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**Cranberry Production Evaluation Tool**

To be used in conjunction with the Food Alliance Whole Farm/Ranch Evaluation Tool.

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| --- | --- |
| **Operation Name:** |  |
| **Address:** |  |
| **Evaluation Date:** |  |
| **Evaluator/Inspector:** |  |

**Scoring System**

Compliance with the Food Alliance Cranberry Standard requires an average overall score of 3.0 (75%) or above in the following Cranberry scored evaluation criteria:

|  |  |
| --- | --- |
| **Crop Management**  Soil pH  Fertilizer Use and Applications  Sanding  Harvest  **Water Management**  Water Quality  Water Use  Irrigation and Chemigation/Fertigation  **Bed Management**  New Bed Construction  Bed Renovation  New Plantings (New and Renovated Beds) | **Pest Management**  Weeds  Insects and Mites  Diseases  Vertebrate Pests  **Additional Management Areas**  Pollinators  Adjacent Area Management |

#### Instructions for Use

1. Using the performances indicators listed in Levels 1-4 of each of the scored evaluation criteria, assign a score for each. Level 1 is worth 1 point; Level 2 is worth 2 points, and so on. Scoring half points is allowed. Example: All Level 2 requirements and half of Level 3 requirements are met. In this instance, a score of 2.5 may be assigned.
2. Inspectors: In the “**Verification methods and notes**“ section at the end of each criterion, include any pertinent additional information that was considered in determining the score. These notes will provide important background information that will be carefully considered in the final certification decision. As applicable, please include reference to documents which were reviewed to verify compliance with requirements.
3. Complete the scoring table and calculate the final percentage score. Points for non-applicable criteria are not included in the final percentage score.

***Note:*** *For the purposes of this document, the words bed, bog, and marsh are used inter-changeably, and refer to cultivated cranberry production units in mineral soils, peat, muck, sand, or peat/sand. Soil type is designated in text where appropriate.*

## Crop Management

### Soil pH

For the purposes of the Food Alliance cranberry inspection tool only, “soil” refers to the planning medium used in a cranberry bed, e.g., sand, peat, sawdust, etc.

**Level 1:** Soil pH levels are not monitored or adjusted. Beds may have been constructed in soils that are not well suited for cranberries.

**Level 2:** Soil pH is tested prior to construction of new beds to ensure pH is suitable for cranberry production. Ideally, soil pH should be at or below 5.5. In some regions where water alkalinity is low, initial pH may be up to 6.25. If soil pH is >5.5, amendments are applied as needed, or as per the nutrient management plan. Amendments are applied incrementally, with periodic retesting.

**Level 3:** Beds are constructed in soils with suitable soil pH levels. Any needed minor adjustments are made prior to planting; significant adjustments are made over time to support the health of plants. Soil pH is monitored over time. New beds are tested every 1-2 years, established beds are tested every 3-4 years, and pH is adjusted when necessary. Generally, beds are tested in the fall.

**Level 4:** Irrigation water tested for pH and alkalinity. Where irrigation water sources vary, irrigation water is regularly tested for pH and alkalinity, and adjusted if necessary to prevent an increase of soil pH. Variability in irrigation water pH is accounted for. Bed pH is maintained at 4.0 - 5.5. Soil pH maintained at or below these levels will prevent excessive conversion of NH4-Nitrogen (N) to NO3-N and to optimize availability of micronutrients. Cranberries preferentially uptake ammonium over nitrate. See “Nitrogen for Bearing Cranberries in North America.”

**Score**:

**Verification methods and notes:**

### Fertilizer Use and Applications

**Level 1:** Fertilizers are applied on a regular schedule without regard to nutrient testing of soil or foliage.

**Level 2:** Leaf tissue and/or soil tests are performed every 3-4 years, and fertilizers are applied according to test results. (Cranberry leaves should be sampled in August or September.) Producer/manager uses labs with participation in North American Proficiency Testing program. Nutrients other than nitrogen (N), phosphorus (P), and potassium (K) are not applied unless a deficiency or low level of that specific nutrient has been shown to exist by fall testing, or deficiency symptoms (e.g., vine color) observed during the growing season.

Three or more of the circumstances below are used to determine rates of N application:

Age of beds (bearing or non-bearing)

Variety

Bed yield history

Crop load

Soil type, organic matter and pH

Total upright length and density (2-4 inches normal, dependent on variety)

Other (please specify):

**Level 3:** As per Level 2, with leaf tissue being tested annually and soil testing done every 3-5 years in the fall between August 15 and September 15. Producer/manager can describe a nutrient management plan, and has records of nutrient testing, fertilizer applications and yields. Ammonium nitrogen-type fertilizers are used.

Applications are timed to be effective at the lowest possible rates for crop development stage. Application rates are established to produce optimal vine health and yield while avoiding stimulating pests or diseases that respond to high nitrogen (e.g., flea beetle, fruit rot) while minimizing leaching and runoff. Phosphorous application rates do not exceed 20 lbs. per/ acre/year, unless the bed has a history of phosphorous deficiency as shown by leaf tissue analysis. Once deficiency is alleviated for 3 years, phosphorous should be reduced

Macro nutrient or micronutrient applications are applied to new or recently renovated beds based on test results and desired crop response. Producer/manager can describe how nutrient levels of bed material established at planting and maintained at a level that minimizes commercial fertilizer needs.

On established beds, 5 or more of the following practices are implemented:

Nitrogen fertilizers are delayed until early rough neck or bud elongation growth phase.

Fertilizers are not applied until soil temperature exceeds 55ºF.

Nitrogen application rates range from 10-60 lbs. of nitrogen/acre per year on established beds, (depending on soil organic matter etc.), or re precise targets are established based on historical records. (60 lb. limit is based on long-term established cultivars.)

Spring nitrogen applications are reduced on recently sanded beds.

Beds with low moisture holding capacity/drain rapidly (e.g., minerals soils or sawdust) receive smaller, more frequent applications to reduce leaching potential.

Producer/manager is aware of nitrogen contributions from bed media, and considers possible nitrogen contribution in the fertilizer decision-making process.

Phosphorous application rates are based on leaf phosphorus concentrations.

Fall fertilizer applications (not later than 3 weeks prior to harvest) are not used (particularly on mineral soils or prior to winter flooding).

Fall nitrogen application rates are low (5 lbs. nitrogen/acre) and timed to prevent leaching or a decrease of winter hardiness. Fall potassium applications are made only in the case of overly vigorous vines or a history of winter injury.

Soils are managed to maintain optimal soil moisture and drainage conditions.

Foliar feeds are only used as a supplement to well-planned fertilizer programs. Liquid applications intended as soil supplements are not considered foliar feeds.

In addition, 2 or more of the following practices are implemented to protect surface water:

Ditch water is lowered/drained to the extent possible prior to application.

Irrigation following application of fertilizers is limited to prevent leaching of nutrients from the root zone.

