# WEED MANAGEMENT 2010

Prepared by Charles D. Armstrong

Weeds compete with cranberry vines for light, water, and nutrients. Weeds can shade vines, reducing cranberry photosynthesis and nitrogen uptake. Tall weeds may discourage pollinating insects, and extend the drying time of rainfall, irrigation, and dew from the vines. Wet vines favor disease development and may impede the release of pollen during bloom. Heavy stands of weeds impede harvesting and can damage berries during harvest. Weeds also allow refuge for many insect pests, and some weeds make attractive primary hosts for dodder, aiding its establishment within the bed. In short, weeds reduce cranberry yield and quality. An effective cranberry weed management program uses both cultural and chemical controls.

## Weeds Found on Maine's Commercial Cranberry Beds

**Weed priorities are indicated by a number** (1=no tolerance, 2=serious concern, 3=less concern, and 4=lowest concern) based on their general likelihood to cause yield loss, ability to spread, and difficulty of control. *However,* when making weed maps, you—as growers—are encouraged to adapt weeds into priority groups of your own choosing in accordance with what best fits your own experiences and management program.

ξ = quite prevalent or widespread  😐 = quite problematic or competitive with Maine cranberry vines.

| | |
|---|---|
| **Barnyard Grass** (annual) 4 | **Ladysthumb** (Smartweed) (perennial) Massachusetts 4 Maine 3 and sometimes 2 ξ |
| **Beggarstick** (Pitchfork) (annual) Mass. 4 Maine 2 or 3 | **Maple Tree Saplings** 3 ξ |
| **Birch Tree Saplings** 3 ξ | **Meadowsweet** (perennial) 4 |
| **Birdsfoot Trefoil** (perennial) 3 ξ | **Narrow-leaved Goldenrod** (perennial) 2 ξ 😐 |
| **Bluets** (Quaker Ladies) (annual) 4 | **New York Aster** (perennial) 2 |
| **Carpetweed** (annual) 4 | **Pitchfork** (Beggarstick) (annual) Massachusetts 4 Maine 2 or 3 |
| **Clover** (Red, White & Low-hop varieties) (perennial) Massachusetts 4 Maine 2 ξ 😐 | **Prostrate Spurge** (annual) 4 |
| **Common Cinquefoil** (Five-finger) (perennial) 3 | **Purple Vetch** (Cow Pea) (mostly annual) 3 ξ |
| **Creeping Yellow Cress** (perennial) | **Ragweed** (annual) 4 |
| **Cudweeed** (annual) 4 ξ sometimes | **Sandspurry** (annual) 4 ξ |
| **Dandelion** (perennial) 3 | **Sedges** (perennial) 3 |
| **Dodder** (a few sites from time to time) (annual) 1 😐 | **Small-flowered White Aster** (perennial) 2 |
| **Dwarf St. Johnswort** (perennial) 3 ξ | **Smartweed** (Ladysthumb) (perennial) 2-3 ξ 😐 |
| **Fireweed** (annual) 4 | **Thyme-leaved Speedwell** (perennial) 3 |
| **Hair-cap Moss** (perennial) 4 | **Toadflax, Blue** (perennial) 3 |
| **Hawkweed** (perennial) 4 | **Yellow Loosestrife** (Swamp Candles) (perennial) 1-2 ξ 😐 |
| **Horsetail** (Mare's Tail) (*equisetum*) (perennial) ξ 😐 Massachusetts 4 Maine 2 (frequently) | **Yellow Wood Sorrel** (Sour Grass) (perennial) 4 |

***NOTE:*** A list like this one is also part of the Maine cranberry website, where you can find **pictures** of most of these weeds: http://extension.umaine.edu/cranberries/grower-services/weeds/ Another *very good* site for weed photos and descriptions can be found at http://www.ipm.ucdavis.edu/PMG/weeds_common.html

# Scientific, Common, and Family Names

| COMMON NAME | SCIENTIFIC NAME | FAMILY |
|---|---|---|
| Barnyard grass | *Echinochloa crus-galli* | POACEAE (Graminae) - Grass Family |
| Beggarstick (Pitchfork) | *Bidens frondosa* | ASTERACEAE (Compositae) - Aster or Sunflower Family |
| Birdsfoot Trefoil | *Lotus corniculatus* L. | FABACEAE (Bean, Pea, Legume Family) |
| Bluets | *Houstonia caerulea* | RUBIACEAE - Madder Family |
| Carpetweed | *Mollugo verticillata* | AIZOACEAE - Carpetweed Family |
| Clover (White clover) | *Trifolium repens* | FABACEAE (Bean, Pea, Legume Family) |
| Clover (Red clover) | *Trifolium pratense* | FABACEAE (Bean, Pea, Legume Family) |
| Clover (Low-hop or hop) | *Trifolium agrarium* | FABACEAE (Bean, Pea, Legume Family) |
| Common Cinquefoil | *Potentilla simplex* | ROSACEAE - Rose Family |
| Creeping Yellow Cress | *Rorippa sylvestris* | BRASSICACEAE (Cruciferae) - Mustard Family |
| Cudweed | *Gnaphalium uliginosum* L. | ASTERACEAE (Compositae) - Aster or Sunflower Family |
| Dandelion | *Taraxacum officinale* | ASTERACEAE (Compositae) - Aster or Sunflower Family |
| Dodder | *Cuscuta* spp. | CONVOLVULACEAE - Morningglory Family |
| Dwarf St. Johnswort | *Hypericum mutilum* | HYPERICACEAE (Clusiaceae) – St Johnswort Family |
| Fireweed | *Epilobium angustifolium* | ONAGRACEAE – Evening Primrose Family |
| Goldenrod | *Solidago* spp. | ASTERACEAE (Compositae) Family |
| Hair-cap Moss | *Polytrichum commune* | POLYTRICHACEAE |
| Hawkweed | *Hieracium pratense* | ASTERACEAE (Compositae) Family |
| Horsetail | *Equisetum arvense* | EQUISETACEAE – Horsetail Family |
| Ladysthumb (Smartweed) | *Polygonum persicaria* | POLYGONACEAE - Smartweed or Buckwheat Family |
| Meadowsweet | *Spiraea alba* | ROSACEAE – Rose Family |
| New York Aster | *Aster novi-belgii* | ASTERACEAE (Compositae) Family |
| Prostrate Spurge | *Euphorbia humistrata* | EUPHORBIACEAE – Spurge Family |
| Ragweed (Common Ragweed) | *Ambrosia artemisiifolia* | ASTERACEAE (Compositae) - Aster or Sunflower Family |
| Sandspurry (Red Sandspurry) | *Spergularia rubra* | CARYOPHYLLACEAE - Pink Family |
| Small-flowered White Aster | *Aster vimineus* | ASTERACEAE (Compositae) - Aster or Sunflower Family |
| Thyme-leaved Speedwell | *Veronica serpyllifolia* | SCROPHULARIACEAE – Figwort Family |
| Toadflax, Blue | *Nuttallanthus canadensis* | SCROPHULARIACEAE – Figwort Family |
| Yellow Loosestrife | *Lysimachia terrestris* | LYTHRACEAE – Loosestrife Family |

**NOTE:** For a much longer list like this one, visit
http://www.umassgreeninfo.org/fact_sheets/weed_herbarium/common_name_list.htm

A list like this is also part of the Maine cranberry website, where you can find **pictures** of most of these weeds: http://extension.umaine.edu/cranberries/grower-services/weeds/ Another *very good* site for weed photos and descriptions can be found at http://www.ipm.ucdavis.edu/PMG/weeds_common.html

