz	E	12 hrs	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.
	pyraclostrobin + boscalid <i>FRAC 11 + 7</i> (Pristine)	18.5 to 23 oz	E	12 hrs	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.
	azoxystrobin + propiconazole <i>FRAC 11+3</i> (Quilt Xcel)	14 to 21 fl oz	E	12 hrs	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).
	ziram <i>FRAC M3</i> (Ziram 76DF)	3 lb	F	48 hrs	See comments	Do not apply later than 3 weeks after full bloom.
	captan <i>FRAC M4</i> (Captan 50WP)	5 lb	G	48 hrs	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.
	fluazinam <i>FRAC 29</i> (Omega 500F)	1.25 pt	G	12 hrs	30 days	Do not use more than 7.5 pt per acre per season.

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, cont.	metconazole <i>FRAC 3</i> (Quash)	2.5 oz	E	12 hrs	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.
Exobasidium leaf and fruit spot	See PRE-BLOOM THOUGH GREEN TIP (LEAF BUDS) AND PINK BUD (FLOWER BUDS)					

Petal fall until one month after bloom

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.

Blueberry rust – Rust is predominantly a problem in the extreme southern blueberry production areas such as south 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).

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Ripe (anthracnose) and/or Alternaria rots	See 10-20% BLOOM UNTIL 80-90% BLOOM recommendations					
Exobasidium leaf and fruit spot	See recommendations at PRE-BLOOM THOUGH GREEN TIP (LEAF BUDS) AND PINK BUD (FLOWER BUDS)					
Twig blight	See mummy berry and twig blight recommendations under 10-20% BLOOM UNTIL 80-90% BLOOM					

Petal fall until one month after bloom, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Blueberry rust	azoxystrobin <i>FRAC 11</i> (Abound and generic formulations)	6.0 to 15.5 fl oz	G	4 hrs	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 qt per acre per season. Blueberry rust is not specifically on the label. However, when applied for other diseases, suppression of rust has been observed.
	azoxystrobin + propiconazole <i>FRAC 11+3</i> (Quilt Xcel)	14 to 21 fl oz	E	12 hrs	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).
	pyraclostrobin + boscalid <i>FRAC 11 + 7</i> (Pristine)	18.5 to 23 oz	F	12 hrs	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.
	fenbuconazole <i>FRAC 3</i> (Indar 2F)	6.0 fl oz	G	12 hrs	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) class of fungicides or target site of action fungicides. Alternation with fungicides of different classes is recommended. Aerial application is allowed for this application (see label).
	propiconazole <i>FRAC 3</i> (Tilt, Bumper 41.8 EC, PropiMax EC)	6.0 fl oz	G	12 hrs	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.

Petal fall until one month after bloom, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Blueberry rust, cont.	metconazole <i>FRAC 3</i> (Quash)	2.5 oz	VG	12 hrs	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.
	prothioconazole <i>FRAC 3</i> (Proline 480 SC)	5.7 fl oz	E	12 hrs	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.
Phytophthora root rot	fosetyl-Al <i>FRAC P07</i> (Aliette WDG)	5 lb	G	12 hrs	12 hrs	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. There are residue concerns for phosphites for export to the European Union. Consult with your purchaser before using these materials.
	potassium phosphite <i>FRAC P07</i> (ProPhyt)	4 pt	VG	4 hrs	0 hrs	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. There are residue concerns for phosphites for export to the European Union. Consult with your purchaser before using these materials.

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 <i>FRAC P07</i> (K-Phite)	2 to 8 qt	VG	4 hrs	0 hrs	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. There are residue concerns for phosphites for export to the European Union. Consult with your purchaser before using these materials.
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.					
	acetamiprid <i>IRAC 4A</i> (Assail 30SG)	4.5 to 5.3 oz	G	12 hrs	1 day	
	chlorantraniliprole <i>IRAC 28</i> (Altacor)	3.0 to 4.5 fl oz	E	4 hrs	1 day	Altacor is also effective against plum curculio.
	indoxacarb <i>IRAC 22</i> (Avaunt)	3.5 to 6 oz	VG	12 hrs	7 days	Avaunt is also effective against plum curculio.
	methoxyfenozide <i>IRAC 18</i> (Intrepid 2F)	16 fl oz	VG	4 hrs	7 days	
	novaluron <i>IRAC 15</i> (Rimon 0.83EC)	20-30 fl oz	G	12 hr	8 days	
	spinosad <i>IRAC 5</i> (Entrust SC) (Entrust 80W)	4 to 6 fl oz 1.25 to 2 oz	F	4 hr	3 days	Entrust is OMRI listed.

Petal fall until one month after bloom, cont.						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Cranberry and Cherry fruitworms, cont.	spinetoram IRAC 5 (Delegate WG)	3 to 6 oz	G	4 hrs	1 day	
	tebufenozide IRAC 18 (Confirm 2F)	16 fl oz	G	4 hrs	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.
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 (<i>Xylella fastidiosa</i>). 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 IRAC 4A (Assail 30SG)	4.5 to 5.3 oz	VG	12 hrs	1 day	
	spirotetramat IRAC 23 (Movento)	10 fl oz	(intentionally left blank)	24 hrs	7 days	Suppression only. Limited efficacy data.
	esfenvalerate IRAC 3A (Asana XL 0.66EC)	9.6 fl oz	G	12 hrs	14 days	Note that there are residue concerns for some Group 3A materials on fruit intended for export.
	imidacloprid IRAC 4A (Admire Pro 4.6F)	1.0 to 1.4 fl oz (foliar application rate)	VG	12 hrs	3 days	Allow 7 days between imidacloprid treatments.
	thiamethoxam IRAC 4A (Actara)	3 to 4 oz	VG	12 hrs	3 days	Allow 7 days between Actara applications. Maximum of 12 oz per acre per season can be used.
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.					
	bifenthrin IRAC 3A (Brigade WSB)	16 oz	G	12 hrs	1 day	Note that there are residue concerns for some Group 3A materials on fruit intended for export.
	chlorantraniliprole IRAC 28 (Altacor)	3.0 to 4.5 oz	VG	4 hrs	1 day	

