

Blueberry Basics



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Virginia State University
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1st: How am I going to sell my fruit?

- U-pick
- Farmers Market
- Commercial outlets
 - Grocery chains
 - Export
 - Coops



College of Agricultural and Environmental Sciences
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Plan

A. Establishment costs: \$6000.00 - \$25,000 / A

- i. Well
- ii. Irrigation/Frost protection
- iii. Plants
- iv. Land

B. Labor availability

C. Accounting (\$)

- i. Capital Invested
- ii. Return expectations



Plan

D. Which Species/Cultivar fits market scenario?

i. Highbush

ii. Rabbiteye

Harvest Timing

Chill hours

Market

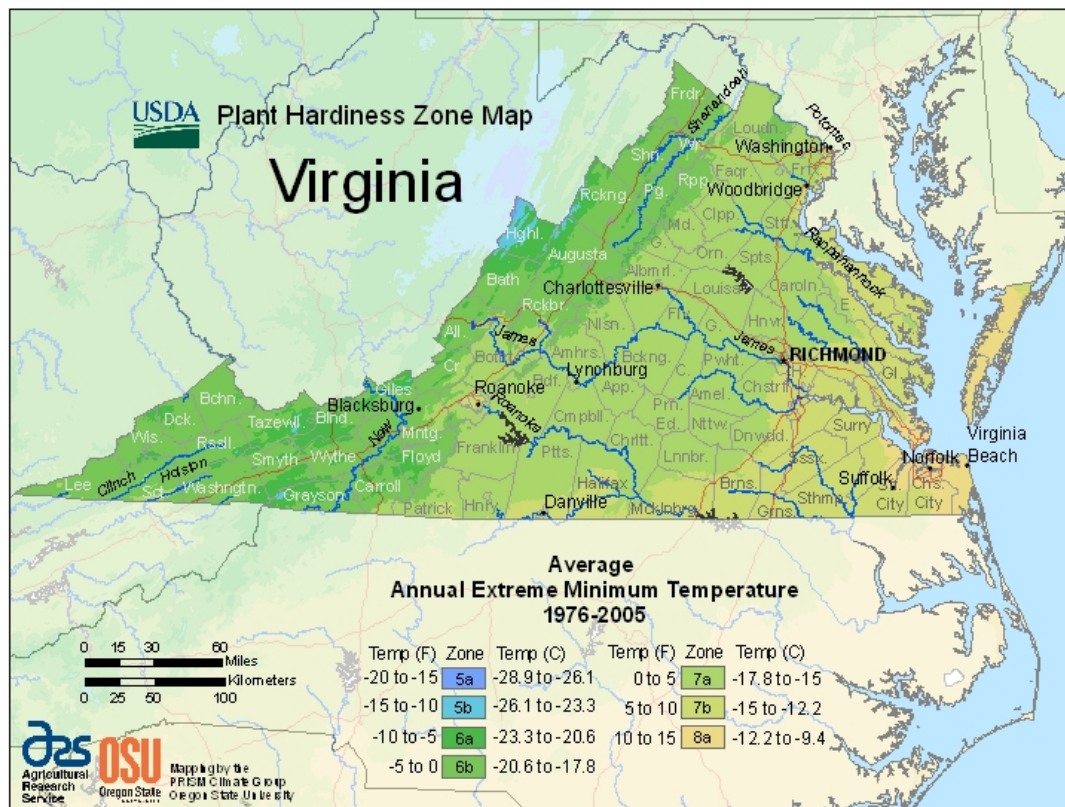


Cultivars for Virginia

- Two Species
 - Highbush
 - Northern (NHB, *V. corymbosum* L.)
 - Southern (SHB, *V. corymbosum* interspecific hybrid)
 - Rabbiteye (RE, *V. virgatum* Aiton., formally *V. ashei* Reade)

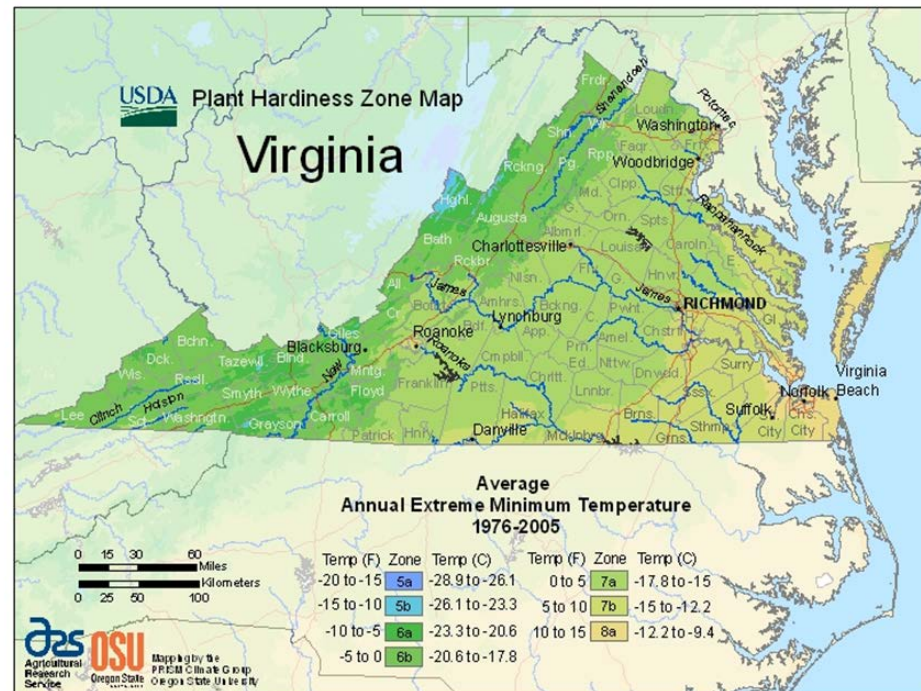


- Cold Hardiness
 - Mountains NHB
 - Piedmont to Coastal Plain (7a – 8a) SHB
 - RE (below 0° F can damage canes and buds)



Chill Hours

- Accumulated during dormancy below 45° F
 - 800 – 1,000 NHB
 - 150 – 800 SHB
 - 350 – 700 RE