## WEED & HERBICIDE NOTES:

- Over **400 species** of weeds have been noted in US cranberry beds.
- **Annual versus Perennial:** *ANNUAL PLANTS* complete their life cycle in one year and reproduce only by seed. *PERENNIAL PLANTS* can live for many years and may reproduce by seed, runners, rhizomes, *etc.* Most of the weeds in cranberry production are, unfortunately, perennials. With few exceptions (such as dodder), annual weeds pose fewer challenges than do perennial weeds, or at least they 'should'.
- **Clipper Applications:** Roundup products are the only products currently labeled for use in clipper application. No other glyphosate products may be used this way. Using the correct technique is critical—the Roundup must be applied to the stem as it is cut! Good stem coverage and adequate flow without dripping on the vines is essential. Concentrated solutions (50-100% Roundup) work best.
- **Cranberry Root and/or Vine Inhibition:** Some herbicides may weaken vines and crops may be reduced.
- **Timing of Pre-emergence Herbicides:** Spring applications in Maine are typically done in April. Fall applications are typically done 1-2 weeks after harvest, but at least 2-3 weeks prior to the winter flood.
- To be most effective, rain should follow the application of any dry herbicide formulation within 4 days or the bed should be irrigated.
- Wash herbicide equipment with soap/detergent and water immediately after use. Rinse the equipment with ammonia after using hormone-type herbicides (such as Callisto® and Stinger®).
- **Mowing:** Mowing of tall weeds helps to prevent shading and reduces seed formation.
- **Late-Water Flood (pp 45-47):** a Late-water flood causes a general reduction of annual grasses and reduces dewberry populations and re-growth.

# ORGANIC WEED CONTROL

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|---|---|
| Dodder *(thus far rare in Maine beds)* | Pulling (by hand) followed by flagging for future inspections; Trash Flooding (removes many of the seeds); Sanding (delayed and synchronized emergence) (if 1/2" or more, then less germination of seeds). |
| Wild bean (ground nut), and rushes | Salt (sodium chloride) (may work on some other Maine weeds as well--probably worth trying); Pulling (by hand); Acidic pH (4.0 to 5.0); Spot-treating with excess sulfur (results variable); Sanding (delayed emergence). |
| Ragweed, Narrow-leaved goldenrod, Pitchfork (beggarstick), & Dandelion (members of the Sunflower family: Asteraceae) | Pulling (by hand); Acidic pH (4.0 to 5.0); Spot-treating with excess sulfur (results variable); Spot-treating with sodium chloride (better on some weeds than others, but probably worth trying); Late Water Flooding (pp. 45-47) (delays weed growth); Trash Flooding (removes small and floatable weed seeds, like those of dodder); Sanding (delays emergence). |
| asters, Cinquefoil, St. Johns-wort, mosses and ferns | Iron sulfate, plus any of the options below. |
| *Essentially all weeds* | Pulling (by hand); Acidic pH (4.0 to 5.0); Spot-treating with excess sulfur (results variable); Spot-treating with sodium chloride (better on some weeds than others, but probably worth trying); Late Water Flooding (pp. 45-47) (delays weed growth); Trash Flooding (removes small and floatable weed seeds, like those of dodder); Sanding (delayed emergence); Mowing weed tops (before seed production); Sawdust mulch (2" depth) – difficult for small plants to grow up through it; Vinegar at 5% acetic acid concentration and 20 to 100 gpa rate (plus an adjuvant) (very good against mosses). |

## CHEMICAL CONTROL OF SPECIFIC WEEDS (listed in alphabetical order):

**ASTERS** (Small-flowered White Aster, New York Aster, Purple Aster, *etc.*) (Priority 2) (perennials)
The impact of asters on cranberries is variable. They are usually found in bare patches, but once a patch of asters becomes established, they are much harder to control. Applications of Casoron in April or November offer some suppression but will probably not eradicate them. Glyphosate wipes in the summer may be helpful (thorough coverage is essential, and repeat applications are often necessary). ***Stinger, at a high rate, is considered the most effective option, but be careful of vine injury.*** Grower results with Callisto have so far been mixed in terms of efficacy against asters.

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|---|---|---|
| **Callisto** | **8 fl. oz/A** | 2 apps / season allowed; best if asters are <5" tall. |
| **Casoron 4G** | **up to 100 lb/A** | Apply in the spring or fall. |
| **Iron sulfate** | **3 oz/sq. ft.** | Apply during summer. |
| **Stinger** | *Spray:* 0.33-0.8 oz/gal or 1.6 to 4.8 tsp (8-23.7 ml) per gallon.<br>*Wipe:* 2.5 oz/gal or 5 Tbsp per gallon. *(The higher rates are recommended for asters!)* | |

**BEGGARSTICK (PITCHFORK), FIREWEED, AND RAGWEED** (annuals)
(Massachusetts: Priority 4) (Maine: Priority 2 or 3 depending on individual levels)

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|---|---|---|
| **Casoron 4G** | **up to 100 lb/A** | Apply in spring. May also be applied in the fall for control of ragweed. Moderate rates are suggested. |
| **Caliber 90** | **up to 3.3 lb/A** | Apply in the spring. |
| **Princep 4L** | **up to 3 qt/A** | Apply before budbreak or in the fall after harvest; high rates may injury the vines, especially on new plantings. |

RAGWEED:

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|---|---|---|
| **Callisto** | **8 fl. oz/A** | 2 apps / season allowed; best if ragweed is <5" tall. |

PITCHFORK and RAGWEED (both are sensitive to Stinger so use lowest effective rate):

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|---|---|
| **Stinger** | *Spray:* 0.33-0.5 oz/gal or 2 to 3 tsp (9.8-14.8 ml) per gallon.<br>*Wipe:* 2.5 oz/gal or 5 Tbsp per gallon (2% solution). |

**BIRCH & MAPLE TREE SAPLINGS (and other trees)** (Priority 3)
The best management strategy is to pull young saplings before the root system becomes established. Larger trees must be dug out. Glyphosate wipes may be used to control small maples and to weaken large trees to facilitate removal. Clipping stems with Roundup-dispensing applicators in August may offer partial control.

- **Roundup WeatherMAX** – Apply anytime trees are present except 30 days before harvest.
- **Glyphosate products** – See Notes section on Roundup.
- **Callisto** (for birches/willows) – Control is possible if timed at early emergence. **8 fl. oz/A** (2 apps / year) For backpack spraying to wet (about 100 gpa), use just 1.5 teaspoons of Callisto® + 1 oz. of surfactant in 3 gallons

**CLOVER, BIRDSFOOT TREFOIL and VETCH** (Mass: Priority 4) (Maine: Priority 2 to at least 3 for many growers)
**Stinger** offers good postemergence control of these plants. Control clover and trefoil early in the spring prior to cranberry budbreak. Vetch is also sensitive to **Callisto**. All three of these weeds tend to occur in areas of high pH. If soil pH is 5.0 or above, spot-treating with two applications of sulfur at the rate of 0.2 oz/sq. ft. is another option. Apply the sulfur in the late spring when soil is drained and frost protecting is past. Lower rates of herbicides may be effective when sulfur has been added and the pH is lowered. Exception: Older and larger clover plants may be rooted too deeply to be affected by sulfur, especially if the root system has penetrated into clay.

**COMMON CINQUEFOIL (FIVE-FINGER)** (Priority 3) (resembles wild strawberry)
The impact of cinquefoil is variable. Colonization of cinquefoil may indicate a problem with vine growth, so sometimes improving one's fertilizer program will help take care of both problems. Wiping or pulling cinquefoil is also an effective means of eliminating this weed, particularly if it is patchy in occurrence. Maintaining a properly acidic pH can help as well by making the vines more competitive.

