

Bee Better Certified™

Production Standards



BEE BETTER
CERTIFIED
XERCES SOCIETY



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Cover photo: Long-horned bee foraging on plains coreopsis planted in beneficial insect habitat on a farm in Montana (The Xerces Society / Jennifer Hopwood).

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Bee Better Certified™ Production Standards

Bee Better Certified™ works to give bees a healthy place to live.

beebettercertified.org

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At its core, Bee Better Certified is about ensuring adequate habitats for bees on working farms. The habitats need to be rich in wildflowers and protected from pesticides. (The Xerces Society / Kelly Gill.)

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Getting Started

This document outlines the standards for a farm seeking to comply with the requirements for Bee Better Certification. It can serve as a resource for questions about the pollinator habitat needed on your farm, pesticide mitigation practices, and other elements of Bee Better that influence farming practices. It can help clarify what information you'll need to develop a Bee Better Certified Plan (BBCP), the prerequisite to applying for certification.

The BBCP must be submitted to the certifier upon application for Bee Better Certification and made available during farm inspections. The applicant will also need to provide annual updates to the certifier to notify of any changes to farm management related to the Bee Better Certified standards.

Bee Better Certified does not require that a farm certify all acreage or crops: it is possible to certify on a parcel, field, or crop basis as long as habitat buffer and other requirements are met. Only those acres included in the BBCP will be "certified" and subject to the standards.

The production standards are divided into four sections:

- Pollinator habitat,
- Pesticide mitigation,
- Managed bumble bees, and
- Record keeping.



The requirements must be met in all four sections to achieve certification.

Definitions of significant terms or phrases are included with each standard. For explanations of additional terms or phrases, please see the glossary in [Appendix R](#).

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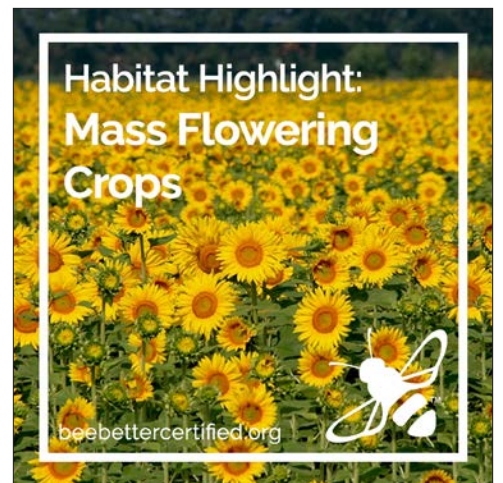
Pollinator Habitat

