

## 6 Insects

### INSECT MANAGEMENT 2004

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MANAGEMENT GUIDELINES PROVIDED HERE SERVE ONLY AS REMINDERS.  
FOR COMPLETE GUIDELINES, REFER TO MATERIALS AVAILABLE AT THE CRANBERRY STATION.

#### MANAGEMENT GUIDELINES

**Reducing inputs to cut costs of production.** Within a cost-cutting framework, some key insect management practices should be the last ones eliminated to save money. The following are listed in descending order of importance for most bogs. If late water was not held, it is **not** advisable to skip the initial spray (the first spray in IPM-based programs) for cranberry fruitworm that occurs 7-9 (Howes/Blacks) or 3-7 days (Ben Lears/Stevens) after 50% out of bloom. This targets the largest portion of the population. When poorly managed, cranberry fruitworm pressure builds over time and is harder to manage. Sweep-netting of all acreage at mid May to detect cranberry weevil, cutworms, gypsy moth, and blackheaded fireworm outbreaks is important. It is likely that as most or all insecticide inputs are lowered, blackheaded fireworm and weevil levels will increase; Sparganothis fruitworm levels should drop. When infestation of weevil or fireworm establishes, management inputs must be intensified in subsequent years. Finally, walking the bog early and late in the season to inspect for soil insects, mites, and webbing of fireworms allows detection of pests that can affect the acreage in subsequent years or require renovation.

**Start scouting bogs May 15.** Always gauge pest levels of insect caterpillars in their early stages! As the caterpillars of many species grow larger, they cling more tightly to the vine or hide in daytime and are harder to pick up in daytime sweep netting. At this point, some recommend night sweeping to gauge numbers. Small black-headed fireworm caterpillars may cling to the top of the net. Continue sweeping at least until the start of bloom. Be aware that some serious pests are active during and after bloom, for example, brown spanworm and cranberry weevil, and that you should continue to closely monitor your bog. Be aware that some pests, particularly cranberry weevil, gypsy moth, and brown spanworm, may be very patchy or in coves or edges, so thorough assessment of total acreage is essential. Many stages of insects are active only at night and are concealed during the day, such as root weevil adults, white grub adults, or some moth species.

**Sweep netting,** using a 12" net and 180° sweeps into the vine, should be conducted at least once a week. A sweep set consists of 25 sweeps across the bog. The insects in the net should be properly identified, counted, and recorded. Conduct 1 set of 25 sweeps for each acre. For larger pieces (more than 20 acres), at least 1 sweep set/2 acres is advisable. In multiple-acre pieces, calculate the average number of each insect in all of your sweep sets. Treat only after average number of each insect in your series of sweep sets exceeds these values, and after other external concerns have been brought to bear including cost of application, expected returns, weather, etc.

	AVERAGE #		AVERAGE #
ADD UP: blossomworm, false armyworm, other cutworms, and gypsy moth	4.5	black-headed fireworm	1-2*
brown spanworm, green spanworm	18	<i>Sparganothis</i> fruitworm	1-2
		cranberry weevil	4.5

**Adjustment of action thresholds to reflect current value of the crop.** In sweep-net sampling, the average numbers of a pest that we use to trigger a management measure is only a rule of thumb. It serves as an indication that an insect pest is being sampled at numbers that we consider high and worthy of attention. In today's slump in returns, the thresholds for most spring caterpillars could be relaxed greatly because the value of the crop saved is too low to equal the cost of the spray. However, caution should be taken before ignoring high numbers of cranberry weevil, blackheaded fireworm, and Sparganothis fruitworm in the spring since established infestations are harder to manage in the summer and the following year.

\*In past years, when black-headed fireworm infestations were very rare, we used the 1-2 larvae per sweep set to make a presence/absence determination on a bed. Now that black-headed fireworm infestations are well established on many beds, accurate assessment of infestation level will require not only the sweep net sample, but also visual assessment of the vines. See the black-headed fireworm section (page 8) for visual assessment methods.

**Pheromone traps.** Traps should be used for timing management of cranberry girdler, black-headed fireworm, and *Sparganothis* fruitworm. Monitor for moths with traps starting June 1. Check and clean traps weekly, recording number of moths captured. Change bait **every** 3 weeks. Use 1 trap/10 acres. Place on upwind side of bog. Check descriptions of adult moths because non-target species are sometimes caught. Confirm, Intrepid, and 3M Sprayable Pheromone follow a different schedule than conventional insecticide sprays (such as Diazinon). See labels.

For black-headed fireworm; if treating summer generation with conventional insecticide, apply insecticide 10 days after peak moth flight, usually during bloom. If fireworm pressure has been high and you are treating with Confirm or Intrepid, it may be advisable to treat 3 weeks after the moth flight begins. Begin searching vines for larvae 1 week after the first moths are caught to determine presence/absence of larvae.

For *Sparganothis* fruitworm; if treating with conventional insecticide, spray 10-14 days after peak moth captures, ca. mid-to-late July. If *Sparganothis* pressure has been high and you are treating with Confirm or Intrepid, it may be advisable to treat 3 weeks after the moth flight begins.

For girdler; treatments are usually in July. Refer to the section on cranberry girdler for timing of specific treatments. Be aware that a bad infestation can exist even with low trap catches.