**Iron sulfate 20%** **3 oz/sq. ft.** Apply during the summer months. Several formulations and percent active ingredient of iron sulfate are available. Granular forms are easier to apply (drop-spreader), but take longer to act than finely powdered formulations. See notes section on Iron sulfate.

***Callisto:*** *Wait until the first flush of new growth is finished (if too early, the cinquefoil will recover).* **8 fl. oz/A**

## **CUDWEED** (Priority 4)

This weed seems to thrive during some years, while it can hardly be found during other years. Growers who have had large masses of it reported having almost none of it return the following year. It is not listed on the Callisto or Casoron labels, specifically, but either of these products would most likely provide control if timed early.

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## **DANDELION** (Priority 3)

If there are too many to pull or to control with any other traditional methods, Stinger will control dandelion as it is a member of the Compositae family. Callisto provides partial control, even if the dandelions are greater than 5" tall.

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## **DODDER** (Priority 1) (rare in Maine beds at present)

Dodder is an obligate parasitic plant and can be truly devastating to a cranberry bed if it becomes successfully established. The best management strategy for dodder control is **prevention of infestation**, because it doesn't take many mature seed capsules spread across a bed to quickly escalate one's dodder problems (each seed capsule may contain 100+ tiny seeds). We have not had any bed in Maine become irreversibly infested with dodder, because growers have been diligent about removing dodder whenever it is found.

- **Casoron 4G at 30-60 lb/A – apply within 10 to 14 days of the first seedling emergence; follow with 0.2" water to incorporate herbicide; split applications can be used, but only up to a total of 100 lb/A per 12-month period, and allow at least 3 weeks between applications.** To maximize Casoron's effectiveness, the soil temperature should be at least 60°F to allow the herbicide to volatilize. If frequent rains occur after application and prior to the volatilization of the herbicide, the water may move some of the herbicide down below the dodder seed zone, thereby reducing its effectiveness. To avoid vine injury, do not apply as the plants approach bud-break.
- **Callisto:** pre-emergence control not yet known; post-emergence applications appear to have a detrimental effect on dodder, especially if the dodder hasn't flowered yet or isn't yet attached to any cranberry vines.
- Begin looking for dodder in mid-to-late June. Most dodder seedlings in Maine have been found during the first part of July (much later than in Massachusetts, where they recommend scouting for dodder in early to mid April). Mild winter temperatures, however, promote earlier emergence of dodder. Massachusetts research has found that most dodder seedlings emerge from about Day 10 through Day 60 after the point of first emergence. Less than 3% of dodder plants emerge within the first 10 days of emergence.
- Anywhere dodder is just beginning, careful scouting and hand removal of the dodder seedlings is a wise practice. Place the dodder in a bucket or garbage bag to avoid the possibility of dropping any seeds or pieces of dodder stems while leaving the bed. This is important because dodder can spread vegetatively: very small pieces of stem can grow into new plants.
- Any locations where dodder is found should be marked - with flags, for example (assuming just a handful of locations), as new seedlings will often sprout up again in the same locations; it is very difficult to completely remove all of the dodder in any given location on the first attempt, and the emergence of dodder seedlings can be spread out over 2 to 3 months!
- For any bed where dodder seed has been successfully released and the bed has been subsequently water-harvested, the dodder seed will tend to accumulate in the area of the bed where the berries are removed during the harvest. Such areas should be scouted carefully in subsequent growing seasons.
- Dodder seed is easily moved in harvest water and on equipment.
- Dodder typically requires a non-cranberry plant to serve as its first host, as cranberry stems are somewhat resistant to dodder infection early in the season. Thus, control of weeds that can serve as alternate hosts, such as goldenrod, loosestrife, St. Johnswort and asters, is important for early-season control.

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## **DWARF ST. JOHNSWORT** (Priority 3) (We used to designate it a Priority 2, but its numbers have been declining)

Regarded as only a minor weed in Massachusetts, but high numbers of this plant have in the past been found on many beds in Maine. It can spread by both seeds and runners. It is a favored host of dodder, before the dodder moves in and infects cranberry vines. This weed tends to be patchy, so consider spot-treatment. Hand-pulling it may stimulate it to spread *faster* via its horizontal runners. However, you can control small infestations

by repeatedly hand-pulling or digging the site over a number of years. Mowing has little effect on existing plants, but may reduce seed production. Burning is effective at preventing its spread, assuming there are little to no vines in the area as cranberry plants do not recover from burning the way wild blueberry plants do. Besides Casoron and Callisto, **postemergence treatment with glyphosate products** may offer some control. Combine herbicide treatments with steps to improve vine growth.

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| **Callisto** | **8 oz/A** (2 applications allowed per season); Best results when applied early. |
| **Casoron 4G** | **Use low rates. Apply in spring or fall.** |

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**FIREWEED** (Priority 4) (*see* recommendations for BEGGARSTICK)

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**GOLDENROD / NARROW-LEAVED GOLDENROD** (Priority 2)

Narrow-leaved goldenrod causes little direct yield loss (a Massachusetts finding), but is extremely difficult to control and spreads rapidly. Every effort should thus be made to control patches before they spread. Preemergence and postemergence herbicides can provide partial control. Clipping the stems with Roundup-dispensing applicators in August may offer an additional method of partial control.

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|---|---|
| **Callisto** | **8 oz/A** (2 applications allowed per season); Best results when applied early. |
| **Roundup WeatherMAX / Glyphosate products** | Apply anytime weeds are present except 30 days before harvest. |
| **Stinger** | *Spray:* 0.33-0.5 oz/gal or 2 to 3 tsp (9.8-14.8 ml) per gallon.<br>*Wipe:* 2.5 oz/gal or 5 Tbsp per gallon (2% solution). |

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**GRASSES: ANNUAL GRASSES** (Priority 4) (Barnyardgrass, Corn grass, Warty panicgrass, and Crabgrass) Generally, annual grasses are most likely to appear in bare patches or on new beds. Hand-pulling and/or treatment with herbicides may be used on new and established beds. Preventing seed production is an effective means of managing these weeds. **TIMING:** Spring applications are typically done in April (possibly late March for southern Maine).

| PREEMERGENCE OPTIONS | | GRASSES CONTROLLED |
|---|---|---|
| **Devrinol 50DF** | **12-18 lb/A for peat-based bogs**<br>**8-12 lb/A for mineral soils** | **Barnyardgrass, Corn grass, Warty panicgrass** |
| **Casoron 4G** | **up to 100 lb/A** | **Crabgrass** |
| **Evital 5G** | **120-160 lb/A** | **Barnyardgrass, Corn grass**<br>Lower rates have been shown to be effective on established beds. Use the minimum effective dose. Very low rates (<25 lb/A) have still caused injury on newly-planted vines. |

POSTEMERGENCE OPTIONS

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|---|---|
| **Poast** | **1-1.5% solution + Dash HC (0.5%) *or* crop oil concentrate (COC) (1%)** for 'true' grasses only! For each gallon, mix 2 oz Poast plus 0.6 oz. Dash HC *or* 1.3 oz crop oil concentrate. **Chemigation of Poast is not permitted.** |
| **Select MAX** | **9-16 oz/A per application + 0.25% v/v non-ionic surfactant (NIS)** in the finished spray volume unless label indicates otherwise. Chemigation not permitted. Use 10-30 gallons of water per acre and allow 14 days between applications. Use 1.3 TBSP (19 ml) Select MAX and 0.65 TBSP (9.6 ml) NIS per gallon for a mid-range rate. Use NIS (not COC) with Select MAX. Do not apply between hook and full fruit set. |
| **Callisto** | Efficacy may vary. **8 oz/A** (2 applications allowed per season); For backpack spraying to wet (about 100 gpa), use just 1.5 teaspoons of Callisto® + 1 oz. of surfactant in 3 gallons of water. |