Southern Piedmont and Coastal Plain

- New SHB
 - Camellia (UGA) 500 Chill Hours



Courtesy D.S. NeSmith, UGA

Southern Piedmont and Coastal Plain

- New SHB
 - Suziblue (UGA)400 Chill Hours



Courtesy D.S. NeSmith, UGA

Southern Piedmont and Coastal Plain

- New SHB
 - Sweetcrisp (UFL) 400 Chill Hours



Southern Piedmont and Coastal Plain

- New SHB
 - Farthing (UFL) 400 Chill Hours



Courtesy J.M. Olmstead, UFL

Southern Piedmont and Coastal Plain

- New RE
 - Ochlocknee (UGA) 650 Chill Hours



Courtesy D. S. NeSmith, UGA

Southern Piedmont and Coastal Plain

- New RE
 - Titan™ (UGA) 500 Chill Hours



Courtesy D. S. NeSmith, UGA

- Blueberry in Georgia

- Ideal is a Spodosol – acidic soil characterized by a subsurface (A horizon) accumulation of humus complexed with Al and Fe
- Occurs often under coniferous forests like those in SE Georgia
- However, much of the blueberry growing region in SE is something less in organic matter

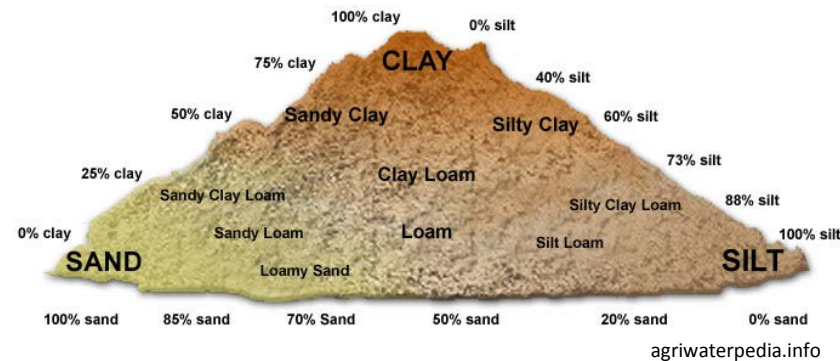


Site Selection

a. Soil

1. Sample at least one year prior to planting

- i. Soil type: permeable, sandy-loam, loamy-sand, or coarse sand w/ high organic matter
- ii. pH: 4.2 – 5.2
- iii. Organic matter: 3%
- iv. Macro (P, K, Ca, Mg, S)
- v. Micro (B, Zn, Cu, Mn, Fe)



2. Notes on analyses

- i. Realize - 3 to 6 months for pH adjustment via S
- ii. Ca above 900 lb/A, limits growth
- iii. Water Table 18 – 20 “ below soil surface

Site Selection

b. Topography

1. Surface Drainage (Slope)

- i. Contact NRCS to determine wetland status
- ii. Avoid making beds across natural drainage
- iii. Avoid planting in low areas (is frost protection needed?)



Site Selection

2. Aspect

- i. Exposure
- ii. Row orientation (Sun)
- iii. Soil warming

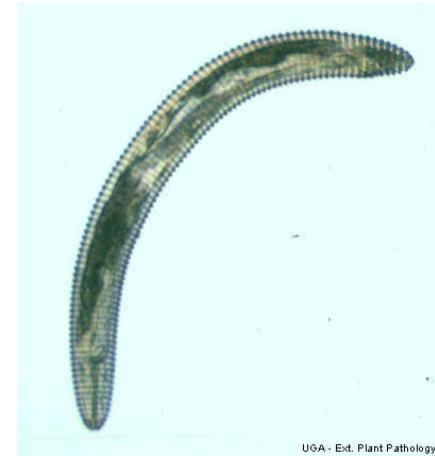
c. Water

- 1. Well
- 2. Open reservoir
- 3. Combined



Soil

- Nematode
 - Associated with replant disorder in blueberry
 - Ring nematode suspected culprit
 - *Criconemella* spp.
 - Pine bark suppresses population
- Soil Sample
 - Suggest ‘Greenhouse Report’ for blueberry



UGA - Ext. Plant Pathology

Results		mS/cm	Parts Per Million (ppm)											Units
		Soluble salts	NO ₃ -N	NH ₄ -N	P	K	Ca	Mg	B	Cu	Fe	Mn	Zn	pH
		Acceptable/Optimum Ranges												
		0.75-3.49	40-199	See ¹	3-10	60-249	80+	30+	0.7-2.5	0.5-1.5	15-40	5-30	5-30	See ²
Lab	Sample	Analysis												
27062	1	0.14	0.27	3.49	6.45	13.70	2.31	1.33	2.55	0.03	1.89	0.02	0.39	4.20

1. Ammonium may be added to nitrate to determine if sufficient plant available nitrogen is present.

2. pH depends on crop grown.

See <http://aesl.ces.uga.edu/Publications/Soil/Greenhouse.pdf> for full recommendations.

See **Blueberries-Southern Highbush in Pinebark Beds** Fact Sheet

Soil

- Soil Sample

- Standard UGA soil test report (Mehlich I)

- * Ca above 900 lb/A - not recommended for blueberry

Results

Mehlich I Extractant

UGA Lime Buffer Capacity Method*

Very High				
High				
Medium				
Low				
	Phosphorus (P)	Potassium (K)	Calcium (Ca)	Magnesium (Mg)
Soil Test Index	54 lbs/Acre	88 lbs/Acre	1191 lbs/Acre	191 lbs/Acre

High				
Sufficient				
Low				
Zinc (Zn)	Manganese (Mn)	pH *	Lime Buffer Capacity (LBC)	
6 lbs/Acre	3 lbs/Acre	5.5	366	Soil Test Index

