Protecting pollinators & improving pollination

ON WISCONSIN CRANBERRY MARSHES

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Cranberry plants require insect pollinators for optimal fruit set. Maximizing pollination through the protection of wild and managed bees is therefore an important aspect of cranberry production. This publication outlines management practices that protect pollinators and promote yield on the cranberry marsh.

Key facts

- Honeybees and native wild bees, including bumblebees, contribute to cranberry pollination.
- You can attract wild bees to your marsh with season-long nectar resources and nesting habitats, such as patches of bare and/or undisturbed sandy soil.
- A contract and/or careful communication with beekeepers helps ensure adequate pollination as well as bee safety and health.
- Pesticide exposure can harm bees. Cranberry growers can reduce bees’ contact with pesticides by adopting the following guidelines:
  - Pesticide applications should be timed outside the bloom period as much as possible.
  - If you must spray during bloom, choose formulations with the least toxicity to bees (see tables 1 and 2, and check the pesticide label).
  - Spray in the evening or early morning when possible.
  - Plan sprays when winds are less than 10 mph and/or humidity is above 50%.
  - Be aware that applying tank mixes or using surfactants may increase toxicity to bees.

Pollination & pollinators

The cranberry flower hangs upside down with the opening facing the ground and the pollen and nectar tucked up inside the flower. Bumblebees are well suited to pollinate this type of flower because they buzz pollinate (i.e., they make the flower vibrate, causing the pollen to drop down and cover the bee, facilitating pollen transfer). Because of this ability to buzz pollinate, each individual bumblebee is a highly efficient cranberry pollinator. Approximately 30% of Wisconsin cranberry growers buy managed bumblebee colonies and place them on the marsh at a rate of 1 to 2 colonies per acre.

Honeybees do not buzz pollinate, and for that reason, each honeybee is less efficient at removing and transferring pollen than a bumblebee. However, the presence of approximately 40,000 worker honeybees per hive during bloom means honeybees often do the bulk of marsh pollination. Approximately 90% of Wisconsin cranberry growers rent commercial honeybee colonies during bloom, which are typically placed on the marsh at a rate of 2 to 3 hives per acre.

In addition to these commercial pollinators, over 400 species of wild bees exist in the Midwest, many of which visit and pollinate cranberries. In fact, many bumblebee species are also native to Wisconsin; these, along with other species of wild pollinators, are likely to be present in varying degrees on most cranberry marshes. Find out what pollinators are visiting your marsh with the “Streamlined Bee Monitoring Protocol” from the Xerces Society (http://xerces.org/streamlined-bee-monitoring-protocol/).

In recent years, the health of both native and commercial bees has globally declined. Colony collapse disorder in honeybees and general population decline among native bees is concerning to all agricultural workers, and implementing best management practices is essential to protecting our valuable pollinators. A suite of factors contributes to pollinator decline, including disease and mite pressure, loss of habitat, pesticide exposure, and poor nutrition. These factors are addressed throughout this publication in the form of concrete strategies to help improve pollinator health.
Habitat enhancement

All growers are encouraged to support native bee diversity. Because native bees can fly in more variable weather conditions, their pollination efforts complement those of commercial honeybees. In order to survive and thrive, native pollinators need appropriate nesting sites and season-long nectar resources. Providing supplemental nectar resources may also improve honeybee health during the time they are on the marsh.

Floral nectar resources

Many publications and websites focus on what can be planted to provide season-long nectar resources for pollinators, which is generally termed a pollinator garden. This publication focuses on plants well suited to accompany commercial cranberry production. Choose at least ten different species of plants that collectively bloom throughout the period when cranberries are not in bloom. Planting native species increases the overall attractiveness to native pollinators, reduces the need for irrigation and fertilization, and reduces the likelihood of invasion from introduced species.

Figures 1 and 2 show the bloom times for some native plants that have been successfully grown as additional nectar resources on cranberry marshes. Although observations suggest these plants perform well on cranberry marshes, systematic research has not yet been conducted. This is not an exhaustive list of available or potentially successful plants.