**GRASSES: PERENNIAL GRASSES** (Priority 3) (Povertygrass, Summergrass, Velvetgrass, Smokegrass, Mannagrass, Rattlesnakegrass, Switchgrass, Rice cutgrass and Panicgrass)

These grasses often colonize bare areas. Encouraging vine growth may reduce the potential for problems. Some species may be difficult to eradicate once they become established. TIMING: Spring applications are typically done in April; Fall applications are typically done 1-2 weeks after harvest, but at least 2-3 weeks prior to the winter flood. For cutgrass, which comes up earlier than other grasses, apply Devrinol early in the spring (usually before April 10th in Massachusetts). **(S)** or **(F)** following the weed name indicates if 'Spring only' or 'Fall only' applications are preferred.

| PREEMERGENCE OPTIONS | | GRASSES CONTROLLED |
|---|---|---|
| **Devrinol 50DF** | **12-18 lb/A for peat-based bogs**<br>**8-12 lb/A for mineral soils** | **Povertygrass, Rice cutgrass,** and **Summergrass (S)** |
| **Casoron 4G** | **up to 100 lb/A** | **Mannagrass (S), Rice cutgrass, Summergrass, Velvetgrass,** and **Rattlesnakegrass (S)** |
| **Evital 5G** | **80-120 lb/A**<br>**120-160 lb/A** | **Rice cutgrass (S), Smokegrass (S)**<br>**Panicgrass (S), Summergrass,** and **Switchgrass (F).** With Switchgrass, repeated mowing helps; best to dig it out prior to seed formation. |

POSTEMERGENCE OPTIONS

**Poast** — **2 oz Poast + 0.6 oz Dash HC (0.5%) *or* 1.3 oz crop oil concentrate (per gallon)** for 'true' grasses only! Apply at 6-8 leaf stage. Addition of other adjuvants is not recommended. May be applied by broadcast applicator. Chemigation is not permitted.

**Select MAX** — **9-16 oz/A per application + 0.25% v/v non-ionic surfactant (NIS)** in the finished spray volume unless label indicates otherwise. Chemigation not permitted. Use 10-30 gallons of water per acre and allow 14 days between applications. Use 1.3 TBSP (19 ml) Select MAX and 0.65 TBSP (9.6 ml) NIS per gallon for a mid-range rate. Use NIS (not COC) with Select MAX. Do not apply between hook and full fruit set.

**Callisto** — Efficacy may vary. **8 oz/A** (2 applications allowed per season); For backpack spraying to wet (about 100 gpa), use just 1.5 teaspoons of Callisto® + 1 oz. of surfactant in 3 gallons of water.

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**HAIR-CAP MOSS & SPHAGNUM MOSS** (Priority 4) (perennials)

The presence of this moss, or of Sphagnum moss, may indicate a drainage problem. Evaluate the drainage in the affected area and improve prior to starting a chemical control plan. Multiple applications (at least 2) of 20-40% **vinegar** solutions (store-bought, 5% acetic acid) made in mid-summer have shown good control of haircap moss. Tolerance-exempt products, such as NoMoss (*e.g.*, SaferGRO, OMRI-approved), have also shown efficacy.

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|---|---|---|
| *For Hair-cap moss:* | | |
| **Casoron 4G** | **up to 100 lb/A** | Be judicious in applying high rates for moss control, especially on vines showing signs of stress. |
| **Ammonium Sulfate** | **15 oz/100 sq. ft.** | 21-0-0. Apply in the spring. |
| *For Sphagnum moss:* | | |
| **Iron Sulfate** | **3 oz/sq. ft.** | Apply during April. |
| **Casoron 4G** | **up to 100 lb/A** | Apply in the fall only. |

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**HAWKWEED (ORANGE HAWKWEED)** (Priority 4) (perennial)

Considered a minor weed, Orange hawkweed is a fibrous-rooted perennial plant originating from Europe. It has a leafless stem with stiff, black, glandular hairs, milky juice, leaves mostly basal, above-ground runners that root at the tips, and unique orange-red flowers evident throughout the growing season. Control small infestations by careful digging of rosette plants. Avoid breaking off the shallow roots as plants can quickly re-grow from root pieces. For this reason, *pulling is seldom effective*. Removal of flower stems prevents seed production, but repeated mowing can encourage vegetative growth.

**Casoron 4G** **Use lowest rates possible. Apply in Spring or Fall.**

**HORSETAIL (MARE'S TAIL) (SCOURINGRUSH) (*Equisetum arvense*)** (Mass: Priority 4) (Maine: Priority 2 for many growers)

*Equisetum* is a native perennial with an extensive tuber-bearing creeping root system. Though distributed world-wide, it is the only surviving genus of the horsetail family, with just 35 living species. It is probably the most ancient plant family alive today, resembling taller plants that dominated the landscape during the dinosaur age. The stems are jointed and hollow; leaves whorled, scale-like, non-green, and somewhat similar to fir needles; Horizontal, vegetative rhizomes beneath the soil/sand surface; Reproductive part of the plant is a very straight, leafless and brown stalk bearing a cone-like strobilus at the tip, within which spores are formed and later released. The reproductive stems/stalks appear to be separated from the green, leaf-possessing stems, but the two types of stems are connected together by the underground rhizomes. **Control:** The tenacious root system of horsetail makes long term control a very difficult prospect. **It generally requires 75 lbs/A or more of Casoron to achieve control, and is reported to be resistant to most other herbicides (Callisto is one exception). Callisto bleaches it, and sets it back, but its overall efficacy against it is uncertain at this time. It may likely take a few seasons of Callisto use to kill it.** Since horsetail does particularly well in neutral or slightly basic soils, make sure the pH of your bed is acidic; Improve your bed's drainage since they do very well in wet areas. Cut fertile stems prior to spore formation to reduce spread potential. Porous landscape fabrics or black plastic mulch effectively prevent horsetail growth. Sawdust or bark mulches are ineffective. Deep cultivation can be effective in the short term. Be aware that rhizomes cut into very short pieces will regenerate, so shallow cultivation and dragging the rhizomes is not advised.

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**LADYSTHUMB (SMARTWEED)** (Mass: Priority 4) (Maine: Priority 3 and sometimes 2 for some growers)

Ladysthumb is a perennial plant that forms dense colonies in shallow water or moist soils and can grow to 3 feet tall. The leaves are distinctly pigmented in the centers. This dark green, triangle-shaped splotch was at one time thought to resemble a lady's thumbprint; Leaves alternate, opposite, 2-6" (5-15 cm) long and narrowly or broadly lanceolate, with a fringe of hairs along the cylindrical sheath located at each leaf base. The small, pink or purplish flowers are clustered together in spikes along a single inflorescence (similar to the flowers of lupine or loosestrife). **Control:** Pre-emergence or post-emergence treatment with **Callisto** (8 oz/A) should provide very good control (*okay to wait until plants are just starting to emerge; Callisto has a short half life in the soil so you don't want to use it prematurely*), and post-emergence glyphosate products may offer some control as well. Consider hand-pulling and/or spot treatment. **Casoron** is another option in the spring or fall, but only at the lowest possible rates.

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**MAPLE TREE SAPLINGS** (*see recommendations under the* BIRCH & MAPLE TREE SAPLINGS *heading*)

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**MARE'S TAIL** (*see listing for* HORSETAIL – top of the page)

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**MEADOWSWEET** (Priority 4)

Meadowsweet is a slow spreader on cranberry beds. As such, it should be pulled out by hand or wiped during the summer: **Roundup WeatherMAX / Glyphosate products –** apply anytime meadowsweet plants are present except 30 days before harvest.