Ground rigs are configured to prevent application to surface water.

Water being released from farm is tested for elevated nutrient content as a monitoring practice.

**Level 4:** Fertilizers are managed as per Level 3, and the producer/manager has implemented a detailed written nutrient management plan with beds grouped by similar nutrient management needs. Crop response is monitored throughout growing season, and any needed changes to the nutrient plan are made. Seasonal records of fertilizer applications and crop response are considered when decisions are made concerning fertilizer use and application rates. Producer/ manager attempting a phosphorous reduction plan to less than 20 lbs./acre/season, provided tissue phosphorous is maintained in the sufficient range.

Fertilizers are applied with special regard to preventing nutrients from moving out of the bed. All applied nitrogen comes from ammonium-nitrogen source fertilizers. A system is in place to hold water on-farm before water is released off-farm.

**Score:**

**Verification methods and notes:**

### Sanding

N/A: Sanding is not done on this operation.

**Level 1:** Sanding is done on a routine schedule. Producer/manager does not consider crop health, economics, environment, or other factors when scheduling sanding.

**Level 2:** All legal requirements are met for sourcing/obtaining sand. Sand is applied to beds for one or more specific purposes, such as to promote rooting, stimulate growth of uprights, provide insect control (e.g., cranberry girdler), suppress weeds and disease, add strength to peat beds, or to help level low spots. If excavated, sand is stockpiled on property. Where practical, stockpiled sand piles are covered and protected from erosion resulting from wind or rain. Sand piles are stored well away from neighboring properties and drainage ways, and/or efforts are made to reduce erosion potential and minimize weed seed banks.

**Level 3:** As per Level 2, and sanding is done as uniformly as possible, using a method that protects workers, prevents damage to the bed, and results in the intended benefit. Floodwater is held at least 72 hours following barge sanding to allow for settling of sediment. Four or more of the following apply:

Only clean sand, free of weed seed is used.

Stockpiling of sand purchased from off-site is limited to the amount of sand that can be used within one year.

Coarse sand in a uniform size class is used to promote rapid settlement of sediment. (Coarse sand as defined here is at least 70% of particle size that is greater than 0.5mm.)

Ice or rail sanding are preferred methods in regions where practiced and weather permits.

If sand is applied over ice, the ice is adequate to safely hold equipment and workers.

Barge sanding is done only where high quality, coarse sand in uniform size class is available.

Sand is not applied to harvest water.

Late water is not applied after sanding.

Records of sanding (dates and rates) are maintained.

Windbreaks or silt barriers are installed to prevent erosion from any sand piles.

Dry sanding is timed to avoid damage to vines (e.g., vines are dormant and soil is not frozen).

Low impact sanders are used for dry sanding.

Spot sanding is incorporated into Integrated Pest Management (IPM) for recovery of vines damaged by root girdling insects, diseases, etc.

Other (please specify):

**Level 4:** As per Level 3, and in regions where sanding is used, sanding is used only where there is real benefit gained from the intended use, where it makes economic sense, and where there is no negative environmental impact resulting from the practice. Producer/manager has participated in or conducted on-farm trials to evaluate benefits of and/or alternatives to sanding.

**Score:**

**Verification methods and notes:**

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### Harvest

**Level 1:** All legally required pre-harvest intervals and residue tolerances are met. Fruit is harvested and delivered as is. Delivery penalties may be incurred for excessive trash or rot. Fruit frequently does not meet minimum standards set down by purchaser. Fruit is not contaminated with any lubricants, including food grade lubricants.

**Level 2:** Harvests are scheduled based on maturity, market, weather, and availability of needed resources. (Wet-harvested fruit is typically sent for processing. Fruit for fresh market can be wet-or dry-harvested.) Fruit for fresh market has been managed for good keeping quality. Fruit is harvested at appropriate color for intended use. Adequate, trained labor is available for harvest. Where needed, training is provided. Safety instructions are provided to all workers. Equipment is safe and maintained in good operating condition. Producer/manager can describe maintenance schedule and process. Deliveries receive occasional penalties.

**Level 3:** As per Level 2, and beds are managed for optimal harvest and fruit quality. Equipment is serviced prior to harvest. Where equipment has catch tray capabilities, catch trays are in place to prevent contamination of fruit by lubricants and hydraulic oils. Only certified H1 lubricants are used.

At least four of the following practices are followed:

Harvesting equipment is cleaned of debris and weed seed between beds.

Harvest water is retained on farm.

For a minimum of 72 hours and a maximum of 10 days prior to release downstream, where release is allowed.

Where appropriate, harvest water is held on bed as part of insect or weed Integrated Pest Management (IPM) program.

Beds are cleaned using post harvest de-trashing floods.

Beds are cleaned during harvest as part of the harvesting process.

Trash is removed from beds and dike roads immediately after harvest is complete.

Equipment is utilized that reduces repetitive strain injuries and vibration-related injuries.

Hydrocarbon spill kits are onsite at each bed being harvested.

Evidence of frost protection is in effect, as fruits ripen in September (e.g., adequate water for harvest and crop protection).

Other (please specify):

For dry harvested fruit, at least three of the following apply:

N/A: Fruit is not dry-harvested on this operation.

Weeds are managed in beds to protect fruit and manage excess vegetative growth.

Berries are managed to protect from frost, scald, deficient or excess soil moisture, excessive vegetative growth and other conditions encouraging fruit rot.

Fresh fruit producer/managers use the Keeping Quality Forecast (KQF) or equivalent model to help determine potential need for fungicide application to fruit to prevent storage rot.

Fresh market fruit is harvested free of moisture, cooled quickly and handled gently for best storage quality.

Beds are pruned during or after harvest, or when vines are dormant.

Vines are trained to the intended direction of picking and picking is consistent in the same direction to avoid damage to the vines.

Other (please specify):

**Level 4:** As per Level 3, and high-quality fruit consistently meets or exceeds handler standards with no penalties. Annual crop performance and harvest practices are analyzed and adjusted for future performance. A preventative maintenance program is in place for all equipment used at harvest. A total of six practices from Level 3 apply (not counting fresh fruit practices).

**Score:**

**Verification methods and notes:**

## Water Management

### Water Quality

**Level 1:** All legal requirements are met. All chemical applications and equipment are in compliance with all federal and state and/or provincial regulations. Aerial application of pesticides may be used. Water is held following pesticide applications, as per label instructions, prior to discharge.

**Level 2:** As per Level 1, and producer/manager implements basic practices to protect water resources and prevent chemicals, sediments, fuels, or hydraulic fluids from contacting surface water (e.g., ditches or natural waterways) or ground water. Beds are able to hold water; in the case of flow-through systems, a strategy or method is in place to segregate or isolate the stream flow from ditch water and protect external water bodies. Producer/manager maximizes retention and water control in all beds, and can describe methods of control. Any water with sediment is held in beds or ditches, or diverted to a holding pond, for settling. Secondary containment is provided for any fuels or chemicals stored within 200 feet of surface water, or within 150 feet of wells. Irrigation system meets Level 2 criteria, and all of the following apply, where applicable:

Ditch water is lowered prior to applications. (Drainage may be less than optimal during high water season and, for example, when frequent irrigation for frost protection is required.)