**Bacillus thuringiensis (B.t.) based products.** Examples include Dipel, Agree, Mattech and MVP2. The several products that are available may have varying activity - not all have been field tested. Check labels for directions and **consult Cranberry Station for specific guidance and efficacy information.** Consider treating before threshold is reached. Early attention to infestation is critical. Maximize effectiveness by treating young caterpillars, less than 1/4". Cutworms larger than 1/2" are difficult to control. Addition of 3-6 oz Pyrethrin or Pyronyl to Dipel ES has improved performance. For larger caterpillars, low rates of synthetic insecticides added to Dipel - e.g. 3-6 oz Pyrethrin or Pyronyl or very low rates of insecticides such as Diazinon or Sevin - improved performance.

Thorough coverage is essential and **repeat applications may be necessary.** Caterpillars stop feeding after eating compounds but may take several (3-10) days to die. New growth is not protected; rain, irrigation, or excessive water after application as a result of a poorly timed or large acreage chemigation system will remove active material. Use aerial application or low-volume ground applications when possible as it usually improves performance. Spot applications of low gallonages with backpack sprayers are a good option. Check the label for bee toxicity. Addition of a spreader/sticker (e.g. Bond, Stik) may be critical, check label.

**Insect growth regulator products (Intrepid and Confirm).** Growth regulators are caterpillar specific and conserve beneficial insects. For Intrepid, chemigation labeling is pending: do not chemigate until supplemental labeling is in hand. Intrepid is restricted use and has Zone II restrictions.

Use aerial application or low-volume ground applications when possible to improve performance. Well timed chemigation systems may be critical for good efficacy. Consider treating before thresholds are reached. Efficacy may vary widely depending on conditions. Thorough coverage is essential and repeat applications are necessary. New growth is not protected; rain, irrigation, or chemigation washout will remove active material. A spray adjuvant should be used. 6 hours drying time following application is required. Death may not be observed until a week or more has passed. Pollinator safe! Check labels for directions and **consult Cranberry Station for specific guidance and efficacy information.**

**Restricted Use Pesticide (Guthion, Lorsban, Diazinon, Intrepid)** A pesticide license (private applicator certification) is required to apply these compounds to your bog.

<p><b>BEES!! INSECTICIDES ARE HIGHLY TOXIC TO BEES, ESPECIALLY DIRECT APPLICATIONS AND RESIDUES. DO NOT APPLY OR ALLOW TO DRIFT TO CRANBERRIES IN BLOOM OR NEARBY BLOOMING PLANTS/WEEDS IF BEES ARE FORAGING. IF APPLICATION IS NECESSARY, MAKE SPRINKLER APPLICATION AT NIGHT AND RUN SPRINKLERS EARLY FOLLOWING MORNING TO DELAY BEE FORAGING ACTIVITY. ADVISE BEEKEEPER.</b></p>
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## 8 Insects

### EARLY SEASON CATERPILLARS

#### BLACK-HEADED FIREWORM

3M Sprayable Pheromone	2-3 oz	Time-released microencapsulated pheromone concentrate used for mating disruption. Consult Cranberry Station on use. Do not exceed 25 oz per season. Most effective for low population pressure.
Confirm 2F	16 oz	Growth regulator product. Efficacy may vary widely depending on conditions. Thorough coverage is essential and repeat applications are necessary. New growth is not protected; rain, irrigation, or chemigation washout will remove active material. A spray adjuvant should be used. 6 hours drying time following application is required. Death may not be observed until a week or more has passed. Pollinator safe!
Intrepid 2F	10–16 oz	Similar to Confirm, but improved activity. Approved for aerial and ground application only; chemigation label is pending. Zone II restricted.
Diazinon 50 W	4 lb	It is advisable to hold water for at least 3 days. Limit 6 applications/season at rates listed at left, limit 4 applications/season if higher labeled rates for cutworms and fruitworm used. 7 day PHI, 14 day spray interval.
Diazinon AG 500	2 qt	
Diazinon AG 600	51 oz	
Guthion 50 WSP & Azinphos-M 50W	2 lb	Note limit of 2 applications/season and <b>7 DAY</b> restricted entry interval on new labels. Hold water for at least 5 days and release gradually. Make sure cranberry is on label. 14 days between sprays. 21 day PHI.
Imidan 70W	1.33–4 lbs	Little Imidan efficacy data available in MA.
Lorsban 4E, Nufos 4E & Chlorpyrifos 4E AG	3 pt	Rates as low as 1 1/2 pts (aerial) or 2 pts (chemigation) are reported to give satisfactory control. 2 applications/season. Do not mix with other insecticides. Observe 60 day PHI. Impound water for 5 days, then release gradually.
Orthene 97	1 lb	1 application/season. Observe 90 day PHI.
Orthene 75S & 75 WSP	1 1/3 lb	Do not apply from 10 days prior to bloom until all berries set.
Sevin XLR Plus	1.5-2 qt	Avoid applying Sevin within 10 days of start of bloom. Sevin XLR Plus is formulated to have minimal bee toxicity once the spray dries. Limit 5 applications/season, 7 day spray interval, 7 day PHI.
Sevin 4F & Carbaryl 4L	1.5-2 qt	
Sevin 80 WSP & Sevin 80S	1.88–2.5 lb	
SpinTor 2SC (Spinosad)	4-10 oz	Do not exceed 29 oz/season 7 days between applications.
Entrust 80W (Spinosad)	1.25-3 oz	Do not exceed 9 oz/season. USDA organic approved.

For both formulations: use lower rates only with good chemigation systems (6 min or better).

