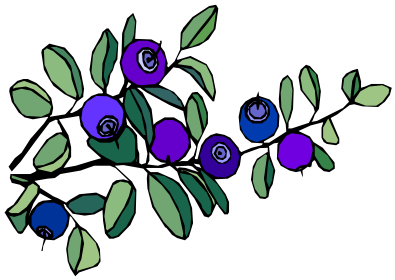
2005 New England
Highbush Blueberry Crop Profile



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This profile is a comprehensive list of pests that may be encountered by New England ***highbush blueberry*** growers, and the approved pesticides that may be used to control them. Only a few pests actually require treatment on an individual farm in a single year. For each pest all of the available effective options are listed. If treatment is needed, only one of those options would be used per application. Some pests require multiple applications for control; others only require a single application.

Special thanks to the editors of the ***New England Small Fruit Pest Management Guide 2003-2004*** for providing cultural practices, damage and control information.

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Introduction

Information in this crop profile was collected by a survey distributed to New England growers in the fall of 2003. A Dillman survey methodology was used to design and conduct the survey. Most percent values in this document have been rounded for ease of reporting.

Survey Timeline

Preliminary Card Notice sent to over 350 growers	July 2003
High bush Blueberry Survey sent to 356 growers in 6 states	August 2003
Reminder card sent to 226 growers in 5 states	September 2003
Second High Bush Blueberry survey sent to 204 growers in 6 states	September 2003
Data Entry Complete	December 2003
Survey Summary Complete	August 2005

Summary of Survey Returns

(December 2003)

State	#Surveys Sent	#Surveys Returned	%Return	#Growing High Bush Blueberry	#High Bush Acres
CT	42	20	48	5	47
MA	145	105	72	68	209
ME	42	27	64	10	4
NH	87	58	67	15	52
RI	10	3	30	3	28
VT	24	18	75	13	54
Total	**350**	**231**	**66**	**114**	**394**

I. Basic Commodity Information

Production Statistics

	New England
Rank in National Production: (6 states considered as a single unit)	8th
Percent U.S. Production:	2.7%
Acres Planted:	1426
Tons Harvested:	1853.8 tons
Cash Value:	$7.2 million
Crop Destination(s):	U-Pick 63% Wholesale 25% Retail 11% Processing<1% Other <1%
Production Regions:	Connecticut Massachusetts New Hampshire Maine Rhode Island Vermont

Cultural Practices

New England is considered the northern edge of the climatic zone in which highbush blueberries can be grown. As a result, a number of disease problems associated with cold stress are more common here than in other blueberry growing areas. Average plant density is 863 plants per acre.

The ideal blueberry soil is a well-drained, yet moist sandy loam soil with a pH of 4.5 to 5.2. The blueberry has fine, fibrous roots near the soil surface that lack root hairs, so the root system has a relatively low absorptive capacity. Blueberry roots are unable to penetrate compacted soils and have limited tolerance to excessively wet or dry soils.

The shallow root system is sensitive to both high and low temperature extremes. A permanent organic mulch (wood chips, bark, sawdust, pine needles) layer 3 to 4 inches thick is required to protect roots from high temperature injury in summer and cold temperature injury in winter and to reduce moisture stress.

Worker Activities

Notes on timing, importance, and worker exposure to pesticide residue.
REI = Reentry interval

Pruning

99% of respondents reported this activity

Dormant Pruning	88%
Removal of old Canes	73%
Detailed Pruning	54%
Summer Pruning	7%
Picking of blossoms	<1%
Fall pruning	<1%

- Used to maintain a balance between vegetative growth and fruit production that allows for adequate penetration of sunlight, chemical treatments, and air flow.
- Summer pruning involves extensive contact with foliage. Wearing protective clothing can be problematic in summer heat, and heat stroke risk poses more immediate and severe health concerns than pesticide exposure.
- While there is usually some flexibility for timing summer pesticide sprays, prolonged REIs create scheduling problems for summer pruning which must be done within a time window of a few weeks.

Mowing, Cultivation, and Mulching

- Methods used to suppress weeds, conserve soil water and nutrients, reduce humidity to discourage fungal diseases, maintain ground conditions for conducting summer pruning and harvest operations efficiently, and discourage voles and other pests.
- Mulching also is required to protect roots from high temperature injury in summer and cold temperature injury in winter. Mulch is maintained one to two times per year depending on need.
- Cultivation and mowing are done four to six times per growing season depending on need.
- All methods involve very little contact with treated bark and foliage. There is potential for operators to brush against foliage. Pesticide exposure is minimal.

Irrigation

- Becoming increasingly important for new plantings in order to maximize early growth and returns. The need for irrigation is not always predictable.
- Irrigation may begin early in the growing season and can extend into September.
- While there is usually some flexibility for timing summer pesticide sprays, prolonged REIs create scheduling and maintenance problems to get this important work done.

Fertilization

- Leaf tissue analysis and soil sampling are used to determine fertilizer needs once per year or every one to three years.

Leaf tissue analysis	44% of respondents reported this activity
1 time each year	18%
More than 1 time each year	<1%
Every other year	6%
Every third year	14%
Every 4 years	<1%
Every 5 years	<1%

Soil sampling	50% of respondents reported this activity
1 time each year	17%
More than 1 time each year	<1%
Every other year	11%
Every third year	18%
Every 5 years	3%

- Fertilizer is generally applied in a split application of nitrogen, the first is applied at bloom and the second one month later.
- Fertilizing involves very little contact with treated bark and foliage. There is potential for operators to brush against foliage. Pesticide exposure is minimal.

II. Pest Management Overview

- 84% of respondents reported spraying for diseases and viruses an average of 2 times per year.
- 90% of respondents reported spraying for insects an average of 1.7 times per year.
- 86% of respondents reported spraying for weeds an average of 1.2 times per year.
- 70% of respondents reported spraying for mites an average of 0.2 times per year.

Factors considered when choosing pesticides for use	% of Respondents Reporting	Importance
Effectiveness (how well it does the job)	80%	92% very 7% somewhat 1% not
Toxicity of materials available (to self, family, employees)	81%	88% very 9% somewhat 3% not
Phytotoxicity (potential for injury to crop)	78%	89% very 9% somewhat 2% not
Potential environmental impacts	80%	84% very 12% somewhat 4% not
Impact on non-target organisms including beneficials	77%	72% very 24% somewhat 5% not
Safety of packaging (such as water soluble bags, etc)	77%	50% very 32% somewhat 19% not
Cost per Acre/Unit	76%	44% very 44% somewhat 13% not

III. Insects and Mites

Group A – Insect and mite pests identified by survey as most important

Notes for all following pesticide tables: Some survey respondents reported occurrence of pest but did not give a rating for frequency. Thus the percentage of respondents reporting occurrence may be greater than the sum of percentages for different frequency ratings More than one material may be used during a growing season, or not all growers may treat for a pest, the percentage of respondents reporting use of listed materials may not add up to 100%. Only those pesticides listed by growers in survey are included in these tables.