Pesticide applications are routinely delayed when precipitation is expected within 72 hours or applied as per label indications of rainfastness.

Ground sprayers are shut off when crossing ditches or waterways.

Ditches are cribbed/lined or vegetated, and maintained to prevent soft soils from eroding.

Other (please specify):

**Level 3:** As per Level 2, and producer/manager employs further strategies to prevent contamination or sedimentation of water on-farm, and to prevent movement of chemicals or soil off-site. (Emphasis is on prevention of negative impact on water. Where prevention is the goal, but water is still impacted, mitigation is in place to restore water quality.) Where contaminants affect water quality, in spite of prevention efforts, techniques are used to restore water quality prior to release or discharge from the farm. If chemigation/fertigation is used, partial-circle sprinkler heads and spray guards are situated to limit chemical drift and backsplash. Where bed configuration allows, there is no aerial application of chemicals, including fertilizers, over source water. A riparian buffer is established along any flow-through waterway. Where waste wood is used to build new bed structures, waste wood is not contaminated (e.g., paint, preservatives). Structures built with waste wood are continually monitored for soundness and potential leachate concerns. Where possible, new beds are constructed with closed water systems; if new bed water system is not closed, producer/manager can explain rationale.

The irrigation system meets Level 3 criteria for Irrigation and Chemigation/Fertigation listed above, and three or more of the following apply:

Ditches that are at risk of direct chemical contact during pesticide applications are covered.

No aerial application of chemicals, including fertilizers.

Spot or boom sprayers are used as an alternative to chemigation on limited sensitive areas of the bed.

Producer/manager has adapted spray equipment/method to allow for effective application of biorational materials (e.g., insect growth regulators, Bt, nematodes).

Spill kits are supplied where pesticides, lubricants, or other chemicals are used. A plan is in place for addressing spills.

Sufficient vegetation is maintained in ditches during the growing season to provide initial filtering of ditch water without impairing drainage.

Ditches are graveled to provide initial filtering of ditch water without impairing drainage.

Subsurface drainage pipe replaces ditches, where soil type permits.

Harvest floodwater is held until sediment has settled.

Where no water-holding requirement is specified on label, or recommended on pesticide charts, producer/manager holds water for one day or more following chemical applications to allow for degradation.

Water is held longer than label requirements (including no holding requirement) after chemical applications.

Control structures are in place to control and contain water movement.

Other (please specify):

For flow-through systems: (For the purposes of this document, in an average water year, flow-through bogs have either a permanently flowing stream or constant water discharge.)

N/A: No beds are flow-through systems.

Where natural waterways continually flow through the marsh, or water is constantly discharged from property, practices are in place to protect and/or filter that water. Discharge water quality is monitored. At least one of the following practices protective of water quality apply:

A riparian buffer is established along length of waterway.

Ditch water is kept separated from waterway.

Flow-through waterways are diverted from bogs during applications of nutrients and pesticides.

Other (please specify):

**Level 4:** As per Level 3, and the producer/manager monitors water quality to determine success of the protection program. If water quality is impacted by management, producer/manager adopts mitigation practices (see list below). The producer/manager has implemented written nutrient and pesticide management plans, and keeps written records of water holding dates (pesticide, flooding). Irrigation system meets Level 4 criteria. Aerial application of chemicals is not used.

Quality of discharged water is equal to the quality of water at inlet. One or more of the following mitigation methods is in use, if mitigation is needed:

Upland spray field, where permitted

Diversion of water to a constructed wetland

Use of filter strips

Addition of sorptive materials (e.g., sawdust)

Activated carbon

Oxygenation

Other (please specify):

**Score:**

**Verification methods and notes:**

### Water Use

**Level 1:** All legal requirements are met. Water management system is not designed to preclude seasonal drawdowns affecting stream flow or lake levels, salt-water intrusion, or well depletion.

**Level 2:** The farm has legal access to adequate water for crop needs (e.g. frost protection, cooling, consumptive crop needs, harvest and other flooding). Producer/managers use practices and make basic improvements to conserve water, prevent drawdowns, and ensure an adequate supply of fresh, clean water for cranberry operations and for downstream water users (e.g. neighbors, wildlife impoundments, aquatic habitat). The irrigation system meets Level 2 criteria for Irrigation and Chemigation/Fertigation, below. Where water diversion laws do not apply to cranberry farms (e.g., Wisconsin), producer/manager works with neighbors and others to address any concerns. Water use is based on need and all of the following apply, as applicable:

Ditch water is lowered/drained prior to chemical applications.[[1]](#endnote-1)

The farm has a water system that efficiently delivers and drains water from the beds, controls the water table level, and/or stores or releases water.

Water structures are maintained to minimize water losses or failures and to prevent erosion (e.g., ditches, drains, canals, dikes, flumes, bulkheads, tidegates, pipelines, holding and recovery ponds etc.).

Irrigation is timed to reduce evaporation.

Water can be pumped or gravity fed from bed to bed for re-use.

**Level 3:** As per Level 2, and substantial improvements are made to the water delivery system to conserve and properly allocate water. Producer/manager cooperates with other water users, and schedules diversions and/or manages storage reservoirs to minimize negative impacts on other water users.

Water is re-used on farm or discharged and made available to other users. Irrigation systems are designed to conserve water and meet Level 3 criteria for Irrigation and Chemigation/Fertigation, below. For wet harvest, three or more of the following apply; for dry-harvest, two of the following apply:

Beds are graded to allow for minimum depth of floodwater and improve irrigation coverage.

Major flumes are fitted with anti-seep collars or similar devices.

Leak prevention is implemented for all flumes (e.g., sawdust applications).

Storage reservoirs/holding ponds are constructed to collect water during high-water season for later use; diversions are made only when stream flow is adequate for minimum impact on other users and aquatic habitat.

Beds are designed to maximize gravity flow to enable re-use of water from bed to bed.

Water is discharged/returned to natural source for later re-use (lake or reservoir) by farm or for use by neighboring bogs or other; discharged water meets water quality standards.

Surface water and runoff are captured and stored on-farm prior to off-farm release.

Other (please specify):

**Level 4:** As per Level 3, and producer/manager documents the maintenance of water structures and all water use (flooding, irrigation, frost or heat protection, chemigation, harvest, etc), and water re-use. Irrigation systems meet Level 4 criteria, and a total of four or more practices from Level 3 apply. Producer/manager cooperates with water drainage districts and has a written plan.