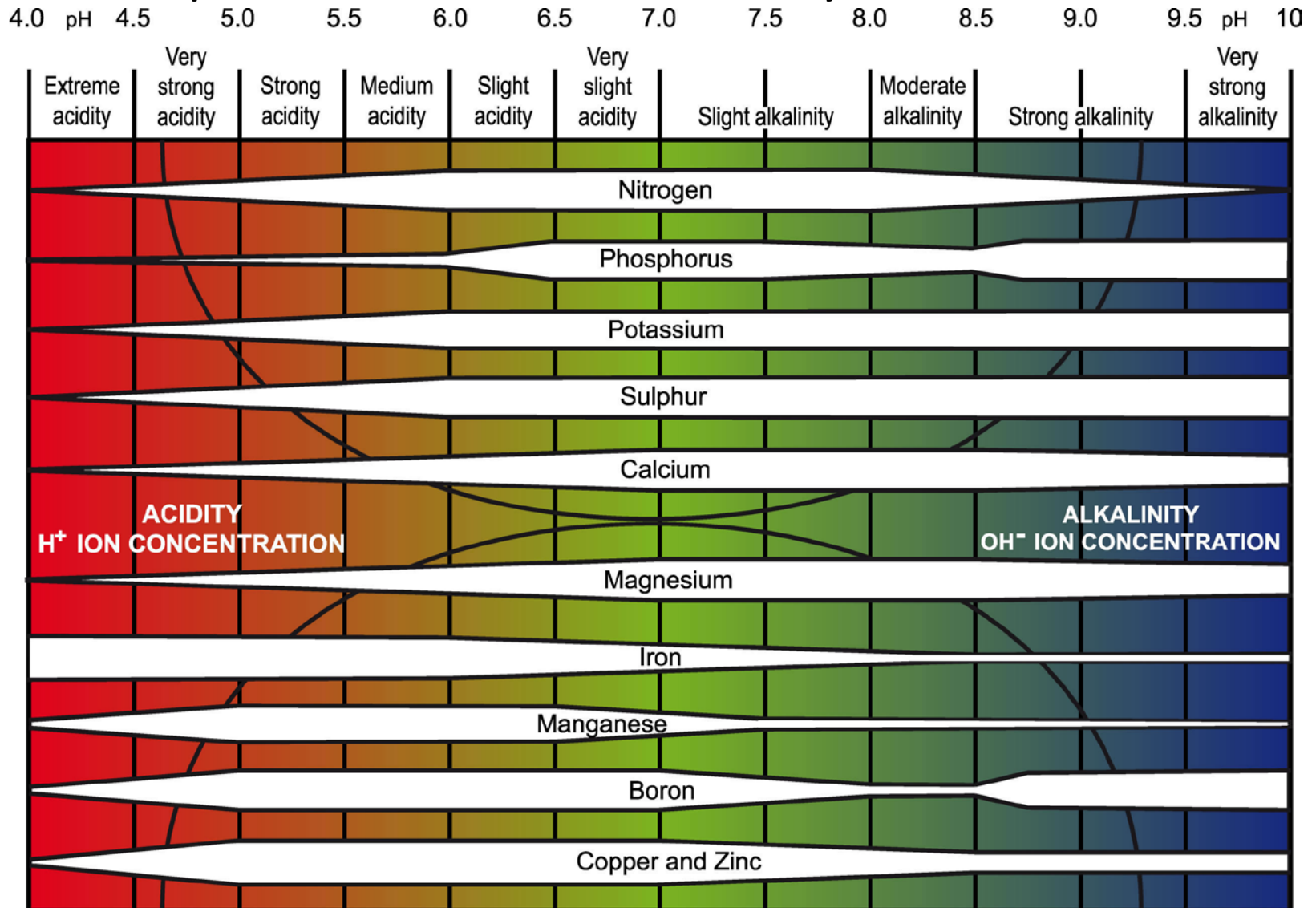
Recommendations

Limestone	Nitrogen (N)	Phosphate (P ₂ O ₅)	Potash (K ₂ O)	Sulfur (S)	Boron (B)	Manganese (Mn)	Zinc (Zn)
0 lbs/Acre	See Comments	30 lbs/Acre	40 lbs/Acre	500 lbs/Acre	--	--	--

Recommended pH: 4.0 to 5.0

pH

– Soil pH and nutrient availability



redrawn by PDA from Troug, E. (1946)

– Soil pH and nutrient availability

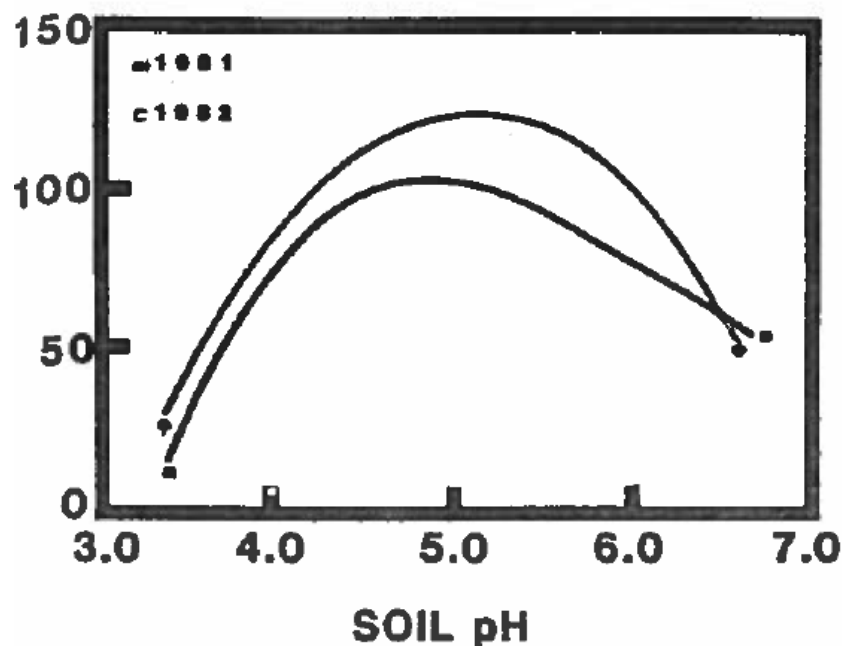


Fig. 1. Influence of soil pH on plant height of rabbiteye blueberries. The appropriate regression equations are: Height 1981 = $-1802 + 1025.9 \text{ pH} - 179.13 \text{ pH}^2 + 10.09 \text{ pH}^3$, and Height 1982 = $-721.1 + 752.4 \text{ pH} - 24.47 \text{ pH}^2$.