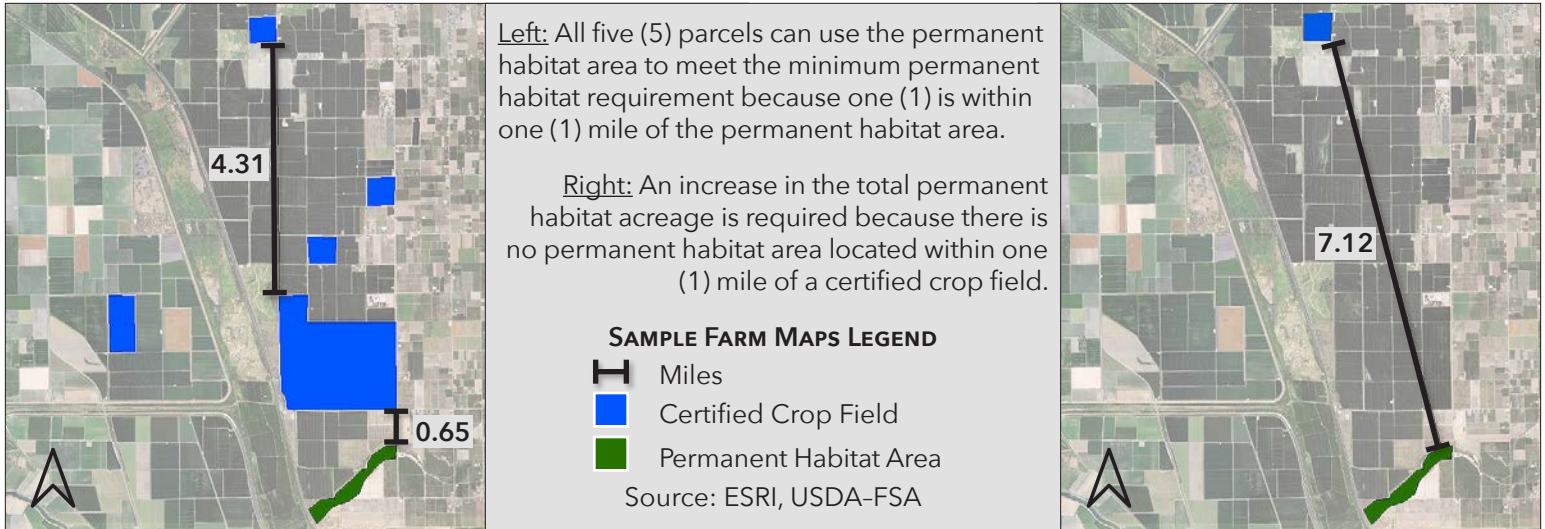
1.1 Habitat Minimums

- a. At least 5% of certified acreage must be in pollinator habitat.
 - i. At a minimum, one-fifth ($\frac{1}{5}$) of the required habitat (i.e., 1% of the certified acreage) must be permanent habitat; the remainder may be in temporary habitat. If 5% or more of the certified acreage is in permanent habitat the operation is not required to have temporary habitat.
 - ii. Temporary habitat must not exceed four-fifths ($\frac{4}{5}$) of the required habitat and it must include one or more flowering, pollinator-attractive plant species. If temporary habitat fails to germinate or takes several seasons to establish, documentation (seed order receipts, photographs etc.) must be provided to verify planting. Follow-up seeding must occur and be verified if temporary habitat fails. Examples of temporary habitat: cover crops, annual insectary strips, mass-flowering crops.
 - iii. Temporary habitat must achieve at least 50% bloom prior to termination. Temporary habitat cannot consist of resident vegetation; it must be intentionally planted.
 - iv. If mass-flowering, pollinator-attractive crops are identified as part of the temporary habitat, they may not account for more than one-fifth ($\frac{1}{5}$) of the required habitat (i.e., no more than 1% of the certified acreage).
 - v. Habitat measurements must follow the Habitat Measurement Guidelines in [Appendix B](#).
 - vi. The land identified as habitat (permanent and temporary) within an operation's BBCP must be owned and/or controlled by the operator and available for habitat management and inspection.
 - vii. Permanent pollinator habitat should be prioritized to be on, adjacent to, or within one (1) mile of at least one (1) Bee Better Certified crop field. This is



Temporary Habitat vs. Mass-Flowering Crops





measured from the edge of a certified crop field to the edge of certified habitat. All certified permanent habitat must be at least 30' from neighboring property.

viii. To meet the permanent habitat requirement, habitat may be broken up into multiple areas, as long as permanent habitat areas are in compliance with 1.1.a.vii and are within 100 miles of at least one (1) Bee Better certified crop field. In situations where an operation is unable to establish **any** permanent habitat within one (1) mile of at least one (1) Bee Better certified crop field (e.g., due to lack of space), more than 1% of certified acreage is required to be in permanent habitat as required by 1.1.a.ix.

ix. As long as some permanent habitat is within one (1) mile of at least one (1) certified crop field, the total certified permanent habitat acreage is not required to be increased. However, in situations where an operation is unable to establish any permanent habitat on, adjacent to, or within one (1) mile of at least one (1) certified crop field, an increase in the total permanent habitat acreage is required. In cases where an increase in the total permanent habitat acreage is required, the permanent habitat acreage must be established no further than 100 miles from certified production fields and, as the distance between permanent habitat areas and certified crop fields increases, the following incremental increase in total required permanent habitat must be met:

