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PLANTING NEW CRANBERRY BEDS: Recommendations and management

University of Massachusetts, Cranberry Experiment Station
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Weed control in preparation for bog renovation
A non-chemical method to renovate is to mechanically remove weeds with a bulldozer. Removal of at least the top 6 inches is recommended for mechanical renovation of dewberry (*Rubus* spp. or trailing brambles) and wild bean infestations. Excavations of the tubers and rhizomes should be done carefully as not to plow them back under as you push material off the bog with a bulldozer. It may be necessary to remove the top 12 inches when mechanically renovating for sawbrier infestations.

Chemical options available for fumigating a bed are as follows:

Vapam (33% a.i.) 50-100 gal/A
Vapam HL (42% a.i.) 56-75 gal/A
Lower rates for herbaceous weeds and higher rates for woody weeds.

Basamid 300 lb/A
Eradicates all weeds.

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. Before application (fall or spring), soil temperature should be 50°F or higher to a depth of at least 3 inches. Aboveground vegetation should be removed. Vapam and Basamid will kill fish if used improperly. Do not contaminate pond, stream, or ditch waters.

Timing Fumigations. *Fall Applications:* Whenever conditions allow, it is preferable to fumigate in the fall because you will not have to wait for soil temperatures to come up to 50°F in the spring. In addition, once the spring arrives, the soil is already fumigated and prepared, and planting can start as soon as weather permits. At least 3 inches of sand should be applied after fumigating, but prior to the winter flood. If you need to use heavy equipment to apply the sand, wait at least 2 weeks as not to prematurely release the vapors. *Spring Applications*: Apply sand after fumigating as with fall applications. Do not plant until the chemical odor has disappeared (usually 2 weeks after application). Plant fast-growing seedlings (e.g., tomato, beans) in several places to see if the fumigant is still present. Keep the tomatoes in moist potting soil. You must know that the wilting (if it occurs) is from the fumigant and not from lack of water. Be sure the fumigant has completely dissipated before planting vines.

Notes on Fumigants. The use of fumigants requires the posting of a special WPS sign.

Basamid: The soil may be rototilled prior to application, but it is not necessary. The soil should be moist prior to treatment. For best results, rototill as soon as possible after application. Then, water 3-4 hr immediately following rototilling.

Vapam: Use low-end rates for eradication of herbaceous weeds and the high rate for eradication of woody plants. For best results, rototill before application. For shallow pests run sprinklers for 5-10 minutes, then over the next 10-20 minutes, inject the Vapam all at once. If targeting weed pests deeper than 18" (e.g., *Smilax* spp.), divide the Vapam into 3 or more equal parts and apply at intervals during the sprinkling period. Water for a total of 3-4 hr immediately following application. Rototilling following a Vapam application is not recommended. If an odor persists the day following an application, run the sprinklers for an additional hour.

Soil Conditions
Cranberry beds should be established on a base material that will retard vertical movement of water. This will supply the so-called 'impermeable layer' that will allow the bog to hold a flood for harvest, winter protection, etc. Examples of base materials are peat, clay, heavy packed topsoil (loam), and packed glacial till. Proper leveling of the base layer will help to prevent drainage problems later. A minimum of 4 inches of sand should be applied above the base layer of the bog prior to planting - a deeper layer (6-10 inches) is better. Sand with at least a 60-70% coarse particle content is best. Higher amounts of coarse particles were correlated with higher yields in Massachusetts research studies. Most likely the benefit comes from providing adequate drainage. Proper drainage is essential for good root development and aeration as well as for the prevention of Phytophthora root rot.

Erosion and Sediment Prevention Methods
Disturbing large areas of land carries with it the risk of erosion. Proper planning for the control of erosion prior to the start of any construction or earthmoving activities will ensure that wetlands and water bodies are protected and that you remain in compliance with the Massachusetts Wetland Protection Act. It is important to formulate an erosion control plan **prior** to the start of any construction activity. The erosion control plan, including planning for where runoff water will go during construction, should be part of your overall project plan. Materials needed for implementing that plan should be on hand or installed prior to earth disturbance. It is vital to have erosion control measures in place prior to substantial rainfalls or storms. See the Erosion and Sediment Control BMP for further information.