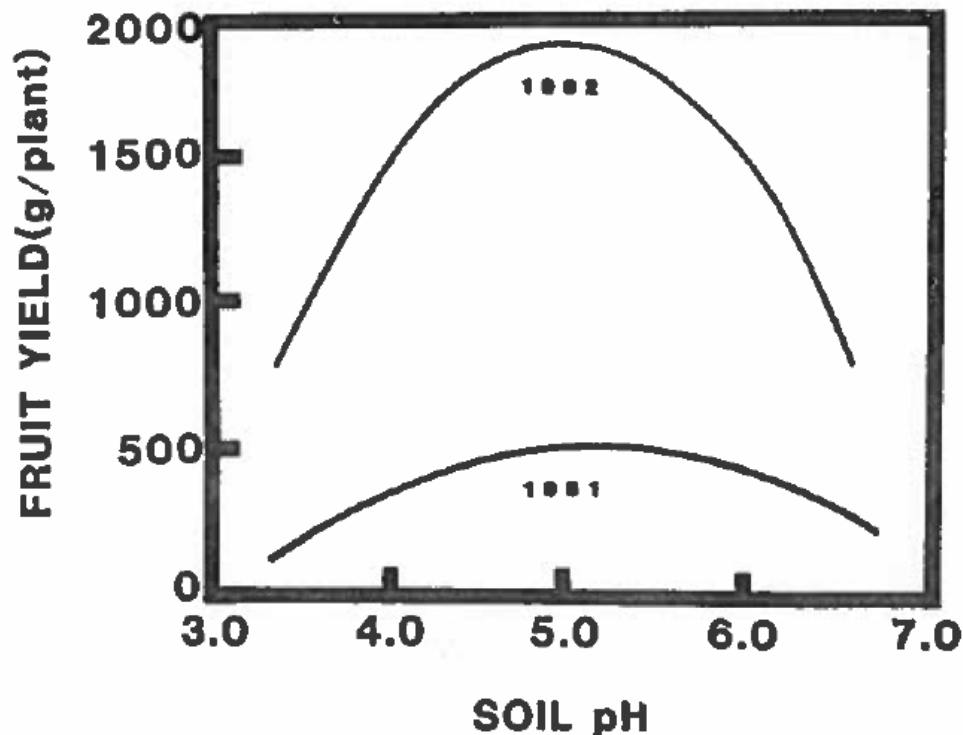


Fig. 3. Influence of soil pH on fruit yields of rabbiteye blueberries.

Spiers, 1984

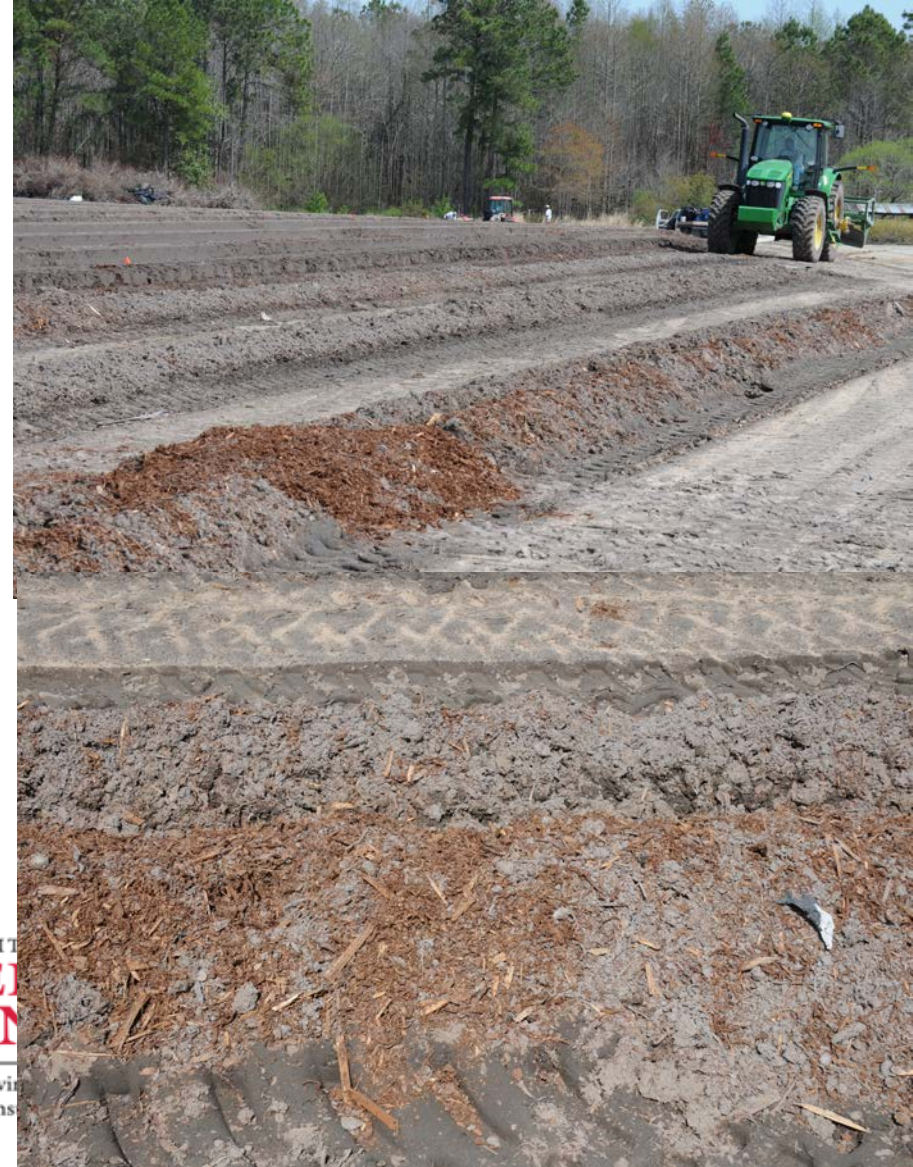
Land Prep: Bedding

- Form bed
 - 18" height
 - 4.0' wide
 - Bed shapers commercially available i.e. Kennco Mfg. Inc, Ruskin, Fl
- Add organic matter
 - Preferably aged fine pine bark
 - Check pine bark for white rocks