Blueberry Maggot

Type of Pest: Insect
Frequency of Occurrence: 83% of respondents reported this pest occurring.

routine annual control	44%
occasional control	9%
rarely a problem	21%
never a problem	26%

Damage Caused: Maggots feeding within developing fruits renders fruit unmarketable. Berries become soft and mushy. Undetected infested berries contaminate pack-out.
% Acres Affected: 5%
Timing of Control: Apply protective insecticide when berries begin to turn blue or when flies begin to lay eggs, usually late June. Maintain protection until harvest.
Yield Losses: 30% without management, 5% with management
Regional Differences: None identified
Cultural Control Practices: In small plantings, it may be possible to trap this insect out with sufficient trap density

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Red Sticky Traps	3%	67% good
NuLure Insect Bait	1%	200% excellent
Yellow sticky trap	1%	100% excellent
Various traps	2%	50% good 50% poor
Hand removal	2%	50% good
100% harvest of berries	1%	100% good
Trap crop wild raspberries	1%	100% good

*Written-in information from survey

Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Blueberry Maggot

48% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Guthion	11%	69% full 31% reduced	69% excellent 8% good 8% poor	First cover* 2nd+ cover**	7	2-21 days	
Imidan	20%	74% full 26% reduced	78% excellent 9% good 4% poor	First cover 2nd+ cover	3	24 hrs	
Malathion	19%	64% full 36% reduced	41% excellent 41% good 9% poor	First cover 2nd+ cover	1	12 hrs	
Pyrenone	2%	50% full	50% good 50% poor	First cover 2nd+ cover	0.5	12 hrs	
Pyrellin	1%	100% reduced	100% good	First cover 2nd+ cover	0	12 hrs	
Sevin	17%	79% full 21% reduced	32% excellent 37% good 5% poor	First cover 2nd+ cover	7	12 hrs	
Other Pesticides Reported* **							
Garlic/Pyrethrin	1%						
Indar	1%	100% full	100% excellent				
Neem	1%	100% full	100% good				

*First cover = about 10 days after petal fall; some berries begin to color
**2nd+ cover = 10 days from previous cover, repeat as needed
***Written-in information from survey

Cranberry Fruitworm

Type of Pest: Insect
Frequency of Occurrence: 71% of respondents reported this pest occurring.

routine annual control	25%
occasional control	17%
rarely a problem	20%
never a problem	37%

Damage Caused: Found within developing and ripening berries. Feeding reduces the crop and spoils marketability of the berries.
% Acres Affected: 3%
Timing of Control: When damage is severe, treat in the following year with insecticide.
Yield Losses: 20%
Regional Differences: None identified
Cultural Control Practices: Effectively controlled by picking off infested berries, which are easily detected because of the webbing and their early ripening. This method is still practical in small plantations with light infestations. Elimination of weeds and dead plant material around blueberry plants cuts down on overwintering protection for cocoons.

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Red Sticky Traps	1%	100% poor
Traps	1%	100% poor
Handpicking	1%	100% good
Harvested infested fruit	1%	100% good

*Written-in information from survey

Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Cranberry Fruitworm

35% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Biobit	0%			Petal fall First cover*	0	4 hrs	Apply when newly hatched larvae (1st or 2nd instar) begin feeding.
Diazinon	2%	100% full	100% good	Petal fall First cover	7	24 hrs	

DiPel	0%			Petal fall First cover	0	4 hrs	Apply when newly hatched larvae (1st or 2nd instar) begin feeding.
Guthion	6%	71% full 29% reduced	29% excellent 43% good 14% poor	Petal fall First cover	7	2-21 days	
Imidan	13%	80% full 20% reduced	67% excellent 33% good	Petal fall First cover	3	24 hrs	
Lannate	1%	100% full	100% good	Petal fall First cover	3	2-7 days	Restricted use; do not apply more than 3.6 ai per acre or make more than 4 applications.
Malathion	9%	50% full 30% reduced	30% excellent 50% good	Petal fall First cover	1	12 hrs	
Methoxychlor	0%			Petal fall First cover	14	12	
Pyrenone	1%	100% full	100% good	Petal fall First cover	0.5	12 hrs	
Sevin	5%	33% full 33% reduced	67% excellent	Petal fall First cover	7	12 hrs	
Other Pesticides Reported**							
Entrust	1%		100% good				
Neem	1%	100% full	100% good				
Garlic Oil	1%	<1% full					

*First cover = 7-12 days after petal fall

**Written-in information from survey

Group B – Insect and mite pests identified by survey as significant problems in some years

Blueberry Tip Borer

Type of Pest: Insect
Frequency of Occurrence: 72% of respondents reported this pest occurring.

routine annual control	13%
occasional control	16%
rarely a problem	34%
never a problem	34%

Damage Caused: In June, before new growth has begun to harden, infested shoots may begin to wilt, arch over, and become discolored, the leaves turning yellowish with red veins and the stems purplish. This injury results in the destruction of the stem's fruit-production potential in the following year.
% Acres Affected: 0%
Timing of Control: The standard spray program used for other insect pests normally keeps this pest under control.
Yield Losses: Unknown
Regional Differences: None identified
Cultural Control Practices: Prune out damaged tips as observed and burn infected canes.

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Cut below tunnels	1%	100% poor
Summer Pruning	4%	20% excellent 20% good 20% poor

*Written-in information from survey

Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Blueberry Tip Borer

22% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Biobit	0%				0	4 hrs	
DiPel	0%				0	4 hrs	
Guthion	4%	50% full 50% reduced	25% excellent 50% good		7	2-21 days	

			25% poor				
Imidan	6%	57% full 43% reduced	43% excellent 43% good 14% poor		3	24 hrs	
Malathion	6%	57% reduced	71% good		1	12 hrs	
Pyrenone	0%				0.5	12 hrs	
Sevin	4%	50% full	25% good		7	12 hrs	

Scale Insects

Type of Pest: Insect
Frequency of Occurrence: 69% of respondents reported this pest occurring.

routine annual control	11%
occasional control	11%
rarely a problem	37%
never a problem	39%

Damage Caused: Infestations can result in reduced vigor and yield of bushes by feeding on the plant's sap.
% Acres Affected: 10%
Timing of Control: During dormancy or delayed dormancy, apply superior-type oil. Treat from March 1 to first bloom.
Yield Losses: 3%
Regional Differences: None identified
Cultural Control Practices: Good pruning is the first step in control of scales on blueberries. Prune out weakened canes.