One of the most common erosion problems in new construction is slumping of bankings along ditches and canals. Proper construction of embankments and the use of erosion barrier materials and/or stabilizing plantings can minimize this problem.

Embankments should be no steeper than 1:1. Site the shallower slope on the outside of the dike to minimize off-site erosion. The dike should be built and compacted in layers using fill materials containing no sod, brush, roots, or stumps. Core materials in the dike should be the most pervious materials available. In Southeastern Massachusetts, this will often be compacted glacial till. In order to establish vegetation on dikes or embankments, the surface soil must have the capacity to hold adequate water to support plant growth.

Stabilize dikes and other disturbed areas by seeding to grass or other plants, by mulching, or by placing soil stabilization fabric (geotextile, netting, or burlap). Mulch should be anchored with mesh. Grade 2-3 turf sods have been used successfully for this purpose. Pay particular attention to dike edges, they remain prone to erosion during rainstorms until stabilized. Keep woody plants off of dikes as their roots can destabilize the structure. Avoid ponding (wheel tracks) on top of dikes.

Grass is best planted in spring or fall and may benefit from a layer of mulch or netting and periodic watering during establishment. Top dress dikes with 3-4 inches of topsoil prior to seeding. Hydroseeding or gel seeding can be used. Choose non-weedy species for seeding dikes. Recommended examples include clovers, fescues, and perennial ryegrass. Mixtures of species in the seed mix are preferable to a single species. Fertilize and lime grasses as needed during establishment.

Planting-Timing and Density
Although vines can be planted in summer, the best time to plant is in the spring, preferably before the end of May. Vines are typically planted at densities between 1-2 tons per acre. Use as high a planting density as you can afford. Keep in mind that densities greater than 2 tons per acre may be difficult to push in the ground unless you have the appropriate planting equipment. Rapid 'vining in' will reduce weed competition and evaporation loss from the sand surface. If planting is late (late May or June) and/or growing conditions are severe, a higher planting density (e.g., 1.5 tons or more per acre) is even more important. Unrooted cuttings are standard planting material, but rooted cuttings (plugs) or tissue culture plants have been used effectively.

Vine Sources
Vines may be obtained from elsewhere on your property or from other growers in Massachusetts or in other states. It is highly recommended to make a visit to the bed where the vines will be pruned. This will enable you to determine the uniformity of the cultivar (i.e., the presence of mongrel vines, which are often highly vegetative and unproductive in fruit production) and the potential infestations of weeds, diseases, and insects. The vigor of the vines can also be determined. If vines are purchase out-of-state, they should be purchased from a reputable grower/handler since a site visit will probably not be feasible. The true identity of a cultivar must be made by DNA fingerprinting. This service is available at the Blueberry and Cranberry Research Center, Rutgers University for a specific fee per sample.

Pruning and Storing Cut Vines
Vines can be pruned using numerous machines or rakes that cause minimal damage to the vines. Vines should be pruned in March or April before growth begins. Ideally, vines should be pruned one day and planted the next. This hardly ever happens and thus, there may be a lag time between obtaining cut vines and planting. It is imperative to keep the vines well watered during this time to maintain their viability.

If the amount of vines is small, they can be stored in the water in the ditches. Larger amounts may be stored in holding ponds or reservoirs. They may be stored this way for many weeks if they are periodically rotated. Vines can be stored in a shady spot on the ground, providing the location has good air circulation. They can also be kept on the bed of a truck or trailer. They must be kept moist with periodic sprinkling (daily watering may be needed depending on weather conditions). If you store vines in this fashion for any length of time (e.g., more than one week), you should periodically turn the pile to make sure

the vines are uniformly exposed to the air. Vines should not be stored in tight bales; these bales should be loosened and periodically turned.

Prior to planting, check vine viability by scraping away the bark. The underlying tissue should be greenish in color.

Resistant Varieties

When replanting bogs or planting new bogs, certain varieties with proven fruit rot resistance should be considered: Black Veil, Foxboro Howes, Howes, Matthews, Shaw's Success, Stevens and Wilcox have shown good field rot resistance in experimental plots. If you wish to have confirmation of one of the above varieties, bring uprights with attached full-size fruit to the Cranberry Experiment Station for examination and identification.