Petal fall until one month after bloom, cont.						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Plum curculio, cont.	esfenvalerate <i>IRAC 3A</i> (Asana XL 0.66EC)	9.6 fl oz	G	12 hrs	14 days	Note that there are residue concerns for some Group 3A materials on fruit intended for export.
	fenpropathrin <i>IRAC 3A</i> (Danitol 2.4EC)	16 fl oz	G	24 hrs	3 days	Note that there are residue concerns for some Group 3A materials on fruit intended for export.
	indoxacarb <i>IRAC 22</i> (Avaunt)	6 oz	VG			Do not apply more than 24 oz per acre of Avaunt per year. Do not use adjuvants.
	phosmet <i>IRAC 1B</i> (Imidan 70W)	1.3 lb	E	24 hrs	3 days	Imidan is effective against plum curculio but is very toxic to pollinators. Do not make treatments if pollinators are active.
	kaolin clay <i>IRAC Unknown</i> (Surround WP)	25 to 50 lb	P	4 hrs	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.
Cover Sprays (from one month after bloom until Pre-Harvest)						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Alternaria and Ripe rots, fruit and leaf spot	See 10-20% BLOOM UNTIL 80-90% BLOOM recommendations					
Flea beetle	Flea beetles are small and metallic blue or green. Flea beetle feeding produces shot-hole damage on blueberry foliage, and is often clustered on terminals. Bushes in healthy, mature rabbiteye fields 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 <i>IRAC 1A</i> (Sevin 80S)	2.5 lbs	G	12 hrs	7 days	

	esfenvalerate <i>IRAC 3A</i> (Asana XL 0.66 EC)	9.6 fl oz	F	12 hrs	14 days	Note that there are residue concerns for some Group 3A materials on fruit intended for export.
Cover Sprays (from one month after bloom until Pre-Harvest), cont.						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Flea beetle, cont.	acetamiprid <i>IRAC 4A</i> (Assail 30SG)	4.5 to 5.3 oz	G	12 hrs	24 hrs	
	imidacloprid <i>IRAC 4A</i> (Admire 4.6F)	7 to 14 fl oz (soil application rate) 1.0-1.4 fl oz (foliar application rate)	VG	12 hrs	7 days 3 days	Soil applied imidacloprid products have longer residual and provide more effective flea beetle control.
	thiamethoxam <i>IRAC 4A</i> (Actara 25WDG)	4 oz	G	12 hrs	3 days	
	spinosad <i>IRAC 5</i> (Entrust SC) (Entrust 80W)	4 to 6 fl oz 1.25 to 2 oz	VG	4 hr	3 days	Entrust is OMRI listed.
	spinetoram <i>IRAC 5</i> (Delegate WG)	3 to 6 oz	VG	4 hrs	1 day	
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.					
	acetamiprid <i>IRAC 4A</i> (Assail 30SG)	4.5 to 5.3 oz	G	12 hrs	24 hrs	
	carbaryl <i>IRAC 1A</i> (Sevin 80S, Sevin 80WSP)	2.5 lb	G	12 hrs	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.

	esfenvalerate <i>IRAC 3A</i> (Asana XL 0.66EC)	9.6 fl oz	G	12 hrs	14 days	Note that there are residue concerns for some Group 3A materials on fruit intended for export.
--	-------------------------------------------------------------	-----------	---	--------	---------	------------------------------------------------------------------------------------------------

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, cont.	imidacloprid <i>IRAC 4A</i> (Admire 4.6F)	1.0-1.4 fl oz (foliar application rate)	VG	12 hrs	3 days	
	phosmet <i>IRAC 1B</i> (Imidan 70W)	1.3 lb	E	24 hrs	3 days	
	azadiractin + clarified neem extract <i>IRAC UN</i> Neemix + Trilogy	7 to 16 fl oz + 2% v/v	G	4 hrs	0 days	OMRI-Listed. More effective when applied when populations are small. May cause issues with fruit finish.
Leafhopper/ sharpshooter suppression	See PETAL FALL recommendations					

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. 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.**

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.					
	phosmet <i>IRAC 1B</i> (Imidan 70W)	1.3 lb	E	24 hrs	3 days	Do not apply more than 2 times.
	malathion <i>IRAC 1B</i> (Malathion ULV) (Malathion 57EC) (Malathion 8F)	10 fl oz	G	12 hrs	1 day	3 applications per season of Malathion ULV are currently allowed. The minimum retreatment interval for Malathion ULV is 10 days.
		1.5-2 pt	G	12 hrs	1 day	3 applications per season of Malathion 57EC are currently allowed. EC formulations may be associated with phytotoxicity.
		1.25-2.5 pt	G	12 hrs	1 day	2 applications per season of Malathion 8F are currently allowed. Flowable formulations may have fewer phytotoxicity issues than EC formulations.
	spinosad <i>IRAC 5</i> (GF-120 NF Naturalyte Fruit Fly Bait)	Broadcast: 10 fl oz bait in 15 fl oz water to 20 fl oz bait in 30 fl oz water Spot spray: 1 fl oz bait in 1.5 fl oz water/bush to 3 fl oz bait in 4.5 fl oz water/bush	G	4 hrs	0 days	GF-120 is OMRI listed. Begin bait application as soon as blueberry maggot flies are caught in traps or 2 to 3 weeks before fruit begins to ripen. Repeat every 7 days; applying more often during rainy periods. Large spray droplets (4-6 mm) and a solution diluted to 1:1.5 GF-120 NF:water . Apply broadcast treatments of GF-120 NF as a directed spray applied to one side of each row, targeting the interior canopy to protect the bait from weathering. Aerial application of GF-120 is not recommended.
	flupyradifurone <i>IRAC 4D</i> (Sivanto Prime)	12 to 14 fl oz	G	4 hrs	3 days	Limited efficacy data. Sivanto is labeled for blueberry maggot, but it should not be used alone for spotted wing drosophila (SWD).
	spirotetramat <i>IRAC 23</i> (Movento)	10 fl oz	G	24 hrs	1 day	Limited efficacy data. Movento is labeled for blueberry maggot, but it should not be used alone for spotted wing drosophila (SWD).