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Pruning	2%	50% good
Lady bugs	1%	100% excellent

*Written-in information from survey

Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Scale Insects

8% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Superior oil	5%	67% full 33% reduced	67% excellent 17% good	Dormant/ delayed dormant	-	4 hrs	Apply oil only when no danger of freezing temperatures within 24 hours.
SunSpray Ultra-fine Oil	4%	75% full 25% reduced	25% excellent 75% good	Dormant/ delayed dormant	-	4 hrs	Apply oil only when no danger of freezing temperatures within 24 hours.

Plum Curculio

Type of Pest: Insect
Frequency of Occurrence: 67% of respondents reported this pest occurring.

routine annual control	15%
occasional control	9%
rarely a problem	24%
never a problem	51%

Damage Caused: Found on developing flower buds and later on developing berries. The larva bores into the fruit and eats its contents. As a result, a prematurely ripened fruit drops off the bush. This feeding activity on buds and fruit reduces yield.
% Acres Affected: 10%
Timing of Control: Spray applications made at petal fall to control cranberry or cherry fruitworm are also likely to control Plum Curculio.
Yield Losses: 3%
Regional Differences: None identified
Cultural Control Practices: None identified

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Harvested infested fruit	1%	

*Written-in information from survey

Biological Control Practices: Plum curculio are more abundant where blueberries are located near tree fruit. If possible, plant blueberries away from tree fruit.
Postharvest Control Practices: None identified

Chemical Controls for Plum Curculio

17% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Guthion	5%	50% full 33% reduced	67% excellent 33% good		7	2-21 days	
Imidan	9%	70% full 10% reduced	20% excellent 70% good		3	24 hrs	
Sevin	6%	29% full 43% reduced	14% excellent 57% good		7	12 hrs	
Other Pesticides Reported*							
Neem	1%	100% reduced	100% good				

*Written-in information from survey

Cherry Fruitworm

Type of Pest: Insect
Frequency of Occurrence: 64% of respondents reported this pest occurring.

routine annual control	12%
occasional control	12%
rarely a problem	23%
never a problem	51%

Damage Caused:
% Acres Affected:
Timing of Control: When damage is severe, treat in the following year with insecticide. Apply when newly hatched larvae (1st or 2nd instar) begin feeding.
Yield Losses: Unknown
Regional Differences: None identified
Cultural Control Practices: Disking between rows and raking and hoeing under plants is helpful for management. In small plantings remove and destroy infested fruit, which turns prematurely blue

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Harvested infested fruit	1%	100% good

*Written-in information from survey

Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Cherry Fruitworm

27% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Biobit	0%			Petal fall First cover*	0	4 hrs	
DiPel	0%			Petal fall First cover	0	4 hrs	
Guthion	5%	50% full 50% reduced	50% excellent 33% good 17% poor	Petal fall First cover	7	2-21 days	

Imidan	7%	75% full 13% reduced	38% excellent 50% good	Petal fall First cover	3	24 hrs	
Malathion	8%	33% full 33% reduced	22% excellent 44% good	Petal fall First cover	1	12 hrs	
Pyrenone	0%			Petal fall First cover	0.5	12 hrs	
Sevin	4%	40% full 20% reduced	20% good	Petal fall First cover	7	12 hrs	
Other Pesticides Reported**							
Garlic Oil	1%						
Neem	1%		100% good				

*First cover = 7-12 days after petal fall
**Written-in information from survey

White Grubs

Type of Pest: Insect
Frequency of Occurrence: 67% of respondents reported this pest occurring.

routine annual control	8%
occasional control	11%
rarely a problem	34%
never a problem	46%

Damage Caused: The grubs consume feeder roots and may also girdle or clip off larger roots. The reduced root system cannot provide enough water to the plant. Damaged bushes show low vigor and reduced production. Adults, especially the Japanese beetle and rose chafer, sometimes become serious pests by consuming leaves, scarring the berries, and contaminating the harvest.
% Acres Affected: 5%
Timing of Control:
Yield Losses: 5%
Regional Differences: None identified
Cultural Control Practices: Growers should check new sites for white grubs before establishing a field, and take actions against grubs before planting. Remove webbed twigs and webworm caterpillars. Remove beetles.

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Pick off beetles	3%	67% good 33% poor
Japanese Beetle traps	9%	40% excellent 20% good 10% poor
Nematodes	1%	100% poor
Trap crop	1%	100% excellent
Bird Netting	1%	100% good

*Written-in information from survey

Biological Control Practices: There is great interest in the use of pathogenic nematodes as biological control agents for the grubs.
Postharvest Control Practices: None identified

Chemical Controls for White Grubs

26% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Imidan	3%	67% full 33% reduced	33% excellent 67% good	2nd+ cover*	3	24 hrs	

Malathion	8%	56% full 22% reduced	22% excellent 33% good 33% poor		1	12 hrs	
Sevin	10%	36% full 45% reduced	18% excellent 55% good 9% poor	2nd+ cover	7	12 hrs	
Other Pesticides Reported**							
Milky Spore	1%						
Mach	1%		100% poor				
Admire	2%	50% full	100% excellent				

*2nd+ cover = 10 days from previous cover, repeat as needed
**Written-in information from survey

Group C – Insect and mite pests identified by survey as infrequent problems

Aphids

Type of Pest: Insect
Frequency of Occurrence: 68% of respondents reported this pest occurring.

routine annual control	5%
occasional control	14%
rarely a problem	31%
never a problem	48%

Damage Caused: Virus vectors
% Acres Affected: 5%
Timing of Control: NA
Yield Losses: 3%
Regional Differences: None identified
Cultural Control Practices: None identified
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Blueberry Bud Mite

Type of Pest: Mite
Frequency of Occurrence: 64% of respondents reported this pest occurring.

routine annual control	4%
occasional control	8%
rarely a problem	29%
never a problem	58%

Damage Caused: Bud mites feed on the surface of the bud tissues and bud scales. Injured buds desiccate and usually produce distorted flowers. These flowers may fail to set fruit, or develop into fruit with rough skins.
% Acres Affected:
Timing of Control: Plants should be inspected for bud mites in September, before the new buds are well formed. Apply immediately after harvest is complete and repeat according to label instructions.
Yield Losses: Unknown
Regional Differences: None identified
Cultural Control Practices: Pruning of infested canes provides good control of bud mites.
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Blueberry Bud Mite

1% of crop reported treated for this pest in 2002

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Phaser	0%			Post-harvest	-	24 hrs	Do not apply after buds are well formed; do not apply more than 2 times per year; do not exceed 3 lbs active ingredient per acre per year.
Thiodan	0%			Post-harvest	-	48 hrs	Do not apply after buds are well formed; do not apply more than 2 times per year; do not exceed 3 lbs active ingredient per acre per year.
Thiodan/ Cottonseed oil	0%				-	-	
Other Pesticides Reported*							
Guthion	1%	100% reduced	100% good				

*Written-in information from survey

Other

Mites: 4% of respondents reported this pest occurring.
Japanese Beetles: 15% of respondents reported this pest occurring.
Wasps: 2% of respondents reported this pest occurring.
Gypsy Moths: 2% of respondents reported this pest occurring.
Canker Worms: <1% of respondents reported this pest occurring.
White Moths: <1% of respondents reported this pest occurring.