As a general guideline for selecting where on the marsh to establish a pollinator garden, it is best to find an area that is sunny and within 1/2 mile of the beds. However, establishing a pollinator garden too close (i.e., within 1/3 of a mile) may increase weed pressure in beds. Observations suggest a buffer (e.g., a road or mowed strip) between the marsh and the pollinator garden may reduce potential weed establishment in beds. In cranberry production, these buffer areas may be on slopes or along the outer edges of the property. More information about planting pollinator gardens can be found at the Xerces Society website (www.xerces.org).

Alternatively, instead of planting a specific area as a pollinator garden, many weeds, especially clover, provide great nectar resources. These weeds may already be growing and blooming...
FIGURE 2. Plants that can provide additional nectar resources for pollinators on cranberry marshes.

- **Pussy willow**  
  *Salix discolor*  
  Blooms in early spring. Often grown for cut flowers.

- **Serviceberry**  
  *Amelanchier spp.*  
  Blooms in spring. Fruit can be eaten fresh or processed into preserves.

- **Lupine**  
  *Lupinus perennis*  
  Blooms in early spring. Can fix nitrogen and enrich the soil.

- **Lanceleaf coreopsis**  
  *Coreopsis lanceolata*  
  Blooms in spring. Grows well in sandy soils.

- **Milkweed**  
  *Asclepius spp.*  
  Blooms in summer. Excellent nectar resource for bees, wasps, flies, and butterflies. Essential food for monarch larvae.

- **Purple coneflower**  
  *Echinacea purpurea*  
  Blooms in early summer. Attracts hummingbirds, butterflies, and bees.

- **Virginia mountain mint**  
  *Pycnanthemum virginianum*  
  Blooms in summer. Prefers nutrient-rich soils with a high water table.

- **Wild bergamot (bee balm)**  
  *Monarda fistulosa*  
  Blooms throughout summer. A good “honey plant” that makes especially sweet-tasting honey.

- **Blue vervain**  
  *Verbena hastata*  
  Blooms in late summer. Grows well in wetlands.

- **Blazing star**  
  *Liatris spicata*  
  Blooms in summer. Tolerant of variable soil and water conditions.

- **Sweet joe-pye weed**  
  *Eutrochium purpureum*  
  Blooms in late summer through fall. May serve as a trap crop for cranberry flea beetles.

- **Aster**  
  *Aster spp. and Symphyotrichum spp.*  
  Blooms in fall. Great for building up energy reserves of overwintering bumblebee queens.
on dikes and near reservoirs, and can provide season-long nectar resources for pollinators. Consider mowing weeds during cranberry bloom to direct pollinators toward the marsh. A good strategy is to mow dikes when cranberry bloom reaches about 25%. Allow weeds to grow back and flower toward the end of cranberry bloom. If these flowers are blooming near beds, it is especially important to prevent pesticide drift and potential pesticide exposure to bees. Do not allow weeds to go to seed if they may become problematic in cranberry beds. Furthermore, nectar resources for pollinators may overlap with plants used in deer plots (e.g., flowering brassicas and clover). If deer plots are within ¼ to 1 mile of your beds, pollinators visiting those plots will likely contribute to cranberry pollination.

**Nesting habitat for wild bees**

In addition to a consistent food source, wild bees also need a place to build their nests. About 70% of wild bees nest in tunnels in the ground while the remaining 30% build tunnels in stumps or twigs, or nest in cavities. The vast majority of bees visiting cranberry flowers nest in the ground or in cavities. Sites with bare loam or sand attract ground-nesting bees, and are often easily found on a cranberry marsh. Keep these sites untilled and grass-free to attract ground-nesting bees. Cavity-nesting bees, like bumblebees, nest in tall grasses or deserted rodent dens. Tunnel-nesting bees simply require standing dead trees, pithy bushes such as elderberry or sumac, or undisturbed grassy areas. You can also create artificial nesting sites for tunnel-nesting bees. More information about creating these nest sites can be found at the Xerces Society website.