Pre-Harvest through Harvest, cont.						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Blueberry maggot, cont.	spinetoram <i>IRAC 5</i> (Delegate WG)	3 to 6 oz	VG	4 hrs	1 day	
	fenpropathrin <i>IRAC 3A</i> (Danitol 2.4EC)	16 fl oz	G	24 hrs	3 days	
	acetamiprid <i>IRAC 4A</i> (Assail 30SG)	4.5 to 5.3 oz	VG	12 hrs	24 hrs	Assail is labeled for blueberry maggot, but it should not be used alone for spotted wing drosophila (SWD).
	imidacloprid <i>IRAC 4A</i> (Admire Pro)	1.0 to 1.4 fl oz	VG	12 hrs	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).
	zeta-cypermethrin <i>IRAC 3A</i> (Mustang 1.5EC, Mustang Max 0.8EC)	4.3 fl oz 4.0 fl oz	G	12 hrs	24 hrs	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.
Spotted wing drosophila	<p>Spotted wing drosophila (SWD, <i>Drosophila suzukii</i>) is an invasive pest of soft skinned fruit in the United States and has been detected throughout the southeast. Infestations were observed in some blueberries. 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 <i>Drosophila</i> spp. by a single spot on the end of both wings. 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.</p> <p>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.</p>					
	phosmet <i>IRAC 1B</i> (Imidan 70W)	1.3 lb	E	24 hrs	3 days	Do not apply more than 2 times per season.

Pre-Harvest through Harvest, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Spotted wing drosophila, cont.	malathion <i>IRAC 1B</i> (Malathion ULV)	10 fl oz	G	12 hrs	1 day	3 applications per season of Malathion ULV are currently allowed. The minimum retreatment interval for Malathion ULV is 10 days.
	(Malathion 57EC)	1.5 to 2 pt	G	12 hrs	1 day	3 applications per season of Malathion 57EC are currently allowed. EC formulations may be associated with phytotoxicity.
	(Malathion 8F)	1.25 to 2.5 pt	G	12 hrs	1 day	2 applications per season of Malathion 8F are currently allowed Flowable formulations may have fewer phytotoxicity issues than EC formulations.
	spinosad <i>IRAC 5</i> (Entrust 2SC) (Entrust 80W)	4 to 6 fl oz 1.25-2 oz	G	4 hrs	3 days	Entrust is OMRI listed.
	spinetoram <i>IRAC 5</i> (Delegate WG)	3-6 oz	E	4 hrs	1 day	
	cyantraniliprole <i>IRAC 28</i> (Exirel)	13.5-20.5 fl oz	VG	12 hrs	3 days	Minimum application interval 5 days. Up to 4 applications at 13.5 fl oz per acre can be made per season.
	fenpropathrin <i>IRAC 3A</i> (Danitol 2.4EC)	16 fl oz	E	24 hrs	3 days	No more than 2 applications per season.
	bifenthrin <i>IRAC 3A</i> (Brigade 10WBS)	16 oz	E	12 hrs	1 day	No more than 5 applications per season. Do not reapply for at least 7 days.

Pre-Harvest through Harvest, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Spotted wing drosophila, cont.	zeta-cypermethrin <i>IRAC 3A</i> (Mustang 1.5EC, Mustang Max 0.8EC)	4.3 fl oz 4.0 fl oz	E	12 hrs	24 hrs	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.
	methomyl <i>IRAC 1A</i> (Lannate LV 2.4EC)	12 to 24 fl oz	VG	48 hrs	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.
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.
	<i>Bacillus thuringiensis</i> <i>IRAC 11A</i> [BT] (Dipel DF)	0.5 to 1.0 lb	F	4 hrs	0 days	Apply to small, early-stage caterpillars. OMRI listed.
	chlorantraniliprole <i>IRAC 28</i> (Altacor)	3.0 to 4.5 oz	VG	4 hrs	1 day	
	esfenvalerate <i>IRAC 3A</i> (Asana 0.66 EC) (Adjourn 0.66 EC)	4.8 to 16 oz 4.8 to 9.6 fl oz	VG	12 hrs	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.
	tebufenozide <i>IRAC 18</i> (Confirm 2F)	4 to 8 fl oz	VG	4 hrs	14 days	Confirm does not control non-caterpillar pests of blueberry.
Blueberry stem borer	Blueberry stem borer, <i>Oberea myops</i> , 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.						
Japanese beetle	See COVER SPRAY recommendations					
Alternaria rot and ripe rots	See comments above on fruit rots, fruit handling, and postharvest cooling					
Red imported fire ants	See DORMANT recommendations					
Flea beetles and leaf beetles	See COVER SPRAY recommendations					
Sharpnosed leafhoppers and other leafhoppers	See PETAL FALL recommendations					
Phyllosticta leaf spot	Common leaf spot in Florida on certain cultivars, such as Jewel. Occasionally a serious problem in Georgia. See controls below for other leaf spots.					
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 as soon as 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, Scale insects	See PETAL FALL recommendations					
Blueberry bud mite	This tiny eriophyid mite, best visible with a dissecting microscope, infests flower buds in late summer and fall, feeding 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 gal/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.

Late season and after harvest, cont.						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Blueberry bud mite, cont.	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 oil (JMS Stylet Oil)	3 to 6 qt/100 gal	See comments	4 hrs	0 days	Recent efficacy data are not available.
	Verdant horticultural oil (Stoller® Golden Pest Spray Oil)	1 to 2 gal (low volume) application or 2 gal/100 gal (dilute spray)	See comments	4 hrs	0 days	Recent efficacy data are not available.
Chilli thrips	Chilli thrips are an invasive species that has recently been detected in Georgia and were previously present in Florida. Monitor weekly by scouting blueberry planting. If more than 5% of the field has obvious hot-spots and Chilli thrips injury, insecticide program may be implemented.					
	acetamiprid <i>IRAC 4A</i> (Assail 30SG)	4.5 to 5.3 oz	E	12 hrs	24 hrs	
	spinetoram <i>IRAC 5</i> (Delegate WG)	3 to 6 oz	VG	4 hrs	1 day	
	imidacloprid <i>IRAC 4A</i> (Admire Pro)	1.0-1.4 fl oz	VG	12 hrs	3 days	Allow 7 days between imidacloprid treatments.
	spinosad <i>IRAC 5</i> (Entrust 2SC) (Entrust 80W)	4-6 fl oz 1.25-2 oz	G	4 hrs	3 days	Entrust is OMRI listed.
Scale insects	flupyradifurone <i>IRAC 4D</i> (Sivanto Prime)	12 to 14 fl oz	G	4 hrs	3 days	Limited efficacy data.
	spirotetramat <i>IRAC 23</i> (Movento)	10 fl oz	G	24 hrs	1 day	Limited efficacy data.