IV. Diseases

Group A – Diseases identified by survey as most important

Mummy Berry

Type of Pest: Fungus
Frequency of Occurrence: 80% of respondents reported this pest occurring.

routine annual control	56%
occasional control	13%
rarely a problem	18%
never a problem	13%

Damage Caused: Attacks new growth, foliage and fruit. Spores infect young tissue and cause rapid wilting. Developing fruit becomes malformed and turns salmon or grey by midsummer. By fall, these fruit have dropped to the ground where they turn to mummies.
% Acres Affected: 20%
Timing of Control:
Yield Losses: 30% without management, 5% with management
Regional Differences: None identified
Cultural Control Practices: Mummies can be raked up and burned or buried by cultivating between rows or by covering with a new layer of mulch at least 2" in thickness. The cultivation should be done just as apothecia start to emerge in the spring, which usually coincides with bud-break in the blueberry bushes. Cultivars exhibiting resistance to the shoot blighting phase of the disease include Jersey, Elliott, Bluejay, Duke, Stanley and Darrow.

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Mulch	5%	33% excellent 17% good
Handpick	4%	25% excellent 75% good
Application of Urea	3%	33% excellent 33% good 33% poor
Pruning	2%	
Handweed	1%	100% poor
Sawdust	1%	
Handrake	1%	

*Written-in information from survey

Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Mummy Berry

56% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Benlate	9%	70% full 30% reduced	50% excellent 40% good		-	-	
Captan	19%	73% full 23% reduced	32% excellent 36% good 5% poor	Early-mid bloom	0	4 days	
Captan plus Benlate	13%	73% full 27% reduced	33% excellent 53% good		-	-	
Captec	7%	75% full 25% reduced	38% excellent 38% good 13% poor	Early-mid bloom	0	72 hrs	
Chlorothalonil (Bravo)	2%	100% full	100% excellent	Dormant/ delayed dormant Early-mid bloom	42	12 hrs	
Indar	9%	60% full 30% reduced	60% excellent 20% good	Dormant/ delayed dormant Early-mid bloom	30	12 hrs	Labeled for this use on a state by state basis.
Orbit	11%	77% full 23% reduced	46% excellent 31% good 8% poor		-	24 hrs	
Ziram	0%			Early-mid bloom	ns	48 hrs	Apply at loose bud scale stage followed 7 days later. Do not apply later than 3 weeks after full bloom.
Other Pesticides Reported*							
Funginex	2%	100% full	50% excellent 50% good				
Switch	2%	50% full	50% excellent <1% good 50% poor				
Neem	1%	100% full	100% good				
Liquid Sulfur	1%	100% full	100% good				

ns=not specified

*Written-in information from survey

Phomopsis Twig Blight

Type of Pest: Fungus
Frequency of Occurrence: 68% of respondents reported this pest occurring.

routine annual control	33%
occasional control	19%
rarely a problem	19%
never a problem	27%

Damage Caused: Infects blueberry stems causing dieback and plant decline. Younger tissue may show no symptoms at first, then exhibit rapid wilting and dieback. Lesions may appear on the stems. Leaf spots have also been observed where disease is particularly severe. The disease will cause premature ripening of the berries.
% Acres Affected: 20%
Timing of Control:
Yield Losses: 5%
Regional Differences: None identified
Cultural Control Practices: Since mechanical damage and cold stress seem to be necessary for infection, avoid careless pruning and cultivating, and do not fertilize late in the summer. Keep the plants well-watered through prolonged periods of dry weather. Avoiding any stresses will help prevent this disease. Cultivars which appear to be more resistant include Bluejay, Jersey, Duke, Pioneer, Darrow, Elliott, Stanley, Bluetta, Wareham, Rubel, Cabot, Rancocas and Pemberton. Prune out affected canes.

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Pruning	2%	100% good

*Written-in information from survey

Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Phomopsis Twig Blight

26% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Benlate	6%	86% full 29% reduced	14% excellent 86% good		-	-	
Bravo	1%	100% full	100% good		42	12 hrs	
Lime Sulfur	15%	65% full 29% reduced	18% excellent 53% good 12% poor	Dormant/ delayed dormant Post-harvest	0	48 hrs	Use only once in spring. Do not use within 14 days of an oil spray or when temperatures are above 75½F. May apply in late October or when 2/3 of leaves drop on Weymouth and Berkeley.
Ziram	0%			Dormant/ delayed dormant	ns	48 hrs	Apply at loose bud scale stage, followed 7 days later. Do not apply later than 3 weeks after full bloom.
Other Pesticides Reported*							
Orbit	1%	100% full	100% excellent				
Captec	1%	100% full	100% excellent				
Topsin	1%	100% full	100% excellent				

ns=not specified

*Written-in information from survey

Anthracnose

Type of Pest: Fungus
Frequency of Occurrence: The disease is especially prevalent during hot muggy weather and frequently occurs post-harvest. Occurs only sporadically and especially during seasons with frequent rain and warm temperatures.

70% of respondents reported this pest occurring.

routine annual control	35%
occasional control	8%
rarely a problem	26%
never a problem	30%

Damage Caused: Primarily damages fruit but may also infect twigs and spurs. Blossoms, mature fruit and succulent tissue are infected. Blossom clusters will turn brown or black. Stem cankers are rare. Young girdled stems die back, resulting in a brown withering of the leaves. Salmon or rust colored berry rot can ruin fruit quality. Infested fruit often exhibit a soft, sunken area. Spores spread to "good" fruit during and after harvest, causing significant post-harvest losses.
% Acres Affected: 5%
Timing of Control:
Yield Losses: 3%
Regional Differences: None identified
Cultural Control Practices: Pruning old canes and small twiggy wood for optimal air circulation and harvesting frequently are beneficial. Varieties in which the fruit hangs ripe for a long time on the bush prior to picking are especially susceptible. No varieties may be resistant when the weather conditions are favorable for the disease.