In general, native pollinators can travel from ¼ to 1 mile depending on the species of bee, so it is important to create nesting space on the margins of the beds or in nearby areas. Some of the most important native bee pollinators in the cranberry system include bumblebees and sweat bees (figures 3 and 4). An online guide to identifying these and other native bees can be found on the Wisconsin Wild Bee Guide website (https://energy.wisc.edu/bee-guide/) and at the UW-Extension Learning Store (Wisconsin Bee Identification Guide; https://learningstore.uwex.edu/Wisconsin-Bee-Identification-Guide-P1849.aspx).

**Cost-share programs**

There are several programs in Wisconsin that help with the cost of creating pollinator gardens and native bee nesting sites.

- The **Environmental Quality Incentives Program** through the USDA provides financial support to agricultural producers to encourage environmentally sustainable agriculture practices: https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/financial/eqip/?cid=stelprdb1044009

- The **Farm Service Agency** of the USDA oversees programs to encourage preservation of high-quality lands for environmental conservation: https://www.fsa.usda.gov/programs-and-services/conservation-programs/index

- The **Land Owner Incentive** program through the Wisconsin DNR provides advice and funding to assist landowners to preserve endangered or declining species, including many pollinators: http://dnr.wi.gov/topic/endangeredresources/lip.html

- **Bayer Crop Science** offers grants to plant forages that appeal to bees across the United States with their “Feed a Bee” initiative: http://img.feedabee.com/impact/

**Communication between beekeepers & cranberry growers**

Understanding, cooperation, trust, and communication are key to the relationship between beekeepers and cranberry growers. However, for larger operations or for a new relationship with an unfamiliar beekeeper, signing a written contract can be an appropriate way to ensure both parties understand the agreement. Sample contracts have been provided at the end of this document for your convenience (see appendices A and B). Some topics worth going over with your beekeeper, either in a written contract or by oral agreement, are discussed below.

**Hive inspections**

Both growers and beekeepers consider it good practice to require inspections of a random 10% of hives to ensure they are of high quality and contain healthy colonies. A third party should conduct these inspections, with both beekeeper and grower present. Inspections benefit both the grower (by ensuring adequate numbers of healthy bees are present to properly pollinate the crop) and the beekeeper (by providing a checkpoint from which the beekeeper can monitor the health of his or her colonies). Wisconsin has two apiary inspectors available for inspections from May through October. Contact information can be found at the Wisconsin Department of Agriculture, Trade, and Consumer Protection website (https://datcp.wi.gov/Pages/Programs_Services/ApairyBeekeepingInspections.aspx), and inspections are free.
**FIGURE 3.** Common native cranberry pollinators.

- **Bumblebee** *Bombus spp.*
  Ground-nesters. Forage from early spring until late fall. Will fly 1 to 2 miles to forage.

- **Sweat bee** *Lasioglossum spp.* and *Halictus spp.*
  Extremely abundant but often overlooked due to small size.

- **Green sweat bee** *Augochlorella spp.* and *Agapostemon spp.*
  Ground-nesters. Distinctive metallic green color.

- **Mining bee** *Andrena spp.*
  Ground-nesters.

- **Long-horned bee** *Eucera spp.* and *Melissodes spp.*
  Ground-nesters.

- **Mason bee** *Osmia spp.*
  Tunnel-nesters. Prefer to forage on trees, but also found in cranberry.

**FIGURE 4.** Approximate flight periods for common groups of native wild bees found around the cranberry marsh. Bees that fly during the period of cranberry bloom are expected to contribute to cranberry pollination.
Timing and duration of hives on the marsh
The timing of when bees begin to visit and eventually leave the marsh can be critical for cranberry pollination, and can also greatly affect honeybee health if no other forage resources are available to bees. Most cranberry growers agree hives should be placed on the marsh when beds are about 15% into bloom, and can be removed 7 to 10 days after beds are 50% out of bloom (see figure 5 to calculate % bloom). In general, bringing bees onto the marsh too early can reduce pollination, because bees learn to fly off the marsh in search of floral resources. When possible, provide a nearby “staging area” with adequate nectar resources where the beekeepers can place hives a few days before the grower wants bees on the marsh. This ensures hives are ready to move to the marsh at the appropriate time. Remove hives promptly once flowers begin to drop. This decreases potential health risks to bees, as they will not be kept without sufficient nectar resources toward the end of bloom.