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**MOSSES** (*see listing for* HAIR-CAP MOSS & SPHAGNUM MOSS)

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**NARROW-LEAVED GOLDENROD** (*see listing for* GOLDENROD)

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**PROSTRATE SPURGE AND SPOTTED SPURGE** (Priority 4)

Spurge is an ascending, branching, mat-forming summer annual found mostly during June and July in Maine. Spotted spurge looks just like prostrate spurge, except that it has a very distinctive reddish-purple spot in the center of each leaf (not to be confused with Ladysthumb, however). The stems and leaves exude a milky sap when injured. Some people develop a rash after coming into contact with the sap. Plants can be easily pulled and bagged if soil is moist. Be sure to wear gloves to prevent skin-contact with the sap. The pale green leaves are opposite and oblong (or somewhat egg-shaped or linear). The plant has a shallow taproot with secondary fibrous roots. The stems persist for only a short time after frost. **Control: Pre-emergence herbicides applied correctly in the spring will reduce or eliminate spurge. Post-emergence herbicides are not very effective unless plants are young.**

**PITCHFORK** (*see listing for* BEGGARSTICK)

**PURPLE VETCH** (*see recommendations under the* CLOVER AND VETCH *heading*)

**RAGWEED** (*see recommendations for* BEGGARSTICK)

**RUSHES** (Priority 3) (Identification tip: *"rushes are round"* – and often milky sap in stems)
Rushes grow in clumps and can become quite large when well-established. Control of large plants with pre-emergence herbicides may be difficult except at very high rates. Control may also be possible with hand-digging or repeated hand-wiping with glyphosate solutions during the summer. TIMING: Spring applications are typically done in April. **Salt can be effective at 1-3 teaspoons. Apply the sodium salt to the base of each rush clump in the spring, prior to bud-break.**

| | | |
|---|---|---|
| **Soft rush:** | Devrinol 50DF | 8-12 lb/A for mineral soils; 12-18 lb/A for peat bogs. |
| | Callisto | at 8 oz/A (up to 2 apps / year) (apply early to actively growing weeds) |
| | Casoron 4G | up to 100 lb/A |
| **Canada rush:** | Casoron 4G | up to 100 lb/A (Spring-only application preferred) (partial control) |
| | Callisto | 8 oz/A (up to 2 apps / year) (apply early to actively growing weeds) |
| | Evital 5G | 120-160 lb/A |
| **Mud rush & Soft rush:** | Casoron 4G | up to 100 lb/A |
| | Callisto | 8 oz/A (up to 2 apps / year) (apply early to actively growing weeds) |

**SANDSPURRY / RED SANDSPURRY** (Priority 4)
Red sandspurry is a prostrate-growing annual that spreads by seed. It is not a problematic weed, as it is generally confined to bare spots in either new or established cranberry beds. It is more prevalent during late Spring when temperatures are slightly warmer but soils are still wet. No control recommendations are necessary, as even the most modest of weed management efforts successfully control this plant.

**SEDGES** (Priority 3) (Identification tip: *"sedges have edges"* – triangular, or 3-sided stems)
Management of sedges combines cultural and chemical controls. Hand-dig, pull small patches, or spot-treat with one of the pre-emergence herbicides listed below. Encourage vine growth in bare areas so the sedges will not re-colonize. **TIMING:** Spring applications are typically done in April; Fall applications are typically done 1-2 weeks after harvest but at least 2-3 weeks prior to the winter flood.

| | | |
|---|---|---|
| **Nutsedge:** | Devrinol 50DF | 8-12 lb/A for mineral soils; 12-18 lb/A for peat bogs. |
| | Casoron 4G | up to 100 lb/A |
| | Evital 5G | 80-120 lb/A |
| | Callisto | 8 oz/A (partial control if under 10" tall) |
| **Spikerush:** | **Casoron 4G** | up to 100 lb/A |
| | **Evital 5G** | 120-160 lb/A |
| **Woolgrass:** | **Casoron 4G** | up to 100 lb/A |
| | **Evital 5G** | 120-160 lb/A |
| **Cottongrass:** | **Casoron 4G** | up to 100 lb/A |
| **Needlegrass:** | **Casoron 4G** | up to 100 lb/A |
| | **Evital 5G** | 80-120 lb/A (Spring) |
| | **Evital 5G** | 120-160 lb/A (Fall) |

It is possible that Callisto® would give some partial control of any or all of these four sedges, even though none of them are listed specifically on the label.

**SMARTWEED** (*see* LADYSTHUMB)

**SMALL-FLOWERED WHITE ASTER** (*see* ASTERS)

**SPIKERUSH** (*see* SEDGES)

**SPURGE** (*see* PROSTRATE AND SPOTTED SPURGE)

**SWAMP CANDLES** (*see* YELLOW LOOSESTRIFE)

**THYME-LEAVED SPEEDWELL** (Priority 3)
This is a creeping plant that has clusters of white or pale blue flowers (4-lobed, about 1/8" wide) with darker stripes on the petals. 3 of the 4 petals are rounded, with the lowest one a bit narrower. The plant forms mats along the ground, and spreads both by seed and underground rhizomes that produce new stems. The mostly opposite leaves are 1/4-1/2" long, minutely-toothed, egg-shaped or sometimes more rounded/ovate. **Control:** Mostly occurs in bare patches, so controlling this weed can be a challenge in new plantings. Refer to the control section for PROSTRATE SPURGE as that plant is very similar to speedwell in its growth habit.

**VETCH** (*see recommendations under the* CLOVER, BIRDSFOOT TREFOIL, and VETCH *heading – page 20*)

**YELLOW LOOSESTRIFE** (Priority 1 to 2)
This plant causes moderate yield reductions in Massachusetts and Maine, and may be worse than that for a few beds in Maine where it has been very difficult to control. It may serve as an early-season host for dodder, and its tips are attractive to *Sparganothis* fruitworm larvae, perhaps providing them some additional refuge. **Control:** Preemergence herbicide application should be made in the spring. Loosestrife may be wiped with glyphosate (RoundUp WeatherMAX) during the season, anytime weeds are present except 30 days before harvest. Spot-treatment with **Callisto** on an annual basis is thought to be one way of achieving permanent control of this weed! Spring or Fall applications of **Casoron** (up to 100 lb/A) may also offer *some* control. Since it is very difficult to control, efforts should begin while patches are still small and before they have a chance to spread. Stinger is reported to *not* be effective at controlling loosestrife.

# WEED MANAGEMENT OUTSIDE THE CRANBERRY BED

Aquatic Weeds:

Note: non-chemical methods, such as harvesting, suction, hand-pulling and dredging are available but are very expensive.

| | | |
|---|---|---|
| **Diquat Reward** | **1-2 gallons per surface acre** (37% ai diquat bromide) | Use during summer months. Water use is restricted for various time periods depending on the product and the pattern of use. CHECK THE LABEL! Use only on still water areas outside of the bed (farm ponds and reservoirs). Water temperature should be >50°F for best activity. **DO NOT USE IN OR ON BED DITCHES.** |
| **Rodeo** | **1.25% solution** (54% ai) | Apply during the summer months. Rodeo is registered for use on non-cropland only. Use in interior ditches is not permissible. Recommended spray solution: 5 oz/3 gallons. Add a nonionic surfactant at the rate of 0.25-0.50% volume basis (1-2 oz or 2-4 Tbsp in 3 gal.). |

Woody & Broadleaf Perennials (NON-BED USE ONLY):

| | | |
|---|---|---|
| **Crossbow** | **up to 2 gallons/A** | Mix with enough water to deliver 10-30 gal/A. Application rates may vary depending on target species and application method. READ THE LABEL! Drift may injure other nearby plants, especially grapes and tomatoes. Do not apply to water. |

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## DITCH MANAGEMENT

### WOODY AND BROADLEAF PERENNIALS ON DIKES (BED/BOG-SIDE)

Cultural controls include mowing the ditch and dike areas during the summer months. Some areas may need to be mowed more than once. Hand-pulling is most beneficial in the spring and early summer when the soil is moist and the plants are fairly small. Controlling weeds on the dikes may be useful in reducing the spread of these weeds onto the beds.