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
100% harvest	1%	

*Written-in information from survey

Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Anthracnose

41% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Aliette	0%			Petal fall First cover* 2nd+ cover**	0	12 hrs	
Captan	13%	60% full 27% reduced	20% excellent 47% good 27% poor	Early-mid bloom First cover 2nd+ cover	0	4 days	
Captan plus Benlate	10%	45% full 27% reduced	18% excellent 45% good 9% poor		-	-	
Captec	6%	71% full 29% reduced	57% excellent 43% good	Early-mid bloom Petal fall First cover	0	72 hrs	
Chlorothalonil (Bravo)	0%			Early-mid bloom	42	12 hrs	
Rovral	0%						
Ziram	0%			Early-mid bloom	ns	48 hrs	Apply at loose bud scale stage followed 7 days later. Do not apply later than 3 weeks after full bloom.
Other Pesticides Reported* **							
Topsin	2%	50% full	50% excellent 50% good				
Lime sulfur	2%	100% full	50% excellent 50% good				

ns=not specified

*First cover = about 10 days after petal fall; some berries begin to color

**2nd+ cover = 10 days from previous cover, repeat as needed

*Written-in information from survey

Botrytis Blight

Type of Pest: Fungus
Frequency of Occurrence: It is present every year, but only causes severe damage during cool, wet periods several days in duration.

68% of respondents reported this pest occurring.

routine annual control	27%
occasional control	13%
rarely a problem	27%
never a problem	31%

Damage Caused: Primarily affects blossoms and ripening fruit, although under certain circumstances the fungus can cause stem blight as well. Rotted berries typically have a gray cast of the mycelium and spore-bearing structures present.
% Acres Affected: 30%
Timing of Control: Infection occurs largely during bloom on flowers. The most critical period for infection is during bloom.
Yield Losses: 3%
Regional Differences: None identified
Cultural Control Practices: Disease is most severe where excessive nitrogen has been used, where air circulation is poor, or where frost has injured blossoms. Varieties possessing tight fruit clusters are particularly susceptible to the disease.
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Botrytis Blight

35% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Aliette	0%			Petal fall	0	12 hrs	Repeat at 7-10 day intervals during bloom if long rainy periods predicted.
Benlate	3%	67% full 33% reduced	100% excellent		-	-	
Captan	11%	54% full 23% reduced	31% excellent 31% good 23% poor	Early-mid bloom	0	4 days	
Captan plus Benlate	11%	54% full 31% reduced	15% excellent 62% good		-	-	
Captec	3%	100% full	67% excellent 33% good	Early-mid	0	72 hrs	Repeat at 7-10 day intervals

				bloom Petal fall			during bloom if long rainy periods predicted.
Chlorothalonil (Bravo)	0%			Early-mid bloom	42	12 hrs	
Rovral	0%			Early-mid bloom	0	24 hrs	Do not make more than 4 applications per year.
Ziram	0%			Early-mid bloom	ns	48 hrs	Apply at loose bud scale stage followed 7 days later. Do not apply later than 3 weeks after full bloom.
Other Pesticides Reported*							
Topsin	1%	100% full	100% excellent				

ns=not specified
*Written-in information from survey

Fusicoccum Canker

Type of Pest: Fungus
Frequency of Occurrence: 65% of respondents reported this pest occurring.

routine annual control	22%
occasional control	14%
rarely a problem	30%
never a problem	34%

Damage Caused: Infects blueberry stems causing dieback and plant decline. On young (1-2 year old) stems, extensive stem infections quickly lead to flagging and dieback of the entire stem. On warm, dry days shoots will suddenly wilt and die due to the stem girdling.
% Acres Affected: 20%
Timing of Control: Spores are released from March to mid-July, and infection probably occurs during this period. New infections occur following rains during the time tender new tissue is present and temperatures are at 50-72½ F. New infections can occur throughout the growing season.
Yield Losses: 5%
Regional Differences: None identified
Cultural Control Practices: Sanitation is essential. Prune out affected canes. Varieties differ in their resistance to this disease. Avoid practices such as late season fertilization that make bushes more vulnerable to winter injury. Winter-injured bushes are more susceptible. Cold stress may play a part in increasing disease damage.

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Pruning	4%	100% good

*Written-in information from survey

Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Fusicoccum Canker

25% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Benlate	4%	100% full	20% excellent 60% good		-	-	
Captan plus Benlate	7%	50% full 50% reduced	38% excellent 50% good		-	-	
Ziram	1%		100% good	Dormant/	ns	48 hrs	Apply at loose

				delayed dormant			bud scale stage, followed 7 days later. Do not apply later than 3 weeks after full bloom.
Other Pesticides Reported*							
Lime sulfur	2%	50% full	50% good				
Captan	2%	100% full	100% good				
Topsin	1%	100% full	100% good				
Captec	1%	100% reduced	100% excellent				

ns=not specified
*Written-in information from survey

Group B – Diseases identified by survey as significant problems in some years

Witches' Broom

Type of Pest: Fungus
Frequency of Occurrence: 68% of respondents reported this pest occurring.

routine annual control	10%
occasional control	16%
rarely a problem	30%
never a problem	44%

Damage Caused: Diseased blueberry plants have broom-like masses of swollen, spongy shoots with shortened internodes and leaves reduced in size. Heavily infected plants produce no fruit.
% Acres Affected: 3%
Timing of Control: Plant removal after harvest.
Yield Losses: 10%
Regional Differences: None identified
Cultural Control Practices: The best control strategy is to eradicate the alternate host (fir trees) within 1200 feet of the blueberry plants. Eradication of diseased blueberry plants effectively eliminates the disease from an affected field.
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Witches' Broom

Chemical controls do not exist.

Blueberry Stunt

Type of Pest: Mycoplasma-like organism
Frequency of Occurrence: 65% of respondents reported this pest occurring.

routine annual control	8%
occasional control	5%
rarely a problem	34%
never a problem	53%

Damage Caused: Affected plants are dwarfed with shortened internodes, excessively branched, low in vigor with small downward cupped leaves which turn red prematurely. Fruits on infected bushes are small, hard, lack flavor, ripen late if at all, and remain attached to the plant much longer than they would on healthy plants.
% Acres Affected: Unknown
Timing of Control: NA
Yield Losses: Unknown
Regional Differences: None identified

Cultural Control Practices: Diseased bushes cannot be cured and must be removed from the field. Using virus indexed plants is also helpful.
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Blueberry Stunt
Chemical controls do not exist.