Larvae hatch in mid-May; even earlier in odd warm springs. 2nd generation appears in July during bloom. Use pheromone traps (see page 7) to time management of 2nd generation. Black-headed fireworm moths are only 1/4" long and are black and gray; be aware that the pheromone trap often picks up a much larger, non-pest moth. Be aware that the status of fireworm is on the rise: While sweeping in May look for the very small larvae on the rim of the sweep net. When larvae are small, using only the sweep net to monitor for infestation can be risky owing to the poor relationship between the actual infestation of young caterpillars on a bed and the number picked up in a sweep net. Further, the infestation most often is patchy, and larvae are often more numerous along edges, where vines are overgrown, where leaf trash has accumulated, or where winter flooding was truncated. Spot treatment is desirable here.

**Visual sampling** is recommended as the most effective means of early detection of spring infestation. Monitoring should begin as soon as larvae begin to hatch in May. The earliest activity will be detected in warmer bog edges by inspecting buds and leaves for mining, webbing, and brown pellets of excrement (frass). 1-2 weeks after the very first larvae are seen, more extensive monitoring can be done by 'visual sweeps.' This involves crouching down to closely examine areas of about 2 ft<sup>2</sup>. Repetition of ten 'visual sweeps' is recommended per acre.

Infestations move rapidly! Spring generation is a much easier target than the second generation (occurs during bloom).

### YELLOW-HEADED FIREWORM

Guthion, Lorsban, Orthene, Sevin, and Spintor can be used as specified for blackheaded fireworm. (see page 8).

Intrepid and Diazinon, FIFRA 2EE recommendations, use as specified for blackheaded fireworm (page 8).

Yellow-headed fireworm has been reported several times recently, typically on beds that are not completely flooded in the winter. Eggs hatch in May and caterpillars are all yellow and are impossible to distinguish from Sparganothis. It is often the case that totally wintered flooded beds have Sparganothis and partially, poorly winter flooded beds have yellow-headed fireworm. The yellow-headed fireworm pupa has a knob, which Sparganothis pupae do not have. The 3M Sprayable Pheromone for black-headed fireworm will NOT work for yellow-headed fireworm.

### SPARGANOTHIS FRUITWORM

3M Sprayable Pheromone	1.7–4.0 oz	Time released microencapsulated pheromone concentrate used for mating disruption. Do not exceed 24 oz./season.
Confirm 2F	16 oz	See insect growth regulator products on page 7 for details.
Intrepid 2F	10–16 oz	Similar to Confirm, but improved activity. Approved for aerial and ground application only; chemigation label is pending. Zone II restricted.
Lorsban 4E, Nufos 4E & Chlorpyrifos 4E AG	3 pt	Many populations are resistant, see note below. For susceptible populations, rates as low as 1 1/2 pt (aerial) or 2 pt (chemigation) have been reported to give satisfactory control. Limit 2 applications/season. Do not mix with other insecticides. Observe 60 day PHI. Impound water for 5 days, then release gradually.
Orthene 97	1 lb	Limit 1 application/season. Observe 90 day PHI.
Orthene 75S &	1 1/3 lb	Do not apply from 10 days prior to bloom until all berries set.
Orthene 75 WSP	1 1/3 lb	In some areas, Sparganothis has shown resistance to Orthene.
Guthion 50 WSP & Azinphos-M 50W	1-2 lb	In almost all areas, this insect has developed resistance. Note limit of 2 applications/season and <b>7 DAY</b> restricted entry interval on new labels. 14 day spray interval. Hold water for at least 5 days and release gradually. Make sure cranberry is on label!
SpinTor 2SC (Spinosad)	4-10 oz	Do not exceed 29 oz/season. 7 days between applications.
Entrust 80W (Spinosad)	1.25-3 oz	Do not exceed 9 oz/season. USDA Organic approved.
For both formulations: use lower rates only with good chemigation systems (6 min or better).		

Small *Sparganothis* caterpillars are already on the bog in mid-May and can be sampled by sweep-netting (see page 6). Check for *Sparganothis* caterpillars in loosestrife weeds that have folded, webbed leaves; this will give you an idea of the larva's appearance so that you can look for in your sweep net. The 2nd generation of *Sparganothis* appears in July and feeds on both fruit and foliage. With both generations, you should target the small caterpillars. Keep an eye on Ben Lears, which tend to be hardest hit, Howes the least.

Beginning in June, use pheromone traps to determine when newly emerged moths are laying eggs--you want to target caterpillars as they are hatching, not the adult moths (see pheromone trap details, page 7). Thus, conventional insecticide applications should be made about 2 weeks after peak moth flight (timing may coincide with second cranberry fruitworm application). Observe label instructions for spray timing of the growth regulators; here, it is recommended that Confirm or Intrepid be applied earlier in the moth flight.

Most populations in the Carver, Middleboro, Plympton, Marion, and Cape areas are resistant to Lorsban and Orthene. Intrepid, Confirm, and Spinosad products (SpinTor and Entrust) are alternatives. Late water has not been shown to be effective against this insect, but it may somewhat synchronize moth emergence.