### DITCH WEEDS (*i.e., Arrowhead, Pickerelweed, Pond lilies, Bur-reed, Duckweed*)

Clean ditches by hand or mechanically, preferably twice a year. Draining ditches can sometimes be helpful in killing some aquatic weeds (*e.g.,* duckweed). Pre-emergence herbicides registered for use on the bed may **NOT** be used in the ditches for weed control.

| | |
|---|---|
| **RoundUp WeatherMAX** | **Use as a *wipe* or a *spray* during the summer months in dry ditches.** |

**For a spray formulation, use a 1-1.5% solution on a volume-to-volume dilution. Spray to just wet vegetation, not to run-off. Ditches must be kept dry at least 2 days after application.**

# Properties of Herbicides in Cranberry Production

| Herbicide | Mode of Action | Kow (Density) | Solubility | Vapor Pressure |
|---|---|---|---|---|
| **Callisto** | Pigment inhibitor | 1.2 g/ml | 160 mg/liter @ 68°F (20°C), pH 2.4-2.8 | $<4.3 \times 10^{-8}$ mmHg @ 68°F |
| **Casoron or Norosac** | Cell wall biosynthesis inhibitor | 500 | 21 mg/liter @ 25°C, pH 7 | $5.5 \times 10^{-4}$ mmHg @ 20°C |
| **Crossbow** | Growth regulator (synthetic auxin) | VAP DENSITY: 4.7 (kerosene) | 2 parts to Crossbow: Part A dissolves in water, 2790 ppm @ 25°C, pH 7; Part B is miscible | 0.1 mm @ 37.8°C (kerosene) |
| **Devrinol** | Thought to block cell division in gap phases of mitosis | 2300 @ 25°C | 73 mg/l @ 20°C | $4 \times 10^{-6}$ mmHg @ 25°C |
| **Evital** | Pigment inhibitor | 280 | 28 mg/l | $2 \times 10^{-8}$ mmHg @ 20°C |
| **Fusilade** | Thought to be a lipid biosynthesis inhibitor; May be involved in disrupting cell membrane function | 1200 @ pH 2.6<br>0.8 @ pH 7 | 1.1 mg/l | $2.5 \times 10^{-7}$ mmHg @ 20°C |
| **Poast** | Lipid biosynthesis inhibitor | 45.1 @ pH 7 | 257 mg/l pH 5<br>4390 mg/l pH 7 | $1.6 \times 10^{-7}$ mmHg @ 25°C |
| **Princep** | Photosynthetic inhibitor (PS II); stops flow of electrons by site competition | 122 @ 25°C | 6.2 mg/l @ 22°C | $6.1 \times 10^{-9}$ mmHg @ 20°C |
| **Roundup** | Inhibits synthesis of amino acids | 0.0006-0.0017 | 15,700 mg/l @ pH 7 | $3 \times 10^{-7}$ mmHg @ 25°C (salt) |
| **Select** | Thought to be a lipid biosynthesis inhibitor; may be involved in disrupting cell membrane function | 15,000 | N/A | $<10^{-8}$ mmHg @ 20°C |
| **Stinger** | Growth regulator; thought to affect cell wall plasticity and nucleic acid synthesis (synthetic auxin) | 64.6 @ pH 5<br>427 @ pH 7 | N/A | $1.3 \times 10^{-6}$ mmHg @ 25°C |

UMass Cranberry Experiment Station, Advanced Cranberry School, Jan. 1999. Prepared by Hilary Sandler.
Re-printed / Re-formatted by Charles Armstrong, May 2003 and updated yearly as needed. Last updated in 2008.

# NOTES ON THE USE OF COMMON HERBICIDES

Based on Hilary A. Sandler's annual section in the UMass Cranberry Chart Book
Revised and updated yearly by Charles D. Armstrong

**CALLISTO (mesotrione).** This is a pigment inhibitor (bleaching type) herbicide which got a Supplemental Label in 2008 for use in cranberry, blueberry, lingonberry, and a few other crops as well. Susceptible plants are bleached, turning white over the course of 3-5 days but sometimes longer, depending on how sunny the weather is (the sunnier it is, the greater the injury will be). Cranberry is one of the few plants that can highly metabolize Callisto's active ingredient, mesotrione, so even when some bleaching of cranberry takes place (and generally only at higher than labeled rates would one expect to see it), the vines recover within a few weeks. This makes it an excellent choice for use on newly-planted vines, with no vine injury reported thus far from new plantings in WI and MA. Mesotrione is derived from a family of plants in the *Callistemon* (bottlebrush) genus that produce the chemical naturally. When applied to plants, it is absorbed by roots, stems and leaves, and is quickly translocated throughout the plant, with 88% of the applied herbicide being absorbed within 3 hours (rain-fast in less than 4 hours). Callisto has pre and post-emergent activity against a very wide range of species. Its half life in soil is short - just 5 to 15 days. There is little runoff or soil mobility (so no leaching), and there is no known hazard to bees or other wildlife, but because of the recommended addition of a surfactant, it is toxic to bees at that point so should not be applied during bloom. Some COC surfactants have also been suspected in causing blossom damage and consequently, reduced fruit set. **Rates:** For chemigation, 8 fl. oz/A with a maximum of 2 applications per season; For backpack spraying to wet (about 100 gpa), use just 1.5 teaspoons of Callisto® + 1 oz. of surfactant in 3 gallons. For more information on Callisto and its use, visit: http://extension.umaine.edu/cranberries/grower-services/weeds/callisto-information/

**CASORON (Dichlobenil).** Applications of Casoron are most effective when applied as close to the time of weed germination or emergence as possible. Since Casoron volatilizes quickly, it must be washed in by irrigation or rainfall ASAP after application. Apply pre-budbreak or post-harvest. Avoid applying during warm temperatures (>60ºF). Application just prior to sanding or on weak or new vines may cause injury. Applications on top of sand or late applications can be made, but must be watered in *immediately*.

Multiple applications of Casoron may be made as needed. Allow an interval of 3-6 wks between appls. Do not exceed 100 lb/A in any 12-month period. Single doses of high rates may be needed to control some perennial weeds. However, some weeds are not controlled by Casoron at any rate due to their deep root systems. Plants with weakened root systems are more susceptible to stresses such as drought and may become more stressed with herbicide application. Some vine injury may occur from herbicide applications made in areas with puddles.

Distribute Casoron uniformly. Avoid overlapping. Temporary reddening of vines may occur especially with late spring application or when applied on sandy beds. Do not apply after bud elongation as yields may be reduced. Do not apply to young beds (less than 3 yrs old) or on beds prior to or immediately after mowing vines. Do not sand (Spring or Fall) on top of a Casoron application. Casoron is labeled for application in the Fall prior to ice sanding or afterwards in the Spring. The efficacy of Fall applications for many weeds has not been documented, but growers in other states have reported good success in some cases.

