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LATE WATER AND CRANBERRY MANAGEMENT 2009

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Late Water (LW) is a 30 day spring reflood applied several weeks after the winter flood has been removed and before the plants have lost dormancy (not yet fully green). LW suppresses some insects and Southern red mite (SRM). Fruit rot disease is reduced on LW bogs and keeping quality is improved. LW has also been shown to suppress growth of dewberries (brambles).

Significant reductions in pesticide inputs may be achieved with the use of late water.

FLOOD MANAGEMENT

When to use LW: Late water should be used no more than one year in three. If the previous summer was very sunny and none of the adverse weather conditions listed below are present, the use of LW should be considered for its benefits in insect, mite, disease, and weed control (see below).

When* not *to use LW: To minimize crop reduction, late water should not be used more often than once every three years. Bogs with poor quality water supplies may not be good candidates for late water. Do not use LW if the winter has been unusually cold or abnormally warm (particularly if the fall was also warm). ***Do not use LW in the spring following a fall flood.*** Inspect the bog after withdrawing the winter flood - if stress, winterkill or leaf-drop are apparent, do not use LW. Do not use LW if the bog was sanded the previous fall or winter. However, barge sanding in the LW flood has been successful. Experience has shown that in some years (on average, 1 in 10 years) late water bogs may produce significantly (>10%) lowered yields. Overall, however, this low yield may be offset by higher yields in subsequent years. Costs in the LW year should also be less, particularly if inputs are reduced due to reduced pest pressure, helping to offset any losses. It is not known exactly what factors contribute to these occasional lower yields, but avoiding LW in the conditions listed above should provide some insurance against a large crop loss.

When to apply the flood: The flood should be applied in the spring prior to the breaking of bud dormancy. The leaves will be beginning to lose their dormant red color but the flower buds should still be red and tight. Generally, the 30 day LW flood will be applied between April 15th and 20th. If temperatures in late March - early April are warm (5°F per day above normal) or the season is early due to warm winter temperatures, the flood may be applied earlier (up to one week). Do not apply the flood if the buds have broken dormancy. We recommend putting sprinkler heads in place prior to the flood. This allows easy application of algaecide if needed (see below) and ensures that you will be ready if a frost night occurs immediately after flood removal.

Depth and temperature: The flood depth should be maintained so that all vines are well covered by water. Shallow floods and/or flood temperatures consistently greater than 65°F should be avoided to prevent injury and crop reduction. Flood water temperatures will generally be cooler if the flood is deep (> 12 inches above the vines). Beds that are severely out of grade may be poor candidates for LW.

Prevention and treatment of scum: Algae (scum) often forms in LW floods. Water temperature is a major factor in the development of scum: shallow floods and inland, warmer locations may be more prone to this problem. If your flood is shallow or if you have had scum problems in LW or winter floods, plan to treat using a liquid copper algaecide applied two weeks into the flood period (Algae-Pro, Cutrine Plus, etc; see the Weed section for more information). The material is injected into the sprinkler system running at 20 psi (30 minute injection, you may continue running for 1-2 hours after to disperse the material). Rates are calculated using label information and the number of acre-feet to be treated. To calculate acre-feet, multiply the number of acres by the depth of the flood in feet (take into account variation due to non-uniform flood depth). If you do not use this treatment, you must scout shore ditch edges for the presence of algae and treat with copper compounds as soon as scum is observed. Remember that copper only prevents further algal growth (it doesn't eliminate existing scum), so prompt treatment is necessary. If scum is severe, early withdrawal of the flood may be necessary. If heavy scum is present after the flood, it should be broken up mechanically so that light can reach the vines. Even so, crop reduction may occur when scum is severe.

Late Water Flood Timing

Location	Apply the flood around:	Remove the flood:
Inland Areas	April 10-15	no later than May 15th
Coastal Plymouth County	April 15-20	about May 20th
Cape Cod	April 20 or later	late May

Choose actual application timing based on weather (see previous page) and hold for approximately 30 days.

Draining: Release the flood slowly over the top board to protect water resources. The date of flood removal will vary with location and date of application. If air temperatures are unseasonably warm, and flood water temperature becomes too high, the LW flood may need to be removed prior to 30 days. If the flood is removed early, pest management benefits may be affected (see insect management next page).

MANAGEMENT AFTER LATE WATER:

Irrigation: There should be no need to irrigate (unless protecting for frost) for at least 2 weeks after the LW flood is withdrawn. Always schedule irrigation based on soil moisture status.

Frost protection: After removal of the LW flood, cranberry buds are sensitive to frost injury. During LW, the appearance of the terminal bud is arrested at the spring dormant stage. However, internal changes in the bud lead to a loss of frost tolerance despite appearances.

When using LW, frost management should be based on the actual duration of the flood, rather than the appearance of the buds. After more than one week of flooding, appearance of the buds will not be an accurate predictor of tolerance. A one-week flood early in the spring has no impact on frost tolerance -- protect the buds based on appearance. After LW of longer than 1 week, protect the bogs for 27°F (flood duration = 2 weeks) or 30°F (any duration longer than 2 weeks).