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### CUTWORMS (BLOSSOMWORM, FALSE ARMYWORM) and HUMPED GREEN FRUITWORM

<i>Bacillus thuringiensis</i> (B.t.) based products		See information on page 7 for details.
Confirm 2F	16 oz	See insect growth regulator products on page 7 for details.
Intrepid 2F	10-16 oz	FIFRA 2EE. Similar to Confirm, but improved activity. Approved for aerial and ground application only; chemigation label pending. Zone II restricted.
Diazinon 50 W	4-6 lb	FIFRA 2EE recommendation. Hold water for at least 3 days.
Diazinon AG 500	2-3 qt	Limit 4 applications/season at higher rates; 6 applications/season
Diazinon AG 600	51-76.5 oz	allowed at lower rates. 7 day PHI; 14 day spray interval
Late Water		False armyworm and blossomworm may be managed with late water. See Late Water Section.
Lorsban 4E, Nufos 4E & Chlorpyrifos 4E AG	3 pt	Rates as low as 1 1/2 pts (aerial) or 2 pts (chemigation) have been reported to give satisfactory control. 2 applications/season. Impound water for 5 days, then release gradually. Do not mix with other insecticides.
Orthene 97	1 lb	1 application/season. Observe 90 day PHI.
Orthene 75S & 75 WSP	1 1/3 lb	Do not apply from 10 days prior to bloom until all berries set.
Sevin XLR Plus	2 qt	Avoid applying Sevin within 10 days of start of bloom. Sevin XLR Plus is formulated to have minimal bee toxicity once the spray dries. Note label changes -
Sevin 4F & Carbaryl 4L	2 qt	limit of 5 applications/season, 7 day spray interval, 7 day pre-harvest interval.
Sevin 80 WSP & Sevin 80S	2 1/2 lb	
SpinTor 2SC (Spinosad)	4-10 oz	Do not exceed 29 oz./season 7 days between applications.
Entrust 80W (Spinosad)	1.25-3 oz	Do not exceed 9 oz./season. USDA organic approved.
For both formulations: use lower rates only with good chemigation systems (6 min or better).		

The action threshold is an average of 4.5 larvae per 25 sweeps. Count all cutworms and gypsy moths together. Very young false armyworm caterpillars are whitish with black spots, each with a black spine. These caterpillars tend to loop like spanworm but gradually drop this movement. Early detection is important because they consume the terminal buds before new growth starts. As cutworms get older they will not be picked up in day sweeps. Night sweeps are required to gauge infestation.

### GYPSY MOTH

<i>Bacillus thuringiensis</i> (B.t.) based products		See information on page 7 for details.
Confirm 2F	16 oz	See insect growth regulator products on page 7 for details.
Intrepid 2F	10-16 oz	Similar to Confirm, but improved activity. Approved for aerial and ground application only; chemigation label is pending. Zone II restricted.
Late Water		Holding late water kills eggs laid on the bog as well as prevents establishment of many tiny caterpillars that drift in from infested uplands. See Late Water section.
Orthene 97	1 lb	1 application/season. Observe 90 day PHI.
Orthene 75S & 75 WSP	1 1/3 lb	Do not apply from 10 days prior to bloom until all berries set.
Sevin XLR Plus	1.5-2 qt	Avoid applying Sevin within 10 days of start of bloom. Sevin XLR Plus is formulated to have minimal bee toxicity once the spray dries. Note label changes -
Sevin 4F & Carbaryl 4L	1.5-2 qt	limit 5 applications/season, 7 day spray interval, 7 day pre-harvest interval.
Sevin 80 WSP & Sevin 80S	1.88-2.5 lb	

Insecticides (Diazinon, Lorsban, SpinTor) applied for cutworms or spanworms may provide control for gypsy moth.

The action threshold for gypsy moths is an average of 4.5 larvae/25 sweeps. Check for patchy infestations that can be spot treated, i.e. along bog edges facing uplands with infested trees. Check previously infested areas -- eggs can

overwinter on flooded bogs. Early detection is key: larvae consume terminal buds before new growth starts.

### SPANWORMS (GREEN SPANWORM, BROWN SPANWORM, BIG CRANBERRY SPANWORM)

<i>Bacillus thuringiensis</i> (B.t.) based products		See information on page 7 for details.
Confirm 2F	16 oz	See insect growth regulator products on page 7 for details.
Intrepid 2F	10-16 oz	FIFRA 2EE. Similar to Confirm, but improved activity. Approved for aerial and ground application only; chemigation label pending. Zone II restricted.
Lorsban 4E, Nufos 4E & Chlorpyrifos 4E AG	3 pt	Two applications/season. Do not mix with other insecticides. 60 day PHI. Impound water for 5 days, then release gradually.
Orthene 97	1 lb	Limit 1 application/season. Observe 90 day PHI.
Orthene 75S & 75 WSP	1 1/3 lb	Do not apply from 10 days prior to bloom until all berries set.
Pyreneone or Pyronyl	12 oz	Spot treating using low gallonage may be helpful for patchy infestations.
SpinTor 2SC (Spinosad)	4-10 oz	Do not exceed 29 oz/season. 7 days between applications.
Entrust 80W (Spinosad)	1.25-3 oz	Do not exceed 9 oz/season. USDA Organic approved.

For both formulations: use lower rates only with good chemigation systems (6 min or better).

For green and brown spanworm, the action threshold is an average of 18 larvae in 25 sweeps. Threshold of 18 may be lowered if these spanworms are large. For big cranberry spanworm, the action threshold is 4.5 in 25 sweeps. As spanworms get older, they will not be picked up in day sweeps. Night sweeps are required to gauge infestation.