Frost Protection and Irrigation

Protecting against frost damage is very important in the first spring, especially if you plant early. New vines should be protected at a cold tolerance of 29.5°F. However, early in the second spring, you may want to protect only when the temperature falls below 15°F. In this way, mild frost events will damage the flower buds permitting more resources to go into vegetative growth. This practice will also minimize the second year crop.

New plantings should be irrigated in a fashion to maintain moist but not saturated soil. For example, during the first 2-4 weeks, use frequent, but short (1-2 hr) irrigation periods. After the plants are rooted, use less frequent, but longer (up to 4 hr) periods. If you get consistent puddling, irrigate less or improve drainage. A bed that is kept too wet will have vines that develop a shallow root system, leaving the plants more susceptible to drought stress when the soil does begin to dry out. However, failure to provide adequate moisture can also retard stand establishment. Irrigation requirements will be different for beds constructed in upland sites. Typically, these sites will dry faster than vines planted in traditional, peat-based settings. Frequently check soil moisture to make sure the vines do not lack for water. This is particularly important during the first few weeks after planting and may be more crucial if the weather is warm and sunny. Keeping the water level up in the ditches alone is not enough to keep new plantings adequately watered. Recommended methods for monitoring soil moisture are the water level float (if a water table is present in you bog) and tensiometers.

Excess moisture can retard root growth, prevent roots from achieving proper depth, and in extreme cases, kill the vines. On the hottest summer days, water in puddles will vaporize and kill the succulent leaf and upright growth.

Sanding

Newly planted bogs should be sanded lightly (1/2 inch or less) during the first two winters to help anchor runners and promote production of uprights. Sanding on the winter ice remains the industry standard. However, if weather does not permit, other methods may be used. If sanding directly on the vines, take care not to make ruts on the bog surface. If sand is applied with a barge, a greater volume of sand may be needed to lightly cover the runners. Avoid heavy sand applications that bury the vines.

Winter Management

New plantings are less susceptible to winterkill (winter drought stress) than established beds. However, frost heaving of the new plants is common if the bed is left unflooded during freeze/thaw cycles. To be effective, the flood should be sufficiently deep to cover the plants entirely. Attention should be given to the prevention of oxygen deficiency if ice forms.

Weed Management in New Plantings

Crowding out weeds with healthy cranberry vines is the best weed management strategy for new plantings. Take all appropriate actions to promote vigorous vine growth on new beds as grasses tend to colonize bare areas.

Hand-weeding: New plantings should be kept weed-free by hand-pulling. Weeds are easiest to pull after watering. It is important to prevent establishment of spreading perennial weeds such as loosestrife, narrow-leaved goldenrod and dewberry. It is best to pull out maples, hardhack, and other woody perennials before their tap root gets well-established in the soil. Some species may be difficult to eradicate once they become established.

Preemergence Herbicides: Devrinol may be safely used in the first year after roots are established. A maximum of 30 lb per acre of Devrinol 10G may be applied up to approximately 4 weeks after planting. We have successfully used this material in field trials for control of weed species in new plantings when applied 2.5 weeks after planting.

It is best to minimize the use of preemergence herbicides on new plantings for at least the first 12 months or until vines become established. Evital rates as low as 25 lb per acre caused injury when applied on 3 to 4 week-old plantings. The application of preemergence herbicides later in the first season (after the post-plant Devrinol) is not recommended. The time limit for application will depend on the prevailing weather patterns (warm temperatures favor degradation and may reduce performance as well as injure the vines). Use postemergence herbicides and hand-pulling for control of invading grasses and perennial weeds later in the season.

Do not use Casoron until the vines are well-established. This herbicide is not recommended during the first two growing seasons. This herbicide inhibits root formation and will limit the establishment of the vine cuttings.