Late season and after harvest, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Phytophthora root rot	fosetyl-al <i>FRAC P07</i> (Aliette WDG)	5 lb	G	12 hrs	12 hrs	Aliette as a foliar spray is also effective against Pythium root rots and Septoria leaf spot. 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. There are residue concerns for phosphites for export to the European Union. Consult with your purchaser before using these materials.
	potassium phosphite <i>FRAC P07</i> (ProPhyt and many others)	4 pt	VG	4 hrs	0 hrs	Apply as a foliar spray for Phytophthora. 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. Plant injury may occur. There are residue concerns for phosphites for export to the European Union. Consult with your purchaser before using these materials.

Late season and after harvest, cont.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Septoria and Anthracnose leaf spots and Phytophthora root rot	mono- and di-potassium salts of phosphorous acid <i>FRAC P07</i> (K-Phite)	2 to 8 qt	VG	4 hrs	0 hrs	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. There are residue concerns for phosphites for export to the European Union. Consult with your purchaser before using these materials.
Septoria and anthracnose leaf spots	azoxystrobin <i>FRAC 11</i> (Abound)	6.2-15.5 fl oz	VG	4 hrs	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 qt per acre per season, and do not apply more than two sequential applications of Abound before switching to a fungicide with another MOA.
	azoxystrobin + propiconazole <i>FRAC 11+3</i> (Quilt Xcel)	14 to 21 fl oz	E	12 hrs	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).
	chlorothalonil <i>FRAC M5</i> (Bravo Weather Stik)	3-4 pt	VG	12 hrs 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 hrs) with restrictions; REI is 6.5 days without restrictions.
	cyprodinil + fludioxonil <i>FRAC 9 + 12</i> (Switch 62.5WG)	11-14 oz	G	12 hrs	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.

Late season and after harvest, cont.						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness	REI	PHI	Comments
Septoria and anthracnose leaf spots, cont.	fenbuconazole <i>FRAC 3</i> (Indar 2F)	6.0 fl oz	E	12 hrs	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.
	propiconazole <i>FRAC 3</i> (Tilt, Bumper 41.8 EC, PropiMax EC)	6.0 fl oz	E	12 hrs	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.
	pyraclostrobin + boscalid <i>FRAC 11 + 7</i> (Pristine)	18.5-23 oz	E	12 hrs	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.
	metconazole <i>FRAC 3</i> (Quash 50 WDG)	2.5 oz	E	12 hrs	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.
Blueberry rust	chlorothalonil <i>FRAC M5</i> (Bravo Weather Stik)	3-4 pt	G	12 hrs 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 hrs) with restrictions; REI is 6.5 days without restrictions.
	fenbuconazole <i>FRAC 3</i> (Indar 2F)	6.0 fl oz	G	12 hrs	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.
	propiconazole <i>FRAC 3</i> (Tilt, Bumper 41.8 EC, PropiMax EC)	6.0 fl oz	G	12 hrs	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.

	prothioconazole <i>FRAC 3</i> (Proline 480 SC)	5.7 fl oz	E	12 hrs	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.
	pyraclostrobin + boscalid <i>FRAC 11 + 7</i> (Pristine)	18.5-23 oz	F	12 hrs	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.
	metconazole <i>FRAC 3</i> (Quash 50 WDG)	2.5 oz	VG	12 hrs	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.

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 Group]		FRAC Group	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)		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)		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
	metconazole (Quash)	3	UN	E	E	UN	E	E	E	E	VG	NA
	propiconazole (Tilt, Bumper, PropiMax)	3	UN	E	E	NA	NA	NA	VG	UN	G	NA
	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
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	VG	VG	G	NA
	azoxystrobin + propiconazole (Quilt Xcel)	11+3	NA	E	E	NA	E	E	E	E	E	NA
	pyraclostrobin + boscalid (Pristine)	11+7	F	VG	E	E	E	E	E	E	F	NA
fenhexamid (Elevate)		17	UN	F	NA	E	NA	NA	NA	NA	NA	NA
fenhexamid + captan (CaptEvate)		17+M4	VG	F	F	E	G	G	F	UN	NA	NA
fluazinam (Omega 500F)		29	UN	NA	G	F	G	G	NA	NA	NA	NA

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.

<i>Common Name</i> (IRAC MOA)	<i>Trade Name(s)</i>	<i>Fire Ants</i>	<i>Armored scale</i>	<i>Soft scale</i>	<i>Blue- berry gall midge</i>	<i>Flower thrips</i>	<i>Glassy- winged sharp- shooter</i>	<i>Sharp- nosed leaf- hopper</i>	<i>Fruit worms</i>	<i>Plum curculio</i>	<i>Blue- berry maggot</i>	<i>Spotted wing drosophila</i>	<i>Japanese beetle/ Green June beetle</i>	<i>Blue- berry bud mite</i>	<i>Foliar feeding cater- pillars</i>
<i>Cultural control</i>	Methods vary	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	E	E
<i>acetamiprid</i> (4A)	Assail 30SG	NA	NA	VG	NA	G	VG	VG	F	P	VG	F	VG	NA	F
<i>Bt</i> (11A)	Dipel DF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	VG
<i>bifenthrin</i> (3A)	Brigade	NA	NA	NA	NA	NA	NA	NA	NA	NA	E	E	NA	NA	NA
<i>carbaryl</i> (1A)	Sevin 80S Sevin 80WSP	NA	NA	NA	NA	NA	F	F	F	F	F	G	G	NA	G
<i>cyantraniliprole</i> (28)	Exirel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	E	NA	NA	NA
<i>esfenvalerate</i> (3A)	Adjourn 0.66EC Asana XL 0.66EC	NA	NA	NA	NA	NA	VG	VG	E	F	VG	NA	VG	NA	E
<i>fenpropathrin</i> (3A)	Danitol 2.4EC	NA	NA	NA	NA	NA	VG	VG	E	G	G	E	E	NA	E
<i>flupyradifurone</i>	Sivanto Prime	NA	NA	NA	NA	NA	NA	NA	NA	NA	G	NA	NA	NA	NA
<i>horticultural oil</i> (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
<i>imidacloprid</i> (4A)	Many trade names	NA	NA	E	NA	NA	VG	VG	NA	NA	F	NA	G	NA	NA
<i>indoxcarb</i> (22)	Avaunt	NA	NA	NA	NA	NA	NA	NA	E	E	NA	NA	NA	NA	E
<i>kaolin clay</i>	Surround	NA	NA	NA	NA	NA	NA	NA	G	G	NA	NA	NA	NA	NA
<i>malathion</i> (1B)	Many formulations	NA	NA	NA	P	G	G	G	G	P	VG	VG	F	NA	G

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.