Green spanworm caterpillars start to appear in early season sweeps; brown spanworm caterpillars appear later. A flight of brown moths in June may be an indication of a brown spanworm problem but only target caterpillars with sprays! **Be aware of brown spanworm infestations during bloom** that may be quite clumped in bog areas. Newly hatched brown spanworms cling like thin threads to the inside of the sweep net.

Big cranberry spanworms appear in mid-June. They can be very destructive, occurring in patches. Caterpillars are dark brown with bumps across their back and grow to 2.5" in size. Spot treating is usually the best approach.

Other miscellaneous spanworms are increasingly common. They appear in patches and grow larger than the common green and brown spanworm, so it may be advisable to lower threshold by about half if infestation occurs.

### CRANBERRY WEEVIL

Lorsban 4E, Nufos 4E & Chlorpyrifos 4E AG	3 pt	Many populations are resistant, see note below. For susceptible population, rates as low as 1 1/2 pt (aerial) or 2 pt (chemigation) have been reported to give satisfactory control. Limit 2 applications/season. Do not mix with other insecticides. 60 day PHI. Impound water for 5 days, then release gradually.
Guthion 50 WSP & Azinphos-M 50W	2 lb	FIFRA 2EE recommendation. Most populations are resistant. 14 days spray interval. Hold water for at least 5 days and release gradually. Note limit of 2 applications/season and <b>7 DAY</b> restricted entry interval on new labels.

Action threshold is an average of 4.5 weevils in 25 sweeps. Adult weevils are found throughout the growing season. See sweep-netting section page 6. Conduct sweep sets for weevil on warm, calm, and sunny days. Let net contents settle: weevils "play dead" when disturbed. Consult sweep records from previous years to determine if you have a history of extended weevil invasion. Even if threshold is exceeded, sometimes it is advisable to wait a week or two early in spring to treat. Weevil numbers may continue to rise, with additional weevils moving in, probably from upland sources. However, waiting becomes risky as blossom buds appear. Late water is not known to be effective against weevil. Look carefully: Do not count non-pest gray weevils.

Many populations are resistant to Lorsban and most populations are resistant to Guthion.

**Check with the Cranberry Station for up-to-date control options.**

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### Section 18 emergency use options are pending.

#### CRANBERRY FRUITWORM

All research shows it is not necessary or desirable to mix compounds for effective control.

Diazinon 50 W	4-6 lb	It is advisable to hold water for at least 3 days. Limit 4 applications/season
Diazinon AG 500	2-3 qt	at higher rates, 6 applications/season at lower rates.
Diazinon AG 600	51-76.5 oz	Observe 7 day PHI, and allow 14 days between applications.
Guthion 50 WSP & Azinphos-M 50 W	1-2 lb	NOTE CHANGED LABEL: limit 2 applications /season. 7 DAY RESTRICTED-ENTRY INTERVAL. 14 days between applications. Hold water for at least 5 days and release gradually.
Imidan 70W	1.33-4 lbs	Efficacy results have been very variable.
Intrepid 2F	10-16 oz	FIFRA 2EE recommendation. Similar to Confirm, but improved activity. Approved for aerial and ground application only; chemigation label is pending. Low gallonage applications only are effective. Zone II restricted. Pollinator safe!
Late Water		Holding late water greatly reduces fruitworm; however, moths are very mobile and may move into late water-treated beds from areas of infestation. See Late Water Section.
Lorsban 4E, Nufos 4E & Chlorpyrifos 4E	3 pt	Rates as low as 1 1/2 pts (aerial) or 2 pts (chemigation) have been reported to give satisfactory control. Limit 2 applications/season. Do not mix with other insecticides. Observe 60 day PHI. Impound water for 5 days, then release gradually.
Sevin XLR Plus	1.5-2 qt	Avoid applying Sevin within 10 days of start of bloom. Sevin XLR Plus is
Sevin 4F & Carbaryl 4L	1.5-2 qt	formulated to have minimal bee toxicity once the spray dries. Note label changes -
Sevin 80 WSP & Sevin 80S	1.88-2.5 lb	limit 5 applications/season, 7 day spray interval, 7 day pre-harvest interval.

#### CRANBERRY FRUITWORM MANAGEMENT

##### FOR ALL PRACTICES

1. Every pump system should be scouted separately as 1 piece.
2. To be valid, sampling of berries by size and bog area must be random because moths select larger berries, particularly along bog margins and inner ditches.
3. Use a magnifier to look for eggs. Look at eggs carefully to be sure they are alive. As you move into the season, many eggs are dead or parasitized.
4. Target only eggs. Do not treat in attempt to control caterpillars in the fruit. Research shows that sprays made after caterpillars have entered fruit are minimally effective.
5. For beds with high fruitworm pressure, it may be cost effective to apply Intrepid 2F in lowest gallonage at 50% out-of-bloom. There is no risk to pollinators with this compound.
6. Timing first spray using % out of bloom: In the event of odd weather (such as we had in 2003 season), in the first two weeks of July where cool temperatures of rain persist to slow fruit set, it may be advisable to shorten the interval between 50% out-of-bloom and the first spray.

**STANDARD PRACTICE**

**1ST TREATMENT - CALCULATE % OUT-OF- BLOOM (1/2 of blossoms have lost petals or become fruits)**

To time your first spray, you must calculate the % out-of-bloom every couple of days as pinheads start to form, usually around the end of June. For each acre of bog, randomly collect 10 uprights and record the number of pods, flowers, pinheads, and fruit. Calculate using the following:

$$\% \text{ out-of-bloom} = \frac{\text{total number of pinheads and fruit}}{\text{total number pods, flowers, pinheads, and fruit}} \times 100$$

*Apply 1st treatment 7-9 days after 50% out-of-bloom for Howes and Early Blacks, 5-7 days for Ben Lears and 3-5 days for Stevens. Timing of this spray is critical.*

**2ND TREATMENT**

Apply 2nd treatment about 10 days after 1st treatment.