The length of time bees should stay on a marsh depends on the weather and the cranberry varieties present, as these factors affect blooming period. The pollination window in cranberries often lasts 3 to 4 weeks. Keeping hives on the marsh for the shortest time period necessary reduces the chance of having to spray while bees are present. Further research is necessary to pinpoint the specific amount of time bees should remain on the marsh to ensure full pollination and optimal fruit set. Once again, communicating with your beekeeper is essential to pollinator health and protection.

Hive placement
Another factor worth discussing ahead of time with your beekeeper is hive placement on the marsh. Beekeepers may prefer to leave multiple pallets of hives in several locations rather than distributing them evenly throughout the marsh. There is no research that shows bees pollinate more effectively when hives are spread evenly throughout a cranberry marsh. Thus, within the limits set by your bed layout and equipment needs, hives placed in several clumps near the center of the marsh should be adequate. Recent research suggests bee visitation increases when hives are placed in the center of the marsh or near marsh edges with wild habitat. Avoid placing hives near water reservoirs.

Honeybee nutrition
Cranberry flowers contain small amounts of nectar and may provide limited resources for honeybees. There are several options to enhance bee nutrition during cranberry bloom (see Habitat enhancement for more details):

- Create nectar-rich pollinator gardens on the marsh.
- Allow nectar-rich plants such as clover to bloom on dikes for a short time.

Pesticide applications during bloom
Beekeepers and cranberry growers should be explicit about pesticide application policies. Communicate in detail what, where, and how pesticides are applied. Information about reducing pesticide exposure to bees is provided in the next section.

Prices and premiums
It may be beneficial for cranberry growers and beekeepers to discuss the possibility of price incentives for actions taken to improve bee health, such as keeping bees on the marsh for a shorter period of time, avoiding pesticide applications while bees are on the marsh, or providing alternative nectar resources. Beekeepers may agree to a discounted price in exchange for cranberry growers actively encouraging colony health on the marsh.
Reducing pesticide exposure

Different species of bees respond to pesticide exposure in varying ways. Body size, nesting habitat, when they are most active, whether they are solitary or social, and other factors affect bees’ response to pesticide exposure. For example, honeybees and other large-bodied bees can travel up to three miles in search of nectar resources and may be exposed to pesticides on neighboring farms. On the other hand, smaller-bodied bees (e.g., sweat bees and mining bees) do not travel as far and are less likely to be affected by the spray schedule of a neighbor.

Many important, and relatively easy to implement, management strategies to improve pollinator health include reducing bees’ exposure to pesticides. Although eliminating the use of pesticides is rarely feasible, you can promote bee health by adopting the following strategies.

Practice IPM

Since the formation of the UW-Extension Cranberry Integrated Pest Management (IPM) program in 1986, IPM has been a focus of Wisconsin’s cranberry growers. IPM techniques include monitoring for pests, setting thresholds for when to spray, using more specific pesticides, and, when possible, using alternative pest control methods such as biocontrol, cultural control, or host plant resistance.

Use reduced-risk chemistries

If you must spray during bloom, it is best to use an insecticide with low persistence in the environment that targets specific pests. This helps reduce toxicity to pollinators and other beneficial insects. Table 1 lists the currently registered insecticides for cranberry and outlines their relative toxicity to bees. Most highly toxic insecticides may not legally be applied to flowering crops or weeds. These regulations and recommendations change, and it is important to refer to the product label for additional information on toxicity to bees and pollinator warnings. Always follow the instructions on the pesticide label.

Although some of these insecticides are considered to be relatively nontoxic, this refers only to the acute toxicity of the insecticide on a bee. There are many potential sublethal effects of insecticides on bees, including lower reproductive capacity, reduced foraging ability, developmental malformations, and difficulties with communication and orientation. However, much more research is necessary to create an index of sublethal effects of these insecticides on bees.

For up-to-date information on cranberry pesticides, refer to Cranberry Pest Management in Wisconsin (UW-Extension publication A3276) and to the insecticide label.