Land Prep: Bedding

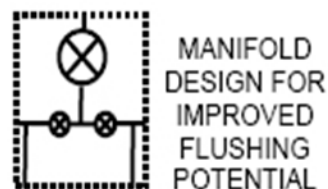
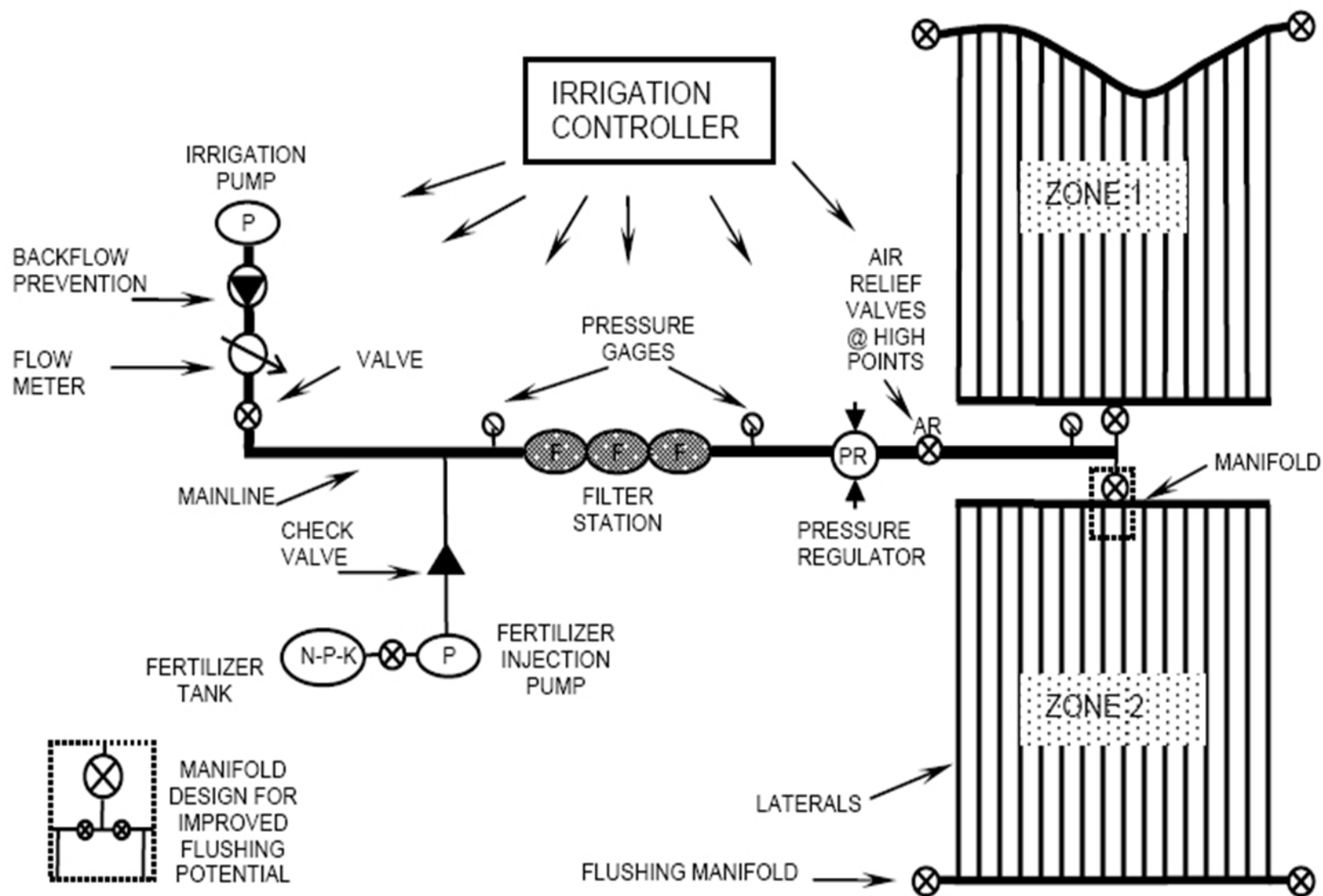
- Incorporate pine bark into the bed or not
- Reform the bed
 - Little things to think about:
 - Grid pattern frost protection lines
 - Flag irrigation risers
 - GPS Guided Tractor!



Land Prep: Bedding

- Irrigation





- Pressure gauges and filtration
 - Importance of water analyses!

Factor	Plugging hazard based on level		
	Slight	Moderate	Severe
pH	<7.0	7.0 to 7.5	>7.5
Dissolved solids (mg/L)	<500	500 to 2000	>2000
Manganese(mg/L)	<0.1	0.1 to 0.5	>0.5
Iron (mg/L)	<0.1	0.1 to 0.5	>0.5
Hydrogen sulfide (mg/L)	<0.5	0.5 to 2.0	>2.0
Hardness (mg/L CaCO ₃)	<150	150 to 300	>300

Adapted from Pitts et al., 2003



<http://www.netafimusa.com>

Bedding

- Mulch
 - Weaved material
 - Plastics
 - Organic Material
 - Pine Bark*
 - Pine Needles
 - Sawdust
 - Wheat Straw
 - Compost



Bedding



Black Up or Down?

Land Prep: Bedding

- Or manage weeds with organic mulch e.g. pine bark and an effective herbicide campaign



Planting

- Row spacing:
 - equipment dependent
 - minimum 10 ft for mechanical harvest
- Plant spacing:
 - minimum of 3 ft





Photos courtesy of Matthew Chappell, Ph.D., UGA



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Planting

- Placement
 - Center of bed and irrigation must wet root zone
 - Dig hole to accommodate roots without 'J' rooting
 - Break up the root ball
- Depth
 - Avoid too deep
 - Avoid too shallow
 - No more than 1" soil above soil line of potted material



Planting

- Water the plants in
 - The root system is at the top of the bed
 - Water frequently, especially in hot dry periods
- Milk carton or planting tubes
 - Minimize herbicide damage
 - training (?)



Photo Courtesy of James Jacobs, UGA Pierce Co.



