

LATE WATER AND CRANBERRY MANAGEMENT 2021 - 2023

Prepared by Leela S. Uppala, H.A. Sandler, and A.L. Averill

Late Water (LW) is a one-month spring flooding practice (applied from mid-April to mid-May) before the plants have lost dormancy, typically recommended once in 3 years. Several benefits of LW are documented, such as protection of plants from spring frost damage, reduction of fruit rot, some insects (Southern red mite, scale), weeds (dewberries also known as brambles), enhancement of fruit quality and improvement of the keeping quality. LW also synchronizes bloom, producing fewer flowers per upright with a larger percentage setting fruit than their unflooded counterparts. Through bloom synchronization, LW helps to improve the efficacy of fruit rot control measures. Newly set berries grow to a more uniform size than fruit on unflooded controls. Due to these factors, LW beds can yield as well as their unflooded controls. LW also reduces the pesticide and nitrogen requirement significantly for the year of LW.

FLOOD MANAGEMENT

When to use LW: It has been our long-time recommendation that LW should be used no more than one year in three. However, many organic growers and others trying to reduce costs have, in recent years, been using LW in successive years, the impact of which on the crop is not well documented. The most important factors in deciding to use LW in a given year is a thorough evaluation of the vine appearance and a review of factors that can lead to negative LW outcomes. If the vines are healthy and 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). Growers could also consider the preliminary forecast issued by the Cranberry Station in early April to aid in decision making regarding the use of LW.

When not to use LW: To minimize crop reduction, LW should not be used when the vines appear stressed after the winter flood is removed. Bogs with poor quality water supplies may not be good candidates for LW. Beds that are severely out of grade may be poor candidates for LW. Any condition that leads to a reduction in the plant's carbohydrate reserves can lead to a poor LW outcome. Such conditions include a heavy crop, abnormally warm late fall, low previous year sunshine, oxygen deficiency, and winter temperature extremes. 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 reported successful. Experience has shown that in some years (on average, 1 in 10 years) LW bogs may produce significantly (>10%) lowered yields. However, this low yield may be offset by higher yields in subsequent years. If the bog holds a flood well, costs in the LW year should also be less, particularly if inputs are reduced due to reduced pest pressure, helping to offset any losses. All factors that contribute to these occasional lower yields are not entirely understood but avoiding LW in the conditions listed above should provide some insurance against a large crop loss.

Timing of LW 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 ensures that you will be ready if a frost night occurs immediately after flood removal and facilitates the addition of algacides if necessary.

Late Water Flood Timing

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

Choose actual application timing based on weather and hold for approximately 30 days.

Depth and temperature of LW flood: 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 (measured in the early morning) 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). If temperatures are approaching 65°F, recirculation of the flood water may prevent having to abort the flood prior to 4 weeks. However, keeping the flood too cool using this technique may reduce efficacy in the suppression of cranberry fruitworm (see the insect section on the next page for more information).

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 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. Barley straw may be used to clear the water; research indicates its efficacy can be variable, working well in many situations but failing in others.

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 flood initiation. 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. However, we recommend that you schedule irrigation based on soil moisture status. Moisture sensors and tensiometers should be re-deployed soon after the flood is removed.

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 LW flooding, the appearance of the buds will not be an accurate predictor of tolerance. A 1-week LW flood 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 can be achieved by eliminating the spring application and/or reducing the fruit set dose. Further reductions may have an 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 (3 weeks or less), standard fertilizer regimens may be followed.

Disease management: LW can be an excellent cultural control strategy against fruit rot.

Fresh fruit Howes and all processed fruit bogs in the year of the LW flood - Use reduced rates (never use less than the recommended rate listed on the fungicide label) and number of applications of fungicides. Fungicide application intervals may be extended to every 10 or 14 days depending on bloom. Fungicides may be eliminated on processed-fruit beds if the final 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. Scientific literature focusing on the effects of LW in the newer cultivars/hybrids is limited.

First-year after LW has been held - Fungicide applications and rates can still be reduced without sacrificing 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 - LW held in a newly planted (one or two year-old) bog will help reduce 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. LW 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 - Winter moth hatches from late April into early May, so on-bog populations of this insect should be suppressed by LW. 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 (other than winter moth) have sometimes been found on LW bogs.

Cranberry weevil - is not impacted by LW.

Cranberry fruitworm - Cranberry fruitworms, which overwinter in the bog in hibernacula (cocoons), have been shown to be greatly reduced by LW, *particularly when held for the full duration of 4 weeks*. Mortality is higher when the flood is warm (approx. 60°F) and is significantly lower if the flood water is cool throughout the 4 weeks. 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). A 4-week flood with water temperatures that rise to the 60°F level provides the best chance for fruitworm suppression. Therefore, growers should closely monitor flood temperature. While 60°F provides the best fruitworm suppression, greater than 65°F increases the potential for crop reduction. 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.

Effects of LW duration on cranberry fruitworm mortality. Data based on the failure of insect to emerge from hibernacula following flood are listed below.

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%

Scale - LW suppresses scale.

Sparganothis fruitworm - is not controlled by LW but flight is synchronized, making management easier.

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Southern red mite - Mites can be severely impacted by holding LW. Intense infestations can be essentially eliminated in the year of LW. 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 2 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 by holding LW has been shown. **Sawbrier** (*Smilax glauca*) was less affected. LW suppression of dewberries should be followed up with other controls such as hand-wiping, clipping, flame cultivation or 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. **Dodder** (seeds or seedlings) are not known to be controlled by LW.

Herbicide use:

- ✓ Do not apply preemergence herbicides prior to a LW flood.
- ✓ Casoron may be applied *after* the LW 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.
- ✓ POST herbicides can be applied when weeds have emerged, according to the label.

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