<i>Common Name</i> (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
<i>methoprene</i> (7A)	Extinguish Professional Fire Ant Bait 0.5%	E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<i>methoxy- fenozide</i> (18)	Intrepid 2F	NA	NA	NA	NA	NA	NA	NA	VG	NA	NA	NA	NA	NA	E
<i>phosmet</i> (1B)	Imidan 70W	NA	F	G	G	NA	G	G	VG	VG	VG	E	VG	NA	E
<i>pyriproxyfen</i> (7D)	Esteem Ant Bait	E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<i>spinetoram</i> (5)	Delegate WG	NA	NA	NA	F	E	NA	NA	VG	NA	UN	E	NA	NA	E
<i>spinosad</i> (5)	Entrust 80W, Entrust SC	G	NA	NA	P	VG	NA	NA	G	NA	UN	VG	NA	NA	VG
<i>spinosad fruit fly bait</i> (5)	GF-120 NF Naturalyte Fruit Fly Bait	NA	NA	NA	NA	NA	NA	NA	NA	NA	VG	NA	NA	NA	NA
<i>spirotetramat</i> (23)	Movento	NA	G	G	G	NA	NA	NA	NA	NA	G	NA	NA	NA	NA
<i>tebufenozide</i> (18A)	Confirm 2F	NA	NA	NA	NA	NA	NA	NA	VG	NA	NA	NA	NA	NA	E
<i>zeta- cypermethrin</i> (3)	Mustang Mustang Max	NA	NA	NA	NA	NA	G	G	VG	VG	VG	E	E	NA	E

Fungicide classes with moderate to high risk of resistance development (generally singl-site modes of action)	
Fungicide class (FRAC)	Trade Name and Chemical Name
Anilopyrimidines (9)	Switch (cyprodinil; one component of a two-part mixture)
Carboximide (7)	Pristine (boscalid; one component of a two-part mixture)
Demethylation Inhibitors (DMIs) or Sterol Inhibitors (3)	Indar (fenbuconazole) Proline (prothioconazole) Quash (metconazole) Quilt Xcel (propiconazole; one component of a two-part mixture) Tilt, Bumper 41.8 EC, PropiMax EC (propiconazole)
2,6-dinitro-anilines (29)	Omega (fluazinam)
Hydroxyanilides (17)	Elevate (fenhexamid)
Phenylamides (4)	Ridomil Gold (mefenoxam)
Phenylpyrroles (12)	Cannonball WP (fludioxonil) Switch (fludioxonil; one component of a two-part mixture)
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)
Fungicide classes with low risk of resistance development (generally multiple sites of action)	
Fungicide class (FRAC)	Trade Name and Chemical Name
Coppers (M1)	Coppers (numerous formulations)
Dithiocarbamates (M3)	Ziram (ziram)
Phthalimides (M4)	Captan 50WP (captan)
Phthalonitriles (M5)	Bravo (chlorothalonil)
Phosphonates (P07)	Aliette (Fosetyl-Al) K-Phite (mono and di-potassium salts of phosphorous acid) ProPhyt (potassium phosphite)
Sulfurs (M2)	Sulfurs (numerous formulations)

Seasonal ‘at a glance’ fungicidal spray schedule options for blueberry

Developmental Stage	Late Dormant	Green tip	Bloom (2-3 applications) ^b	Petal Fall	10-14 Days after Petal Fall	20-24 Days after Petal Fall	Pre-Harvest ^c	After Harvest Foliage Management
Disease Controlled (Fungicides)	Exobasidium (lime sulfur [NC]) ^a	Mummy Berry (Pristine [11+7] or Indar [3] or Tilt or Bumper or PropiMax or Quash [3] or Proline [3]) Twig blight (Pristine [11+7] or Indar [3]) If Exobasidium has been a problem, add Captan [M4]	Mummy Berry and Twig blight (Pristine [11+7] or Indar ^c [3] + Captan [M4] or Tilt or Bumper or PropiMax or Quash [3] or Quilt Xcel [11+3] or Proline [3]) For serious Botrytis problems, add (CaptEvate [17+M4] or Elevate [17] or Pristine [11+7] or Switch [9+12]) If Alternaria and Ripe Rot have been a problem, add (Abound [11] or Pristine [11+7] or Switch [9+12] or Omega [29]) ^d If Exobasidium has been a problem, add Captan [M4]	Alternaria and Ripe Rots (Abound [11] or Pristine [11+7] or Switch [9+12] or Captan [M4] or Omega [29] or Quilt Xcel [11+3]) Septoria Leaf Spot (Abound [11] or Aliette [33] or Pristine [11+7] or Switch [9+12] or Quash [3] or Quilt Xcel [11+3] or Proline [3]) ^f If Exobasidium has been a problem, add Captan [M4]	Alternaria and Ripe Rots (Abound [11] or Pristine [11+7] or Switch [9+12] or Captan [M4] or Omega [29] or Quilt Xcel [11+3]) Septoria Leaf Spot (Abound [11] or Aliette [P07] or Pristine [11+7] or Switch [9+12] or Quash [3] or Quilt Xcel [11+3] or Proline [3]) ^f If Exobasidium has been a problem, add Captan [M4]	Alternaria and Ripe Rots (Abound [11] or Pristine [11+7] or Switch [9+12] or Captan [M4] or Omega [29] or Quilt Xcel [11+3]) Septoria Leaf Spot (Abound [11] or Aliette [P07] or Pristine [11+7] or Switch [9+12] or Quash [3] or Quilt Xcel [11+3] or Proline [3]) ^f If Exobasidium has been a problem, add Captan [M4]	Alternaria and Ripe Rots (Abound [11] or Pristine [11+7] or Switch [9+12] or Captan [M4]) Septoria Leaf Spot (Abound [11] or Tilt or Bumper or PropiMax [3] or Aliette or ProPhyt [P07] or Bravo [M5] or Pristine [11+7] or Switch [9+12] or Indar [3] or Quilt Xcel [11+3] or Proline [3]) Anthracnose (K-Phite or Aliette or ProPhyt [P07] or Pristine [11+7] or Quilt Xcel [11+3] or Quash [3]) Rust (Bravo [M5] or Tilt or Bumper or PropiMax [3] or Pristine [11+7] or Indar or Quash [3] or Proline [3]) ^g	

^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. Bloom sprays should provide protection against the primary pathogens of blooms for the entire bloom period. The number of applications required for bloom may vary from 1-3, depending on the season and the variety.