**ADDITIONAL TREATMENTS - MONITOR EGGS TO TRIGGER SPRAYS**

A week after your 2nd treatment, inspect 50 randomly picked berries/A (with a minimum of 200 berries per piece no matter how small piece is) for eggs. Follow guidelines in table below to determine necessity of spray. If egg numbers trigger spray, spray ASAP. If no egg is found, repeat berry inspection process every 3-4 days until Aug. 15.

**SCOUTING PRACTICE**

**1ST TREATMENT - CALCULATE % OUT OF BLOOM**

Apply 1st treatment 7-9 days after 50% out-of-bloom (half the blossoms have lost all petals or become fruits) for Howes and Early Blacks, 5-7 days for Ben Lears and 3-5 days for Stevens. Timing of this spray is critical.

**ADDITIONAL TREATMENTS USING SCOUTING PRACTICE**

Five days after treatment, inspect 50 randomly picked berries/A (with a minimum of 200 berries per piece) for eggs. Follow guidelines in table below to determine necessity of spray. If egg numbers trigger spray, spray ASAP. If no egg is found, repeat berry inspection process every 3-4 days until Aug. 15.

**LATE WATER PRACTICE**

Late water may effectively reduce fruitworm pressure. It is possible that sprays can be eliminated for cranberry fruitworm → but berries must be monitored for eggs throughout the fruitworm season as the moths are very mobile and may move into your bog from external sources.

**TREATMENTS - MONITOR EGGS TO TRIGGER SPRAYS**

As fruits set, begin inspecting 50 randomly picked berries/A (with a minimum of 200 berries per piece) for eggs. Follow guidelines in table below to determine necessity of spray. If egg numbers trigger spray, spray ASAP. If no egg is found, repeat berry inspection process every 3-4 days until Aug. 15. If fruitworm pressure is low through fruit set, it may be safe to extend intervals between berry sampling dates.

TABLE USED (for all practices) TO DETERMINE NECESSITY OF SPRAY

Number of acres	Number of berries checked	Number of viable eggs needed to trigger spray
0-5	200-250	1
5-7	251-350	2
7-9	351-450	3
9-11	451-550	4
11-13	551-650	5
13-15	651-750	6
for each additional	add 100	add 1

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2 acres	berries	egg
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### SOIL INSECTS

#### BLACK VINE WEEVIL AND STRAWBERRY ROOT WEEVIL

Nematodes		Target immatures in soil. Apply in early evening in May and/or September. Best results occur when soil temperatures are higher than 56°F. Irrigate before and immediately after application. Chlorpyrifos (e.g. Lorsban) has been reported to adversely affect nematodes.
Cryolite Bait	20-30 lb/A	Target adults; they must ingest product. Limit 2 applications/season. Apply with ground equipment when adults are actively feeding, usually late June. A second application is possible 10-14 days after the first. Cryolite bait production has been discontinued, availability limited.
Fall Flood		Flood for 10-14 days as soon as possible after harvest. Warmer water temperatures enhance effectiveness.
Winter Flood		If you can winter flood, populations should be less abundant.

In the spring, look for grubs in soil associated with areas of dying vines (often near bog edge) that may have an orange halo of vines around edges. Grubs feed on the bark of the vine. Adults emerge in June; they must feed for about 4 weeks before egg-laying starts. Night sweep for weevils at edge of weevil-damaged areas, starting after dusk but before dew forms in mid-June through July. Notched new foliage indicates adult feeding. Sweep when vines are dry. These pests are more abundant in bogs with no winter flooding or high spots.

#### CRANBERRY GIRDLER

Diazinon 14G	21 lb	Limit 2 applications/season. Target immatures in soil. Do NOT apply aerially. Where one treatment is needed, apply 2 weeks after <b>end</b> of moth flight. For sites that are badly infested, apply 2 weeks after <b>peak</b> flight and again 10 days later. Applications made by the end of July give the best results. Water in thoroughly to increase efficacy and <u>reduce bird hazard</u> . Avoid puddling. Do not apply to bare ground or ditch water. Do not discharge water from treated area for at least 7 days. Spot treat isolated infestations.
Nematodes		Apply Nematodes 2 weeks after <b>end</b> of moth flight. Target immatures in soil. Apply in early evening under low wind conditions. Irrigate before and immediately after application. Excessive leaf trash may reduce effectiveness. Chlorpyrifos (e.g. Lorsban) has been reported to adversely affect nematodes.
Fall Flood		Flood for a week as soon as Early Blacks are harvested starting not later than Sept. 25. Vines must be completely covered. It may be necessary to flood late varieties with berries on the vine.
Regular Sanding		Sanding with 1-3 inches every 3rd year will reduce favorable girdler habitat.

In June through July, appearance of silvery-white moths with a "snout" on front of head that make short, jerky flights as you walk through the vines may signal a problem, but be sure to target immatures in soil with control treatment. If there is a history of girdler on your bog, use pheromone traps to time treatments (details on page 7). Be aware of girdler's true appearance; a very similar non-pest moth is also picked up in traps. A bad girdler infestation can exist even with low pheromone trap catches. Just below the trash line, look for old feeding damage that may be quite deep in the wood of the vine. Thorough trash flows are beneficial.