1. 1-20 miles away from certified production fields: minimum 2% of certified acreage must be permanent habitat
2. 21-40 miles away from certified production fields: minimum 3% of certified acreage must be permanent habitat
3. 41-60 miles away from certified production fields: minimum 4% of certified

Permanent Habitat Examples



- acres must be permanent habitat
4. 61-80 miles away from certified production fields: minimum 5% of certified acreage must be permanent habitat
 5. 81-100 miles away from certified production fields: minimum 6% of certified acreage must be permanent habitat
- x. Permanent pollinator habitat must not be planted in locations where nitroguanidine neonicotinoids were applied in the previous two (2) years. Application includes the planting of seeds treated with nitroguanidine neonicotinoids.

Definitions

Certified acreage includes crop production acreage and all pollinator habitat not in a production field.

Pollinator habitat is defined as areas containing flowering plants and/or nesting sites. Remnant natural habitat and newly created habitat are both considered pollinator habitat. Invasive or noxious species will not be considered for bloom abundance requirements of pollinator habitat.

Growing season is defined as the natural growth period of native vegetation in the area. This varies by region.

Permanent habitat is present year-round, although the plants may be in a vegetative or dormant state during the winter. Examples of permanent habitat: hedgerows, perennial or re-seeding wildflower strips, riparian forests, and filter strips.

Temporary habitat typically dies back annually. It may remain in one location or move around the certified parcels (as is the case with rotating cover crops). Temporary habitat must be on, adjacent to, or within one (1) mile of certified crop fields.

Mass-flowering crops provide abundant floral resources during their bloom period, which is often short. Examples of mass-flowering crops: almond, blueberry, canola, and sunflower. When differentiating between mass-flowering crops and temporary habitat, we: a) consider whether the crop was already a core part of the crops planted, and b) whether the primary purpose of the crop is revenue.

Relevant Appendices

§ [Appendix A: On-Farm Habitat Practices That Can Be Managed to Support Pollinators](#)

§ [Appendix B: Habitat Measurement Guidelines](#)

1.2 Bloom

- a. Permanent habitats must have a minimum of three (3) flowering species present during each season. Permanent habitat may be free of flowering species during natural, cyclical, locally occurring dormant seasons.
- b. Permanent pollinator habitat must contain a significant proportion of native, pollinator-attractive plants.
 - i. For new permanent habitat, at least 70% of the vegetation established must be native to the region and preferably acquired from local sources.
 - ii. In natural or mature created permanent habitats, at least 35% of the species must be native.
- c. Across permanent habitat areas the combined vegetative cover of the plant species in bloom must be classified “abundant” or “common” in each season. In desert regions (defined as arid ecosystems that receive fewer than 25 cm [10"] of precipitation a year on average as determined by certifier) habitat cover will be lower than temperate and tropical regions. In these regions the plant species in bloom in permanent habitat areas must have a combined vegetative cover classified as “common” or “sparse”. A protocol for assessing remnant vegetation cover can be found in [Appendix C](#).

- i. Abundance Categories:

Abundant: Numerous individuals of the flowering species are present (51- 100% cover).

Common: Several individuals of the flowering species are present (11- 50% cover).

Sparse: Only a few individuals of the flowering species are present (1- 10% cover).

Absent: No flowering species are present (0% cover).



The Xerces Society/Jessa Kay Cruz (all photos)

Definitions

Flowering / pollinator-attractive species can include trees, shrubs, or forbs known to provide pollen and/or nectar to pollinators.

Native plants are species that are indigenous to a region, i.e., those that occurred historically in an area without human intervention. In United States see USDA PLANTS database for native status. <https://plants.sc.egov.usda.gov/java/>

New habitat is any habitat less than three years old or habitat created following initial certification by a farm entity.

Region having definable ecological and geographic characteristics; i.e., Sonoran Desert or Upper Midwest.