Group C – Diseases identified by survey as infrequent problems

Phytophthora Root Rot
Type of Pest: Fungus
Frequency of Occurrence: 64% of respondents reported this pest occurring.

routine annual control	3%
occasional control	11%
rarely a problem	33%
never a problem	53%

Damage Caused: In severely infected bushes, the entire root system is reduced in stature and is totally black. Above-ground symptoms include chlorosis and reddening of the leaves, smaller leaves, defoliation, branch dieback, death of entire canes, stunting, and death of the entire bush.
% Acres Affected: 5%
Timing of Control: Apply in spring before growth begins in established plantings. In new plantings, apply at or just after planting.
Yield Losses: 20%
Regional Differences: None identified
Cultural Control Practices: The disease is avoided through careful site selection before planting. Heavy soil which becomes waterlogged or suffers from a high water table should be avoided when selecting a site. Internal and surface water drainage should be improved. Most varieties are susceptible to the disease, although some varieties may better tolerate heavy infections.

Other Practices Reported*	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Hilling	1%	100% excellent

*Written-in information from survey

Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Phytophthora Root Rot

3% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Aliette	0%			Dormant/ delayed dormant	0	12 hrs	Apply as a 5 ft. band. Do not tank mix with copper compounds or apply to foliage with copper residues or phytotoxicity may occur.
Ridomil Gold	4%	75% full 25% reduced	100% good	Dormant/ delayed dormant	30	48 hrs	Apply only as an emergency use, not as a routine or preventative treatment. *In new plantings, do not exceed 3.6 gallons/A within 12 months of harvest or illegal residues may result.

Powdery Mildew

Type of Pest: Fungus
Frequency of Occurrence: 64% of respondents reported this pest occurring.

routine annual control	3%
occasional control	5%
rarely a problem	37%
never a problem	55%

Damage Caused: When severe infection occurs, defoliation may occur.
% Acres Affected: 1%
Timing of Control:
Yield Losses: Unknown
Regional Differences: None identified
Cultural Control Practices: Some cultivars are more resistant than other cultivars.
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Powdery Mildew

1% of crop reported treated for this pest in 2002.

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Sulfur	1%	100% full			0	24 hrs	
Other Pesticides Reported*							
Liquid sulfur	1%	100% full					

*Written-in information from survey

Mosaic

Type of Pest: Virus
Frequency of Occurrence: 61% of respondents reported this pest occurring.

routine annual control	1%
occasional control	7%
rarely a problem	40%
never a problem	51%

Damage Caused: Infected plants become unproductive. It may take several years for a bush to show symptoms.
% Acres Affected: Unknown
Timing of Control: NA
Yield Losses: Unknown
Regional Differences: None identified

Cultural Control Practices: Most varieties appear to have field resistance to the virus. Infected bushes cannot be cured and must be removed promptly.
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Mosaic
Chemical controls do not exist.

Red Ringspot
Type of Pest: Virus
Frequency of Occurrence: 60% of respondents reported this pest occurring.

routine annual control	2%
occasional control	6%
rarely a problem	34%
never a problem	59%

Damage Caused: Production of the bush is seriously reduced and the berries become pockmarked and unattractive.
% Acres Affected: Unknown
Timing of Control: NA
Yield Losses: Unknown
Regional Differences: None identified
Cultural Control Practices: Bluecrop, Collins, Jersey, Rancocas and Weymouth are resistant or tolerant to the disease. Infected bushes must be rogued out.
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Red Ringspot
Chemical controls do not exist.

Blueberry Scorch
Type of Pest: Virus
Frequency of Occurrence: 61% of respondents reported this pest occurring.

routine annual control	4%
occasional control	3%
rarely a problem	33%
never a problem	62%

Damage Caused: The disease is characterized by dieback of blossoms and young vegetative shoots in the spring followed by a flush of growth in the summer. The roots suffer injury, and production of the bushes can be greatly impacted.
% Acres Affected: 1%
Timing of Control: NA
Yield Losses: Unknown

Regional Differences: None identified
Cultural Control Practices: The sole control strategy is to remove affected bushes.
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Blueberry Scorch

Chemical controls do not exist.

Blueberry Shoestring Disease

Type of Pest: Virus
Frequency of Occurrence: 61% of respondents reported this pest occurring.

routine annual control	3%
occasional control	1%
rarely a problem	33%
never a problem	63%

Damage Caused: Diseased leaves are narrow, wavy and somewhat sickle-shaped. Flowers may be red-streaked, and berries turn purple prematurely. Within a few years, berry production drops dramatically.
% Acres Affected: 1%
Timing of Control: NA
Yield Losses: Unknown
Regional Differences: None identified
Cultural Control Practices: Prevent disease introduction by buying disease-free plants, destroying wild plants near the planting, and removing diseased plants.
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Blueberry Shoestring Disease

Chemical controls do not exist.

Crown Gall

Type of Pest: Bacteria
Frequency of Occurrence: Since blueberries are grown on acid soils, and the crown gall bacterium does not grow well in an acid situation, the disease occurs infrequently.

62% of respondents reported this pest occurring.

routine annual control	0%
occasional control	0%
rarely a problem	42%
never a problem	58%

Damage Caused: Globose, pea-size to large galls occur on low branches, twigs, and at the base of canes near the ground.

% Acres Affected: Unknown
Timing of Control:
Yield Losses: Unknown
Regional Differences: None identified
Cultural Control Practices: Sanitation, purchasing healthy nursery plants and maintaining proper soil conditions are the most reliable controls. Injured tissue is more likely to produce galls.
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Crown Gall

0% of respondents reported report treating for this pest in 2002. Data not collected in survey

Pesticide	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Appli-cation Periods	PHI days	REI hours	Application Notes and Comments
Agrocin							soil treatment or for dipping the root systems of bushes prior to planting.

Coryneum Canker

Type of Pest: Fungus
Frequency of Occurrence: Not regular in occurrence and the fungus often occurs in conjunction with other canker fungi.

58% of respondents reported this pest occurring.

routine annual control	2%
occasional control	3%
rarely a problem	32%
never a problem	64%

Damage Caused: The symptoms are similar to other canker diseases.
% Acres Affected: Unknown
Timing of Control: NA
Yield Losses: Unknown
Regional Differences: None identified
Cultural Control Practices: Cultural practices which maintain vigorous growth without stimulating too much succulent growth are recommended: avoid careless pruning and cultivating, and do not fertilize late in the summer. Keep the plants well-watered through prolonged periods of dry weather. Avoiding any stresses will help prevent this disease. Wounds are apparently necessary for infection.

Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Coryneum Canker

No chemical controls are specifically recommended.

