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2016 Chart Book: Weed Management

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WEED MANAGEMENT 2016

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New herbicides and updates.
Check our web site (ag.umass.edu/cranberry) and upcoming newsletters for further information about any new uses or products. The manufacturer of Devrinol has discontinued production of the 10G formulation. It is still legal to use if in stock. Follow the label of the product you are using! Cranberries have been removed from the Princep label; recommendations for its use have been deleted. The tolerance is still in place, so please use any remaining stock before it is considered hazardous waste. Special Local Need (24c) labels for Callisto (spot-treatment and adjuvant rate for chemigation) and a 2ee for QuinStar (shorter injection times) were secured in 2015. Please obtain these labels if you will be employing these uses.

Weed Life Cycles. ***Annual plants*** complete their life cycle in one year and reproduce by seed (e.g., dodder). They germinate from seeds, grow to maturity, flower, and make seeds all within a single growing season. ***Biennial plants*** take two years to complete their life cycle. They typically germinate from seeds and grow vegetatively in the first year, then enter a period of dormancy over the winter. They flower and make seeds the following growing season. ***Perennial plants*** can live for many years and may reproduce by seed, runners, rhizomes, etc.

Most of the weeds in cranberry production are perennials. With the exception of dodder, annual weeds are much less common and easier to control than perennials. However, infestations of annual weeds should not be taken lightly, especially on new plantings. Annual plants are designated with an (**A**). Unless otherwise noted, all other weeds are perennials.

Weed Priority Ratings. (Very high, High, Medium, and Low)
The Priority Rating of each weed is determined by considering the following: 1) impact of a given weed on cranberry, 2) the biological form or type of weed, 3) its invasive and/or reproductive capacity, and 4) its adaptation to the cranberry habitat. Each criterion has 4 possible values (1, 2, 4, or 8). The values of the 4 criteria are added together to determine the rating. Totals of 24 to 32 points = Very High Priority, 16 to 23 = High, 8 to 15 = Medium, and 1 to 7 = Low. Please see the **ID Guide for Weeds in Cranberries** (available for purchase at the Cranberry Station) for the specific rankings for the criteria for each weed (pp. 261-272) for more details. Page numbers in the ID Guide are provided in this section as appropriate. Some weeds are in the Chart Book but were not included in the ID Guide and do not have a Priority Rating. These weeds have been given one of the four ratings according to the experience of the Extension Weed Specialist.

Weed Mapping. Weed maps can help you organize the management of your weed problems, especially with perennial weeds. Weed maps should be done every few years, depending on weed pressure and management objectives. Several steps are involved: 1) Correctly identify the weeds, 2) Document the location of the weeds (by drawings, GPS, or photographs), and 3) Designate a priority rating to the weed. Growers may change and adapt weeds into priority ratings to best fit their own management program.

VERY HIGH PRIORITY WEEDS (Rating values 24 – 32)

DODDER (A) *Cuscuta gronovii* *(see ID Guide, p. 247)*

Dodder is an abundant seed producer. All management efforts should be directed towards minimizing or eliminating seed production. A single plant can produce thousands of seeds in one season. The seed bank is very long-lived (>13 yr), so do everything possible to eliminate seed production and/or reduce seed viability.

Dodder is an obligate parasite and must have a host plant to survive. Woody cranberry stems are somewhat less appealing to dodder, so control of succulent weeds (such as goldenrod, loosestrife and asters) early in the season may be important.

Prevention

The best management strategy for dodder control is prevention of infestation. This is best accomplished through **good sanitation**. Dodder seed is easily moved in harvest water and on equipment. When possible, dodder-infested beds should be harvested after clean beds. Floats used to corral berries should be inspected for the presence of dodder seed before they are placed in beds that are dodder-free. This is especially important for custom harvest operations.

Dodder may also be spread vegetatively; pieces of stem can be moved on equipment and become attached to healthy plants. Care should be taken when moving any piece of equipment from a bed infested with dodder to one that is not. Equipment should be sanitized in these situations!

Where dodder infestations are just beginning, **careful scouting and hand removal** of seedlings prior to infection is a good practice. Weeds that are infected with dodder should be completely removed from the bed; dodder stems will re-grow if haustoria (the part of the parasite that penetrates the host) remain embedded in the weed. Infected cranberry vine tips should be cut off and thrown away.

Scouting

Begin scouting for dodder in early-mid April (unless your bog history or unusual weather conditions indicate otherwise). Mild winter temperatures may promote earlier emergence of dodder. Scout in areas where infestation has occurred in the past. Often, dodder seed will accumulate in the areas where berries are removed from the beds at harvest. Dodder seedlings may also be seen in warm, bare areas or newly sanded areas. Newly emerged seedlings are usually yellow in color, very slender, and 0.5 to 3 inches long. If the vine cover is good, move the vines aside so that you can see the duff layer; this is where early emerging seedlings will be seen.

Dodder populations in MA emerge slowly at first, but then quickly peak (50-90% germinate 30-45 days after first or early emergence) and subside. In addition, as the seeds accumulate year after year in the soil, seedlings emerge later and later, creating overlapping generations. The most vigorous population is the one most recently seeded (from last year). It is not known how variable dodder populations are from bog to bog but variation from farm to farm is likely. At least two separate species of dodder have been found on MA cranberry bogs, sometimes growing together. Growers should consider previous successful experiences, along with scouting, and make a management plan accordingly.

Preemergence Herbicide Use

Scouting is necessary for correct timing of preemergence herbicide application. Herbicides should be applied within 10-14 days of early seedling emergence, so that the chemical is present when peak germination occurs.

Casoron may control dodder germination. Some growers have experienced poor control with 30-40 lb rates. If this is your experience, consider increasing the rate and/or making a second application for improved control. Make applications at least 3 weeks apart (not to exceed 100 lb/A in a 12-month period), and may be more effective than a single application, especially if there are many frost irrigation events, significant rainfall, or past failures with a single application. See Notes on Casoron, page 45.

Handlers may be restricting QuinStar use so check before using! QuinStar can be used during the preemergence and postemergence phase. Time preemergence QuinStar (8.4-16.8 fl oz/A) application as described for Casoron, targeting the majority of the seed population as they are germinating and emerging. Two applications are permitted (not to exceed 16.8 fl oz/A in a 12-month period) but a minimum of 30 days must elapse between applications. See notes on QuinStar, page 49.

We do not know if Callisto will control dodder populations when applied preemergence, though some growers have experimented with this application timing. Please contact the Station (508-295-2212 x21 or x43) and share your observations.

Postemergence Control

Raking: For heavy infestations, raking can prevent the onset of upright dieback caused by infection, prevent leaf-drop due to shading of the cranberry by the dodder canopy, and reduce dodder seed production. Raking is more effective at reducing seed production if it is done before the seeds are formed (flowering). Raking too early may not be effective because the dodder stems can re-grow from the portions embedded within the cranberry. No benefit is gained from raking more than once. For light to moderate dodder infestations, raking is not recommended.

Trash floods: A good trash flow after harvest is helpful in removing seed capsules from the bed, but is not a replacement for prevention since subsequent infestation occurs. Growers could consider multiple trash flows if seed production is high.

Chemigating Callisto: Control has been reported when Callisto is chemigated but overall, results seem better when this herbicide is used as a spot-treatment. Chemigating Callisto definitely appears much less effective when dodder is attached to cranberry. Dodder will turn white after application, and may re-grow. Applications made before dodder flowers seem more effective than those made after flowering. Higher rates are better. See notes on Callisto, page 48.

Spot-treatment with Callisto: Spot-treatments with a single application of concentrated Callisto and COC (crop oil concentrate) significantly reduce dodder seed production. Treatments made before dodder flowers reduce seed production more than applications made after flowering has started (though both are better than the untreated). If you spot-treat with Callisto, you must not exceed 8 oz/A per application (2 applications permitted per year)! At 1.5 oz/gal, you can only spray out 5.3 gallons per acre per application to stay within the label rate. Lower rates (1 oz or less/gal) might also be effective and allow you to treat more area, but we have not tested this. A 24c (Special Local Needs) label is now available for this application. If you have any questions regarding this usage, please contact the Station (508-295-2212 x21 or x43).

Other spot-treatment options: Growers report backpack applications of sea water and COC can give some control. We cannot recommend the use of any plant growth regulators at this time for dodder control.

Thermal Weeding: Spot treating small areas of dodder with flame cultivation (thermal weeding) may control dodder. Cranberry plants exposed will also be injured but will recover. Reports from New Jersey indicated that short exposures may not kill the haustoria that are embedded inside the plant. Repeat applications or longer exposure times may be needed. Thermal treatments may need to be applied to an area slightly larger than what is obviously infected.

Spring Floods: Short (24-48 hr) floods in early to mid-May may be effective for reducing dodder infestations. Floods should cover vine tips adequately. No adverse vine or yield impact has been reported when growers have held these spring floods. Dodder floods may coincide with floods used to control black-headed fireworm. Flooding dodder 3-4 weeks after early seedling emergence appears to be more effective (compared with flooding 1-2 weeks after early seedling emergence).