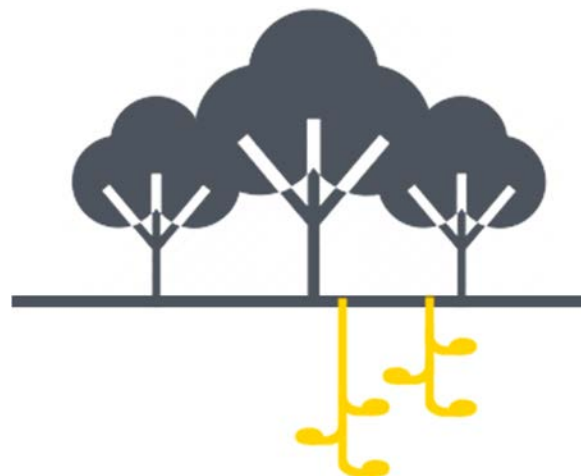
Relevant Appendices

§ *Appendix C: Recommended Protocol for Assessing Remnant Vegetation*

§ *Appendix D: Bloom Abundance Categories*

1.3 Nesting Features

- a. Other than shallow tillage for weed control, no tillage is to be conducted in or around permanent habitat areas.
- b. Any known mass-aggregated pollinator nesting sites must be identified and protected (i.e., those of alkali bees, or other gregarious, mass-nesting, soil- or cliff-dwelling species).
 - i. Known nesting areas outside crop fields must be left undisturbed.
 - ii. Identified nesting areas must be marked on a map and, if necessary, physically flagged to identify them to farm workers.
 - iii. Employees must be trained in the location and protection of nest sites.
- c. At least 5% of plants in new permanent pollinator habitat plantings must be comprised of pithy-stemmed plants and plants that are used for nest cell materials; some of each category must be included. Operations are encouraged to prioritize larval host plants for species of butterfly shown to be in decline, such as, in appropriate areas milkweed for monarch butterflies.



Relevant Appendices

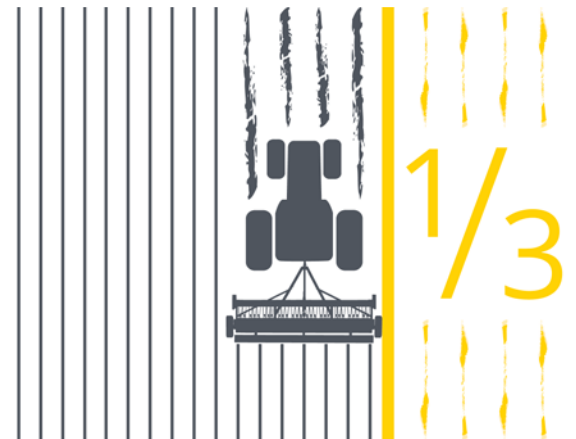
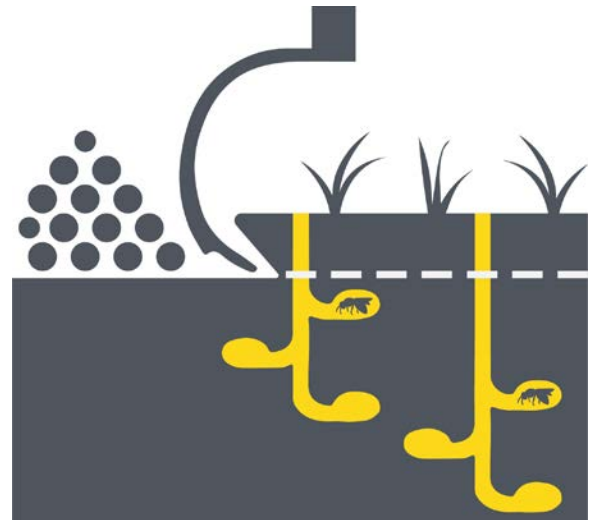
§ [Appendix E: Identifying Native Bee Nests](#)

§ [Appendix F: Pithy-Stemmed Plants That Above-Ground Nesting Bees Use for Nest Sites](#)

§ [Appendix G: Plants That Above-Ground Nesting Bees Use as Nesting Materials to Create Cell Divisions](#)