The Pacific Northwest Extension publication How to Reduce Bee Poisoning from Pesticides has a companion app by the same name that allows you to search pesticides, not just insecticides, by trade or chemical name and provides information on the toxicity of these pesticides to bees (see Appendix C). The University of California’s IPM program provides a resource on reduced-risk pesticides that can be found at http://www2.ipm.ucanr.edu/beeprecaution/.

### TABLE 1. Registered insecticides for cranberry with relative toxicity to bees as of 2018.

<table>
<thead>
<tr>
<th>Toxicity to bees</th>
<th>Class (and IRAC* code)</th>
<th>Example active ingredients</th>
<th>Example trade names</th>
</tr>
</thead>
<tbody>
<tr>
<td>relatively nontoxic</td>
<td>diacylhydrazines (18)</td>
<td>methoxyfenozide, tebufenozide</td>
<td>Intrepid, Confirm</td>
</tr>
<tr>
<td>diamides (28)</td>
<td>chlorantraniliprole</td>
<td>Altacor</td>
<td></td>
</tr>
<tr>
<td>biologicals</td>
<td>Bacillus thuringiensis</td>
<td>Biobit, Dipel</td>
<td></td>
</tr>
<tr>
<td>moderately toxic</td>
<td>benzoyleurases (15)</td>
<td>novaluron</td>
<td>RimOn</td>
</tr>
<tr>
<td>acetyl CoA inhibitors (23)</td>
<td>spirotetramat</td>
<td>Movento</td>
<td></td>
</tr>
<tr>
<td>biologicals</td>
<td>Burkholderia spp., strain Chromobacterium subtsugae</td>
<td>Venerate, Grandevo</td>
<td></td>
</tr>
<tr>
<td>highly toxic</td>
<td>carbamates (1A)</td>
<td>carbaryl</td>
<td>Sevin</td>
</tr>
<tr>
<td>organophosphates (1B)</td>
<td>acephate, chlorpyrifos, diazinon, phosmet</td>
<td>Acephate, Orthene, Lorsban, Hatchet, Diazinon, Imidan</td>
<td></td>
</tr>
<tr>
<td>neonicotinoids (4A)</td>
<td>acetamiprid, imidacloprid, thiamethoxam</td>
<td>Assail, Admire Pro, Alias, Widow, Actara</td>
<td></td>
</tr>
<tr>
<td>spinosyns (5)</td>
<td>spinetoram, spinosad</td>
<td>Delegate, Entrust, Success</td>
<td></td>
</tr>
<tr>
<td>oxadiazines (22A)</td>
<td>indoxacarb</td>
<td>Avaunt</td>
<td></td>
</tr>
</tbody>
</table>

*Insecticide Resistance Action Committee chemical class codes based on modes of action.
Considerations for fungicides
Many people think the only pesticides that affect bees are insecticides; however, some fungicides have sublethal detrimental effects on pollinators and contribute to pollinator stress. Table 2 describes which fungicides are most likely to show direct lethal effects on bees. As with insecticides, fungicides designated as “relatively nontoxic” to bees may also cause sublethal effects. For up-to-date information on cranberry fungicides, refer to Cranberry Pest Management in Wisconsin (UW-Extension publication A3276) and to the fungicide label.

Tank mixes and surfactants
Mixing a fungicide with an insecticide or mixing two fungicides can have a synergistic effect, meaning the combination of products has a higher toxicity to bees than would individual applications of the chemicals. Specifically, research has shown that combining insecticides such as pyrethroids (IRAC group 3A) and neonicotinoids (IRAC group 4A) with FRAC group 3 fungicides can have increased toxic effects on pollinators. Other combinations of fungicides and insecticides are likely to have similar effects, and research is ongoing to address these concerns.

Surfactants (e.g., oils and detergents) should be used with caution when bees are flying. The use of surfactants to reduce surface tension may also increase the ease with which the pesticide penetrates the bee’s cuticle, leading to increased toxicity. More research is necessary to assess the effect of surfactants on bee health. In the meantime, the use of surfactants should be minimized during bloom unless the label requires its use.