**Score:**

**Verification methods and notes:**

### Irrigation and Chemigation/Fertigation

**Level 1:** All legal requirements are met. If chemigation is used, all application and system requirements are followed and only products that are registered for chemigation are used.

**Level 2:** Beds are designed to hold water for label-required holding periods (e.g., following chemical applications). The system has sufficient capacity for peak water use. Irrigation scheduling is based on average crop consumptive tables (if available) and local weather conditions. The irrigation uniformity coefficient is at least 70%, and the operating system has at least 40 psi at the final sprinkler nozzle.

Fuel tanks by pumps have secondary containment or double-walled tanks. Two of the following apply:

Beds are designed for combined overhead and subsurface irrigation.

Beds are leveled to maximize water conservation for flooding and irrigation needs.

Where beds highly variable (e.g., soil type or bed grade), soil moisture is monitored in multiple locations.

Duration of irrigation to meet crop water needs is scheduled, and drainage is adequate, to prevent ponding or saturated root zones.

Irrigation system is automated to monitor temperature for frost or heat crop protection needs.

In addition, where chemigation/fertigation is used, all of the following apply, where applicable:

System is calibrated every 1-3 years to determine time of application (e.g., dye test). If any changes are made to delivery system, system is recalibrated.

Chemigation/fertigation is typically scheduled during the night or early morning hours.

Proper anti-backflow protection is in place.

Secondary containment is provided at injection ports.

Other (please specify):

**Level 3:** As per Level 2, and the irrigation system is designed and maintained for efficient delivery of water. Sprinkler pressure ranges from 40-60 psi, and nozzle rotations are maintained to deliver adequate frost protection. Sprinkler system performance (uniformity and rate of delivery) is monitored annually. Improvements are made to increase uniformity coefficient, (e.g., nozzles, pumps, lines and riser spacing, coverage, etc.). Application is scheduled in response to crop water needs, and crop protection needs. Three or more of the following apply:

Soil moisture and depth of water table are monitored for irrigation scheduling (e.g., use of water level float, tensiometer or other moisture sensor).

Irrigation uniformity coefficient is 75% or more.

Routine efficiency tests are conducted, and system upgrades are in progress if coefficient of uniformity is less than 85%.

Most efficient sprinkler heads for site are used for irrigation. Producer/manager can explain rationale behind sprinkler choice, and describe how it is most effective at conserving water on his/her operation.

Crop consumptive use is monitored by measuring soil moisture or evapotranspiration models.

Automatic cycling of sprinklers for frost protection and cooling.

Seasonal water use is documented.

Other (please specify):

In addition, if chemigation/fertigation is used, all the following apply, where applicable:

Pesticides do not contact open water unless water can be held for degradation as per label requirements.

Irrigation and injection pumps and entire system are checked for leaks or other malfunctions prior to every application.

Partial-circle sprinkler heads and spray guards are situated to limit drift and backsplash to ditches, streams and any other sensitive areas.

Sprinkler coverage is set/adjusted to limit contact with open water and dike erosion.

Satellite injection ports are installed.

Other (please specify):

**Level 4:** As per Level 3, and farm has an irrigation management plan that is being actively implemented. If chemigation is used, pesticides do not contact open water. Calibration of wash off (dye tests) and injection times are documented, and no Toxicity Class I or II pesticides are used. At least 4 Level 3 practices and one or more of the following apply:

System is designed to allow for treating partial units.

Producer/managers document annual maintenance of irrigation system components and irrigation efficiency tests.

Irrigation systems are designed to have a uniformity coefficient of 85% and are maintained to stay within 80-85%.

Wash-off time is typically 6 minutes or less. Wash-off time is the time from when pesticide reaches the first sprinkler to when the pesticide reaches the last sprinkler. Long wash-off times will dilute and wash the material from the target area (leaves or fruit). Generally, the wash-off time should be as short as possible (5 minutes or less).

Other (please specify):

**Score:**

**Verification methods and notes:**

## Bed Management

### New Bed Construction

N/A: No new beds are being constructed.

**Note:** If, within the next two years new bed construction is planned, producer will be asked to provide documentation at the renewal inspection that bed construction meets Level 3 criteria. Documentation may include plans, permits, inspection results, photos, videos, etc.

**Level 1:** All required federal, state, and or provincial permits have been issued and are on hand (e.g., surface and/or ground water rights, discharge or construction permits, wellhead regulations, depth to ground water, distance from surface water or wetland, etc.). Any compensatory mitigation requirements for wetland conversion are met. Beds may not be able to hold water (no natural or fabricated water-restricting subsoil layer).

**Level 2:** New cranberry sites are selected with generally suitable physical characteristics, low pest pressure, and potential market access. Soil pH and drainage are optimal, or can be readily modified, and sites have adequate water for irrigation, frost and heat protection, harvest and other water needs. Beds can hold water. Some sites (e.g., mineral soils that lack natural confining layers) may require substantial disturbance during construction to create layers with highly reduced permeability that are able to hold water similar to wetland bogs. Erosion is prevented during construction by limiting site disturbance, constructing beds progressively, avoiding construction in wet soil and/or channeling water around disturbed areas. Where a mineral soil bed is designed to use the natural water table, in lieu of a constructed perched water table, a thick layer of moderately permeable material (e.g., soil with high organic matter content) is placed above the restricting layer to limit potential leaching of nutrients and pesticides to the groundwater. Four or more of the following apply:

Size and shape of beds are suited for topography, harvest, available water, and type of irrigation, fertilizer, and pest application equipment.

Soil has pH of 5.5 or less.

Topsoil removed to reach the subsoil is replaced on top of restricting layer.

Extra subsoil is used to build dikes and roads when suitable.

An engineer was consulted for planning where construction of a water-restricting layer needed.

Recovery ponds are constructed prior to beds and act as silt basins/runoff catchments, if needed, during construction of beds.

There is minimal erosion or sedimentation resulting from the construction process.

Other (please specify):

**Level 3:** As per Level 2 and beds are sited and designed for optimal crop, soil, and water management. Mineral soil sites are constructed with a perched water table providing a barrier to the natural water table. Sites have one or more natural semi-permeable layers so only moderate disturbance (e.g., removal of top soil and leveling) is required. Beds are designed with water systems that meet, at a minimum, the Level 3 criteria for Water Quality, Water Use, and Irrigation and Chemigation/Fertigation, above.

Overhead irrigation systems are designed for a uniformity coefficient of 85%. Six or more of the following apply:

Bed planning and construction maximizes land-use efficiency.

Bed site selection relies on natural restricting subsoil layer.

Off-site erosion is prevented by pre-planning and installation of silt fencing, including biodegradable fencing, straw bales, or other sediment barriers.

New dikes are 4 feet wide or more at the top, have a maximum of a 1:1 slope, and are 1 foot or higher than typical flood elevation.

Dikes, ditch banks, roads, etc. are stabilized immediately by re-seeding to grass or other vegetation (e.g., non-woody native plantings), and/or covered with fabric or anchored mulch.