1.4 Tillage

- a. Develop a standard operating procedure (SOP) for how to reduce the impact of tillage activities on ground-nesting bee nests located within crop fields and in non-crop areas.
 - i. The SOP should demonstrate that existing tillage practices are low risk or that new practices reduce the risk of disturbance to ground-nesting bees.
 - ii. The SOP should encompass at least one-third ($\frac{1}{3}$) of the total certified acreage each year.
 - iii. The SOP must address at least two (2) of the following:
 1. Tillage depth
 2. Timing of tillage
 3. Frequency of tillage
 4. Equipment type
 5. Location of tillage



Relevant Appendix

§ [Appendix H: Example Tillage Standard Operating Procedures \(SOPs\)](#)

2

Pesticide Mitigation

2.1 Preventive Non-Pesticide Management

- a. Develop a written pest/disease scouting and monitoring protocol and demonstrate that scouting and monitoring occurs regularly through the growing season on all certified acreage. This requirement may be waived on operations that do not use insecticides or fungicides.
- b. Implement and maintain at least two (2) preventive non-chemical pest management strategies, and one (1) more if fungicides are used during pre-bloom and/or bloom time of the certified crop(s). Fungicides may only be used on a crop during its pre-bloom or bloom-time if at least one non-chemical pest management strategy is used to directly address the fungal concern prompting the application(s).
 - i. Select strategies from the Bee Better Certified Non-Pesticide Management Strategies ([Appendix J](#)).
 - ii. Document all approved preventive non-chemical pest management strategies (refer to [Appendix J](#) for guidance) using the BBCP or the Non-Pesticide Management Record form.

Relevant Appendices

§ [Appendix I: Pest Scouting and Monitoring Guidance](#)

§ [Appendix J: List of Approved Non-Pesticide Management Strategies](#)

2.2 Pesticide Application

- a. There must be no unjustified use of pesticides employed against insects, mites, and diseases.
 - i. A justified use must be supported by evidence that an economically damaging pest or disease outbreak exists or has strong potential to exist.
 - ii. Farm-specific scouting and monitoring records must be used to demonstrate an outbreak. Additional documentation (e.g., extension publications, newspaper articles) that supports the severity of the issue may also be submitted.
 - iii. Documentation must provide evidence that an economic threshold has been exceeded. If no threshold is available, provide an expert opinion. Experts may include a certified pest control adviser, accredited crop consultant, extension agent, or other credentialed independent pest management

specialist. Advice or recommendations from pesticide or seed company representatives is not considered sufficient evidence to justify pesticide use.

- iv. Even if use is shown to be justified, growers must follow all other Bee Better Certified pesticide mitigation standards.

Note: Standard 2.2a does not apply to weeds and herbicide use. We do not require scouting and monitoring records nor economic injury thresholds as justification for the use of any herbicides.

- b. During bloom for crops that are visited by or pollinated by insects, do not apply, or allow to drift, to any flowering plants (including weeds) products containing any pesticide rated as Level I under the Bee Precaution system maintained by the University of California Statewide Agricultural and Natural Resources IPM Program. See [Appendix K](#).
 - i. Certain crops are exempt from this standard (see [Appendix L](#)).
- c. Never apply, within three (3) days of one another, pesticides that jointly may increase toxicity to bees.
 - i. Use the online Bee Precaution pesticide rating tool from University of California Statewide Agricultural & Natural Resources Integrated Pest Management Program to determine if there is potential for a pesticide combination to increase toxicity. See [Appendix M](#) for instructions.
- d. The use or application of nitroguanidine neonicotinoids (clothianidin, dinotefuran, imidacloprid, and thiamethoxam), including the use of seeds treated with nitroguanidine neonicotinoids, is prohibited on certified land.
- e. Do not use genetically modified crops that express pesticides or are resistant to herbicides.
- f. Do not use conventional soil fumigants (see [Appendix N](#)).
- g. Do not use avicides, other than those that only act as repellents and do not cause injury, illness, or death to wild birds.