Avoid pollinator/pesticide contact
Techniques that can prevent pollinators from coming into contact with pesticides are illustrated in figure 6 and discussed below (bulleted numbers below correspond to numbers in figure 6).

1. Avoid spraying during bloom when possible. If unavoidable, spray when bees are least active. Most bees begin foraging early in the morning and continue until shortly before sunset. Therefore, the best time to apply a pesticide, especially during bloom, is in the late evening or at night.

2. Minimize spray drift to ditches and waterways. Even if the field being sprayed is not in bloom, it is important to target pesticide applications to avoid drift into nearby fields and flowing dikes, or runoff into ditches. The pesticide label contains information intended to reduce drift and runoff, and should always be thoroughly read and completely followed.

Using a boom sprayer when possible allows for more precise pesticide applications. Off target spray and pesticide residue in ditches are thus minimized, which is important as bees may use these as a water source.

Follow these simple methods to reduce pesticide drift:
- Be sure to calibrate your boom to optimize spray pressure and volume.
- Select drift reducing nozzles, and, when possible, avoid spraying pesticides with small droplet size.
- When possible, spray when winds are under 10 mph unless the label specifies otherwise.
- When possible, spray when the relative humidity is above 50%.

<table>
<thead>
<tr>
<th>Toxicity to bees</th>
<th>Class (and FRAC* code)</th>
<th>Example active ingredients</th>
<th>Example trade names</th>
</tr>
</thead>
<tbody>
<tr>
<td>relatively nontoxic</td>
<td>sterol demethylation inhibitors (3)</td>
<td>fenbuconazole, prothioconazole</td>
<td>Indar, Proline</td>
</tr>
<tr>
<td></td>
<td>strobilurins (also called quinone outside inhibitors, QoI) (11)</td>
<td>azoxystrobin, fluoxastrobin</td>
<td>Abound, Evito</td>
</tr>
<tr>
<td></td>
<td>chitin synthase inhibitors (19)</td>
<td>polyoxin D zinc salt</td>
<td>Oso</td>
</tr>
<tr>
<td></td>
<td>botanical</td>
<td>Reynoutria sachalinensis</td>
<td>Regalia</td>
</tr>
<tr>
<td></td>
<td>dithiocarbamate (M3)</td>
<td>mancozeb</td>
<td>Dithane, Penncozeb</td>
</tr>
<tr>
<td>moderately toxic</td>
<td>sterol demethylation inhibitors (3)</td>
<td>propiconazole</td>
<td>Orbit, Tilt, Topaz</td>
</tr>
<tr>
<td></td>
<td>inorganics (M1)</td>
<td>copper hydroxide</td>
<td>Kocide, Champion</td>
</tr>
<tr>
<td></td>
<td>chloronitrile (M5)</td>
<td>chlorothalonil</td>
<td>Bravo, Echo, Equus</td>
</tr>
<tr>
<td>highly toxic</td>
<td>inorganics</td>
<td>hydrogen dioxide</td>
<td>OxiDate</td>
</tr>
</tbody>
</table>

*Note that rotating Fungicide Resistance Action Committee (FRAC) class codes (modes of action) will help delay fungicide resistance.
3. **Protect bee nesting habitat.** Bee nesting habitat can include honeybee hives (3a) and bumblebee boxes, as well as native bee nesting sites, such as bare sandy areas (3b). Never spray near the hives when they are on your marsh or near known native bee nesting habitats.

4. **Be aware of systemic insecticides and treated seeds.** Systemic insecticides are taken up through the roots or into the leaves of the plant, and incorporated into all parts of the plant. Thus, plants and foliage sprayed with systemic insecticides, as well as crop seeds coated with insecticides (primarily neonicotinoids), are known to contain pesticide particles in the pollen and nectar they produce.
   - Non-crop plants near your marsh may be treated with systemic insecticides, which, when in bloom, can affect visiting pollinators (4a).
   - Even when not in bloom, the leaves of plants treated with a systemic insecticide may contain pesticides in the guttation droplets exuded from their leaves, which may be a water source for bees (4b). Guttation droplets are xylem sap produced by plants on the edges of leaves from accumulation of water in the plant at night.