^c When using Indar during bloom, always tank-mix with Captan. Captan provides additional control of mummy berry, and it has some activity against twig blight, Botrytis and fruit rots. However, it is mainly of value to prevent increased rots with the use of Indar, as well as providing resistance management.

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

^e 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.

^f 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.

^g 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.

Herbicides for Non-Bearing Plants Only

Weed/Timing	Material <i>Mode of action</i>	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
PREPLANT/SITE PREPARATION					
	glyphosate , WSSA 3 Roundup and other generic formulations	1 to 5 qt Depending on formulation and weeds being treated	<u>Apply 30 days prior to planting.</u>	4	Apply broadcast or POST-directed to control weeds prior to planting. Generic formulations may require the addition of a surfactant. See label for details on controlling specific perennial weeds.
PREEMERGENCE					
Annual broadleaf weeds and grasses	benefin / oryzalin WSSA 3 (XL 2G)	150 to 300 lb Depending on soil type	<u>USE ON NON- BEARING PLANTS ONLY.</u> Newly planted and non-bearing plantings. May also be used in bark bed production systems.	24	
Annual broadleaf weeds	flumioxazin WSSA 14 (Broadstar 0.25 GR)	150 lb	<u>USE ON NON- BEARING PLANTS ONLY.</u> Newly planted and non-bearing plantings. May also be used in bark bed production systems.	12	To avoid crop injury do not apply to moist or wet foliage. Irrigate plants with overhead irrigation within 1 hour after application with 0.5 to 0.75 inch of water to wash particles off of foliage and to activate the herbicide. See label for further instructions.

Weed/Timing	Material <i>Mode of action</i>	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
PREEMERGENCE					
Small seeded broadleaf weeds	isoxben WSSA 27 (Gallery 75 DF)	0.66 to 1.33 lb	<u>USE ON NON-BEARING PLANTS ONLY.</u> Newly planted and non-bearing plantings. May also be used in bark bed production systems.	12	Maximum of 4 pounds per year. May be tanked mixed with a preemergence grass herbicide (i.e. Surflan)
Annual weeds	isoxaben + trifluralin + oxyfluorfen WSSA 27 WSSA 3 WSSA 14 (Showcase 2.5 TG)	100 to 200 lb	<u>USE ON NON-BEARING PLANTS ONLY.</u> Newly planted and non-bearing plantings. May also be used in bark bed production systems.	24	Controls a wide range of annual weeds. <u>DO NOT</u> apply to newly planted blueberries until the soil has firmly settled and no cracks are present. <u>DO NOT</u> apply to blueberries when foliage is wet. Apply 1 inch of irrigation water if adequate rainfall is not received within 3 days of application. Repeat applications of 150 lbs or greater should not be made sooner than 60 days. <u>DO NOT</u> apply more than 600 lbs of Showcase per year.
Annual broadleaf and grass weeds	trifluralin/ isoxaben WSSA 3 WSSA 27 (Snapshot 2.5 TG)	100 to 200 lb	<u>USE ON NON-BEARING PLANTS ONLY.</u> Newly planted and non-bearing plantings. May also be used in bark bed production systems.	12	
POSTEMERGENCE					
Broadleaf weeds and yellow nutsedge	bentazon WSSA 6 Basagran 4 L	1.5 to 2 pt	Newly planted or non-bearing plantings. May also be used in bark bed production system.	48	Apply as a directed spray in a minimum spray volume of 20 GPA. Timely, sequential applications will control yellow nutsedge. Apply when yellow nutsedge is 6 to 8 inches tall. If needed make a second application at the same rate 7 to 10 days later. Add oil concentrate to the spray solution at a rate of 2 pt in 20 to 50 gal of water per acre. Refer to label for further details regarding yellow nutsedge. Do not apply within 1 year of harvest.

Herbicides for Non-Bearing and Bearing Plants

Note restrictions regarding application to bearing or non-bearing plants.

Weed/Timing	Material <i>Mode of action</i>	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
PREPLANT/ SITE PREPARATION					
	glyphosate WSSA 9 Roundup and other generic formulations	See label for rate, depending on formulation and weeds being treated.	Apply 30 days prior to planting.	4	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.
PREEMERGENCE					
Annual grasses and small seeded broadleaf weeds	napropamide WSSA 15 Devrinol 50 DF Devrinol DF-XT Devrinol 2-XT	8 lb 2 gallons	Newly planted (once soil has settled after transplanting) and established plantings.	24	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.
Annual grasses and small seeded broadleaf weeds	oryzalin WSSA 3 Surflan 4 AS Oryzalin 4 AS	2 to 4 qt	Newly planted (once soil has settled after transplanting) and established plantings. May also be used in bark bed production system.	24	Oryzalin may be tank mixed with paraquat (see comments on rabbiteye) or glufosinate for postemergence weed control. Rainfall or irrigation is needed to activate oryzlin. In established plantings tank mix with simazine for broad spectrum residual weed control.
Annual grasses and small seeded broadleaf weeds	norflurazon WSSA 12 Solicam 80 DF	1.25 to 5 lb	Plantings established at least 6 months. May also be used in bark bed production system.	12	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 bleaching or chlorosis of the leaves. Tank mix with paraquat or glufosinate for control of emerged weeds. Tank mix with simazine or diuron for expanded residual control. Preharvest interval is 60 days.

Herbicides for Non-Bearing and Bearing Plants, cont.

Weed/Timing	Material <i>Mode of action</i>	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
PREEMERGENCE					
Annual broadleaf weeds	mesotrione WSSA 27 Callisto 4 L	3 to 6 oz	Apply as prebloom post-directed spray in highbush blueberry.	12	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.
Annual broadleaf weeds and some annual grasses	flumioxazin WSSA 14 Chateau SW 51 WDG	6 to 12 oz	Newly planted and established. See Comments. May also be used in a bark bed production system.	12	May be applied in season. Preharvest 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.
Annual weeds and some perennial weeds	dichlobenil WSSA 20 Casoron 4 G Casoron CS 1.4 L	100 to 150 lb 1.4 to 2.8 gal	4 G formulation may be applied to newly planted (4 wks after transplanting) and established plantings. CS 1.4 L formulation may be applied to plants at least one year after transplanting. May also be used in bark bed production system.	12	Apply between November and February (air temperature 60° 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 (<i>Stachys floridiana</i>) and non-seed bearing plants (i.e Ferns).