<b>SCARAB GRUBS</b>
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Admire 2F 16-32 oz Target oriental beetle immatures in soil with a soil drench treatment. In turf and blueberry, oriental beetle grubs are suppressed; we have no efficacy data in MA cranberry. Limit 2 applications/season; limit 32 oz./season. No aerial application. 30 day PHI. Newly-hatched grubs are most vulnerable and the best results are achieved when the compound is present just prior to egg hatch—this can be determined by monitoring beetle flight with pheromone traps. Irrigate before and after application. Kills bees: Apply post-bloom when bees are not present at the end of July through early August. Admire has a long residual.

Summer flood Drain bog thoroughly from early April to May 12. Reflow May 12 and keep well flooded until July 20. This will eliminate cranberry root grub and cranberry white grub larvae, as well as the crop for that year. Oriental beetle and *Hoplia* are probably also impacted by the summer flood. Check for true cutworm infestations after flood removal.

**Cranberry root grub** - grubs turn into beetle adults that are low-flying bumblebee mimics; they emerge from the soil during cranberry bloom and set. Males fly after dawn through mid-morning.

**Cranberry white grub** - grubs turn into large-bodied "June bugs" as adult beetles and are active in the evening in May and June.

**Oriental beetle** - small beetle (5/8 inch), vary greatly in color and pattern from light brown to black. Grubs develop over two years and are similar in appearance to small white grubs. An adult sex pheromone trap is available.

***Hoplia equina*** - adult beetles emerge synchronously from the soil during bloom in late afternoon. The small brown beetles are about 5/16 inch in size. The grubs develop over two years and are similar in appearance to small white grubs.

In the spring, look for grubs in both root layer and lower soil associated with areas of weak or dying vines. Because it is unknown if Oriental Beetle and *Hoplia* respond to summer flooding, let us know if you summer flood for these species. In grub-infested areas, try to avoid stress to vines such as high doses of Casoron and drought. For *Hoplia* only, there is some evidence of nematode efficacy. Call the Cranberry Station.

<b>STRIPED COLASPIS</b>
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Admire 2F	16-32 oz	Soil drench treatment applied to immatures in soil. Very preliminary data in MA cranberry appears favorable. No aerial application. Limit 2 applications/season. Limit 32 oz./season. Irrigate before and after application. Kills bees: applications should be made in July post bloom after the bees have been removed. Admire has a long residual.
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Diazinon 50 W	4-6 lb	FIFRA 2EE recommendation targeting adults. It is advisable to hold water for at least 3 days. 4 applications/season at higher rates, 6 applications/season allowed at lower rates. 7 day PHI and 14 day interval between applications.
Diazinon AG 500	2-3 qt	
Diazinon AG 600 & 5 WP	51-76.5 oz	
Sevin XLR Plus	1-2 qt	FIFRA 2EE recommendation targeting adults. Do not spray within 10 days of bloom. Limit 5 applications/season, 7 day spray interval, 7 day PHI. Sevin XLR Plus is formulated to have minimal bee toxicity once the spray dries.
Sevin 4F & Carbaryl 4L	1-2 qt	
Sevin 80 WSP & Sevin 80S	1.25-2.5 lb	

Diazinon and carbaryl (Sevin) efficacy levels may vary greatly. Sprays should target adults when they are active at bloom and are being picked up while sweep netting. They are ca. 1/6" long; oblong-oval. Head area metallic greenish-black and wings blackish, striped with yellow. Legs and antennae yellow. Grubs in soil feed in root area, killing vines. Adult feeding results in distinct notching in top leaves of uprights, particularly in infested area.

## 16 Insects

### MISCELLANEOUS PESTS

#### CRANBERRY FLEA BEETLE

Sevin XLR Plus	1-2 qt	Avoid applying Sevin within 10 days of start of bloom.
Sevin 4F & Carbaryl 4L	1-2 qt	Limit 5 applications/season, 7 day spray interval, and 7 day PHI.
Sevin 80 WSP & Sevin 80S	1.25-2.5 lb	Sevin XLR Plus is formulated to have minimal bee toxicity once the spray dries.
Diazinon 50 W	4-6 lb	FIFRA 2EE recommendation. Hold water for at least 3 days.
Diazinon AG 500	2-3 qt	Limit 4 applications/season at higher rates, 6 applications/season
Diazinon AG 600	51-76.5 oz	allowed at lower rates. Observe 7 day pre-harvest interval.

Adult flea beetles are active in late July through September. Beetles and their feeding damage are very patchy, often in areas of lush vine. Beetle feeding can impact bud development for the following year. Firm thresholds have not been quantified, but sweep net counts of 15 per 25 sweeps on average over all acreage is the current rule of thumb.

#### SOUTHERN RED MITE

Pyramite	4.4-8.8 oz	Low-end rates provide control in most chemigation systems. Limit 2 applications/season. Apply by ground and chemigation only – no aerial application. Hold water for minimum of 3 days after application. 5 hours of drying time required.
Late Water		Research shows that late water can eliminate mites in the year that the flood is held. In the second year following late water, mite pressure may still be low. See Late Water Section.
Trilogy 70 EC		This is a neem oil product. Use 1% rate for ground application or 1 qt/A for aerial application in 10 gallons of water. Do not chemigate. Do not use older formulation, 90 EC. Useful as a dormant application for suppression of egg hatch. Be aware that it accelerates plant growth stage and adjust frost protection accordingly. Also suppresses eggs and motile mites post bloom. We have no evidence to support claims that this product controls cranberry diseases.