5. **Be aware of insecticides applied to neighboring crops.** You can’t control your neighbors’ spray times or habits, but through awareness, you can help protect the bees on your property. One strategy to minimize your bees’ exposure to pesticides is to place hives away from the sides of your marsh that are adjacent to other managed crops. Another strategy is to communicate with your neighbors about the presence of hives on your property, as neighbors may be unaware of their presence.

**FIGURE 6.** How to protect pollinators on the cranberry marsh. Numbers correspond to the bullet points on pages 8 and 9.
**Pollination Agreement**

<table>
<thead>
<tr>
<th>Grower</th>
<th>Beekeeper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name</td>
</tr>
<tr>
<td>Address</td>
<td>Address</td>
</tr>
<tr>
<td>Phone number</td>
<td>Phone number</td>
</tr>
<tr>
<td>Crop</td>
<td></td>
</tr>
<tr>
<td>Crop location</td>
<td></td>
</tr>
</tbody>
</table>

**Colony rental**

- Distribution pattern of colonies shall be
- Number of colonies ordered
- Rental fee for grade A colonies
- Rental fee for grade B colonies
- Compensation for additional movement of bees or other extras
  - **Total rental fee**

**The grower agrees to:**
1. Give _____ days of notice to deliver colonies into crop.
2. Give _____ days of notice to remove colonies from crop.
3. Pay one-half of the total agreed upon fee when the bees are delivered.
4. Pay in full within _____ days after the delivery date.
5. Use less-toxic pesticides in the crop during the rental period, except with the understanding and consent of the beekeeper.

**The beekeeper agrees to:**
1. Open and demonstrate the strength of colonies randomly selected by the grower.
2. Register with DATCP when entering into Wisconsin.
3. Acknowledge and communicate with the grower regarding hive histories and potential stressors to the hives.
4. Leave the bees in the crop for a period necessary for effective pollination, estimated to be approximately _____ days with a maximum period of _____ days, after which time the bees will be removed or a new contract negotiated.
5. Ensure that colonies are properly located and will remain in good condition while pollinating the crop.

**Grower signature**

**Beekeeper signature**

For season

Date ________________

**APPENDIX A. Sample short agreement between cranberry grower and beekeeper.**
Pollination Agreement

Parties to this agreement

This agreement is between ____________________________, hereinafter referred to as “grower”; and ____________________________, hereinafter referred to as “beekeeper.”

Terms of this agreement

1. **Colony numbers.** Beekeeper agrees to deliver and grower agrees to rent a minimum of ________ honeybee colonies for ________ season(s).

2. **Honeybee colony populations.** Honeybee colony populations will average 11 frames of bees* per colony, which means bees covering 11 frames or more.

   *A frame of bees being defined as a deep (9 ⅝”) frame with 70% bee coverage per frame at 70 degrees Fahrenheit or higher, with wind no higher than 5 mph.

3. **Price, payment terms, and duration of this agreement.** Beekeeper and grower agree to the pollination base rate per honeybee colony of ________ per hive for the duration of this contract.

   a. **Pricing adjustments.** This is an 11-frame contract. If beekeeper delivers less than an 11-frame average, the adjusted base rate will represent the prevailing price, less $10 per frame average shortfall. If beekeeper delivers a 14-frame average or better, an additional $5.00 bonus per colony will be paid over the base rate. If the average frame count is below 14 frames, only the percentage of hives meeting or exceeding 14 frames will receive the additional $5.00 bonus.

   b. **Payment terms.** Annually, ________ % of invoice total is due upon delivery and the ________ % balance is due on or before the ________ of each year.

   c. **Renewability.** This contract will automatically renew on or before January 1 of each year unless terminated in writing by either party.