**COPPER SULFATE and COPPER COMPLEXES (Algae-Pro, Cutrine-Plus).** Copper sulfate may be used to control algal growth on winter floods or late water (pp 45-47) floods. Cutrine-Plus and Algae-Pro work best when water temperatures are warm (~ 60°F). These copper-complex products are formulated to last longer than copper sulfate in hard water (carbonates present) and they work best when applied under calm and sunny conditions. When beds are treated with copper sulfate in the winter, water should be impounded for one week. Do not apply to water except as directed on the label. These products are toxic to fish.

**CROSSBOW (2,4-D).** Crossbow is labeled for non-bog use only. Be cautious! Crossbow contains trichlopyr for which there is NO FOOD TOLERANCE. Do not use Crossbow on dikes or canal banks. Use it only on weeds located far away from the bog. This product has considerable potential to evaporate and cause crop injury. Avoid applying 2,4-D on hot, sunny, and humid days when there is little air movement. 2,4-D products can be highly effective at controlling some weeds. However, the potential for significant vine injury may outweigh the advantages of using these materials.

**DEVRINOL (Napropamide).** Devrinol 50DF is now the only Devrinol product being manufactured. It is available for use on Maine cranberries as a 24c Special Local Needs label. Unlike the older 10G formulation, the 50DF can be injected

through the irrigation system. Both Massachusetts and Maine growers who have used it report good control from it. Be sure to get the supplemental label, which is available online as well as at the point of purchase. When using the material, be careful that your irrigation coverage does not reach the banks of your ditches if you are attempting to get grass established on them.

Do not exceed 6 lbs/A of 50DF on new plantings. On established beds, this herbicide provides some control of grassy weeds and annual broadleaf plants at higher rates (12-18 lb/A of 50DF for peat beds; 8-12 lb/A of 50DF for mineral soils), but it works best on weed-free areas. For best results, water in immediately. Use the appropriate rate for the age of the bed. Devrinol can be used under *or* on top of sand.

**DIQUAT.** This herbicide should only be used on water weeds growing in areas OUTSIDE OF THE BED. Do not use in any ditch associated with the production area. Diquat will control water weeds such as bladderwort, coontail, elodea, and pondweeds. A non-ionic surfactant (*e.g.* X-77) may improve performance. Check the label for rate information.

**EVITAL (Norflurazon).** Vine injury may occur in areas where water stands several days after flooding or heavy rains. Be very conservative when applying Evital to new plantings! Vines have shown severe phytotoxicity to rates as low as 25 lb/A when applied 3-4 weeks after planting. Do not apply more than 80 lb/A on newly planted bogs. Do not apply more than 160 lb/A per season on an established bog. Use lower rates on stressed vines or sensitive cultivars such as Stevens and McFarlin. Growers have reported good results with low rates (50-75 lb/A) for Fall applications on these varieties; Spring applications should not exceed 60 lb/A. Sanding can be done on top of an Evital application, but it is not recommended especially on bogs that have drainage problems. Sanding after applications of 50 lb/A or less has given good results. In 2006, Massachusetts growers were testing if Evital could be safely applied on top of sanded vines. Update: those growers have reported that applications of Evital at 50-60/A or less, on top of sanded vines, *do in fact* work safely and adequately on top of *healthy*, well-drained beds.

**FUMIGANTS.** Basamid (dazomet) and Vapam (metam-sodium) are soil fumigants that can be used on beds scheduled for renovation. DO NOT USE FUMIGANTS AS A SPOT-TREATMENT IF ANY VINES WITHIN A DIKED SECTION WILL BE HARVESTED. If you are renovating an entire section, a portion of that section can be spot-treated with a fumigant.

**IRON SULFATE.** May be spread as a broadcast application through conventional fertilizer rigs, such as hand cranks. Traditional use has been with a 20% ferrous sulfate (fine powder) product, but other formulations are available. Application rates *in this guide* are for the 20% a.i. product. Adjust accordingly if using another percent active ingredient. Iron sulfate at rates exceeding 1.1 oz/sq. ft (20% a.i. product) may kill vines if they have been sanded within the past 18 months. Do not use on new beds. To be most effective, rain should follow within 4 days of an iron sulfate application or the bed should be irrigated. When a 9:1 iron sulfate to salt combination is used, rain or sprinkling is not necessary.

**POAST (Sethoxydim).** This herbicide effectively controls emerged annual and some perennial *true grasses*. Sedges are not controlled. It may be used on bearing and non-bearing beds. There is a 60-day PHI on bearing beds. Do not apply more than 5 pints of product per season. Allow a minimum of 14 days between repeat applications. Phytotoxicity may result if the herbicide is applied during the heat of the day or during bloom. Application during cool periods of the day, but after dew has dried, is preferable. Efficacy is enhanced by addition of crop oil concentrate or Dash HC. For a one gallon Poast solution, mix 2 oz. of Poast with 0.6 oz of Dash HC (or 1.3 oz of COC) in 1 gallon of water. Other adjuvants may reduce efficacy or increase crop injury. Since COC or Dash HC can be mildly phytotoxic, Poast should not be applied during periods of crop stress or during flowering. Poast should not be mixed with other chemicals, particularly chemicals whose label warns against inclusion of an adjuvant.

Poast must be absorbed into the grass to be effective. Therefore, do not apply Poast if rainfall or irrigation is expected within one hour of application. Poast should be applied when grasses have 6 to 8 leaves to provide enough leaf surface for absorption. Apply Poast to grasses that are actively growing and free of stresses such as drought, disease, or mechanical injury. POAST CANNOT BE APPLIED THROUGH THE IRRIGATION SYSTEM! Spot treatments with small sprayers are effective. For one gallon Poast solution, mix 2 oz of Poast with 0.6 oz of Dash HC (or 1.3 oz of crop oil concentrate) in 1 gallon water. Thoroughly wet the grass foliage, but do not let the solution run off the leaves.

*Broadcast Application:* Use standard high-pressure hollow cone or flat fan nozzles only. Use 5-20 gal of spray solution per acre at 40-60 psi. Inadequate coverage of grasses due to heavy cranberry canopy may reduce control. Do not use re-circulating sprays, wiper applicators or shielded applicators. Use of Poast with control drop application is not recommended due to erratic coverage. *Aerial Application (if applicable):* Do not apply if wind speed is greater than 10 mph.

**PRINCEP (Simazine).** The Caliber 90 & Princep 4L formulations must be sprayed evenly with continuous agitation. Application through the sprinkler systems is not allowed. Apply before budbreak or in the fall after harvest. High rates may injure vines or crop. Thin or weak vines and new plantings one week to three years old are very susceptible to injury.

**RODEO.** This glyphosate product can only be used to control weeds that occur in dry ditches and canals outside of the production area. Application is spray to wet leaf surfaces, not to runoff. Extremely cool or cloudy weather following application may slow the activity of this herbicide. Best control is obtained when plants are at late growth stages approaching maturity. Weeds under stress will not be controlled as well as healthy plants. Rainfall within 6 hours of application may reduce effectiveness and heavy rainfall within 2 hours of application may necessitate re-application. Do not add ammonium sulfate to Rodeo mixtures.