BRISTLY AND PRICKLY DEWBERRY *Rubus hispidus, R. flagellaris* *(see ID Guide p. 151)*
Dewberries spread rapidly on bogs by rooting at the tips of canes. Both types will kill vines if allowed to spread. The most effective way to manage dewberries is to eliminate them as they invade the bog. Remove young plants by pulling or digging out by the roots. Control of established plants with glyphosate products is difficult because the weed grows close to vine level. Sparse or moderately colonized spots can be hand wiped with glyphosate products. Some growers opt to stake the stems of the dewberry plants to make wiping easier and to allow shorter drying time. Clipping stems with Roundup-dispensing applicators may offer partial control. See notes on Roundup, page 51. Wipes with Weedar 64 may also be effective when used in late June and July. See notes on Weedar 64, page 53.

Callisto will discolor and injure dewberries, however, the long-term management of this weed with Callisto is not yet known. Use 2 applications of Callisto (at least 14 days between applications) to manage dewberry infestations. Repeated annual applications will likely be necessary to reduce infestations. If dewberries are in a mixed canopy with tall weeds, target the spray to reach the lower portion of the canopy (where the dewberries are). See notes on Callisto, page 48.

Non-chemical options
Late water floods reduce numbers of dewberry crowns and offspring plants in that year. Summer refloods (May 10-12 through July 15-20) may be used in desperate circumstances. This will eliminate the crop for that year! It is particularly helpful to hand pull or hand wipe remaining dewberry plants after the flood has been withdrawn. Fall floods may suppress populations of *R. hispidus*; results have varied from no impact to reduced crown density. Start the flood as early as possible (mid-September) and hold for 4 weeks for best dewberry management. Consider starting a fall flood in early-mid September, if possible. It is important to remove the flood by early November to allow the vines time to become dormant prior to winter.

Recent research indicates that using flame cultivation (thermal weeding) can reduce dewberry plant size. One short duration (3-6 sec/yd^2 if using an open flame torch; longer times, 15-30 sec are needed with infrared torches) exposure made mid-summer seems effective (reduces shoot and root biomass). Cranberry vines will be injured when exposed to thermal weeding but they will recover. Typically, however, few cranberry vines are present in heavy dewberry infestations, so the risks are much lower than in well-vined areas. Contact the Station (508-295-2212 x21 or x43) for more information about thermal weeding.

Knife-raking or pruning in the fall may help uproot offspring plants. Significant dewberry patches should be scraped and replanted with new vines.

ALLENGHENY BLACKBERRY *R. allegheniensis* (*Upright dewberry*) (*see ID Guide p. 148*)
This weed has become much less prevalent but is a Very High Priority if found in the cranberry bog. Scout and control early because it can form large colonies and reduce the vigor of the vines. Control may be obtained with glyphosate wipes since it grows tall above the vine canopy. It is not controlled by floods. Young plants can be pulled or dug out by the roots. Weedar 64 may be used as described for other *Rubus* (dewberries) species.

GLAUCOUS GREENBRIER *Smilax glauca* *(Silverleaf sawbrier)* (*see ID Guide p. 241)*
Greenbriers are very difficult to control because they have extensive underground storage organs. Glaucous greenbrier (silverleaf or sawbrier) is more difficult to control than common greenbrier (greenleaf). Sawbrier grows in dense patches, spreads rapidly, and usually reaches just above vine level. It significantly impacts fruit production. Digging up the root system is not practical and will cause significant vine and bog damage. Infestations of sawbrier are more likely to occur on high edges or in locations where the bed is out of grade.

Sawbrier may be managed by hand wiping if sufficient coverage is obtained. Summertime wipes of Roundup may offer partial control. Clipping stems with Roundup-dispensing applicators in August may offer an additional partial control. Severe infestations of sawbrier may necessitate bog renovation. Weedar 64 and Callisto may be used on sawbrier as per dewberry recommendations. Flooding is not effective against sawbrier. A single exposure of a mid-summer thermal weeding (hand-held flame cultivators or torches) treatment may not be effective for reducing sawbrier growth.

PHRAGMITES ***Phragmites australis*** *(Common reed) (see ID Guide p. 206)*
This highly invasive species and aggressive weed is being observed more frequently on commercial bogs and must not get a foothold on the bog. Scout often and pull young plants. Expanding or established populations should be **treated and controlled immediately**!! The best treatment is glyphosate applications (10-20% solutions) in early to mid-summer (before it gets too tall) followed by mowing approximately 3-4 weeks after herbicide application. You can also mow first and then apply glyphosate about 4 weeks later. Control any infestations that are occurring near the bog as well. Maintaining good drainage will make the bog less favorable for Phragmites.

POISON IVY ***Toxicodendron radicans*** *(see ID Guide p. 153)*
Poison ivy (PI) is getting worse on many bogs. Treat small infestations early and eradicate! Repeated annual applications of a concentrated Callisto solution decrease PI cover and increase cranberry cover, especially where PI infestations are severe. Our results showed slightly better control with mid-June applications compared to late May applications. If you spot-treat with Callisto, you must not exceed 8 oz/A limit (2 applications permitted per year)! At 1.5 oz Callisto/gal, you can only spray out 5.3 gal per acre per application to stay within the label rate. Lower rates (1 oz or less Callisto/gal) might also be effective and allow you to treat more area, but we have not tested this. A 24c (Special Local Needs) label is now available for this application. Please call the Station (508-295-2212 x21 or x43) for updates and rate information.

Consider resistance management concerns when using Callisto.

Glyphosate wipes will control this weed, but the potential for vine damage is high. Research has shown that clipping the stems with Roundup-dispensing applicators may offer partial control. Early-mid September applications may give better control than August applications. Glyphosate has a 30-day PHI. Late applications can be used on bogs that will not be harvested due to crop-destruct floods (or very late harvested bogs). Rates as low as 5-10% solutions gave decent control. Control for significant infestations of poison ivy is post-harvest spot treatments with Roundup sprays or mechanical spot renovation followed by replanting. Adding 1 part Weedar 64 to 4 parts of the Roundup mixture may be helpful but will likely increase the possibility of crop injury. See 2,4-D cautions, page 53.

DO NOT USE thermal weeding or burning for poison ivy control. The toxic plant components can become air-borne and cause significant health problems.

Many people are highly allergic to poison ivy. Protective lotions and soaps are available that minimize the irritation caused by the poison ivy oils; these work very well when applied according to label instructions. Lotions are usually applied prior to exposure and soaps are used to remove oils after exposure to the plant. Rinse with a lot of cool water; small amounts of water may only spread the oils.

YELLOW LOOSESTRIFE ***Lysimachia terrestris*** *(see ID Guide p. 118)*
Yellow loosestrife (YLS) can cause moderate yield reductions. It may also serve as an early season host for dodder and tips may harbor *Sparganothis* larvae. Since loosestrife is difficult to control, efforts should begin while patches are still small and before they have a chance to spread.

Reports from NJ indicated that QuinStar at 8.4 oz/A plus NIS or COC in mid-July controls YLS. The evidence of control is seen in the year AFTER application. This timing may coincide with YLS post-bloom. Handler restrictions may apply for QuinStar – please check with you handler before using.

Fall or spring applications of Casoron may offer some control of loosestrife. Wipes with Roundup or Weedar 64 may also provide control. Efficacy of Callisto on YLS seems low.

HIGH PRIORITY WEEDS (Rating values 16 – 23)

POVERTY GRASS *(see ID Guide p. 190)*

Poverty grass (little bluestem (*Schizachyrium scoparium)* and broomsedge *(Andropogon virginicus)* is being reported as increasingly problematic. These species reproduce by seeds. To control these perennial grasses, control effort should be directed at all life stages. It is important to stop seeds from germinating (preemergence herbicides), stop adult plants from making seeds (mowing and postemergence herbicides) and also to control adult plants (postemergence herbicides, hand weeding/digging out clumps).

Poverty grass (PG) is a slow-grower; it does not begin to grow rapidly until later in the summer (mid-July). In the spring and early summer, plants are at the same height or lower than the cranberry canopy, making problem areas hard to identify.

Preemergence / Post-cranberry harvest

In recent demonstration plots, Evital (80 lb/A) in the spring or fall injured existing plants but did not prevent new plants in the spring. The spring application of Evital seemed to give better control of existing plants than the fall application, and also decreased the appearance of new PG plants. The spring application did cause visible symptoms of vine stress (on Stevens). The stress did not result in yield loss. Growers report good control when winter sanding followed a fall Evital application (60-75 lb/A).

Devrinol DF-XT (18 lb/A) applied in the fall or the spring did not result in control of existing plants or decrease the emergence of new plants. Some growers felt that they got control with granular Devrinol and are not seeing control with the newer formulations (DF-XT and 2-XT). Spring Casoron (80 lb/A) seemed to provide only slight control of existing plants.

Roundup (0.7% solution) sprayed directly into the base of grass clumps in the fall injured existing plants but did not reduce seed production (PG had already make and shed seeds at this point) or new plant growth in the following year. Poast sprayed directly into the base of grass clumps in the fall also injured existing plants, but was less effective than Roundup.

Postemergence

Postemergence herbicides that work on grasses include sethoxydim (Poast) and clethodim (Select Max, Intensity, and other registered products with this active ingredient). A grower reported good control with a pre-bloom (cranberry) spray of Select by air. Treatment of individual clumps in mid-July with one application of Select, Intensity, or Poast at recommended Chart Book rates reduced PG biomass compared to the untreated and the PG did not produce seeds.