Beds are laser-leveled between dikes to within 6 inches with a center crown to facilitate drainage.

Peat or muck bogs are graded as needed.

Additional drains placed to aid drainage where beds are too wide to construct center crown.

Perimeter ditches are well sited and sized to provide adequate drainage and timely water delivery.

Ditches are lined/cribbed where appropriate (e.g., in soft organic soils).

Lateral or interior ditches are sufficiently wide and deep to handle peak flow.

Subsurface drain tile is installed to replace open lateral ditches.

Vines planted at adequate density to filter water before it moves off-site. Planting densities: 1 plug/sq. ft., 1-2.5 tons cuttings/acre.

Flumes, tail water recovery and holding ponds are constructed to handle needed volume of water.

Beds are terraced for gravity feed and recovery of water from field to field.

Water is recovered and returned to on-farm storage reservoir.

Other (please specify):

**Level 4:** As per Level 3, and the producer/manager has developed a conservation farm plan, including a construction plan, prior to excavation or earth moving. Soil fumigants are not applied for vegetation control as part of new bed construction. A total of eight practices listed in Level 3 are used.

**Score:**

**Verification methods and notes:**

### Bed Renovation

N/A: No beds are under renovation.

**Note:** If, within the next two years a bed renovation is planned, producer will be asked to provide documentation at the renewal inspection that renovation was implemented in accordance with Level 3. Documentation may include plans, permits, inspection results, photos, videos, etc.

**Level 1:** All required federal, state, and or provincial permits, and farm plans (where required) are on hand.

**Level 2:** Beds are renovated when other corrective actions (e.g., spot-renovations) are inadequate to maintain profitability. Minor system or horticultural improvements are made to site during renovation. One or more of the following apply:

Vegetation and weed seeds are minimized on bed surface by burning, scalping or scraping, or soil surface is inverted in place.

Some grade improvements are made if necessary (e.g., beds that are well out of grade are divided into smaller beds etc.).

Spoils are used to repair and strengthen dikes and roads if material is suitable.

Improvements are made to drainage system or irrigation system.

Improvements are made to cultivar selection.

Other (please specify):

**Level 3:** As per Level 2 and renovation is planned with additional structural, system, or horticultural improvements (e.g., laser leveling, irrigation, and drainage upgrades) as needed to upgrade water management and/or to support long-term viability and profitability of the renovation. A basic written plan to prevent erosion during renovation is in place, and erosion and sedimentation appear well controlled. Irrigation system meets or is improved to meet Level 3 criteria under Irrigation and Chemigation/Fertigation. Five or more of the following apply:

Weedy vegetation, vines, and weed seed are scalped/scraped clean to bare soil of the bed and turned under or removed from beds to areas well away from to beds without burning.

If vine debris is burned, residue material is reincorporated into bed.

Vine debris, etc., from old beds is composted on-farm following recommended BMPs, or removed for off-farm composting.

Renovation is designed to minimize reinfestation by perennial weeds.

Sand is applied at a thickness that restricts reinfestation of perennial weeds.

Organic matter from bed is screened and re-used as liners on new beds if re-use does not pose pest problems.

Bed settling in localized areas is brought back to grade using equivalent bed materials.

Improvements affecting water use or water quality are made to the irrigation and/or chemigation system (e.g., fitted with part-circle sprinklers with splashguards).   
Please specify:

Subsurface drainage tile installed or adequate surface drainage.

Open ditches are covered where appropriate.

Beds are laser-leveled between dikes to within 6 inches with effective drainage installed.

Renovation improves weed and/or pest management.

Sides of dikes are adequately covered to prevent runoff/erosion from dike.

Dikes, ditch banks, and roads, etc. are stabilized immediately by re-seeding to grass or other vegetation (e.g., non-woody native plantings) and/or covered with fabric or anchored mulch.

Other (please specify):

**Level 4:** As per Level 3 and in areas where not a required Level 1 practice, producer/manager has an approved plan (e.g., NRCS nutrient management plan) completed prior to renovation. Renovation plan must outline needed and intended improvements and address any potential environmental concerns. Renovation is made with minimum adverse impact on water and land. Flow-through water systems are converted to closed systems or diversions are constructed for any flow through waterway and all beds or tail water ponds are capable of holding water for needed time to degrade chemicals or settle sediment prior to discharge. In addition, a total of 7 practices from Level 3 apply.

**Score:**

**Verification methods and notes:**

### 

### New Plantings (new and renovated beds)

N/A: No new plantings are being done in new or renovated beds.

**Level 1:** Vines for new plantings are not inspected prior to selection or purchase. Little consideration is given to market or variety characteristics of new planting. Source fields are not evaluated for presence of “off-type” vines.

**Level 2:** Healthy vines are selected from disease-free beds with low weed pressure or are purchased from a reliable source. Vines are either planted as soon after cutting as possible or stored in a manner that preserves viability. (Some growers find that pruned vines kept in water over the winter form callous tissue and grow more vigorously when planted.) Vines are planted into a weed-free bed.

**Level 3:** As per Level 2 and vines are selected based on intended market and varietal attributes (such as vigor, color, production potential, and performance expected of type). Producer/manager obtains cultivar and fertilizer histories, date of pruning or mowing, and storage method of vines. The planting is managed for healthy and rapid vining-in to better compete with weeds and reduce pesticide use. At least three of the following apply:

Vines are planted at the recommended density to promote rapid colonization.

Varieties with resistance to insect and disease pests are selected when available.

New weed growth is aggressively controlled by pulling, mowing, clipping, and/or herbicide spot-treatments during the first two years of establishment.

Optimal soil moisture, with adequate drainage, is maintained during rooting (may require frequent light irrigations).

Where appropriate, coarse, clean, weed-free sand, sawdust, or gravel is spread to anchor vines and runners and promote upright growth.

Certification, tissue culture, or DNA typing is used to guarantee desired vine type.

Adequate plant nutrition is provided.

Other (please specify):

**Level 4:** As per Level 3 and site preparation and adequate weed control contribute to successful vining-in and commercial viability of new plantings. New vines are certified, guaranteed by DNA typing or tissue culture is used to guarantee desired vine type. One or more additional practices from Level 3 are used for a total of four or more.

**Score:**

**Verification methods and notes:**

## Pest Management

### Weeds

**Level 1:** All legal requirements are met. Herbicides are applied on a regular schedule.

**Level 2:** Planting is scouted to detect and spot treat weeds early before they become established. Herbicides are spot applied whenever possible. Herbicides are not used on an annual basis unless indicated by previous season weed populations.

**Level 3:** As per Level 2 and weed maps are prepared least once per season. Weeds are ranked in order of type, abundance, and potential crop loss to guide control decisions including herbicide selection, if used. Cultural controls and non-chemical strategies are implemented.