**ROUNDUP (Glyphosate).** Many RoundUp (*e.g.,* RoundUp Ultra, RoundUp WeatherMAX) and glyphosate products are available on the market. Please read the label of any product you are using to ensure compliance. This product may be applied on beds, by wiper or clipper, during the growing season. If you are using RoundUp Ultra, you will need supplemental labels for dry ditch and postharvest sprays. If you are using WeatherMAX, these spray uses are incorporated into the label and additional labels are not needed. WeatherMAX is slightly more concentrated than Ultra, so keep that in mind when preparing solutions. Use 1%-1.5% solutions (2.5-3.8 TBL or 38-57 ml/gal) for dry ditch applications and 0.4%-0.7% solutions (~3.0-5.5 tsp or 15-27 ml/gal) for postharvest sprays. Research indicates that Howes may be slightly more sensitive to postharvest spray injury than Early Black. Grower Tip: *Glyphosate binds very readily with soil particles, so if weeds are coated with a layer of dirt or dust, the product will be less apt to contact the actual foliage.*

It is not necessary to mix Roundup Ultra or WeatherMAX with any additional surfactants or additives (as with older glyphosate products). Add a dye to track leaf coverage. Technical information indicates that ammonium sulfate may improve uptake of these RoundUp products when moderate to large amounts of carbonates ('hard water') are present in water. RoundUp WeatherMAX is rain-fast 1-2 hours after application. Available glyphosate products vary as to whether they carry a 'Caution' label or 'Warning' label. Look at the label!! When using RoundUp, protective eyewear is not mandated; the REI for WeatherMAX is 4 hours. Thorough coverage is essential to maximize control of perennial weeds. Do not touch or allow the material to drip onto vines. Apply any time weeds are present except after 30 days before harvest. Make herbicide mixtures fresh each day for maximum effectiveness. Do not store in galvanized containers.

| | |
|---|---|
| **Roundup Products** | Mix 1 part glyphosate with 4-9 parts water (10-20% solutions). No additional additives, buffers, or surfactants are needed. However, the addition of ammonium sulfate may sometimes improve performance. |
| + **A marker dye** | Such as Blazon Blue. Add according to manufacturer's recommendations. |
| **Glyphosate products** | Mix 1 part glyphosate with 4-9 parts water (10-20% solutions). |
| + **Surfactant** | 1 oz (2 tablespoons) per gallon of glyphosate mixture. |
| + **Ammonium sulfate** | 3 oz (6 tablespoons) per gallon of glyphosate mixture. |
| + **A marker dye** | Add according to manufacturer's recommendations. |

**OTHER GLYPHOSATE PRODUCTS**. Glyphosate is sold under several product names. CHECK THE LABEL! To enhance control with glyphosate products other than Roundup WeatherMAX, add a nonionic surfactant (*i.e.,* X-77) and ammonium sulfate (see rates above). Other label differences include: Do not apply if rainfall is expected within 6 hours of application. Do not irrigate within 6 hours of application. The REI is 12 hours for these products. Note also that glyphosate products other than Roundup WeatherMAX may carry a 'Warning' label, instead of a 'Caution' label. Always use a dye to track your coverage with any wipe product. Check the label for appropriate protective clothing.

*Clipper Applicators (RoundUp only).* Concentrations of 50-100% RoundUp have worked well. The herbicide should flow out consistently, but not so fast that herbicide drips from the blades. Be sure to use a dye. Clip weeds close to the ground, without contacting the vines. RoundUp must contact the stem as you are cutting! 'Clip and dab' or 'mow and wipe' techniques may have reduced efficacy as the herbicide is not applied simultaneously with the cut. Late-season treatments give better results than early-season treatments. The effectiveness of post-harvest treatments with clippers is not known. Be sure to clean the blades after use to prevent corrosion. Availability of commercial clippers has become more scarce over the past few years. Growers may need to manufacture their own clippers.

*General Wiping Tips*. Use a small sponge or applicator that permits excellent coverage with minimal dripping. Adequate coverage of each stalk must be obtained. Several leaves (at least 50%) on each stalk must be

treated with the herbicide. Repeat applications to remaining plants the following year. Be patient. Most treatments will not give 100% control in the first year. Applications in subsequent years should be less time-consuming.

*Hand-wipe Technique for Controlling Dewberries or Other Prostrate Weeds*. Application by hand with sponges or specially designed applicators may be necessary with low-growing weeds (*e.g.,* bristly dewberry, poison ivy). Repeat applications within a season are legal and may be necessary, especially for well-established perennial weeds. Poor growing conditions such as drought stress, disease, or insect damage may reduce effectiveness. Avoid touching or dripping material onto cranberry plants during application.

SUPPLEMENTAL LABEL USES. Supplemental labels are needed only if you are using Ultra for post-harvest sprays (0.5%-1%), applied as a spot-treatment, or sprays in dry ditches (1%-2%); these uses are permitted under regular labeling for WeatherMAX. These labels can be obtained at a local ag supplier.

**SALT.** Salt (sodium chloride) may be used as a spot-treatment for control of certain weeds (*e.g.,* wild bean, rushes). Judicious applications do not inhibit re-colonization of cranberry vines once the weed dies. Do not use during bloom. Use of calcium chloride or other types of salts is not recommended. Salt is corrosive to machinery. Be sure to wash equipment thoroughly after application.

**SELECT (clethodim).** Similar to Poast with regards to target species, timings, and applicators. Note these differences. Apply when weeds are 2-4 inches high and actively growing. Use of crop oil concentrate is recommended with Select. For a 1-gal mixture, use 0.4 oz Select with 1.3 oz COC. Select has a 30-day PHI. Do not apply more than 8 oz per application per acre. Do not exceed 32 oz/acre per season. Allow 14 days between applications. You can use 3-10 gallons water with aerial applications, 10-30 gal/A otherwise.

**STINGER (clopyralid).** *See also* Using Stinger on Maine Cranberry Beds Fact Sheet posted on the UMaine Cooperative Extension's cranberry website. Stinger is a selective, postemergence herbicide used to control members of the **Pea Family** (Fabaceae) such as wild bean (also called groundnut), clover, and birdsfoot trefoil, and especially members of the **Aster or Sunflower family** (Asteraceae) such as asters (of course), goldenrods, ragweed, pitchfork (beggarstick), *etc.*, and certain other weeds within the treated area. Massachusetts growers have reported effective control (and reduced vine injury) when using lower rates than recommended on the label. In at least one case in Maine, this was not the case: the target weeds—primarily clover—were merely suppressed and the grower felt a higher rate would have been better.

Apply Stinger when weeds are actively growing. It is best to apply it when vines are dormant, if possible. For weeds that emerge late (goldenrod, groundnut, *etc.*), wait until after fruit set to apply. It is not recommended to apply Stinger when vines are going through active growth spurts (*e.g.* budbreak-roughneck stage). Stinger has a 50-day PHI. Stinger may be applied as a wipe or as a spray. Spray to just wet the weeds, but not to run-off. **BE VERY CAREFUL! Overspray can cause injury that may take 1-3 years for full vine recovery.** Minimize drift when applying as a spray. Results may be slow to show, so be patient. Two apps per season are permitted, not to exceed a total of 1 pint per acre. Stinger cannot be applied by air or through the irrigation system.

**SULFUR.** Determine soil pH in the weedy area prior to sulfur application. If pH is 5.0 or above, use two appls of 500 lb/A each (or 4 appls of 250 lb/A) to reach 1,000 lb. of elemental sulfur per season. Begin application in late Spring when soil is drained and frost protection is over. Most growers allow 3-6 weeks between appls. Do not apply sulfur to puddles or waterlogged areas as resultant production of hydrogen sulfide can cause severe vine toxicity. Changes in pH can be very slow. Granular applications may take up to 9 months to reduce pH enough to affect weed populations. The smaller the sulfur pellet size, the faster the pH is lowered. Use pelletized sulfurs only. Do not use flours of sulfur; they can be phytotoxic and are difficult to apply. Do not use potassium sulfate. Yearly sulfur applications may be needed as the pH can creep up in subsequent years. Test soil pH yearly to determine the effectiveness of sulfur applications. The effect of lowered pH on control of cinquefoil is moderate. Eye protection and dust masks are recommended when making sulfur applications.