Roundup wipes of the grass clumps during the summer may also offer control, but should be done before PG begins to make seeds. Roundup **sprays** can only be done during the season if the plants are **in the ditches** and the water level is dropped prior to treatment.

Hand weeding PG clumps is effective but very labor-intensive. After weeding, we did not observe any regrowth from root fragments left behind. Weeding done before plants make seeds will help control the emergence of new plants the next year. However, hand weeding can be done anytime to control existing plants, including after harvest. Use of a dandelion puller tool can be useful to remove small isolated clumps.

Mowing: Try to mow as early as you can. Remove the seed heads from the bog (bag them) if possible. Even if seed heads appear immature when they are mowed, we have seen “seemingly” immature seed heads open up within several days after being cut down.

CHOKEBERRY ***Photinia melanocarpa*** *(see ID Guide p. 147)*

Infestations of chokeberry can reduce yields and will spread in the beds. The best management strategy is to prevent infestation and treat patches before they get too large. Chokeberry plants do not grow tall on the bog. Take extra care when using postemergence wipes of glyphosate products to minimize vine injury. When chokeberry plants are short, it may be more effective to hand wipe them rather than wiping with a hockey stick wiper.

COMMON GREENBRIER ***Smilax rotundifolia*** *(Greenleaf sawbrier, bullbrier) (see ID Guide p. 242)*
Common greenbrier is bushier, more upright, and spreads more slowly than glaucous greenbrier, and grows well above the cranberry vines. It is easier to control with glyphosate wipes than glaucous greenbrier. Thorough coverage is important. Repeat applications in successive years may be needed for total control. See Notes on Roundup, page 51. Digging up the root system is not practical and will cause significant vine and bog damage.

GOLDENRODS ***Euthamia*** **and** ***Solidago spp.*** *(see ID Guide p. 63)*
To the best of our knowledge, goldenrods cause little direct yield loss, but they can be extremely difficult to control and spread rapidly. For this reason, every effort should be made to control patches before they spread. Preemergence (Casoron) and postemergence (Callisto) herbicides can provide partial control of this weed.

Data indicates that Callisto works very well against narrow-leaved goldenrod (NLGR). Stinger applications should also offer reasonable control of NLGR. Use the lowest effective rate of Stinger as cranberry vine injury is likely with over-application or off-target coverage. Wipes with Roundup or Weedar 64 may also offer control.

SHEEP LAUREL ***Kalmia angustifolia*** *(see ID Guide p. 144)*
Although not a common weed, sheep laurel is very well adapted to the bog habitat. It can spread on the bog and reduce yields. Young saplings should be pulled by hand. Larger plants are much more difficult to control but can be wiped with glyphosate products. See Notes on Roundup, page 51.

WILD BEAN ***Apios americana*** *(Ground Nut)*
Wild bean can be well controlled with Stinger applications. It is very sensitive to Stinger at rates lower than the usual label rate. As a spray, use 0.06-0.12 fl oz (0.37-0.75 tsp) per gallon. As a wipe, use 2.5 fl oz (5 Tbsp) per gallon (2% solution). When using wipes, stake the wild bean vines to make wiping easier.

Some growers have reported good wild bean control with Callisto (Stinger provides superior control but carries a greater risk of vine injury). Glyphosate products can also be used to wipe wild bean. A salt water solution applied after berry set can also be used to burn the bean tops off (1 lb/gal water, do not exceed 200 gal/A).

Preemergence options can include Casoron 4G (75 lbs/A) followed by Devrinol DF-XT (15 lb/A) or 2-XT at 15 qt/A. Allow 10 days between applications.

MEDIUM PRIORITY WEEDS (Rating values 8 – 15)

ASTER ***Aster spp.*** *(see ID Guide pp. 52)*
The impact of asters on cranberries is variable. Asters are usually found in bare patches on the bog. Once the patch becomes established, asters are much harder to control. Applications of Casoron in March-April or November offer some suppression but will probably not eradicate this weed.

Glyphosate wipes in the summer may be helpful. Thorough coverage and repeat applications are necessary. Some growers report efficacy with Callisto against asters, but results were not always compelling. Iron sulfate and Weedar 64 may also be effective. Higher rates of Stinger offer the best option; use care to avoid contact with cranberry vines during application to minimize any vine injury. For a spray, use 0.33-0.5 fl oz (2-3 tsp) per gallon. As a wipe, use 2.5 fl oz (5 Tbsp) per gallon (2% solution).

CINQUEFOIL ***Potentilla spp.*** **and** ***Argentina anserina*** *(Five-finger)* (*see ID Guide p. 121)*
The impact of cinquefoil is variable, but infestations seem to be getting worse, and could be considered a High Priority weed in some situations. Colonization of cinquefoil may indicate a problem with vine growth and higher than ideal pH. Improvement of fertilizer program may help control this weed. If the soil pH is greater than 5.0, the use of sulfur to lower pH will favor the growth of the cranberry vines over that of the weed. See Notes on Sulfur, page 53.

Callisto seems to work well on this weed, but it takes a while for symptoms to appear and for the weed to die; be patient! Hand wiping or hand pulling can also be used to eliminate small patches. Growers report using 60 lb Casoron in early May (as a spot-treatment) with very good results. Iron sulfate may also work when applied in the summer.

FERNS *(ID Guide p. 250*)
Dryopteris thelypteris, Onoclea sensibilis, Osmunda regalis, O. cinnamomea, Pteridium aquilinum
Ferns are well-adapted to bog conditions but typically are found in ditch areas. Spring (S) or Summer (Smr) follow the weed name in the chart below to indicate when applications are preferred. When using iron sulfate treatments, apply a small amount to each plant. See Notes on Casoron, page 45 and Iron Sulfate, page 46.

Chemical Recommendations for Ferns

HERBICIDE	RATE	WEEDS CONTROLLED	NOTES
Casoron 4G (Preemergence)	up to 100 lb/A	Bracken fern (S) Royal fern (S)	Appears on bogs showing signs of stress. Spot-treat and use moderate rates.
Iron sulfate (Postemergence)	2 oz/sq ft	Feather fern (Smr) Sensitive Fern (Smr)	Sensitive fern is difficult to hand weed due to perennial rhizomes breaking. Use caution on bogs that have been sanded within 18 months.
Iron Sulfate & Salt (Postemergence)	9:1 ratio (iron:salt)	Cinnamon fern, Feather fern, Sensitive Fern	Treat during the summer months. Place a small amount at the base of each plant.

STEEPLEBUSH ***Spiraea tomentosa*** *(Hardhack) (see ID Guide p. 157)*
Hardhack is a solitary plant that does not spread except through seed. Scout and control young plants. Pulling this weed is very effective, but the roots of established plants can be woody and larger plants may cause damage to the bog when pulled. Wipe with glyphosate.

LEATHERLEAF ***Chamaedaphne calyculata*** *(see ID Guide p. 143)*
Leatherleaf is a perennial, woody plant that can spread on the bog and reduce yield. Scout and remove young plants. It can be controlled by hand wiping during the summer with a solution of glyphosate products. Weedar 64 can also be used as a wipe as per dewberry recommendations.

MOSSES ***Polytrichum*** **spp.** *(Haircap moss),* ***Sphagnum*** **spp.** *(Sphagnum moss) (see ID Guide p. 258)*
Moss infestations seem to be on the increase and may warrant a higher Priority Rating in some situations. The presence of these plants on the bog may indicate a drainage problem. Evaluate the drainage in the area and improve prior to starting a chemical control plan.

Iron sulfate has historically been recommended at 3 oz/ft^2 in March-April for spot-treatment of sphagnum moss. Crop damage has sometimes been associated with use of this high rate. Recent testing has shown that use of ½ - ¼ of this rate (4.7-9.4 lb/100 ft^2) still provided good moss control, even when applied in the summer, with no visible damage to the crop. Other regions report very good results with chemigating iron sulfate, but we have no local experience with this application.

A 20% acetic acid product (known as horticultural acetic acid) is sold as a biopesticide for use on food crops. Applications of 20% acetic acid have shown good control of moss; actively growing cranberry plants were damaged but recovered. Use of 5% acetic acid (store-bought vinegar) is mostly ineffective.

High rates (15 oz/100 ft^2) of ammonium sulfate (21-0-0) applied in the spring may also offer some control of haircap moss. If used, fertilizer must be adjusted accordingly. Growers report using 100 lb/A Evital in the spring against Sphagnum moss with good results. Other products may be available. Contact the Weed Specialist for updates.

PERENNIAL GRASSES *(see ID Guide pp. 185-211)*
Depending on the species, perennials grasses could be considered Medium to Very High Priority (see related species information if not specifically listed). These grasses often colonize bare areas and are becoming more problematic, especially on newer bogs. Encouraging vine growth may reduce potential for problems. Some species may be difficult to eradicate once established.

Preemergence herbicides Casoron or Evital (spring or fall) or Devrinol (spring only) may all offer control. Use high-end rates for preemergence herbicides. Postemergence herbicides that work on grasses include sethoxydim (Poast) and clethodim (Select Max, Intensity, and other registered products with this active ingredient). Clethodim products usually have better efficacy against perennial grasses.

Roundup wipes or sprays (1-1.5%) that are directed into the base of the grass clumps may also offer control.