Site preparation of new or renovated beds limits potential weed problems. New plantings are intensively managed, and where possible weeds are removed by hand pulling and clipping. Any sawdust, sand, or sandy gravel used in new plantings is free of weed seeds. Where emergent weeds are a problem, any sawdust, sand, or sandy gravel used for new planting is applied 4-6 inches deep, or more, to prevent weed emergence.

Herbicides, if used, are rotated and post-emergent options and spot treatments are used when effective; producer/manager can provide rationale if herbicides are used. Records match application materials to target pest and population numbers. Toxicity Class I and II herbicides are not used when less toxic alternatives are available.

**Level 4:** As per Level 3 and producer/manager has a long-term management program. Weed maps are used to track impacts/outcomes of management decisions. Adjoining areas are managed to prevent weeds and weed seed immigration into the bog. Weeds are removed by hand pulling and/or clipping. If herbicides are needed, only Toxicity Class IV herbicides are used and none that threaten biological control programs. Producer/manager may participate in on-farm trials supporting potential bio-control programs for weeds.

**Score:**

**Verification methods and notes:**

### 

### Insects and Mites

**Note:** See Additional Management Areas/Pollinators for more criteria regarding pesticide use.

**Level 1:** All legal requirements are met. Labeled pesticides are applied against insects and/or mites on a regular schedule.

**Level 2:** Beds are scouted for potential pests throughout the growing season. When treatment is necessary, visual monitoring and/or sweeping and percent out- of-bloom calculations are used to determine optimum timing for pesticide treatment. Insecticides are applied only after a species has been identified to ensure correct pesticide selection. Pesticides are applied only when infestations over economic threshold or when indicated by bog history. Applications are timed according to degree-days, trapping, or other monitoring technique. Spot treatments are used when possible.

**Level 3:** As per Level 2 and cultural controls (e.g., sanitation etc) are practiced as part of the pest management plan. Insecticide applications, if necessary, are made using the least toxic pesticides available to maximize the safety of applicators, the fruit, the environment, and beneficial natural enemies.

Toxicity Class I or II pesticides are not used. (Use of Toxicity Class II pesticides may sometimes be acceptable at Level 3, if no Class III or IV pesticides are registered for use, or if there are insufficient chemicals to support a program to prevent resistance development.) Records are used to match application materials to target pest and population numbers. Pheromone traps, when available, are used to monitor flights of pests (e.g., sparganothis fruitworm). Producer/ manager is able to discuss examples of cultural controls used on this farm. Pollinator management meets Level 3 criteria.

**Level 4:** As per Level 3 and producer/manager has a written management plan and detailed pest management records. The pest program focuses on prevention as the first line of defense. When pests are over threshold, only Toxicity Class IV pesticides, horticultural oils or soaps, or biological agents (e.g., nematodes, Bt) are applied. One or more of the following apply:

Producer/manager participates in on-farm trials to identify, observe, and measure presence and activity of beneficial natural enemies (e.g., spiders, and parasitic or predatory insects, and mites) in cranberry beds.

Producer/manager participates in on-farm trials to manage beds and adjacent areas for the support and protection of potential beneficial natural enemy populations and/or native pollinators.

Producer/manager participates in on-farm trials to support continued research of mating disruption where no commercial product is available.

**Score:**

**Verification methods and notes:**

### Diseases

**Level 1:** All legal requirements are met. Labeled fungicides are applied on a regular schedule (e.g., fruit rot, cotton ball, etc.) No specific preventive management plan implementing cultural control options is used.

**Level 2:** Beds are scouted to detect disease and permit early corrective action. Fungicides are applied in areas with a history of the disease when conditions favor disease development or when over threshold. Treatments are timed per professional recommendations to prevent infection of new growth. Where options are available, rotation of chemicals is employed to delay pest resistance to fungicides.

**Level 3:** As per Level 2 and a combination of cultural controls and non-chemical strategies are used (e.g., sanitation). False blossom disease is managed by control of the vector. Injuries to vines and fruit are prevented with careful field operations and handling. Toxicity Class I or II materials are not used. (Use of certain Toxicity Class II fungicides (e.g., propiconazole) might be acceptable at Level 3 where used in rotation with Toxicity Class III or IV materials to support a program to prevent development of pest resistance.)

Fungicides are applied against fruit and root rots only when indicated by bed history and/or intended market for fruit. Fungicides are selected to minimize environmental and applicator risk. Producer/manager is able to discuss examples of cultural controls used on this farm.

**Level 4:** As per Level 3 and sanitation, irrigation management, and other appropriate cultural controls and preventative strategies are used effectively to prevent or control any disease. Detailed records and observations of incidence, severity, and control methods bed performance are collected and used in planning for the next year. No fungicides are applied unless severe crop damage or major economic loss is likely without treatment. Integrated Pest Management (IPM) or extension personnel are consulted to establish most low risk yet effective options prior to treatment.

**Score:**

**Verification methods and notes:**

### 

### Vertebrate Pests (Birds (e.g., geese, swans, and ducks); Deer, Elk and/or Bear; Muskrat, Beaver and Nutria; Voles, Mice, Gophers, Groundhogs; Other)

**Level 1:** All legal requirements are met. Vertebrate pest damage is not actively monitored. Bait application, trapping and/or removal (or shooting) done on a routine schedule while following all laws and regulations.

**Level 2:** Vertebrate pest damage is monitored and control actions are made in response to damage history of beds. All actions are taken in compliance with applicable laws and regulations. Hazing, netting, repellants, and/or fencing may be used (e.g., birds, deer, elk, bear) and installed/activated prior to feeding habits becoming established. Direct removal by trapping (rodents) is conducted in compliance with all laws. Any repellants used on beds are approved for use on food crops. Baits (voles, mice) are used only outside of beds, and are used in ways to protect non-target species. Check any of the following used:

Damage is monitored.

Fencing is installed.

Repellants are used.

Hazing is used.

Netting is used.

Traps is used.

Legal hunting is done.

Bait stations are used (please specify):

Other (please specify):

**Level 3:** As per Level 2 and a comprehensive vertebrate pest management plan is developed and implemented, including sampling and assessing economic losses due to damage for each pest. The costs of management actions are proportionate to actual losses. Baiting (e.g., rodents) is supplemented with biological and mechanical methods such as encouraging predation, managing ground cover on dikes, trapping, or flooding. No Toxicity Class I or II baits or other chemical controls are used. Check all that apply:

Owl or kestrel boxes, raptor perches are installed.

Geese and swan damage are discouraged by weed control and/or managing flooding to limit access to open water.

Predator populations are encouraged. Predator dens left undisturbed.

Vegetation on dikes is kept mowed to 3 inches or less to facilitate raptor predation of rodents.

Sticky cards and/or snap traps are used for mice, voles, and weasels.

Intermittent flooding of dry harvest beds is used to control mice, voles, etc.