Postemergence Herbicides: Poast, Select, and Fusilade are postemergence herbicides effective for control of grasses on non-producing beds. Please note that these herbicides will not control broadleaf weeds, sedges, or rushes. *Fusilade is labeled for use on non-producing beds only*. Some studies have shown that weeds may develop a tolerance towards Poast. Thus, try to incorporate another grass herbicide as part of the postemergence herbicide program on new plantings .

Controlling weeds by wiping may be applicable for some new planting situations but in general, it is not a common practice. Glyphosate products may be applied as a wipe by hand or by mechanical applicator.

Notes on Poast, Select, and Fusilade: These products will only control true grasses. Broadleaf weeds, sedges, and rushes will not be controlled by these products. If you are unsure if a weed is truly a grass, contact the Cranberry Experiment Station to get an identification. Do not rely on the common name of a plant; it is often misleading (e.g., nut grass is actually a sedge and will not be controlled by the above herbicides).

Do not apply these herbicides if rain is expected within 1 hr of application. Optimum control is achieved when applied to actively growing plants (usually between 2-8 inches tall) that are not under any kind of stress. Spray to wet leaves, but do not spray to runoff. Use higher rates under heavy grass pressure and/or when grasses are at maximum height. Symptoms are generally observed 7-14 days after application. Do not apply to grasses that have tillered, formed seed heads, or exceeded recommended growth stages. Poast and Fusilade are toxic to fish. Do not apply any of these products directly to water or contaminate water when cleaning equipment. For more information on postemergence grass herbicides, see the Weed Management section of the UMass Cranberry Chart Book.

Poast has a 60-day PHI that must be observed. If you apply Poast to grasses within a diked section that contains both producing and non-producing areas, you cannot harvest the producing area until the 60 days have elapsed.

Insect Management

In general, insecticides are not needed on a new planting. However, you should scout your new plantings for incoming insect populations. You may not be able to use a sweep net since the vine cover will not be extensive. As you walk around weeding or doing other activities, visually assess the vines for signs of insect feeding. Gypsy moth larvae may drop in from surrounding woody areas. Yellow-headed fireworm larvae have also been noted on new plantings. As the vines start to fill in the bare spots, use a sweep net as you would on an established bog.

Fungal Disease Management

Prevent Phytophthora root rot through good water management. If the bog is adjacent to a diseased bog or uses water that also services root rot-infected bogs, an application of Ridomil or Aliette (supplemental label use permitted in 2001) may be useful to insure the strongest possible root system during establishment. Check the Disease Management section of the UMass Cranberry Chart Book for current recommendations on the use of these fungicides.

Consideration must be given to the prevention of fruit rot disease. Frequent irrigation can lead to the buildup of pathogenic organisms that cause fruit rot and other cranberry diseases. High nitrogen fertilizer doses may result in outbreaks of red leaf spot disease, particularly on Ben Lear. The lush foliage will reduce air circulation within the vine canopy, resulting in increased incidence of fruit rot and leaf spots on the leaves caused by the fungi that normally only cause fruit rot. Particularly on cultivars susceptible to fruit rot, reduced rates of fungicides may be beneficial during the first two seasons to discourage buildup of fungal inoculum. Even rot-resistant varieties benefit from reduced rates of fungicides during the first two seasons. Timing of these fungicide applications is not critical. One application at 50% bloom (recommended) *or* two applications at 25% bloom and two weeks later should suffice. Late water is also recommended to suppress disease and encourage vine growth. If excessive leaf drop due to leaf spotting occurs, hold a trash flood or apply sand over the winter.

Fertilizing a New Cranberry Bog

Slow-release N applied at the time of planting (just after the vines have been set in) provides a sustained growth stimulation during stand establishment. In addition to this application, nitrogen fertilizer is added regularly throughout the first season to encourage rapid and even vining-in over the soil surface. Research indicates that the application of P (triple superphosphate) prior to or at planting increases growth of new vines (more ground covered). Encouraging the cranberry plants to cover the soil surface is essential if weed competition is to be minimized. By the end of the first year, runners should be about 1 foot long. The plants will have a good root system and will begin to tolerate drier conditions. Late water may help to encourage vining-in if used in the second season.