Herbicides for Non-Bearing and Bearing Plants, cont.

Weed/Timing	Material <i>Mode of action</i>	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
PREEMERGENCE					
Annual weeds and some perennial weeds, cont.	hexazinone WSSA 5 Velpar L CU 2 SL Velpar 80 WDG	0.5 to 1 gal 1.3 to 2.6 lb	Blueberry plantings established at least 3 years.	48	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.
Broadleaf weeds and some annual grass species	pronamide WSSA 3 Kerb 50 WP Kerb 3.3 SC	2 to 4 lb 2.5 to 5 pt	Blueberry plantings established at least 1 year.	24	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 herbicide activity occurs when applications are made under cool temperature conditions and are followed by rainfall or overhead irrigation. Do not exceed maximum rate listed per year. Apply only in late fall or winter.
	diuron WSSA 7 Karmex 80 DF Karmex XP 80 or various generic formulations	1.5 to 2 lb	Blueberry plantings established 1 year.	12	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.
	simazine WSSA 5 Princep 4 L Princep Caliber 90 WDG various generic formulations	2 to 4 qt 2.2 to 4.4 lb	Newly planted (use half rate and apply once soil has settled after transplanting) and established plantings. May also be used in bark bed production system.	12	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.

Herbicides for Non-Bearing and Bearing Plants, cont.

Weed/Timing	Material <i>Mode of action</i>	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
POSTEMERGENCE					
Broadleaf weeds and some annual grass species, cont.	terbacil WSSA 5 Sinbar 80 WP	0.5 to 2 lb	Plantings established 1 year or more.	12	Apply as directed spray in early fall or spring before fruit set. Do not contact foliage. Do not 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.
Non-selective control	glufosinate WSSA 10 Reckon 280 S L	1.5 to 2.5 qt	Newly planted (shielded) and established blueberry. May also be used in bark bed production system.	12	Do not allow spray solution to contact desirable foliage or green, uncalled bark. Use a minimum spray volume of 20 gal/A. Do not apply within 14 days of harvest or exceed 12 qt. in 1 year. May be tank mixed with preemergence herbicides.
	glufosinate WSSA 10 Reckon 280 SL Rely 280 SL Cheetah 2.34 SL	See label Depending on formulation and weeds being treated	May also be used in bark bed production system.	4	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
	paraquat WSSA 22 Gramoxone 2SL Firestorm 2SL Paraquat 2 SL Parazone 3 SL	2 to 4 pt 1.3 to 2.7 pt	Newly planted (shielded) and established blueberry plantings. May also be used in bark bed production system.	12	Do not allow herbicide to contact desirable foliage or uncalled bark. Young plants must be shielded. The addition of a nonionic surfactant at 0.25 % v/v (1qt per 100 gal. of spray solution) is necessary for adequate control. Tank mix with preemergence herbicides for residual control. 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.
Yellow and purple nutsedge	halosulfuron-methyl WSSA 2 Sanda 75 DG	0.5 to 1 oz	Do not apply to plants established less than 1 year.	12	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). Preharvest interval is 14 days.

Herbicides for Non-Bearing and Bearing Plants, cont.

Weed/Timing	Material <i>Mode of action</i>	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
POSTEMERGENCE					
Broadleaf weeds less than 3" tall	carfentrazone-ethyl WSSA 14 Aim 2 EC	1 to 2 oz	Established fields only; do not use on newly set plants.	12	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 gal/100 gal of spray solution) or a nonionic surfactant at 0.25% v/v (1 qt/100 gal of spray solution).
Annual and perennial grasses	clethodim WSSA 1 Select and Intensity 2 EC Select Max and Intensity One 1 EC	See label for rate.	Newly planted or non-bearing plantings only. May also be used in bark bed production system.	24	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 qt/100 gal 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 has been observed in Georgia. The Select Max formulation is registered for application in bearing blueberry and has a 14 day PHI. All other clethodim formulations are registered for application in non-bearing blueberry only
Annual and perennial grasses (Cont'd)	fluazifop WSSA 1 Fusilade DX 2 EC	12 to 24 oz	Newly planted or non-bearing plantings. May also be used in bark bed production system.	12	Sequential applications will be necessary for perennial grass control. The addition of a nonionic surfactant (0.25% v/v, 1 qt/100 gal of water) or crop oil concentrate (1 gal./100 gal. of water) is necessary. Do not apply within 1 year of harvest. Do not apply over the top or crop injury can occur.
	sethoxydim WSSA 1 Poast 1.5 EC	1 to 2.5 pt	Newly planted and established plantings. May also be used in bark bed production system.	12	Sequential applications will be necessary for perennial grass control. The addition of a nonionic surfactant (1 qt/100 gal of water) or crop oil concentrate (1 gal/100 gal of water) is necessary for optimum results. Do not apply within 30 days of harvest. Total use rate per season cannot exceed 5 pt/A.

Suggested Blueberry Herbicide Programs

Crop Age	Fall	Winter	Spring	Summer
First Year	Preplant-glyphosate (when applied in fall or winter wait at least 30 days prior to planting)		Princep + Surflan. Existing annual weeds can be removed with separate paraquat, glufosinate, glyphosate, or Sandea for sedge control	Princep + Surflan. Existing annual weeds can be removed with separate paraquat, Reckon, glyphosate, or Sandea for nutsedge control
			Devrinol once soil settles after transplanting.	
			Devrinol once soil settles after transplanting). Existing annual weeds can be removed with separate paraquat, glufosinate, glyphosate, or Sandea for nutsedge control. Poast and Select Max can be used to control emerged grasses	Gallery 1 lb /A + Surflan. Existing annual weeds can be removed with separate paraquat, Reckon, glyphosate, or Sandea for nutsedge control. Poast and Select Max can be used to control emerged grasses.
Blueberry Established 1 year or more	Existing annual weeds can be removed with separate paraquat, Reckon, glyphosate, or Sandea for nutsedge control. Poast and SelectMax can be used to control emerged grasses.		Princep + Surflan (2 qt or 2 lb /A). Existing annual weeds can be removed with separate paraquat, glufosinate, glyphosate, or Sandea for sedge control. Poast and Select Max can be used to control emerged grasses	Chateau (8 to 10 oz/A). Existing annual weeds can be removed with separate paraquat, glufosinate, glyphosate, or Sandea for nutsedge control. Poast and Select Max can be used to control emerged grasses.
			Princep + Surflan. Existing annual weeds can be removed with separate paraquat, glufosinate, glyphosate, or Sandea for nutsedge control. Poast and Select Max can be used to control emerged grasses.	Solicam. Existing annual weeds can be removed with separate paraquat, glufosinate, glyphosate, or Sandea for nutsedge control. Poast and Select Max can be used to control emerged grasses.