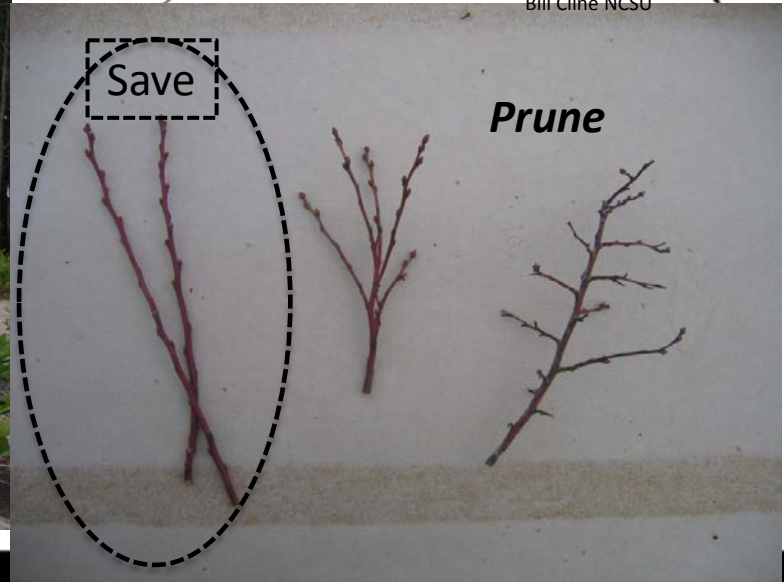
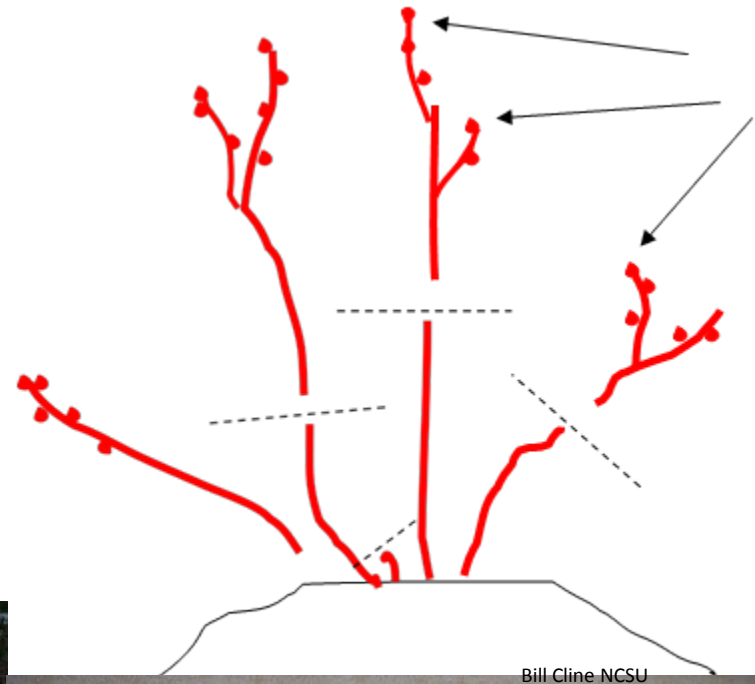
Pruning:

- Blueberry fruits on one year old wood
- Younger wood is more productive
- Light inception
- Air movement through canopy
- Training
- Timing is important



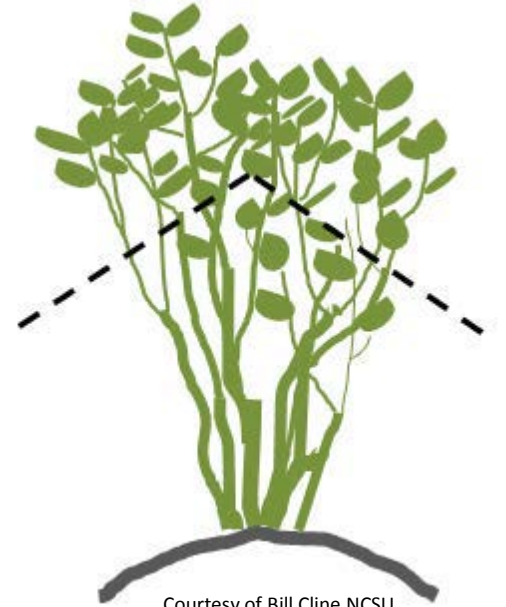
Pruning

- Remove fruiting buds
- Remove weak and twiggy shoots
- Mechanical Harvest?
 - Orange carton
 - Upright Growth Habit



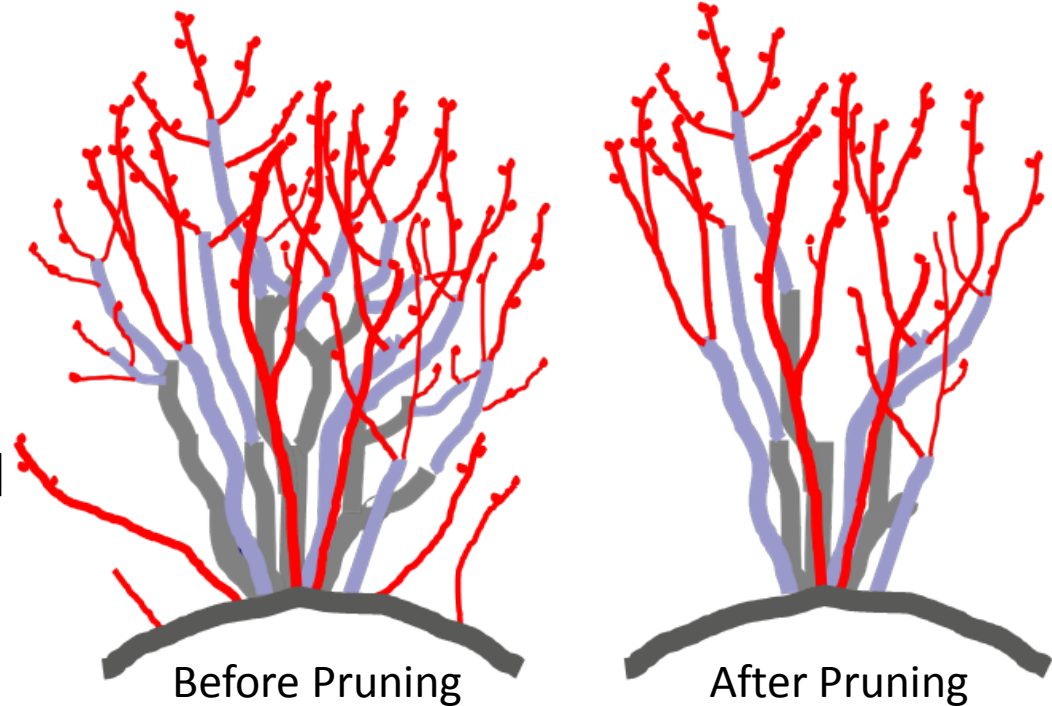
Pruning

- Summer Pruning SHB in Southeast
 - Post harvest (soon after)
 - Hedging cuts
 - Vigor control
 - Height control



Pruning

- Winter, Early Spring
 - Structural Cuts
 - Old Wood
 - Select renewal shoots
 - Remove low-angled and undesirable shoots that impede mechanical harvest
 - After any pruning apply a fungicide