FERTILIZER SCHEDULE - YEAR 1

At planting:

Nitrogen - slow release	50-200 lb fertilizer/A	Apply at or just after planting. Use materials that are entirely slow-release based on the action of water and soil microbes. Examples: 31-0-0 IBDU; 40-0-0 Noram Blue Chip (MU). (apply Blue Chip only after roots are present)
Phosphorus triple superphosphate	100 lb 0-46-0/A	Apply to soil surface, then scatter and disk-in vines OR Apply 50 lb/A under the top 2-3 inches of sand and the rest on the surface, then disk-in vines.

When roots are established and growth starts:

Nitrogen	5-10 lb N/A	Use urea types, ammonium sulfate may burn new roots.
Phosphorus	50 lb 0-46-0/A	*Only apply if no P was used at planting.* If P applied at planting, omit this application.

Remainder of Year 1 (until mid-August):

Nitrogen or N-P-K	5-10 lb N/A	Alternate ammonium sulfate (21-0-0) or urea with a complete N-P-K fertilizer (50-100 lb/A 10-20-20, 12-24-12, or 14-14-14, or similar). Using N alone for the whole season will result in tender top growth susceptible to drought injury. Fertilize every 2-3 wks. until mid-August then stop fertilizing to allow plants to harden off. Otherwise, tender new growth may be damaged by cold in the fall.

FERTILIZER SCHEDULE - YEAR 2

Early May until late June:

Nitrogen or N-P-K	5-10 lb N/A	Alternate ammonium sulfate (21-0-0) or urea with a complete N-P-K fertilizer (50-100 lb/A 10-20-20, 12-24-12, or 14-14-14, or similar). Fertilize every 2-3 wks.

Early July to mid-August:

Nitrogen or N-P-K	5-10 lb N/A	Alternate ammonium sulfate (21-0-0) or urea with a complete N-P-K fertilizer (50-100 lb/A 10-20-20, 12-24-12, or 14-14-14, or similar). Fertilize every 2-3 wks. ***BUT cut back dose if fill-in and growth are good to prepare for fruit production in Year 3.*** As in Year 1, stop fertilizing in August.

CHEMICAL RECOMMENDATIONS FOR POSTEMERGENCE WEED CONTROL IN NEW PLANTINGS

Control of grasses on non-producing bogs only

Fusilade DX	16-24 oz/A + 1% crop oil (2 pt/25 gal) OR 0.25% nonionic surfactant (0.5 pt/25 gal)	For tank mix, spray volume should be 5-40 gal/A. For spot treatment, add 0.75 oz (1.5 tablespoons) Fusilade to 1.5 oz (3 tablespoons) crop oil or 0.5 oz nonionic surfactant for each gallon of water. Do not apply more than 72 oz/A per season. Check label and UMass Chart Book for more information.

Control of grasses on producing and non-producing bogs

Poast	1-1.5% solution + Dash HC (0.5%) OR crop oil concentrate (1%)	For each gallon, mix 1.3-2 oz Poast + 0.6 oz Dash HC or 1.3 oz crop oil concentrate. Adding other adjuvants is not recommended. Chemigation applications are NOT allowed. Per acre rates can vary between 0.5-2.5 pints, depending on the target weeds. Check label and the Weed Management section of the UMass Chart Book for further instructions.
Select	6-16 oz/A + 1% crop oil concentrate	Use 6-8 oz/A for control of annuals and 8-16 oz/A for the control of perennials. Do not apply more than 32 oz/A Select per year.

By Year 3, the bog should be well established and should have received a light sanding. The fertilizer schedule should similar to that used on established beds. If all has gone well, some crop will be harvested during the fall of the third year. Do not forget to maintain proper pest management practices as the bog comes into full production.

For further information:

C.J. DeMoranville and H.A. Sandler. **Best Management Practices for Massachusetts Cranberry Production, Year 2000 Update.** See: Erosion and Sediment Control, Weed Management, Renovating Producing Cranberry Acreage, and Mineral Soil Bog Construction BMPs. UMass Extension Publication, in cooperation with MA Dept. of Food and Agric. Available at the Cranberry Experiment Station.

H.A. Sandler, ed. Bog Construction and Renovation Manual. UMass Extension Publication. January 1998.

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