Look for tiny red mites in sweep net and for red/orange streaks on rim of net or white card. Use a 10X magnifier to examine leaves to determine that mites are present: misidentifications frequently occur. Areas of discolored vines late in the season are often an indicator of mite infestation.

#### CRANBERRY TIPWORM

Extensive spray trials in MA have shown that available insecticides do not control tipworm, probably because this insect has developed resistance. Early-season tipworm damage often is high, but good vine health enhances rebudding. Appearance of damage does not mean that insects are still present. Only very late-season damage, which is rare, appears to consistently impact yield. Stressful vine conditions in the year of damage may also result in yield reduction. Diazinon and Guthion are labeled for tipworm. However, research shows ONLY ca 20% mortality. Sprays are not encouraged for this insect.

### MANAGEMENT NOTES FOR ALL INSECT RECOMMENDATIONS

1. **READ AND FOLLOW LABEL INSTRUCTIONS.** Do not use a pesticide for control of a pest not on the label unless a specific recommendation is made by a person authorized to do so (FIFRA 2EE). Pesticide-treated bogs may need to be posted. Check labels. Workers and scouts should be notified prior to treatments, and informed

about re-entry times. See label for variation in restricted entry times and worker protection standards (WPS). **ONLY APPLY INSECTICIDES IF DAMAGING NUMBERS ARE PRESENT--DETERMINE THIS BY SCOUTING EACH BED.**

2. **LATE WATER** -- See Late Water section. Late water research shows that the flood severely reduces mites, cranberry fruitworm, false armyworm, and gypsy moth.

**REFLOODING –**

- a) About May 18<sup>th</sup> for 10 hours controls false armyworm and blossomworm.
- b) About June 1-12<sup>th</sup> for 10 hours controls green spanworm, small black-headed fireworm, spotted and black cutworms and armyworms, but is likely to **increase fruit rot** and **seriously reduce the crop**.
- c) About May 12<sup>th</sup> and holding up to July 15-20<sup>th</sup> kills all insects, but with the loss of crop.
- d) Sept. 20-30<sup>th</sup>. Flooding within this time for a week every third year discourages girdler and blossomworm. A 3 or 4 week flood at this point will manage cranberry fruitworm. These floods are best done when fruits have been removed.

3. **SANDING** -- Regular uniform sanding helps check girdler and green spanworm and may temporarily suppress early season tipworm populations.

4. **LEAFMINERS** -- There is no evidence that available registered insecticides control this insect.

5. For complete guidelines -- Refer to materials available at the Cranberry Station. Management guidelines provided here serve only as reminders. Review the Insect Management BMP in the UMass Best Management Practices Guide.

**6. BEES!! INSECTICIDES ARE HIGHLY TOXIC TO BEES, ESPECIALLY DIRECT APPLICATIONS AND RESIDUES. DO NOT APPLY OR ALLOW TO DRIFT TO CRANBERRIES IN BLOOM OR NEARBY BLOOMING PLANTS/WEEDS IF BEES ARE FORAGING. IF APPLICATION IS NECESSARY, MAKE SPRINKLER APPLICATION AT NIGHT AND RUN SPRINKLERS EARLY FOLLOWING MORNING TO DELAY BEE FORAGING ACTIVITY. ADVISE BEEKEEPER.**

**CAUTIONS**

<b><u>Insecticides</u></b>	<b>Maximum actual toxicant/A</b>	<b>Pre-harvest interval (PHI)</b>	<b>Restricted entry interval (REI)</b>	<b>Maximum number of applications</b>
Admire (Imidacloprid)	0.5 lb	30 day	12 hrs	2
<i>B.t.</i> based products	NA	No PHI	4 hrs	-
Confirm (Tebufenozide)	1 lb	30 days	4 hrs	4
Cryolite bait	NA	30 days	12 hrs	2
Diazinon *	4 lb	7 days	24 hrs	4 or 6
Diazinon granular *	0.5 lb/1,000sq ft	7 days	12 hrs	2
Entrust (Spinosad)	0.45 lb	21 days	4 hrs	6
Guthion (Azinphos Methyl) *	1 lb	21 days	<b>7 DAYS</b>	2
Imidan (Phosmet)	15.6 lbs	14 days	24 hrs	-
Intrepid (Methoxyfenozide)*	1 lb	14 days	4 hrs	4
Lorsban (Chlorpyrifos)*	1 1/2 lbs	60 days	24 hrs	2
Nematodes	NA	No PHI	0 hrs	-
Orthene (Acephate)	1 lb	90 days	24 hrs	1
Pyramite (Pyridaben)	26.6 oz	21 days	12 hrs	2
Pyrenone or Pyronyl	60% PBO + 6% Pyrethrins	No PHI	12 hrs	-
Sevin (Carbaryl)	4 lb	7 days	12 hrs	5
SpinTor (Spinosad)	0.55 lb	3 days	4 hrs	6
Sprayable Pheromones	24/25 oz	No PHI	4 hrs	read label
Trilogy (Neem Oil)	NA	No PHI	4 hrs	read label

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\* = restricted use pesticide, requires a pesticide license to buy and apply.