Preferred foods (e.g., nutsedge, red root, wild bean) and weeds are controlled to discourage damage.

Delay of winter flood until near winterkill temperatures.

Other trapping is done.

Non-poison rodent baits (e.g., oats+ plaster of Paris) are used.

Other (please specify):

**Level 4:** As per Level 3 and habitat is intentionally managed around beds to reduce vertebrate pest activity and encourage predators. Any new or renovated beds are designed to minimize problems (e.g., use of galvanized wire or chicken wire fencing on new dikes prior to seeding to prevent burrowing where muskrats are problematic). Dikes are assessed for potential damage from burrowing rodents. Lethal removal, trapping, and baiting is used only when damage is severe and live traps or habitat modifications are unsuccessful. No chemical poisons are used.

**Score:**

**Verification methods and notes**:

## 

## Additional Management Areas

### Pollinators

**Level 1:** All legal requirements are met including beekeeper registration with state agencies, where required. Pesticide use is consistent with the label and all restrictions regarding bees are followed.

Producer/manager is aware of any state or provincial pollinator protection regulations.

Producer/manager has copy or bookmark of state rules on hand.

**Level 2:** Bees are not placed in beds until blossoms are open (>10% bloom) ***or*** bees are placed in beds prior to bloom with sufficient food supplies provided. Hives are identified with keeper’s name. Pesticides hazardous to bees are not applied when blossoms are open on cranberries, or in adjacent areas where pesticides may drift, unless applied in such a manner as to not be hazardous. Pesticide application timing is adjusted for weather conditions. Applicator chooses the least hazardous pesticide option, e.g., granular hazard < liquid hazard < dust or microencapsulated. Check any of the following used to prevent bee exposure:

Blossoms in adjacent areas (non-crop) are mowed or removed before bees are placed.

Pesticide applications are made at the appropriate or state-regulated time, when bees are not foraging (late evening to midnight for chemicals with less than an 8-hour residual hazard).

Pesticide applications are avoided on unusually cold or heavy dew nights because residues remain toxic much longer.

Pesticide applications are not made on unusually warm mornings or evenings when bees are more likely to be foraging earlier or later, and are more susceptible to exposure.

No pesticides are applied using aerial application during bloom.

Pesticides not used during pollination.

Other (please specify):

If any pesticide is applied that is highly toxic to bees and has a residual hazard of longer than 8 hours, hives are not oversprayed and applications are done when pollinators are not active. One of the following must apply:

Hives are removed from bed prior to spray and returned only when safe for bees according to label; ***or***

Hives are covered in wet burlap prior to application, and bees are kept inside covered hives until safe according to label.

**Level 3:** As per Level 2 and the cranberry IPM program is tailored specifically to provide a safer environment for honeybees and native pollinators throughout the year. Pesticides hazardous to bees are not routinely applied on cranberries, or on adjacent bloom areas, from one week prior to bloom through the end of bloom. If required to address an emergency, low bee-hazard materials may be applied during bloom only if applied in a manner that effectively reduces any hazard. Only pesticides that have a low residual hazard (less than 4 hours) are applied.

Pesticides are applied during the evening or night while honeybees and bumblebees are not foraging. (Bumblebees will begin foraging at cooler, damper conditions than honeybees.) Application is completed a minimum of recommended hours prior to when bumblebees are active. Two or more of the following apply:

Mulch, or grass, or other plant species that do not have bee-attractant blooms are used for cover on dikes and roads.

Producer/manager monitors bee colony strength.

If bloom is provided or present for native pollinators (in beds or adjacent areas), pesticide application is adjusted to protect native pollinators, before, during and after cranberry pollination season.

Chemicals that pose a risk to pollinators are allowed to dry on vines prior to bees beginning to forage following application.

Following nighttime application, chemicals are rinsed (irrigated) off vines prior to bees beginning to forage.

Other (please specify):

**Level 4:** As per Level 3 except that pesticides hazardous to bees are never applied on cranberries or adjacent areas from one week prior to bloom through the end of bloom. Producer/manager has a written contract with beekeeper specifying hive quality, entrance and exit times, pesticide use, etc. Efforts are made to enhance and support habitat for important native pollinators of cranberries (e.g., bumblebees), including at least two of the following:

Native pollinators are identified, including seasonal activities, and measures for their protection are implemented.

Where no natural areas or inadequate natural areas exist in close proximity to the beds, producer/manager voluntarily sets aside adjacent land to support pollinators

Ground cavities are left undisturbed for bumblebee nesting.

Nest boxes are provided where undisturbed natural sites are limited.

Native plants are established to provided pollen or nectar for bumblebees in late winter, spring (e.g., winter-blooming heather in the Pacific Northwest), and after cranberry bloom has ended.

Direct chemical applications are not made on adjacent/support lands near beds that provide potential bumblebee habitat. Likewise, drift is prevented from reaching adjacent/ support lands near beds that provide potential bumblebee habitat.

Producer/managers participate in observations of honeybee and native pollinator activity and population density. Producer/managers monitor the success or lack of success of their support efforts, and record and share their observations.

Producer/manager encourages beekeeper to rotate out used brood comb to avoid build-up of pesticide residue.

Other (please specify):

**Score:**

**Verification methods and notes:**

### 

### Adjacent Area Management

**Level 1:** All legal requirements are met. Areas adjacent to the bed are not managed.

**Level 2:** Areas adjacent to the bed and under the control of the farmer are managed in response to pest problems that are exacerbated by conditions in these areas, e.g., overwintering sites for pests exceeding thresholds are disrupted. At least two of the following apply:

Vine trash is removed from border areas of beds annually.

Vegetation is kept trimmed back from border areas to allow for adequate light and air movement.

Dikes are included in the IPM program (e.g., dikes can be a reservoir for cranberry girdler).

Other (please specify):

**Level 3:** As per Level 2 and adjacent areas are managed to reduce potential for pest immigration, and pesticide and fertilizer movement off-site. Some adjacent area is left to support general beneficial organisms. At least four of the following apply:

Monitoring is done along edges of beds to detect pests moving in from adjacent areas (e.g., gypsy moth or invasive weeds at forest edges).

Appropriate measures are taken to prevent new infestations of invasive species.

Adjacent wetlands are maintained as high-functioning wetlands for wildlife and aquatic habitat.

Dikes, roads, and other vegetated areas are managed (e.g., mowed) to prevent weed seed production.

Leaf trash piles are composted and compost piles are situated more than ¼ mile from beds if possible.

Sand piles are managed to prevent growth and dispersal of weed seed.

In-line filters are installed to collect weed seeds and other contaminants. Pumps, intakes, and outlets are screened to prevent weed seed moving into bed or between beds.

Vegetation is allowed to grow in ditches during growing season to slow water movement and promote filtering of sediment, nutrients, and pesticides.

Ditches and waterways are cleaned out after harvest and managed to promote adequate winter and spring drainage.