Courtesy of Bill Cline NCSU

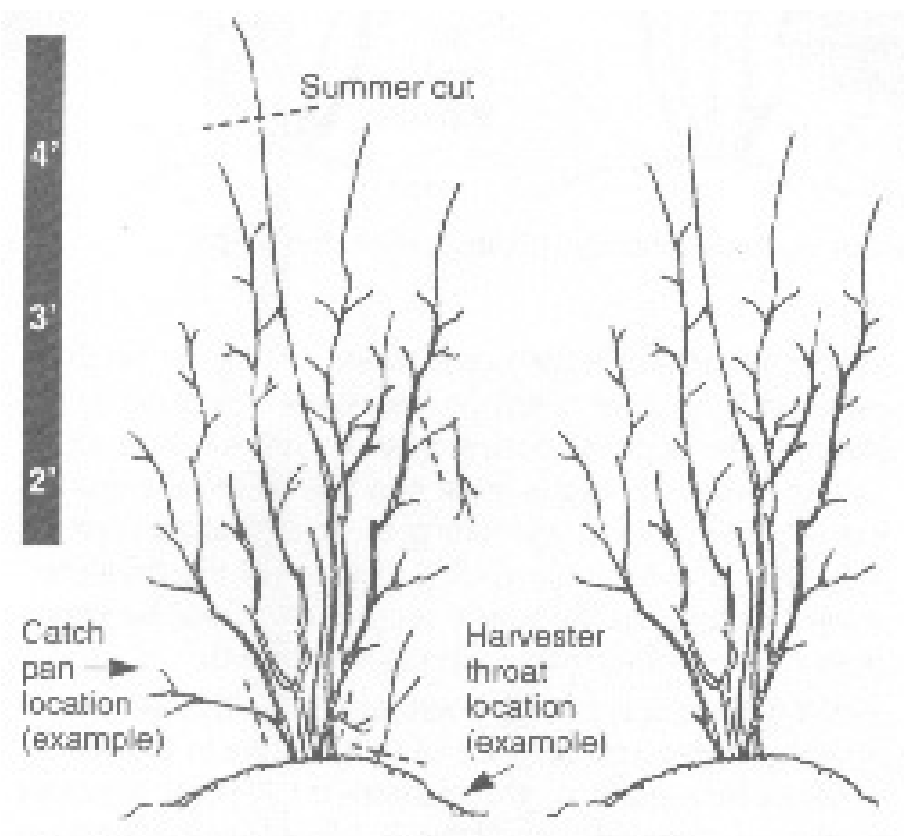
Pruning: Mechanical Harvest



Courtesy of Jeff Williams, UFI

Pruning: Mechanical Harvest

- SHB has the nasty habit of losing production through its life.
 - Severe pruning is being utilized to invigorate the plants
 - Labor is also forcing pruning to shorter stature
 - Moves people through the orchard faster



Pruning



Nutrition

- Nitrogen:
 - NH_4^+ vs. NO_3^-
 - NH_4^+ considered preferred source: ammonium sulfate or urea
 - NO_3^- is considered limiting because of low nitrate reductase activity
 - Soil pH, blueberry adaptation to low pH, and chemical reactivity, acid/base.

Nutrition

- First year non irrigated
 - 1 oz by wt 10-10-10 per plant
 - Bud break
 - July
 - August
- First year irrigated
 - 1 oz by wt 10-10-10
 - Bud break
 - May
 - July
 - August



Spread the fertilizer evenly
in a 24 inch circle

Table 2. Rabbiteye blueberry hand applied fertilization with 10-10-10, 12-4-8, 16-4-8 or ammonium sulfate. Years two through six.

Age of Plant	Plant Height	Plant Diameter	Amount of fertilizer per plant per application-use soil test to determine which material to use				Applications Per Year
1st Year	) 1 foot		(See previous recommendations)				
			10-10-10	12-4-8	16-4-8	Ammonium sulfate (summer application if no P and K needed)	
2nd year	) 2 feet	24"	1.5 oz	1.2 oz.	.93 oz.	.71 oz.	3 or 4
3rd year	) 3 feet	30"	3.0 oz.	2.5 oz.	1.9 oz.	1.4 oz.	2 or 3
4th year	) 4 feet	36"	4.5 oz.	3.7 oz.	2.8 oz.	2.1 oz.	2 or 3
5th year	) 5 feet	42"	6 oz.	5 oz.	3.75 oz.	2.9 oz.	2
6th year	) 6 feet	48"	8 oz.	6.7 oz.	5 oz.	3.8 oz.	2

Fertilizing rabbiteye blueberries with banded applications in years four through six (four to six feet tall) based on row spacing and plant density

2015 Southeast Regional Blueberry Integrated Management Guide

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

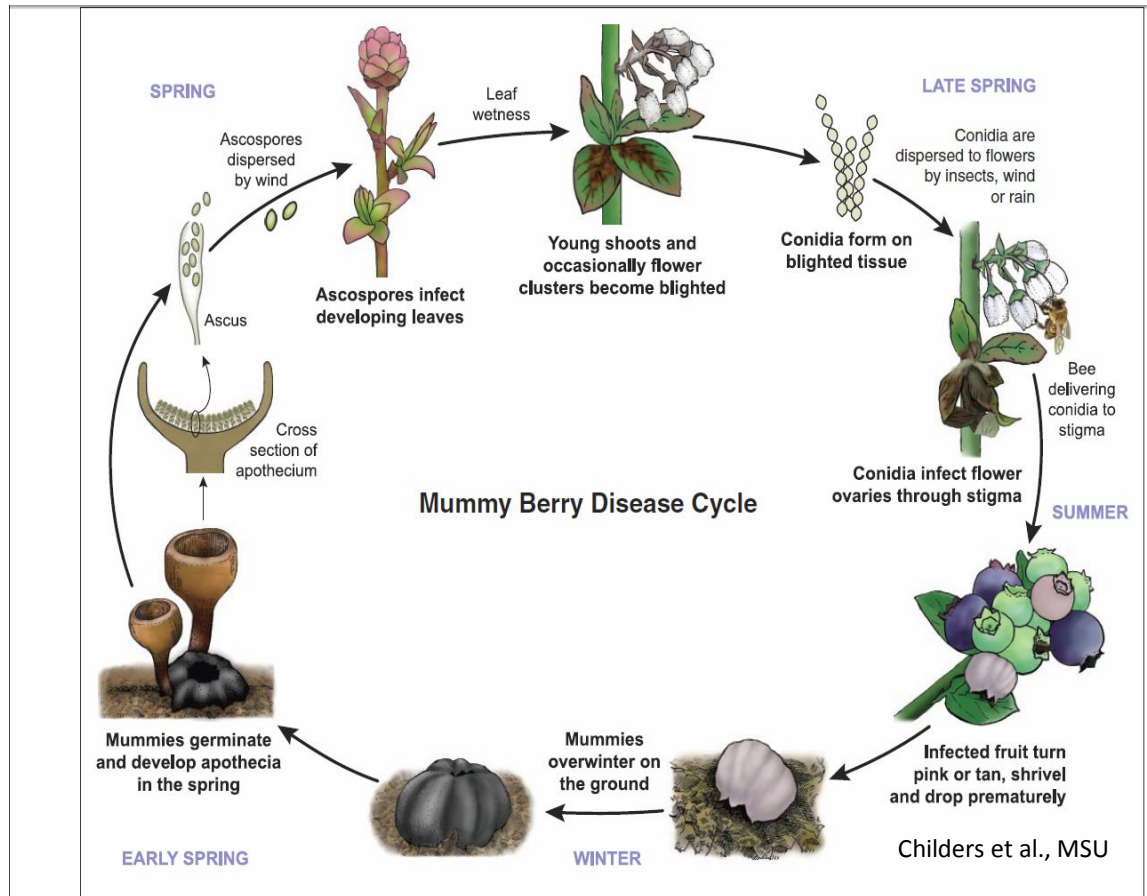
Because environmental conditions and grower application methods vary widely, suggested use does not imply that performance of the pesticide will always conform to the safety and pest control standards indicated by experimental data.