Fertilizer use: LW bogs respond readily to fertilizer: N dose should be reduced to avoid overgrowth. A 30-40% reduction of N is possible by eliminating the spring application and/or reducing the fruit set dose. Further reductions may have impact on bud development for the following year. Remember, fertilizer applied in the current season has the greatest impact on the *following* season's crop. The best tactic for a LW bog is to add no fertilizer for at least 2 weeks after flood withdrawal and then add small amounts with close monitoring of response. Generally, no fertilizer should be needed until bloom. Time your applications by the plant's development. This is especially important when development has been shifted in time by the use of LW. If the LW flood was terminated early (duration of 3 weeks or less), standard fertilizer regimens may be followed.

Disease management: Late water is an excellent cultural control strategy against fruit rot.

Processed fruit and fresh fruit Howes, year of the LW flood - Use reduced rates and number of applications of fungicides. Fungicides may be eliminated on processed-fruit beds if keeping quality is forecast to be good. If one application is to be made, apply at 50% bloom. If two fungicide applications are made, apply the first at 10% bloom and the second two weeks later. *Reduced fungicide **rates** should be employed*, especially for Howes, which has greater resistance to rot. Experience with Stevens in LW is limited, but generally it has even better rot resistance than Howes.

First year after LW has been held - Fungicide applications and rates can still be reduced without sacrifice in fruit quality.

Second year after LW has been held - Fungicide applications and rates should be increased to a normal schedule. Otherwise, fungal inoculum will increase and may cause significant field and storage rot losses.

New Plantings - Late water held in a newly planted (one or two year-old) bog will help prevent inoculum buildup, as well as helping the vines spread over the surface of the soil. Both of these factors will help reduce the amount of rot during the initial two crop seasons. Late water may also slow down weeds on new bogs (see next page).

Insect and mite management: Many insects are affected by LW. Emergence is delayed, and when a type of insect does appear, emergence is often synchronous, permitting better management. LW can be used to manage several pest insects:

Early season insects - False armyworm and Gypsy moth may be suppressed. In general, cutworms have not been a problem in recent years on LW bogs. Pre-bloom sprays are seldom needed, but sweep net **scouting** should still be carried out -- cutworm moths may be attracted to the wet bog just after flood removal as a site for egg laying. If this happens, infestation may be quite severe. In addition, spanworms have sometimes been found on LW bogs.

Cranberry fruitworm - Cranberry fruitworms, that overwinter in the bog in hibernacula (cocoons), have been shown to be greatly reduced by LW. Mortality is higher when the flood is warm (approx. 60°F). Shorter duration (2.5-3 weeks) LW floods appear to have little effect on mortality in the hibernacula; populations are suppressed very little, compared to those on unflooded beds and significantly less than those on beds receiving a 4-week flood (see table below). Monitoring for infestation is important (see the insect section for scouting practice after LW). Fruitworm sprays may be eliminated on LW bogs. Second and third sprays are seldom needed but scouting for eggs should continue as populations may move in from surrounding beds.

Effect of late water duration on cranberry fruitworm mortality. Data based on failure of insect to emerge from hibernacula following flood.

Site	**Flood length**	**CFW mortality**	
		flooded	**no flood**
1	2.5 weeks	50%	28%
2	2.5 weeks	45%	13%
3	2.5 weeks	40%	34%
	4 weeks	98%	20%
4	3 weeks	41%	37%
	4 weeks	94%	71%

Sparganothis fruitworm is not controlled by LW. Flight is synchronized making management easier.

Southern red mite - Mites can be severely impacted by holding late water. Intense infestations can be essentially eliminated in the year of late water. The mites begin to increase in the second year following the flood, but even then, may stay much below the original infestation level prior to the flood. Generally, LW affords two years of control for this pest.

Weed management: While LW may delay weed development and suppress the growth of some perennial weeds, this technique alone does not result in *control* of most established weeds. LW does not control dodder.

Dewberries (running bramble) - Some success in retarding the growth of dewberries (*Rubus* spp.) by holding late water has been shown. Sawbrier (*Smilax glauca*) was less affected. LW suppression of dewberries should be followed up with other controls such as hand-wiping or clipping with glyphosate. Fall flooding also suppresses dewberries. However, severe crop loss resulted when LW was used in the spring following a fall flood. Do NOT combine these practices.

Herbicide use:

- Do not apply preemergence herbicides prior to a late water flood.
- Low rates of Casoron (up to 40 lb/A) may be applied *after* the late water flood is withdrawn for the control of **dodder**. Apply herbicide as soon as possible after the withdrawal of the flood (be sure the vines are dry and the soil has drained).
- No other preemergence herbicides should be applied after the flood is withdrawn.

Bees: Bees for pollination may be more important on late water bogs due to the fact that the period of flowering is of shorter duration than that for early water bogs. Protect bees from pesticide exposure.