Armillaria Root Rot

Type of Pest: Fungus
Frequency of Occurrence: 60% of respondents reported this pest occurring.

routine annual control	0%
occasional control	3%
rarely a problem	28%
never a problem	69%

Damage Caused: Infected bushes usually decline over several growing seasons. Affected plants will be chlorotic, have smaller-than-usual leaves, and be more susceptible to other stresses than healthy-appearing plants. Branches may suddenly wilt, followed by plant mortality in some instances.
% Acres Affected: Unknown
Timing of Control:
Yield Losses: Unknown
Regional Differences: None identified
Cultural Control Practices: To date, the disease has only been found in fields which were originally pine/oak forests. The disease is best avoided by thoroughly discing the soil where blueberries are to be planted, and removing as many of the root fragments as is possible. If possible, leave the field fallow three years after the trees have been removed. Dead or dying plants should be removed, and adjacent plants should be inspected. Remove any plants which have signs of the pathogen. Wood chip mulch should be removed from infection “hot spots.”
Biological Control Practices: None identified
Postharvest Control Practices: None identified

Chemical Controls for Armillaria Root Rot

Soil sterilants or fumigants are effective at killing the fungal inoculum. Chemical controls are usually not feasible in fields where the disease is present.

V. Weeds

Damage Caused: Weeds reduce yields by competing with the crop for water, light, and nutrients. Weeds also harbor insects and diseases, inhibit spray penetration, maintain a high humidity in the crop canopy, and encourage vertebrate pests. Many of the weeds found in these fields are difficult-to-control perennial weeds. New plantings usually have fewer perennial weed problems than older plantings. Annual and biennial weeds can also exist in these fields.
Percent acres affected: 90%
Timing of Control:
Yield Losses: 5%
Regional Differences: None identified
Cultural Control Practices: Cultivation and mulching are sometimes used as weed management tools. Mulches that are free of weed seeds and placed thickly enough can be very effective at reducing or eliminating most annual weeds from the crop row. They are seldom effective on perennial weeds. The areas between the crop rows is usually maintained with a mowed cover of sod, clover, weeds, or a combination of these. This cover is used primarily for erosion control and to improve trafficability in the field. Flame weeding is the killing of weeds with intense, directed heat produced by a propane burning device.

	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported
Mowing	81%	42% excellent 53% good 4% poor
Mulching	64%	36% excellent 59% good 5% poor
Cultivation	18%	33% excellent 48% good 19% poor
Hand weeding	8%	22% excellent 44% good
Wood chips	1%	100% good

Biological control: None identified
Postharvest Control Practices: None identified

Annual Broadleaf Weeds

Frequency of Occurrence: 81% of respondents reported this pest occurring.

routine annual control	82%
occasional control	10%
rarely a problem	4%
never a problem	4%

Perennial Broadleaf weeds

Frequency of Occurrence: 83% of respondents reported this pest occurring.

routine annual control	76%
occasional control	13%
rarely a problem	5%
never a problem	6%

Annual Grass Weeds

Frequency of Occurrence: 84% of respondents reported this pest occurring.

routine annual control	78%
occasional control	13%
rarely a problem	4%
never a problem	5%

Perennial Grass Weeds

Frequency of Occurrence: 83% of respondents reported this pest occurring.

routine annual control	79%
occasional control	14%
rarely a problem	2%
never a problem	5%

Chemical Controls for Pre-emergent Weeds

48% of crop reported treated for this pest in 2002.

Pesticide --- Target --- Crop Maturity	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Application Periods	PHI days	REI hours	Application Notes and Comments
Caliber 90 --- Broadleaf weeds and some grasses. Suppression of some perennial weeds. --- Transplant Year and Established Plantings	4%	75% full 25% reduced	50% excellent 50% good	TY: Consider applying half the maximum rate after planting and half in the fall before winter annuals emerge. EP: Apply in the spring before bud break and before weeds emerge, or in the fall.	ns	12 hrs	TY: Use to improve the broadleaf weed activity of Devrinol or Surflan. Do not use on newly transplanted tissue culture plants. EP: Do not apply when fruit is present. For improved control as well as quackgrass suppression apply half in the spring and half after harvest.
Casaron --- Broadleaf weeds and some grasses. Suppression of some perennial weeds. --- Established Plantings	10%	82% full 18% reduced	45% excellent 55% good	EP: Apply at temperatures below 40½F, preferably just before rain or snow.	ns	12 hrs	EP: Soil must be settled around established plants. Uniform application is essential. Do not apply during new shoot emergence. The 4G formulation is effective on many perennial weed species. May reduce plant growth in plantings that are young or lacking vigor.

							High leaching risk.
Devrinol --- Annual grasses and small seeded broadleaf weeds --- Transplant Year and Established Plantings	4%	75% full 25% reduced	50% excellent 50% poor	TY: Apply after transplanting to weed-free soil. EP: Apply in the early spring before seedling weeds emerge.	ns	12 hrs	Must be activated within 24 hrs by cultivation or enough water by irrigation or rainfall to wet the soil to a depth of 2 to 4 inches. TY: The full rate may not be necessary.
Kerb	0%				ns	24 hrs	
Princep --- Broadleaf weeds and some grasses. Suppression of some perennial weeds. --- Transplant Year and Established Plantings	14%	56% full 44% reduced	13% excellent 69% good 19% poor	TY: Consider applying half the maximum rate after planting and half in the fall before winter annuals emerge. EP: Apply in the spring before bud break and before weeds emerge, or in the fall.	pf	12 hrs	TY: Use to improve the broadleaf weed activity of Devrinol or Surflan. Do not use on newly transplanted tissue culture plants. EP: Do not apply when fruit is present. For improved control as well as quackgrass suppression apply half in the spring and half after harvest.
Sinbar --- Broadleaf weeds and some grasses. Suppression of some perennial weeds. --- Established Plantings	4%	40% full 60% reduced	60% excellent 40% good 20% poor	EP: Apply in the early spring or in the fall as a directed spray to the base of the plants.	70	12 hrs	EP: Will also control small emerged weeds. Do not contact new shoots and avoid contact with foliage. Spring application must be made before fruit set. Avoid

							application on plantings low in vigor. Planting must be at least 1 year old before application.
Solicam --- Annual grasses and small seeded broadleaf weeds --- Established Plantings	2%	100% reduced	50% excellent 50% poor	EP: Apply in early spring when crop is dormant to clean and weed-free soil.	60	12 hrs	EP: May result in temporary bleaching or chlorosis of leaves from which the plant will recover. Do not use on nursery stock.
Surflan --- Annual grasses and small seeded broadleaf weeds --- Transplant Year and Established Plantings	11%	75% full 17% reduced	8% excellent 67% good 17% poor	EP: Apply to weed-free soil in the spring.	ns	24 hrs	Irrigation or 1 inch of rain is needed within 21 days of application. Shallow cultivation will improve control. TY: Do not apply until soil has settled around the plants and no cracks are present. May injure newly planted tissue culture plants.
Other Pesticides Reported*							
Velpar L	1%	100% full	100% excellent				
Corn Gluten Meal	1%		100% poor				
Roundup	1%	100% reduced	100% good				
Diuron	1%	100% full	100% poor				

ns=not specified; pf=labeled for pre-fruit formation application
TY=Transplant Year; EP=Established Plantings
*Written-in information from survey

Chemical Controls for Post-emergent Weeds

63% of crop reported treated for this pest in 2002.