PREEMERGENCE OPTIONS

Broad-leaved panicgrass	Evital. Gives partial control. (*Dichanthalium clandestinum*; ID Guide p. 182)
Mannagrass	Use Casoron (Spring). (*Glyceria obtusa*; ID Guide p. 198)
Poverty grass	Devrinol applications (combined with repeated mowing to remove seed heads) is the best PRE herbicide recommendation we have at this point. See page 38.
Rattlesnake grass	Casoron (Spring). Clean ditches in infested area. Pulling helps a little. (*G. canadensis*; ID Guide p. 197)
Rice cutgrass	Best choice is Devrinol applied before April 10. Casoron and Evital can also be used; give partial control. Improve drainage. Can tolerate pH<3. (*Leersia oryzoides*; ID Guide p. 199)
Smokegrass	Evital (Spring). (*Muhlenbergia capallaris*; ID Guide p. 204)
Summergrass	Devrinol, Casoron or Evital. Hard to mow. (*Agrostis hyemalis*; ID Guide p.189)
Switchgrass	Evital (Fall). Difficult to control, repeated mowing helps. Best to dig out plants prior to seed formation. (*Panicum virgatum*; ID Guide p. 182)
Velvetgrass	Casoron (Spring). (*Holcus lanatus*)

RED MAPLE and other trees *(see ID Guide pp. 135-140, 158-167)*
The best management strategy is to pull saplings before the root system becomes established (hopefully less than 1 year old). Larger trees must be dug out. Glyphosate or Weedar 64 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. Wisconsin reports best results with early applications of Callisto at high rates with crop oil concentrate. A weed wrench or pliers can be helpful for removing large saplings.

RUSHES ***Juncus* spp.** *(see ID Guide pp. 231-237)*

The impact of rushes can be very variable depending on the species and the location of the infestation. Rushes grow in clumps and can become quite large when well established. Control of large plants with preemergence herbicides may be difficult except at very high rates. Control may also be possible with hand-digging or repeated hand wiping with glyphosate solutions.

Casoron and/or Devrinol applied in the spring may offer partial control of rushes. Evital may also offer some control. Salt (1-3 tsp) applied at the base of each clump in the spring can also be effective. Glyphosate wipes can be used in summer. We have evidence that flame cultivation (thermal weeding) may help to control rushes, and may be practical for use in ditches and along bog edges. Call the Station (508-295-2212 x21 or x43) for more information.

SEDGES *(see ID Guide pp. 212-230)*

Management of sedges combines both cultural and chemical controls. Hand dig and/or pull small patches or spot-treat with one of the preemergence herbicides listed below. Encourage vine growth in the bare areas so the sedges will not re-colonize.

Refer to the following table to locate the target weed and recommended control options and related information. TIMING: Spring applications are typically done from March through mid-April; Fall applications are typically done 1-2 weeks after harvest but at least 3 weeks prior to the winter flood. (S) or (F) following the weed name indicates 'Spring only' or 'Fall only' applications are preferred.

Preemergence Control Options

HERBICIDE	RATE	WEEDS CONTROLLED	NOTES
Devrinol DF-XT	12-18 lb/A (peat bogs) 8-12 lb/A (mineral soils)	Toothed flatsedge (nut sedge)	
Devrinol 2-XT	12-18 qt/A (peat bogs) 8-12 qt/A (mineral soils)		
Casoron 4G	up to 100 lb/A	Tussock cottongrass, Dulichium (S), Fresh meadowgrass (F), Needlegrass, Nut sedge, Spike rush, Woolgrass	
Evital 5G	80-120 lb/A	Needlegrass (S), Nut sedge	Needlegrass is difficult to handpull. Broom sedge may be controlled with glyphosate wipes. Dig up clumps.
	120-160 lb/A	Broom sedge, Needlegrass (F), Spike rush, Woolgrass	

Postemergence Control Options

HERBICIDE	RATE	WEEDS CONTROLLED	NOTES
Callisto	4-8 fl oz/A	Nut sedge, perhaps others	Spot treatment or chemigation. **See Notes on Callisto.**
Weedar 64		Chairmaker's bulrush (Three-square)	Mix 1 part Weedar to two parts water for hockey stick application. Best results when used in late June and July. Do not drip or touch vines.

WHITE VIOLET ***Viola lanceolata*** *(see ID Guide p. 131)*

Found most often in bare patches on beds, white violet is thought to compete poorly with established vines. Thus, the best management approach is to fill in bare spots on the bog by encouraging runner growth. Otherwise, hand pulling is the next best recommendation, especially on new bogs. No chemical controls are recommended.

LOW PRIORITY WEEDS (Rating values 1 – 7)

ANNUAL GRASSES

Generally, annual grasses are most likely to appear in bare patches and/or on new bogs. Hand pulling and/or treatment with postemergence grass herbicides may be used on new and established bogs. Encourage vine growth to reduce ability of weeds to colonize the bog surface. Preventing seed production may also be important in managing these weeds.

Devrinol, Casoron, and Evital give effective preemergence control for annual grasses. Use at high-end label rates.

Postemergence herbicides that work on grasses include sethoxydim (Poast) and clethodim (Select Max, Intensity, and other registered products with this active ingredient). Callisto may provide variable control.

Barnyard grass	Evital, Devrinol (S). (*Echinochloa crus-gall;* See ID Guide p. 177)
Fall panicgrass	Devrinol (S), Evital. (*P. dichotomiflorum*; See ID Guide p. 181)
Witchgrass	Devrinol (S). (*Panicum capillaire;* See ID Guide p. 179)
Crabgrass	Casoron (S). (*Digitaria* spp.; See ID Guide p. 174)

CLOVER and VETCH *Trifolium* spp. *and Vicia* spp. *(ID Guide pp. 94-97)*

Clover and vetch tend to occur in areas of high pH. If soil pH is 5.0 or above, spot treat with two applications of sulfur at the rate of 0.2 oz/sq. ft. Apply in the late spring when soil is drained and frost protecting is over. For more details, refer to Notes on Sulfur, page 53. Lower rates of herbicides may be effective when sulfur has been added and the pH is lowered.

Stinger offers good postemergence control of these weeds. See Stinger notes, page 49. Control clover early in the spring prior to budbreak; this minimizes crop injury. Use lowest effective rate.

Callisto can also control clover. However, vine overgrowth has been reported in heavily infested (treated) areas after clover dies back (apparently acts like a green manure, releasing nitrogen into the soil).

JAPANESE KNOTWEED *Polygonum cuspidatum (Mexican bamboo, Fleeceflower)*

This is an invasive species that has been seen on bog ditches but rarely on the bog itself. It is common (relatively) on new plantings. Japanese Knotweed has heart-shaped leaves that become quite square at the end close to the stem. It produces abundant white flowers in June-July. It is a perennial plant and can form dense patches (large rhizome system underground). It may die back at the end of the season and form a dense mat of dead material.

The best control is prevention!! Cutting, mowing and flame cultivation should also provide control of established plants, but it is absolutely best to eradicate before the plant establishes.

JOE-PYE WEED *Eupatorium dubium*

This perennial plant generally grows along the ditch areas. Due to its tough stem, it may be difficult to hand-weed. Some growers use pliers to uproot large plants. Glyphosate wipes during the summer offer good control. Stinger should also control this weed (in Aster family).

MEADOWSWEET ***Spiraea latifolia*** *(see ID Guide p. 155)*
Meadowsweet is a slow spreader on cranberry bogs. Scout and remove young plants. This weed should be pulled out by hand or wiped with Roundup during the summer.

MINOR WEEDS
If weeds are scattered or of minor importance, consider potential vine stress or injury when choosing herbicide and rate. Consider hand pulling instead. For localized weed patches, consider spot treatment. Postemergence treatment with glyphosate products may also offer some control. Combine herbicide treatments with steps to improve vine growth.

Common minor perennial weeds include: Blue joint (*Calamagrostis Canadensis;*ID Guide p. 192), Hawkweed (*Hieracium* spp;. ID Guide p. 59), Horsetail (*Equisetum* spp. ID Guide p. 254), *Hypericum* spp. (ID Guide p. 76), Marsh St. John's wort (*Triadenum* fraserii ID Guide p. 85), Sweet pepperbush (*Clethra alnifolia* ID Guide p.141), Plantain (*Plantago* or *Littorella* spp. ID Guide p. 112), Common sheep sorrel (*Rumex* acetosella ID Guide pp. 113), Common yellow oxalis (*Oxalis* spp.; wood-sorrel ID Guide p. 111) and Wild Strawberry (*Fragaria virginiana*; ID Guide p.120).

Minor weeds that are annuals include smartweeds, knotweeds, and ladysthumb (*Polygonum* spp., ID Guide pp. 36-42).

Casoron will control many of these minor weeds. Use 75 lb/A Casoron for horsetail control. Postemergence Roundup wipes may also control these minor weeds. Weedar 64 wipes are labeled to control *Hypericum* species and sweet pepperbush. A grower has reported control of horsetail with 60-75 lb/acre Evital in the fall followed by winter sanding.

ORANGEGRASS (A) ***Hypericum gentianoides*** *(Pineweed) (see ID Guide p. 32)*
Orangegrass is becoming more problematic on bogs, especially new plantings. Other common names may be used (horsetail, horseweed, or mare's tail), but those are very different plants. High rates of Casoron should control orangegrass but be careful using Casoron on new plantings. In Wisconsin, growers reported good control with 30 lb/A Casoron. Some growers are trying fall applications (postharvest) of Poast, but efficacy is not yet verified. There has been a report of efficacy with preemergence applications of Callisto at 8 fl oz/A, but this has also NOT been verified. Success with combinations of Callisto and Devrinol (both as PRE) on new plantings has also been reported. Orangegrass can be hand-pulled if infestations are not too large.