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.

[**http://www.smallfruits.org/**](http://www.smallfruits.org/)

Disease, Pests, and Weeds

- Mummy Berry
 - Cleanliness
 - Spray Timing



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.

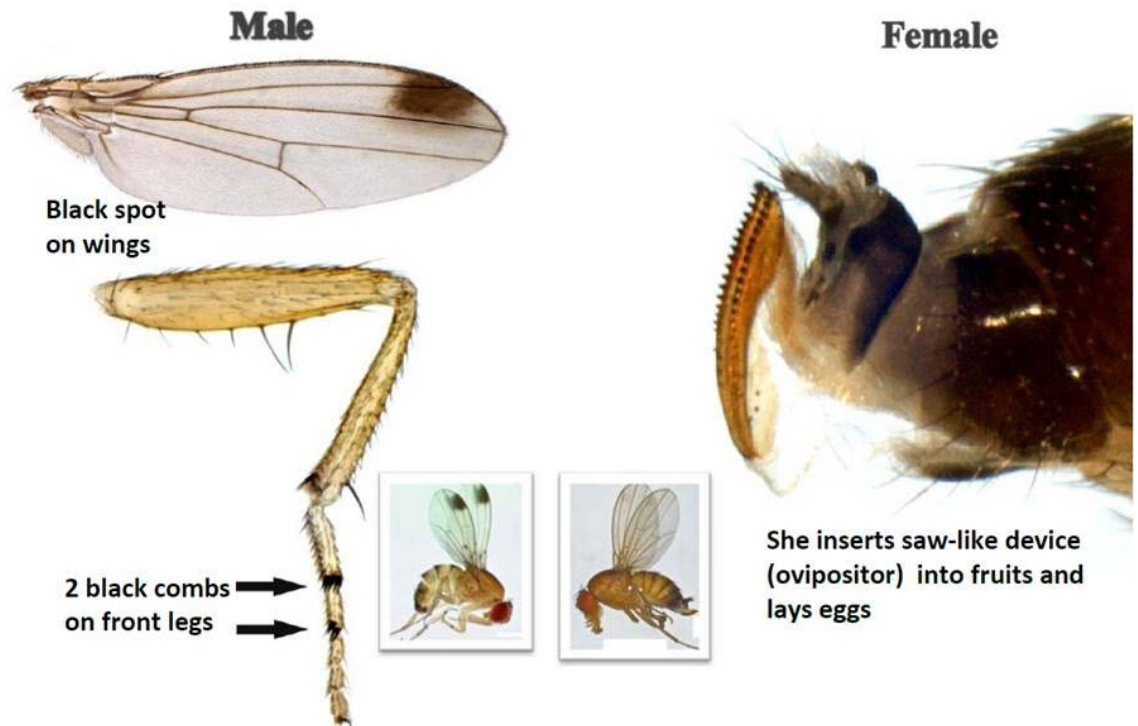
Blueberries are a pollination-sensitive crop; insecticide-related injury to bees can impair pollination and ruin fruit set. **Exercise caution when applying any pesticide during bloom to minimize impact to pollinators. Insecticides should not be applied during bloom. All pesticide (including fungicide) applications should be made when bees are not actively foraging and to allow maximum drying time (evening/dusk).**

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	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 till all blooms have fallen.					
	pyraclostrobin + boscalid <i>FRAC 11 + 7</i> (Pristine WG)	18.5 to 23 oz	++++	24 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Pristine per acre per crop year.
	fenbuconazole <i>FRAC 3</i> (Indar 2F)	6.0 fl oz	+++++	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 4 applications or apply more than 24 oz of Indar 2F (0.38 lb active) 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> (Orbit 3.6E, Tilt 3.6E, Bumper 41.8 EC, PropiMax EC)	6.0 fl oz	+++++	24 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.

Disease, Pests, and Weeds

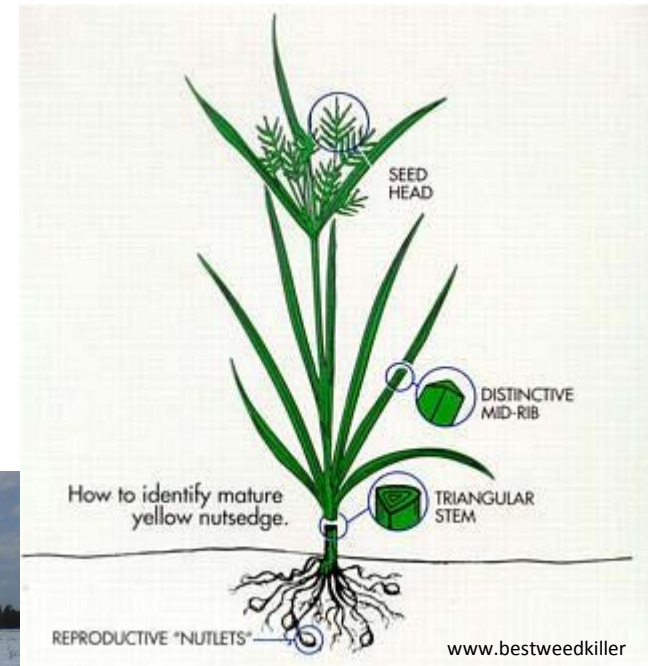
- Spotted Winged Drosophila
 - Affects Ripe Fruit
 - Spray Timing

SWD Identification – key characters



Disease, Pests, and Weeds

- Nutsedge
 - Competes for nutrients
 - Plastic Not effective



Thank you