Suggested Blueberry Herbicide Programs

Crop Age	Fall	Winter	Spring	Summer
Blueberry Established 1 year or more, cont.			Chateau. Existing annual weeds can be removed with separate paraquat, glufosinate, glyphosate, or Sandea for nutsedge control. Poast and Select Max can be used to control emerged grasses.	Diuron. Existing annual weeds can be removed with separate paraquat, glufosinate, glyphosate, or Sandea for nutsedge control. Poast and Select Max can be used to control emerged grasses
Blueberry established 2 years or more	Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or Reckon applications. Glyphosate (spot treat for perennial weeds). Poast (as needed).	Velpar (follow all label precautions and restrictions-only for high organic matter soils)	Chateau plus glufosinate (to control emerged weeds). Poast or Select Max as needed for grass control.	Chateau plus glufosinate. Poast or Select Max as needed.
	Existing annual weeds can be removed with separate paraquat, glufosinate, glyphosate, or Sandea for nutsedge control. Poast and Select Max can be used to control emerged grasses.	Velpar (follow all label precautions and restrictions-only for high organic matter soils)	Chateau. Existing annual weeds can be removed with separate paraquat, glufosinate, glyphosate, or Sandea for nutsedge control. Poast and Select Max can be used to control emerged grasses.	Norflurazon. Existing annual weeds can be removed with separate paraquat, Reckon, glyphosate, or Sandea for nutsedge control. Poast and Select Max can be used to control emerged grasses
			Chateau. Existing annual weeds can be removed with separate paraquat, glufossinate, glyphosate, or Sandea for nutsedge control. Poast and Select Max can be used to control emerged grasses.	Sinbar and Chateau. Existing annual weeds can be removed with separate paraquat, glufosinate, glyphosate, or Sandea for sedge control. Poast and Select Max can be used to control emerged grasses.

Suggested Blueberry Herbicide Programs

Crop Age	Fall	Winter	Spring	Summer
Blueberry established 3 years or more	Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Grass herbicide as needed.		Diuron, norflurazon, or simazine/oryzalin. Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Grass herbicide as needed.	Rotate to different herbicide. Simazine + oryzalin or norflurazon (solo). Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments, not recommended) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Grass herbicide (as needed).

Weed Response to Herbicides used in Blueberry

Herbicides	Annual Grasses					Annual Broadleaf Weeds															Perennial Weeds						
	Crabgrass	Foxtail	Goosegrass	Panicum, Fall	Ryegrass, Annual	Chickweed	Dock	Galinsoga	Geranium, Carolina	Groundsel, Common	Henbit	Jimsonweed	Lambsquarters	Morningglory, 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	N	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	N	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	N	NA	F	F	N	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	
Clethodim	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	
Reckon 280	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

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.	
Birds	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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:</p> <ul style="list-style-type: none"> - Assess the potential for objections to the noise from your neighbors. - Start before birds establish a feeding pattern. - Operate control devices beginning shortly before sunrise and continuing until just after sunset, as early and late in the day may be the most intense feeding times. - Vary the frequency, the direction and the timing in which auditory devices are operated. Propane cannons should not be fired at intervals closer than 3 minutes. - Consider using more than one type of auditory device and possibly combine them with visual repellents. - If using distress calls, it is essential to identify the type(s) of birds you want to discourage and get distress calls specific to them. - Reinforce the sense of danger by shooting (if allowed). <p>Visual repellants</p>

	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.
--	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Wildlife Damage Prevention in Small Fruit Crops	
Pest/Problem	Management Options
Birds, cont.	<p>Chemical repellants</p> <p>Methyl anthranilate is registered as a bird repellent. While it is sometimes advertised as a taste repellent, this is not exactly correct. When sprayed on a crop, it causes an unpleasant sensation in the bird's mouth. Methyl anthranilate is a naturally occurring material used in the food service industry. Early reports have been inconsistent in regards to its effectiveness. It has also been reported to impart an undesirable foxy flavor to certain grape varieties. Methyl anthranilate has a short residual, so frequent reapplication will be necessary to achieve lasting results. Results may vary depending on the type of birds. Combining with another type of deterrent may result in greater effect than when used alone. As with other types of deterrents, applications need to start before birds establish feeding patterns.</p> <p>Exclusion</p> <p>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.</p>
Deer	<p>Deer can damage small fruit plantings by foraging on succulent new growth during the growing season or by eating fruit. In fall, bucks can damage plants by rubbing 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.</p> <p>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.</p>

	<p>Exclusion</p> <p>Exclusion (fencing) is the only truly effective long-term control for deer damage prevention. Fences can be electrified or not. Deer will try to go under a fence, through a fence, or over it. For non-electrified fences, the lowest wire needs to be within 10 inches or less of the lowest point in the ground around the fruit crop planting and tight enough to prevent deer from pushing under it. Do not neglect ditches or other low spots in the ground around the field, because the deer will find them. While some deer can easily clear an 8 foot fence, generally 6 feet 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-feet high with the addition of 3 single strand wires for a total of 8 feet will reduce costs.</p>
--	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Wildlife Damage Prevention in Small Fruit Crops	
Pest/Problem	Management Options
Deer, cont.	<p>Repellants</p> <p>Both taste and smell repellents exist. Smell repellents include commercially available products or materials such as tankage, blood, putrified 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.</p>

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

An Equal Opportunity Employer/Affirmative Action Organization Committed to a Diverse Work Force

Bulletin 48

Jan. 2020

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

Samuel L. Pardue, Dean and Director