Pesticide --- Target --- Crop Maturity	% of Respondents Reporting Use	Of Respondents, Typical Rate Reported	Of Respondents, Efficacy Rating Reported	Application Periods	PHI days	REI hours	Application Notes and Comments
Fusilade --- Annual and most perennial grasses --- Transplant Year	2%	50% full 50% reduced	50% excellent 50% good		nb	12 hrs	TY: Do not apply to crops to be harvested within 1 year of application. Do not apply if rainfall is expected within 1 hour or if grasses are under drought stress. Must be used with a crop oil concentrate or non-ionic surfactant.
Gramoxone --- Annual grasses and broadleaf weeds. Suppression of perennial weeds. --- Established Plantings	4%	25% full 75% reduced	25% excellent 75% good	EP: Apply before emergence of new canes or shoots to avoid injury.	21	24 hrs	EP: Contact herbicide. Use with a non-ionic surfactant. Apply as a coarse directed spray to wet the weeds. Use of a shield is highly recommended.
Poast --- Annual and most perennial grasses --- Transplant Year and Established Plantings	4%	80% full 20% reduced	20% excellent 20% good 40% poor		30	12 hrs	Crop oil concentrate must be added to the spray tank. Do not cultivate 5 days before or 7 days after application. Do not apply more than 5 pints per acre per season. Do not apply to grasses under stress (e.g. drought).

							EP: Effective on actively growing grasses.
Roundup --- Annual and perennial weeds. --- Established Plantings	49%	70% full 29% reduced	57% excellent 34% good	EP: Apply to actively growing weeds.	14	12 hrs	EP: Apply with a wiper or a shielded/directed spray to the base of the plants. Do not permit herbicide solution to contact desirable vegetation, including green shoots, canes, or foliage. Do not cultivate within 7 days after application.
Scythe --- Annual weeds. Suppression of perennial weeds --- Transplant Year and Established Plantings	3%	33% full 67% reduced	100% good		0	12 hrs	Contact material for burn down only.
Other Pesticides Reported*							
Select	1%	100% full	100% excellent				
Touchdown	1%	100% full	100% good				

nb=for use on non-bearing fields
TY=Transplant Year; EP=Established Plantings
*Written-in information from survey

VI. Vertebrate Pests

Birds

Frequency of Occurrence: 82% of respondents reported this pest occurring.

routine annual control	72%
occasional control	15%
rarely a problem	9%
never a problem	4%

Damage Caused: Left unchecked, they can destroy enough of the crop to ruin the profitability of a planting.

Cultural Control Practices:

	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported	Application Notes and Comments
Scare eye balloons	38%	34% good 64% poor	Visual scare devices have variable effectiveness on birds.
Flash Tape	25%	7% excellent 50% good 43% poor	Visual scare devices have variable effectiveness on birds.
Propane Cannons	10%	9% excellent 55% good 36% poor	Noise deterrents seem to have the least effect on birds in blueberries.
Owls	24%	7% excellent 30% good 63% poor	Visual scare devices have variable effectiveness on birds.
Netting	36%	76% excellent 24% good	Netting is the most effective way to keep birds out of the planting.
Other Practices			
Distress Calls	21%	8% excellent 54% good 33% poor	
Shot gun	3%	33% excellent 33% good 33% poor	
Dogs	2%	50% excellent 50% good	
People picking	1%	100% excellent	
Fire crackers	1%	100% good	
Bottle rockets	1%	100% excellent	
Bird guard	1%	100% good	

wind noise maker	1%	100% poor	
cats	1%		
bird feeder	1%		

Chemical Controls for Birds

Bird Shield™, a repellent formulated from methyl anthranilate, is registered for use on blueberries. Bird avoidance is based on odor quality and irritation. Efficacy data does not support recommending the use of this material at this time.

Deer

Frequency of Occurrence: 68% of respondents reported this pest occurring.

routine annual control	20%
occasional control	14%
rarely a problem	31%
never a problem	35%

Damage Caused: White-tailed deer can cause extensive damage to blueberries by browsing top-growth in winter.

Cultural Control Practices:

	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported	Application Notes and Comments
Other Practices			
Electric fence	10%	100% excellent	
Shooting	20%	50% good 50% poor	
Fence	10%	100% excellent	
scare crow	10%	100% excellent	
soap	10%	100% good	
pin wheels sprayed with garlic	10%	100% excellent	
ground sprayed with garlic	10%	100% excellent	

Voles

Frequency of Occurrence: 67% of respondents reported this pest occurring.

routine annual control	21%
occasional control	21%
rarely a problem	36%
never a problem	22%

Damage Caused: They feed on the bark of the stems or on the roots depending on which species of vole is present.

Cultural Control Practices:

	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported	Application Notes and Comments
Mulch selection or removal			A mulch material that does not support tunneling is recommended. In some cases, the removal of mulch material around the bushes can help in reducing the meadow vole population.
Other Practices			
D-con Poison	67%	50% good 50% poor	

Woodchucks

Frequency of Occurrence: 62% of respondents reported this pest occurring.

routine annual control	13%
occasional control	10%
rarely a problem	26%
never a problem	52%

Other

Bears: 5% of respondents reported this pest occurring.
Raccoons: 6% of respondents reported this pest occurring.
Squirrels: 2% of respondents reported this pest occurring.
Coyote, Porcupine, Turkey, Chipmunk, Fox: <1% of respondents reported this pest occurring.

Cultural Control Practices:

	% of Respondents Reporting Use	Of Respondents, Efficacy Rating Reported	Application Notes and Comments
Other Practices			
Electric fence	43%	67% excellent	Bears
Dogs	14%	100% poor	Bears
Fence	14%	100% excellent	Bears
Ground sprayed with garlic	14%	100% excellent	Bears
Trap	25%	100% good	Raccoons
nets	25%	100% good	Raccoons
electric fence	50%	50% excellent	Raccoons
Shoot	25%	100% poor	Raccoons
Have a heart trap	25%	100% good	Raccoons
Have a heart trap		100% good	Squirrels
Fence			Squirrels
Ground sprayed with garlic		100% excellent	Coyotes
Cats		100% excellent	Moles

VII. Acknowledgements and Contacts

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