PITCHFORK, RAGWEED, and FIREWEED (A) *(see ID Guide pp. 18, 22, 23)*
Bidens frondosa, Ambrosia artemisiifolia, **and** ***Erechtites hieracifolia*** *(Beggartick, stick-tights; Common ragweed; American burnweed, fireweed, pilewort)*
Casoron may be applied in the spring or fall for control of ragweed. Weedar 64 wipes may be used for ragweed control postemergence. Stinger (wipes or spray) is effective for pitchfork, ragweed, and fireweed control. Use lowest effective rate to minimize vine injury.

HERBICIDES

ALWAYS read the label of any chemical before use and always comply with the manufacturer recommendations.

Preemergence – (PRE) These are herbicides that are applied prior to the emergence of weeds. In general they work by preventing weeds that are germinating from seeds from growing, but can also act on perennial plants that spread by rhizomes, tubers, and stolons. Application is timed to coincide with when the target weeds are about to begin germinating. These herbicides prevent new weeds from establishing, but do not impact weeds that are already growing.

Multiple frost protection or rain events in the spring following the herbicide application might affect herbicide effectiveness. Preemergence herbicides move through the soil at different rates. We do not have good information on how these chemicals move in cranberry soils. Based on information from noncranberry soil types, Evital has high soil mobility. Devrinol is also likely to leach through the soil profile. In a loamy sand soil, it will move about 1 inch for every inch of rain or water. Casoron is relatively less likely to leach but we have no numbers for Casoron (like with Devrinol). Sandier soils are less likely to hold onto herbicides than soils with some organic matter. Whenever possible, it is best to delay applications of herbicides until a reasonable window of dry and/or warmer weather is predicted.

Postemergence – (POST) These herbicides work on actively growing weeds. They can be absorbed by the leaves or roots of the plants, depending on the chemical.

Adjuvants – These products are added to a pesticide mixture to improve its effectiveness. They include surfactants, stickers, penetrants, compatibility agents, etc. Pesticide labels may list specific types of adjuvants that will maximize effectiveness of the pesticide. Be sure to use the proper category of adjuvant if the manufacturer makes a specific recommendation.

Several herbicides require the use of adjuvants, commonly either nonionic surfactants (NIS) or crop oil concentrates (COC). NIS spread the spray droplet evenly over the leaf surface and help the droplet to stick to the leaf. Common commercial NIS products include Induce or Activator 90. COC may consist of petroleum, vegetable, or methylated vegetable or seed oils designed especially for use in agricultural pesticide spray programs. Many COCs are available and may be sold as Crop Oil or under other trade names such as Herbimax. They increase penetration of the herbicide through the leaf cuticle.

Dyes - If you want to add a dye to an herbicide mix to track your coverage, many choices are available. Be sure the dye you use in labeled for food crops (e.g., Spray Tracer).

CASORON 4G (Dichlobenil) – Used PRE **HRAC GROUP: L**

Annual allowable formulation	Restricted entry interval (REI)	Preharvest interval (PHI)	Max number of applications
100 lb/Acre	12 hr	N/A	N/A

Casoron is a preemergence herbicide that works on germinating seeds, very small seedlings, and also some perennial weeds that propagate by rhizomes, tubers, and stolons. It is effective against both grasses and broadleaf weeds. Applications of Casoron are most effective when applied as close to the time of weed germination or emergence as possible. Casoron is labeled to be applied in early spring (pre-budbreak) while perennial weeds are still dormant and annual weeds have not started to germinate, or in late fall after the crop has been harvested. The efficacy of fall applications for many weeds has not been documented, but growers have reported good success in some cases.

Casoron may be applied by air or by ground equipment. Since Casoron volatilizes quickly, avoid applying during warm temperatures (air and soil temps should be <60°F). It must be incorporated by irrigation or rainfall ASAP after application. Do not exceed 100 lb/A in any 12-month period. Multiple applications may be made as needed. Allow an interval of 3-6 weeks between applications. Single doses of high rates of Casoron may be needed to control some perennial weeds. Some growers have experienced poor control with 30-40 lb rates. If this is your experience, consider increasing the rate and/or number of applications for improved control.

Cranberry vines with weakened root systems are more susceptible to stresses such as drought and may become more stressed with herbicide application. Application of Casoron to stressed vines may cause yellow vine syndrome symptoms or other injury. Vine injury is likely with mid to higher rates if the buds have begun growth. Some vine injury may occur from herbicide applications made in areas where puddling is a problem.

Distribute Casoron uniformly. Avoid overlapping of herbicide. Temporary reddening of vines may occur, especially with late spring application or when applied on sandy bogs. Do not apply after bud elongation as vine injury may occur and yields may be reduced. Do not apply to young beds (less than 3 years old unless root systems are well established) or on bogs prior to or immediately after mowing vines. Do not sand (spring or fall) on top of a Casoron application. Applications on top of sand or late applications can be made, but must be watered in *immediately*. Low rates (<40 lb/A) may be applied after removal of a late water flood to control dodder with minimal risk of phytotoxicity.

After Casoron is applied and is incorporated by initial irrigation or rainfall, it binds to soil particles. The efficacy of Casoron may be reduced if excessive irrigation or rainfall (+ 0.5 inches) follows application, as the chemical will be washed too deeply into the soil to affect germinating seeds. It is not known if frequent frost protection impacts the efficacy of Casoron.

Casoron is labeled for use on:

Sensitive fern	Summer grass	Woolgrass	Wild strawberry
Bracken fern	Velvetgrass	Cotton grass	Aster
Royal fern	Bent grasses	Needle grass	Buckbean
Haircap moss	Little hairgrass	Oniongrass	Hawkweed
Common horsetail	Rice cutgrass	Arrowleaf tearthumb	Western Lilaeopsis
Water horsetail	Bunch grass	Beggarticks	Marsh pea
Rush (*Juncus* spp.)	Muskrat grass	Knotweed	Plantain
Dodder	Nutsedge (Nutgrass)	Loosestrife	Smartweed
Bluejoint grass	Short wiregrass	Tideland clover	Pacific silverleaf
Rattlesnake grass	Wideleaf grass	Ragweed	Marsh St. Johnswort
Manna grass	Stargrass	Sorrel	Crabgrass

IRON SULFATE – Used PRE

May be spread as a broadcast application through conventional fertilizer rigs, such as hand cranks, or with drop spreaders. Traditionally, a 20% ferrous sulfate (fine powder) product has been used, but other formulations are available. Application rates listed in the Chart Book 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 bogs. To be most effective, rain should follow within 4 days of an application or the bog should be irrigated. When a 9:1 iron sulfate to salt combination is used, rain or irrigation is not necessary for incorporation.

We do not have local efficacy data but WA reports good results with chemigation of iron sulfate. Recommendations from WA are to use 80 to 100 lbs/A of the water soluble (powered) form. Dissolve well (dissolves best in warm water, if possible) prior to injections, and continue to stir as you inject. Use a slow injection time - It can clog intakes/values/sprinklers if you dissolve too much at once or go to fast. You might need to do more than one application.

DEVRINOL DF-XT and 2-XT (Napropamide) - Used PRE **HRAC GROUP:K3**

		Annual allowable formulation	Restricted entry interval (REI)	Preharvest interval (PHI)	Max number of applications
Established peat beds	DF-XT 2-XT	12-18 lb/Acre 12-18 qt/A			
Established sand beds	DF-XT 2-XT	8-12 lb/A 8-12 qt/A	24 hr	N/A	3
New plantings	DF-XT 2-XT	6 lb/A* 6 qt/A*	* We have asked for a 24c label to permit use of up to 18 lb or qt/A on new plantings. Please check for approved label when purchasing product.		

Use up existing stocks of Devrinol 10G and 50DF as they are being replaced by DF-XT and 2-XT. Devrinol is a preemergence herbicide and will not control existing weeds. Unlike Devrinol 10G (has been discontinued but is still legal to use, and must be applied by air or ground), the new formulations can be injected though the irrigation system. Devrinol is typically applied in the spring before growth begins, but it may also be applied in the fall after harvest. Do not apply when beds are under winter flood. The efficacy of fall applications for many weeds has not been documented.

Rate differences for the soil types (higher rates with more organic matter) are primarily due to efficacy issues rather than toxicity or groundwater concerns. The label states that it should be applied with sufficient water to wet the soil to a depth of 2 to 4 inches. Use the appropriate rate for the age of the bog and soil type. Devrinol can be used under or on top of sand.

This herbicide provides some control of grassy weeds, nutsedge, and annual broadleaf plants, but works best on weed-free areas. It may also work against your goals if you are trying to establish grass on ditch banks and your irrigation system delivers coverage to the ditch bank area.