Other (please specify):

**Level 4:** As per Level 3 with a total of six or more from Level 3. Producer/manager has written wildlife management plan. Adjacent areas are planted with native plants, hedgerows, windbreaks, or other low-maintenance plantings to encourage specific beneficial organisms. Where no or inadequate natural areas exist in close proximity to the beds, producer/manager voluntarily sets aside adjacent land to support beneficials or manages dikes for support of beneficials. Producer/ manager cooperates or works with conservation organizations and/or agencies to promote local and regional biodiversity and land preservation, etc. (e.g., land trust, conservation easements, etc.).

**Score:**

**Verification methods and notes:**

## Scorecard

|  |  |
| --- | --- |
| **SCORED CRITERIA** | **SCORE/LEVEL** |
| Crop Management |  |
| Soil pH |  |
| Fertilizer Use |  |
| Sanding |  |
| Harvest |  |
| Water Management |  |
| Water Quality |  |
| Water Use |  |
| Irrigation and Chemigation |  |
| Bed Management |  |
| New Plantings |  |
| New Bed Construction |  |
| Bed Renovation |  |
| Pest Management |  |
| Weeds |  |
| Insects and Mites |  |
| Diseases |  |
| Vertebrates |  |
| Additional Management Areas |  |
| Pollinators |  |
| Adjacent Area Management |  |
|  |  |
| (1) TOTAL POINTS EARNED |  |
|  |  |
| Total Points Available | 64 |
| - Minus Total Points Not Applicable |  |
| (2) TOTAL APPLICABLE POINTS= |  |
| (3)SCORE AS A PERCENTAGE Convert Total Points Earned to a percentage (% = Total Points Earned/Total Applicable Points) |  |

## 

## References

The evaluation criteria included in this inspection tool were developed using information from many sources, including\*:

2010 Pest Management Guide. Washington State University Cooperative Extension Publication EB0845E.

2008 - 2009 Berry Production Guide. Cranberry Chapter, pp. 107 – 121.   
British Columbia Ministry of Agriculture and Lands.

An Online Guide to Plant Disease Control. Oregon State University Department of Botany and Plant Pathology. <http://osu.orst.edu/dept/botany/epp/guide/index.html>

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Oregon State University.

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Packing of Cranberries.

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Renovation of Abandoned Cranberry Bogs. June 2007. BRP WW 13.   
Massachusetts Department of Environmental Protection; Bureau of Resource Protection – Wetlands & Waterways.

*\*Not all practices from these sources were incorporated into the final draft of these evaluation criteria, so acknowledgement of their use does not constitute an endorsement of these criteria.*

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*\*\*Not all reviewer comments and suggestions were incorporated in the final draft of these evaluation criteria, so recognition of their contribution does not constitute an endorsement.*

## Appendices

**Appendix A. Cranberry Pest Reference List**

1. **Diseases/Nematodes**

* Berry Speckle
* Cottonball
* Fairy ring
* False Blossom Disease (Leaf hopper vectored)
* Fruit Rots
* Leaf Blight
* Phytophthora Root and Runner Rot
* Red Leaf Spot
* Rose Bloom
* Stem Blight
* Stem Gall
* Twig Blight
* Upright Dieback

1. **Insects/Mites**

* Root Weevils (Black Vine or Strawberry Root Weevil)
* Cranberry Weevil
* Cranberry Girdler
* Cutworms (Cranberry Blossom Worm and False Army Worm)
* Fireworms
* Fruitworms
* Gypsy Moth
* Spanworms/Loopers
* Tipworms
* Scales
* Southern Red Mite
* Cranberry Root Worm
* Grubs (White Cranberry, Cranberry, Hoplia Equina, Oriental Beetle, Scarab)
* Cranberry Flea Beetle
* Blunt Nosed Leaf Hopper
* Striped Colaspis
* Rusty Tussock Moth
* Parasitic nematodes

Appendix B: Reference List of Examples of Cultural Controls for Cranberry Pest Management.

To be used in conjunction with Food Alliance Whole Farm Tool Reducing Pesticide and Cranberry Tool Pest Management sections.

1. Weed Management

* Mapping and targeted control of priority weeds
* Screens on inlet and outlets
* Sandpits and stockpiles are covered and weeds controlled
* Adjacent areas weed control
* Mowing (e.g., dikes) to prevent maturation of weed seed
* Cleaning of harvest equipment between beds
* High vine density planting rate
* Maintain optimal fertility for cranberry
* Sanding
* Pruning
* De-trashing flood
* Late Water
* Short Spring Flood
* Summer Flood
* Removal of vine trash from bed borders
* Hand pulling, clipping
* Removal of dodder seed from beds by hand prior harvest flood
* Maintain low soil pH
* Renovation
* Careful prevention of weed seed contamination during renovation

1. **Insect/Mite Management**

* Maintain optimal fertility for cranberry
* De-trashing flood (e.g., girdler)
* Pruning of infested material and removal from beds
* Fresh fruit beds are managed to meet standards for zero tolerance for cranberry fruitworm
* Plant individual beds with varieties having uniform development and bloom time
* Periodic late water flood (control of mites, Gypsy moth, false armyworm, cranberry fruitworm, Southern red mite)
* Summer flood (e.g., control of grubs)
* Winter flood

1. **Disease Management**

* Planting disease free vines in new plantings (see Renovation section)
* Adequate drainage (e.g., lateral and perimeter ditches, subsurface drain tile)
* Morning irrigation scheduled to allow for drying of leaf surface
* Avoiding plant stress (too hot or dry, frost)
* Optimal fertility
* Pruning for optimal canopy conditions (adequate air movement and light)
* Removal of trees shading bogs to promote air flow and rapid drying.
* De-trashing flood and removal of vine trash from bed borders
* Periodic late water flood (control of fruit rot)
* Sanding to bury infested leaf litter
* Pruning out infected wood and removing prunings from beds
* Removal of mummies
* Mechanical injury of fruit during harvest avoided
* Harvest equipment is disinfected between use in different beds, especially when phytohpthora is present
* Harvesting of infected bogs last (see harvest section)
* Percent bloom counts used to time fungicide

**Appendix C: Listings of threatened and endangered species**:

Maine: <http://www.maine.gov/ifw/wildlife/endangered/listed_species_me.htm>

Massachusetts: <http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/species-information-and-conservation/mesa-list/list-of-rare-species-in-massachusetts.html>

Michigan: <http://www.michigan.gov/dnr/0,4570,7-153-10370_12141_12168---,00.html>

New Jersey: <http://www.state.nj.us/dep/fgw/tandespp.htm>

Oregon: <http://www.dfw.state.or.us/wildlife/diversity/species/threatened_endangered_species.asp>

Washington: <http://wdfw.wa.gov/conservation/endangered/>

Wisconsin: <http://dnr.wi.gov/topic/endangeredresources/etlist.html>

1. [↑](#endnote-ref-1)