4. **Prompt delivery and removal of honeybee colonies.**

   a. **Delivery.** Grower agrees and requests that beekeeper begin early prebloom placement of honeybee colonies in the pollination locations or staging sites (i.e., pooling yards—see **Other conditions**) at/near the cranberry beds to facilitate quick and complete delivery on or before bloom, and to provide a “safety margin” (i.e., honeybees on site) for unexpected early bloom. Full delivery of all honeybee colonies will be completed on or before 10% of full bloom on all beds, spray schedule permitting.

   b. **Removal.** Beekeeper agrees to remove honeybee colonies promptly when released by the grower. Beekeeper and grower agree that the release of honeybee colonies will begin no later than one week after cranberries have achieved 90% of full bloom. Removal must be complete within 7 days of the initial release date.

Date ____________________________

For season ____________________________

continued on following page
Other conditions to this agreement

1. **Communications between beekeeper and grower.** Beekeeper and grower agree to maintain communication well in advance regarding pollination needs, estimated dates, and deadlines to facilitate prompt delivery and removal of the honeybee colonies. Beekeeper understands that weather conditions may often dictate an unexpected change and will adapt as quickly and completely as possible to accommodate these unexpected schedule changes common to farming.

2. **Off-site pooling yards for rapid delivery and removal of honeybee colonies.** Grower agrees to provide off-site pooling yards reasonably located with gross capacity of all yards equal to approximately 80% of contracted hives.

3. **Compensation for damage and/or destruction of honeybee colonies.** Grower agrees to pay beekeeper the cost of the loss of bees and equipment that might be burned, damaged by equipment, and/or vandalized by man or beast (bears especially) during the cranberry pollination period. A complete loss of a honeybee colony will be set at $200 per complete unit (including equipment).

4. **Postbloom pesticide application.** When grower needs to apply postbloom pesticides, beekeeper shall be given a five-day advance notice so that all hives can be removed from the cranberry fields. A minimum of four days' notice in exceptional situations will be considered acceptable. If beekeeper is unable to remove all honeybee colonies (hives) within this period of time following advance notice, beekeeper will hold grower harmless for any honeybee losses that might arise due to necessary pesticide application with bees still present in one or more fields. Grower guarantees that no highly or moderately toxic pesticides will be applied for less time than complies with label before bee placement in a one-mile radius (for example, Diazinon carries a highly toxic cautionary label for honeybees, recommendations are that bees not be present for five days plus after application).

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Grower signature  
Print name  
Company name

Beekeeper signature  
Print name  
Company name
**Apps for your mobile device**

- **Reduce Bee Poisoning from Pesticides** app, Pacific Northwest Extension: [https://catalog.extension.oregonstate.edu/pnw591](https://catalog.extension.oregonstate.edu/pnw591)
- **Mode of Action** app, Insecticide Resistance Action Committee: [http://www.irac-online.org/moa-app-available-for-android-apple-devices/](http://www.irac-online.org/moa-app-available-for-android-apple-devices/)
- **IPM Toolkit** app, University of Wisconsin Integrated Pest Management: [http://ipcm.wisc.edu/apps/ipmtoolkit/](http://ipcm.wisc.edu/apps/ipmtoolkit/)

**Websites**

- Wisconsin Department of Agriculture Apiary Inspection Services: [https://datcp.wi.gov/Pages/Programs_Services/ApiaryBeekeepingInspections.aspx](https://datcp.wi.gov/Pages/Programs_Services/ApiaryBeekeepingInspections.aspx)
- The Wisconsin Wild Bee Guide provides identification information for bees commonly found in Wisconsin in the spring and early summer: [https://energy.wisc.edu/bee-guide/](https://energy.wisc.edu/bee-guide/)
- The Xerces Society website has information on nesting sites for wild bees and pollinator gardens (http://xerces.org/enhancing-habitat-for-native-bees/), as well as general information about pollinator conservation: [http://xerces.org/pollinator-conservation/](http://xerces.org/pollinator-conservation/)
- The Driftwatch website provides location information for some honeybee hives, along with beekeeper contact information, to allow growers to contact and communicate with beekeepers before spraying: [http://www.driftwatch.org](http://www.driftwatch.org)
- The Wisconsin Fruit website has information about pollination as well as other aspects of fruit crop production in Wisconsin: [http://fruit.wisc.edu](http://fruit.wisc.edu)

**Publications**