EVITAL 5G (norflurazon) - Used PRE **HRAC GROUP:F1**

	Annual allowable formulation	Restricted entry interval (REI)	Preharvest interval (PHI)	Max number of applications
Established beds	160 lb/Acre	12 hr	N/A	1
New plantings	80 lb/A	12 hr	N/A	1

Apply Evital 5G as a single application in the early spring after removal of winter flood and before weed growth resumes OR in the fall after harvest at least 2 weeks before winter flood. Only one application per 12 month period can be made. Vine injury may occur in areas where water stands several days after flooding or heavy rains. 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 be careful especially on bogs that have drainage problems or sensitive varieties. Sanding after applications of 50 lb/A or less has given good weed control. Growers have reported that applications of Evital (50-60 lb/A or less) on top of sanded vines work adequately on healthy well-drained beds. Although higher rates may injure cranberry, the product label does recommend using higher rates for poverty grass control (120-160 lb/A).

Be conservative when applying Evital to new plantings! Usually, new vines are very sensitive to Evital. However, growers have reported using 35 lb/A in the fall on Stevens that were planted in the same year with good success. In other instances, vines have shown severe phytotoxicity to rates as low as 25 lb/A when applied 3-4 weeks after planting.

CALLISTO (Mesotrione) - Used PRE and POST **HRAC Group: F2**

Annual allowable formulation	Restricted entry interval (REI)	Preharvest interval (PHI)	Max number of applications
16 fl oz/Acre Max 8 oz/A per application	12 hr	45	2

Callisto is a systemic preemergence and postemergence herbicide. It works mainly on broadleaf weeds, and does not work well against most grasses. When used preemergence, weeds take up the product through the soil during emergence. When used as a postemergence, susceptible weeds absorb the herbicide through the treated foliage and also through the soil.

Please note that you CANNOT exceed the maximum allowable amount of Callisto used, regardless of how you apply it. For example, if you chemigate 8 oz/A twice, you CANNOT also spot treat. You can chemigate once at 8 oz/A and spot treat once at 8 oz/A, etc. There must be at least 14 days between applications.

Chemigating with Callisto. Callisto can be used through the chemigation system; this method is commonly used by growers. Adjuvants may be added for postemergence use. Use a "per acre" rate for the adjuvant (e.g., 1-4 pt/A), not a % or v:v rate as per the supplemental label granted in 2015. NIS and COC should work equally well with Callisto; however, some COC may cause injury on cranberry under certain conditions.

Spot-treatment with Callisto. Some growers also used Callisto to spot treat weeds. If you want to add a dye to the herbicide mix, the manufacturer recommends using Spray Tracer; we recommend AGAINST using Blazon Blue (this product is NOT labeled for food crops). Add a nonionic surfactant (NIS) at 0.25% v:v or 1.9 tsp per gallon or crop oil concentrate (COC) at 1% v:v or 2.5 Tbsp per gallon with all postemergence applications, regardless of Callisto rate.

Suggested amounts of Callisto per gallon of water for spot-treatments

Callisto per gallon of water	Solution description	Max solution per acre per application
0.8 teaspoon	approximates 4 oz/acre rate	30 gal
1.9 teaspoons	approximates 8 oz/acre rate	30 gal
3 Tablespoons	very concentrated, for woody weeds like PI	5.3 gal

Plants affected by Callisto will turn white. Injury may take several days or weeks to show. Allow a minimum of 14 days between applications. Hardier weeds will likely need 2 applications per year over a period of successive years for control. Callisto should work well against crabgrass but is weak against foxtails. Callisto is rain-fast in less than 4 hours and has no known bee issues.

Use on New Plantings. Callisto is an excellent choice for use on newly planted vines. Growers have first applied Devrinol (within 3 weeks of planting) and then followed up with one or two Callisto applications; this combination seems to have worked well. No injury has been reported. Some growers have applied Callisto within days of planting with no injury (especially so for rooted cuttings). Lower rates are often a good choice as many of the early weeds are annual weeds.

Resistance Management Concerns. Resistance to Callisto has been reported in other crops after only 7 years of use. It is important that we do not lose this tool for dodder and general weed management. Occasionally rotate Callisto out of your herbicide sequence and substitute other herbicides. Use non-chemical forms of weed control whenever possible. Do not use Callisto repeatedly year after year. You CANNOT EXCEED 2 APPLICATIONS per year, even if you remain below the 16 oz/acre annual maximum.

QUINSTAR 4L (quinclorac) - Used PRE and POST **HRAC Group: L, O**

Annual allowable formulation	Restricted entry interval (REI)	Preharvest interval (PHI)	Max number of applications
16.8 fl oz	12 hrs	60 days	2

There are export issues with this herbicide. Check with your handler before using, because handler restrictions may apply. Do not apply to crops that are stressed. Do not apply by air.

Dodder, loosestrife, and other broadleaf and grasses may be controlled by this herbicide. A maximum of 2 applications (8.4 oz/A each) are permitted per 12-month period, not to exceed 16.8 fl oz/A. As per FIFRA 2ee granted in 2015, injection times of less than 30 minutes can be used (label states 30-45 minutes). Applications must be separated by at least 30 days. COC at a rate of 2 pt/A may be added to the spray mixture.

Quinclorac is taken up through roots and leaves. Adequate rainfall after application and good soil moisture is important for root uptake. Symptoms include twisting, stunting, reddening and chlorosis; symptoms on perennial plants may take more than 3 weeks to show. The full effect of the herbicide may not be evident for 3-6 months after application. Some growers report good dodder control the year after application, even if they did not see results in the year of application.

STINGER (Clopyralid) – Used POST **HRAC Group: O**

Annual allowable formulation	Restricted entry interval (REI)	Preharvest interval (PHI)	Max number of applications
16 fl oz	12 hrs	50 days	2

Type of application	Rate
Wipe	2% solution - 2.5 oz (5 Tbsp) per gallon
Spray (wild bean)	0.06-0.12 fl oz (0.37-0.75 tsp) per gallon
Spray (asters, ragweeds, etc.)	0.33-0.5 fl oz (2-3 tsp) per gallon

Stinger **CANNOT** be applied by air or through the irrigation system! Do not apply within 5 hours of expected rainfall or irrigation.

Stinger is a postemergence herbicide used to control wild bean, narrow-leaved goldenrod (NLGR), asters, clover, ragweed, pitchfork (and other members of the Aster and Legume families), and certain other weeds within the treated area. Growers have reported effective control (and reduced vine injury) when using lower rates than recommended on the label. This is particularly true for wild bean control.

Apply when weeds are actively growing. It is best to apply Stinger when vines are dormant, if possible. For weeds that emerge late (NLGR, wild bean, etc.), wait until after fruit set to apply. Cranberry plants are most sensitive to Stinger applied prior to bloom. Do not apply Stinger from 1 week prior to bloom until 1 week after bloom. After bloom, Stinger can be applied up until 50 days prior to harvest. Higher rates of Stinger can be applied to cranberry plants post-bloom because the plants are less sensitive to Stinger than during the spring flush. Stinger can also be applied in autumn after harvest.

Stinger may be applied as a broadcast spray, as a wipe or as a spot treatment with a handheld sprayer. Spray to <u>just wet the weeds</u>, 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; be patient. Two applications per season are permitted, not to exceed a total of 1 pint per acre.

POAST (Sethoxydim) - Used POST **HRAC Group: A**

	Annual allowable formulation	Restricted entry interval (REI)	Preharvest interval (PHI)	Max number of applications
Broadcast	5 pt/Acre (80 oz) max 2.5 pt/A per app	12 hr	60 days	NA
Spot treat	1-1.5% solution			

Poast **CANNOT** be applied through the irrigation system! It may be applied by broadcast applicator or air. Spot treatments with small sprayers are effective.

Poast is a postemergence herbicide that controls true grasses (most annual grasses and some perennial grasses). Sedges and rushes are not controlled. Poast is absorbed through foliage after application. The effects range from slowing or stopping growth (generally within 2 days), to foliage reddening and leaf tip burn. Subsequently, foliage burnback may occur. These symptoms will generally be observed within 3 weeks. 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. Poast works best before grasses begin to flower.

Cranberry plant injury may occur if the herbicide is applied during the heat of the day or during bloom (due to added COC). Application during cool periods of the day, but after dew has dried, is preferable. If you have never used this material before, it may be wise to test a small area before applying the product to a larger area.

Poast should always be used with a crop oil concentrate (COC). Physical incompatibility, reduced weed control, or crop injury may result from mixing Poast with other pesticides (fungicides, herbicides, insecticides, or miticides), additives, or fertilizers.

Spray Solution Volume (gallons)	COC (1%)		Poast Spray Solution 1%		1.50%
1	1.3 fl oz		1.3 fl oz		1.9 fl oz
3	3.8 fl oz	AND	3.8 fl oz	OR	5.8 fl oz
5	6.4 fl oz		6.4 fl oz		9.6 fl oz
25	2.0 pints		2.0 pints		3.0 pints
50	4.0 pints		4.0 pints		6.0 pints

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. Do not apply if wind speed is greater than 10 mph.

Use on New Plantings. Poast can be safely used on newly planted vines. Wait for roots to develop before application. Growers report mid-July applications approximately 6 weeks after planting worked well. Grass control was enhanced when Poast applications were followed by Callisto applications.

SELECT MAX, INTENSITY, ARROW, etc. (Clethodim) – Used POST HRAC Group: A

Clethodim herbicides **CANNOT** be applied through the irrigation system! They may be applied by broadcast applicator or air. Spot treatments with small sprayers are effective, but care should be taken not exceed the maximum rate allowed on a "per acre" basis or crop injury may result. Clethodim is similar to Poast (sethoxydim). It is also a postemergence herbicide that controls true grasses (most annual grasses and some perennial grasses). Sedges and rushes are not controlled.

There are several products registered for use in cranberry that contain the active ingredient clethodim. The labels are different for each product (rates and adjuvants). Please read the label carefully and follow the manufacturer recommendations. For example, you can use an NIS with Select Max but not with Select 2EC.

Select Max, Intensity One	9-16 fl oz/A per application (not to exceed 64 fl oz/A per year). Add 0.25% v/v nonionic surfactant (NIS). For each gallon, mix 1.3 Tbsp (0.65 fl oz; 19 ml) + 0.65 Tbsp (0.33 fl oz; 10 ml) NIS for a mid-range rate. Allow 14 days between applications. Do not apply between hook and full fruit set. 30-day PHI.
Select 2EC, Intensity	6-8 fl oz/A per application (do not exceed 32 fl oz/A per year). Add 1% v/v crop oil concentrate. For each gallon, mix 0.25% to 0.50% (0.33 fl oz. to 0.65 fl oz/gal) and include crop oil concentrate at 1% (1.3 fl oz/gal). Treat to wet vegetation, while not allowing runoff of spray solution. Allow 14 days between applications. Do not apply between hook and full fruit set. 30-day PHI.

ROUNDUP and other Glyphosate products – Used POST HRAC Group: G

Many Roundup and glyphosate products are available on the market. **Please read the label of any product you use to ensure compliance.** Available glyphosate products vary as to whether they carry a 'Caution' label or 'Warning' label. Check the label for appropriate protective clothing. These products may also vary in the amount of active ingredient, the REI times, and length of dry time before they are rain-fast. Check the label. For example: Roundup Weathermax has 48.8% active ingredient (a.i.) while Roundup Ultra has 41% a.i.

Most Roundup products do not need an additional surfactant. It may be necessary to add a nonionic surfactant to other glyphosate products (again, check the label of the specific product you are using). Ammonium sulfate may improve uptake of these Roundup products when moderate to large amounts of carbonates ('hard water') are present in water, but this is rarely an issue in MA (waters typically <50 ppm calcium carbonate). Follow instructions on the label.

Make herbicide mixtures fresh each day for maximum effectiveness. Do not store in galvanized containers. Always use a dye to track your coverage with any wipe product. Depending on the label, glyphosate products can be applied by wiper, by clipper, as a spot treatment spray in dry ditches, and as a spot treatment post-harvest spray.

Glyphosate is absorbed into plants through the leaves. Cranberry vines are very sensitive to glyphosate and can be killed by exposure. Avoid cranberry plants and do not allow material to drip onto vines during application. Glyphosate can be applied any time weeds are present, and repeat applications are permitted. There is a 30-day preharvest interval.

During the growing season glyphosate can be applied (on bog) by wiper. Some products (but not all) are also labeled for clipper use (stump-cut). Some products are also labeled for spray use in DRY ditches, and ditches must remain dry for 2 days after application.

Type of application	**Roundup Rate** (for a 48% a.i. product)
Wiper	10-20% (1 part glyphosate product to 4-9 parts water)
Dry ditch spray	1-1.5 % (2.5-3.8 Tbsp or 38-57 ml per gallon water)
Clipper	50-100% (use full strength or dilute by half)
Post-harvest spray	0.4 – 0.7% (3-5.5 tsp or 15-27 ml per gallon water)
IF additives are needed:	
Surfactant	1 oz (2 tablespoons or 30 ml) per gallon of mixed solution
Ammonium sulfate	3 oz (6 tablespoons or 90 ml) per gallon of mixed solution

Wipes - Use an applicator that permits excellent coverage with minimal dripping. Adequate coverage of weeds must be obtained for glyphosate to be absorbed. Several leaves (at least 50%) on each stalk must be treated with the herbicide. 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. Some growers have had success staking the vines (tomato stakes or similar) for wiping and allowing them to dry prior to laying them back on the vines. This certainly reduces vine injury.

	Wiping Solution Strength				
	Weaker	Moderate	Strong		
	Roundup (fl oz)				
To make 1 gallon	13 fl oz	17 fl oz	25 fl oz	+	enough water make 1 gallon of solution
To make 2 liters	7 fl oz	9 fl oz	13 fl oz	+	enough water make 2 liters of solution

Clipper Applicators (Roundup only) - Roundup products are the only products currently labeled for use in clipper application ('Cut Stump'). Availability of commercial clippers has become limited over the past few years. Growers may need to manufacture their own clippers.

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.

Spray application to DRY ditches - Some products are also labeled for spray use in DRY ditches. The ditch should be dry for 1 day before application, and ditches must remain dry for 2 days after application.

Post-harvest sprays - Certain products allow for post-harvest sprays. Supplemental labels may be needed with certain generic glyphosate products when doing post-harvest sprays (0.4 – 0.7%), applied as a spot-treatment, or sprays in dry ditches (1-1.5%). These uses are included in the regular labeling for Roundup WeatherMAX and PowerMAX. CHECK THE LABEL of the product you are using for specific uses. Varieties can respond differently; we have seen that Howes are slightly more sensitive to postharvest spray injury than Early Black.

WEEDAR 64 (2,4-D) – Used POST HRAC Group: O

Weedar 64 is a State-restricted use product!! These products have considerable potential to evaporate and cause crop injury. 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.

Avoid applying 2,4-D on hot, sunny, and humid days when there is little air movement. Weedar 64 is the only 2,4-D product that can be used on the bog. Weedar 64 has a 30-day PHI and may only be applied once per season. For wipers, mix 1 part Weedar to 2 parts water for hockey stick application. Best results are obtained when used in late June and July. Do not drip or touch vines.

If you are using Weedar with Roundup, first mix your Roundup solution. Then mix Weedar in a 1:4 ratio with the Roundup solution (1 part Weedar to 4 parts RU solution).

SALT – Used POST

Salt (sodium chloride) granules or salt sprays may injure 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. It may be sprinkled at the base of weeds (for rushes use 1-3 teaspoons per clump) or sprayed in a solution. For wild bean, 1 lb/gal water used after fruit set can help to control this weed. Do not exceed 200 gallons per acre. One grower recently reported that they obtained some control of dodder using a salt water spray. 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.

FLAME CULTIVATION (FC) or THERMAL WEEDING – Used POST

We have evidence that the use of hand-held propane torches can provide control of some weeds (e.g., dewberry, rushes, and dodder). Applications (in test studies) have been made in the summer months. FC is a good option on organic farms or as an alternative to continual POST herbicide use. Several torches, called open flame (OF) or infrared (IR), are available. Cranberry vines can be injured during a FC application but the vines will recover. Short exposures (~8 sec) provide control when using OF; longer exposures are needed (~30 sec) with IR.

VINEGAR – Used POST

Vinegar (acetic acid). Treatment with 20% acetic acid gives moss control, but also injured cranberry vines. Data are limited for control of other weeds. In our experience, applications of vinegar (especially store-bought, 5%) are mostly ineffective and may cause injury.

Soil pH management to improve weed control

SULFUR

Determine soil pH in the weedy area prior to sulfur application. If pH is 5.0 or above, use two applications of 500 lb/A each (or 4 applications of 250 lb/A) to reach 1,000 lb. of elemental sulfur per season. Begin application in late spring when soil is drained and the need for frost protection is over. Most growers allow 3-6 weeks between applications. Do not apply sulfur to puddled 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 flowers of sulfur (usually bright yellow powders); they can be phytotoxic and are difficult to apply. Reducing soil pH below 4.0 may weaken the cranberry vines. Do not use potassium sulfate since *sulfate* (SO_4) will not lower soil pH. 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. See page 66 for more info.

ON-BOG AQUATIC WEED CONTROL

Make sure any aquatic weed control (targeting *Hydrilla, Elodea,* Water lettuce, etc.) that is performed within the bog system (irrigation laterals, ditches) is done with a product labeled for CROP use.

COPPER SULFATE and COPPER COMPLEXES (Algae-Pro, Cutrine-Plus). Copper sulfate may be used to control algal growth on winter or late water 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); ours waters are usually low in carbonates. Copper-complex products work best when applied under calm and sunny conditions.

If you are holding a 4-week late water flood, plan to apply a copper product mid-way through the flooding cycle (for more details, see Prevention of Scum in the Late Water section). These products are typically applied directly through the irrigation systems (with heads on risers). For winter floods or late water floods of short duration, scout for algae and apply when growth is first visible on the water surface. Remember, these products only prevent further algal growth; they do not kill or remove what has already grown. Crystal copper sulfate will dissolve easily in water and can be applied as a spray solution. Though somewhat uncommon now, crystalline products can be placed in burlap bags and dragged across the water surface. When bogs are treated with copper sulfate during the winter months, water should be impounded for one week. Since late water floods tend to be warm, there is no need to impound these waters. Do not apply to water except as directed on the label. These products are toxic to fish. Do not use any other algaecide products; consult with the Weed Specialist if you have any questions.

Nautique (by SePro) has crop uses on its label. It is a copper carbonate (double-chelated copper formulation) product that is labeled to control floating, emerged, and submerged vegetation in still or flowing aquatic sites such as reservoirs, ponds, slow-flowing water bodies, crop and non-crop irrigation systems. Do not use if carbonate hardness of the water is less than 50 ppm (this is generally the case in MA) as efficacy may be decreased and non-target toxicity may be increased. If applying to public waters, check with the local authorities for permit process. Nautique can be mixed with other aquatic herbicides; check the label. When applying to irrigation ponds, hold water for a minimum of 3 hours before irrigating plants. It is highly corrosive and carries a DANGER label. It may be fatal if absorbed through the skin. Be very careful with this product!! Wear all recommended protective equipment. Application rate varies by vegetation density and depth of treated area. Please read the label. If you have any questions, please consult with a Weed Extension specialist prior to treating.

ALGAE *(Green scum)*

Algaecides are usually prescribed on an acre-foot basis. An acre-foot is the amount of water needed to cover one acre of bog with one foot of water (~300,000 gallons of water, assuming the bog is level). Barley straw can also be used to help clarify cloudy water (common mostly in late water floods). When water temperatures are cool (<50°F), it may take 6-8 weeks for the straw to decompose; 1-2 weeks if water temperature is >68°F. The bales should be contained in nets and maintained at the surface (floats can be inserted) to be most effective. For water that requires treatment, 90-225 lb/acre of surface area should be enough to clear the water. Use higher end rates if the density of the algae and/or the turbidity of the water is high. Do not use more than you need; overdosing may cause fishkills as the straw deoxygenates the water as it decays.

The products listed below are legal for use in cranberry farms. Many other available algaecide products are not for use in food crop systems; check with the Weed Specialist if you have questions about other products.

CHEMICAL RECOMMENDATIONS FOR ALGAE

Copper sulfate	4 lb/A-ft	Apply evenly in bog waters. When bogs are treated during winter months, water should be impounded for 5-7 days to allow for degradation in cool-temperature water. May also be used in late water floods.
Algae-Pro	0.75-1.5 gal/A-ft	Amount will vary depending on product, water volume, and algal density. Carefully read the label before application. See Notes on Copper Sulfate and Copper Complexes, page 54.
Cutrine-Plus	0.6-1.2 gal/A-ft	

NON-CROP USE: WEED MANAGEMENT OUTSIDE OF BOG AREA

AQUATIC WEEDS. Reports of grower problems with aquatic weeds have been increasing. Aquatic weeds can be submersed, floating plants, floating leaf plants or emergent plants. Common aquatic species for our area may include fanwort, variable watermilfoil, bladderwort, hydrilla (a new one to look out for), duckweed, and water lilies. Be sure to get a correct identification of the weed problem before treating. Treatment of some water areas may require a permit. Non-chemical methods (e.g., harvesting, suction, hand pulling, dredging) are available but are very expensive. The use of grass carp for aquatic weed control is NOT permitted per MA Fish and Wildlife. Call 508-389-6300 for more information.

DIQUAT. This herbicide should only be used on water weeds growing in areas **outside of the bog**. 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., Induce, Activator 90) may improve performance. Check the label for rate information.

RODEO

This glyphosate product can only be used to control weeds that occur 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 reapplication. Do not add ammonium sulfate to Rodeo mixtures.

OFF-BOG AQUATIC WEED CONTROL

Diquat **Reward**	1-2 gal per surface acre (37% ai diquat bromide)	Use during Summer months. Water use is restricted for various time periods depending on product and pattern of use. CHECK THE LABEL! Use only on still water areas outside of bog (e.g., farm ponds, reservoirs). Water temperature should be >50°F for best activity. Do not use in or on bog ditches. HRAC Group: D
Rodeo	(54% ai) 1.25% solution	Apply during the Summer months. Rodeo is registered for use on noncrop land only. Use in interior ditches is not permissible. Recommended spray solution: 5 fl oz/3 gallons. Add a nonionic surfactant at the rate of 0.25-0.50% volume basis (1-2 fl oz or 2-4 Tbsp in 3 gal.). HRAC group: G More effective against cattails and water lilies. Not effective against submersed weeds.

OFF-BOG WOODY AND BROADLEAF PERENNIALS CONTROL

(not in ditches or canal banks)

Hand pulling is most beneficial in Spring and early Summer when the soil is moist and the plants are fairly small. Both of the following herbicides are restricted-use compounds. Be sure you have the proper license or use licensed personnel to do the application.

CROSSBOW, WEEDONE CB (2,4-D). State Restricted use!! Crossbow and Weedone are labeled for **non-bog use only**. Be cautious! Crossbow contains triclopyr for which there is **no food tolerance**. Do not use Crossbow or Weedone CB on dikes or canal banks. Use it only on weeds located far away from the bog. These products have considerable potential to evaporate and cause crop injury. They have the potential to drift far from the site of application, and can injure nearby plants such as apple trees, grapes, etc. 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.

Weedone CB	Do not dilute	Apply in February and March. Spray to wet. Avoid drift onto bog. Controls woody plants on roadsides and non-crop areas. It is no longer produced, but available product may be used off the bog. HRAC Group: O
Crossbow	up to 2 gal/A	Mix with enough water to deliver 10-30 gal/A. Application rates vary depending on target species and application method. Drift to desirable plants may cause injury (esp. grapes and tomatoes). Do not apply to water. Read the label! See Notes on 2,4-D. HRAC Group: O

DITCH MANAGEMENT

WOODY AND BROADLEAF PERENNIALS ON DIKES (BOG-SIDE)

Cultural controls include mowing the ditch and dike areas during the summer months. Some areas may need to be done 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 spread of these weeds onto bogs.

DITCH WEEDS (*e.g., 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). Preemergence herbicides registered for use on the bog may **NOT** be used in the ditches for weed control. Roundup use is permitted in dry ditches as a wipe or a spray. See notes on Roundup. Evidence also suggests that flame cultivation may be an effective nonchemical tool for ditch weed management.

NOTES ON CONSERVATION SEED MIXES FOR DIKES AND DITCHES

Several criteria were used to compose the seed mix recommended by Plymouth County Conservation District. The seed mix needed to contain perennial species, must contain at least one nitrogen-fixer, must be drought-resistant, must not introduce known weed seeds, contain at least 3 species and be economical to purchase. The current seed mix is creeping red fescue (39.7%) with a germination rate of 85%, perennial ryegrass (34.2%) with a germination rate of 90%, empire birdsfoot trefoil (24.5%) with a germination of 70%, and 5% hard seed and some inerts.

Mixes may also contain timothy grass, riverbank rye, switchgrass, Virginia wildrye, orchardgrass, deer tongue, perennial wildrye, and clover. For more information on planting rates and cost, please contact the West Wareham office at 508-295-5495 Ext 4.

Other seed mixes may be used but if you want to take advantage of cost-sharing, be sure to confer with NRCS prior to using a non-standard, non-recommended seed mix. Creeping red fescue and hard fescue may offer good stabilization coupled with low maintenance. You may want to consider the addition of an annual ryegrass (small proportion of total) for quick colonization along with the fescues. If you wish the fescues to predominate, be sure to mow the ryegrass prior to seed production (late summer-early fall).

Use herbicide with caution when re-seeding dikes, as some herbicides will control grasses and legumes present in seed mixes. A UMass Cranberry Station greenhouse study showed that red clover was susceptible to injury from Callisto applications. Hard and creeping red fescue and switchgrass showed symptoms briefly but recovered within a few weeks.

RENOVATION AND NON-PRODUCING BOGS

FUMIGANTS. Basamid (dazomet) and Vapam (metam-sodium) are soil fumigants that can be used on cranberry beds. **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. More information on the use of fumigants may be found in the Planting New Cranberry Beds Fact Sheet (http://ag.umass.edu/cranberry/fact-sheets). HRAC Group: Z.

REGLONE (Diquat dibromide). Non-selective herbicide. Reglone should only be used on bogs that will be renovated or will not be harvested for 1 year. The intended use is as a site-preparation product, not for use for spot weed control on an active farm. This product works as a plant desiccant and should be used as a directed spray. Reglone cannot be applied by chemigation. Use 1.5-2 pt/15 gallons water by ground. May need repeat applications. Add NIS. HRAC Group: D.

FUSILADE (Fluazifop). This selective grass herbicide can only be used on non-producing bogs. It is used postemergence for control of true grasses. Sprayed grass will turn yellow and die back over a 1-4 week period depending on climatic conditions. It is rainfast after 1 hour. Add a COC at 0.5-1% v:v or 0.25-0.5% v:v if using a NIS. Use 0.75 fl oz herbicide per gallon water. REI is 12 hr. HRAC Group: A.

CAUTIONS AND OTHER NOTES

1. Chemicals not registered for use on cranberries must not be used.
2. Herbicide use may weaken vines and crops may be reduced.
3. To be most effective, rain should follow the application of any dry herbicide formulation within 4 days or the bog should be irrigated.
4. Wash equipment with soap (or detergent) and water immediately after using. Rinse with ammonia after using hormone-type herbicides (such as 2,4-D).
5. Hand wiping with glyphosate products is often practical with some weeds if roots are weakened. This is particularly useful for dewberries after late water or a summer flood.
6. Mowing of tall weeds helps to prevent shading and reduces seed formation.
7. Late water causes general reduction of annual grasses and may reduce dewberry populations and re-growth.
8. Agricultural burning of brush or grass is allowed under regulations from the Director of Air Pollution Control, Southeastern Office of the Dept. of Environmental Protection and under permit from the local fire chief.
9. Review the Weed Management BMP in the UMass Best Management Practices Guide. ag.umass.edu/cranberry/publications-resources/best-management-practices