Definitions

Pesticides are any substance or mixture of substances intended for preventing, destroying, repelling or mitigating a pest or disease; or intended for use as plant or insect growth regulators, defoliants, desiccants, or nitrogen stabilizers. The term pesticide includes bactericides, fungicides, herbicides, insecticides, miticides, molluscicides, nematocides, avicides, repellents and piscicides. Pesticides may be conventional, biopesticides, or antimicrobials.

Pesticide applications include any activity that introduces a pesticide into the environment for the purposes of controlling pests, including but not limited to spraying, dusting, and chemigation. We also consider the planting of pesticide-coated seed a pesticide application.

Pre-bloom will commence 10 days prior to when bloom is expected to occur.

Bloom is defined as the time period from when first blooms open until petal drop or closure of all blooms (e.g., squash blossoms are open for a single day, but spent flowers can remain attached for a long period, still attracting pollinators, after they cease to be viable). See [Appendix L](#) for a list of exempt crops, those that are not visited by insects and that do not bloom (e.g., leafy greens not grown for seed production).

Relevant Appendices

§ [Appendix K: List of Pesticides Prohibited During Bloom in Crops and Temporary Habitat Areas Under Bee Better Certified](#)

§ [Appendix L: Crops That Are Exempt from Bloom-Time Pesticide Application Standard](#)

§ [Appendix M: Bee Precaution Use Instructions](#)

§ [Appendix N: List of Soil Fumigants Prohibited Under Bee Better Certified](#)

2.3 Minimizing Off-Site Movement of Pesticides

- a. Aerial application of pesticides is prohibited, except that, aerial applications of fungicides are allowed under the following conditions:
 - i. Other application methods are not feasible,
 - ii. The fungicide is not listed in [Appendix K](#) and,
 - iii. An appropriate justification and drift prevention plan has been reviewed and approved by the certifier as part of the operation's BBCP prior to any aerial application of fungicides.
 - iv. Aerial applications of fungicides are not allowed within 60' of permanent habitat areas.
 - v. Justification for the use of aircraft to apply fungicides must be documented, and fall into one of the following categories:
 1. Field conditions (i.e., wet soil which makes ground applications impractical).
 2. Shortage of ground-applicator equipment available during the window needed to treat the pest. Where equipment shortages are the cause, the grower must provide proof of the lack of equipment.
 3. Risk of damage to ripe crops from ground application.
 - vi. Operators must adhere to their aerial application/drift prevention plan and maintain records of aerial applications per the plan.
- b. Calibrate application equipment according to manufacturer specifications at least on an annual basis.

c. Establish a pesticide-free buffer around permanent pollinator habitat on land that is owned or controlled by the operation.

i. Spatial buffers must be established within **land that is controlled by the certified farming operation** and must meet the following minimum widths:

1. 40' for ground-based applications, except air-blast sprayer applications.
2. 60' for air-blast and aerial fungicide applications.

If spatial buffers consist of an unsprayed section of crop field, then the buffer must be clearly delineated via physical markers and/or GPS polygons.

ii. Vegetative buffers (drift fences) of species that are not attractive to pollinators may be used instead of spatial buffers, or if spatial buffer distances cannot meet the above requirements.

1. Vegetative buffers should be comprised of densely planted, small-needled evergreen species.
2. Airflow must be maintained within vegetative buffers.
3. Vegetative buffers should be designed to grow above spray release height. Until the buffer is above spray release height any pesticide applications on your property must be in accordance with the drift and runoff precautions on the label in order to minimize potential for movement into permanent pollinator habitat.

iii. Minimum spatial buffers in land that is controlled by the certified farming operation must be met on property controlled by the operation.

1. Where permanent pollinator habitat exists or is installed on certified land adjacent to neighboring property, a minimum 30-foot-wide buffer must be established between the habitat and neighboring farm's boundary.
2. If insecticide application practices on neighboring properties change, spatial buffer requirements around permanent habitat created on your parcels can be waived, although when feasible, we recommend incorporating a vegetative buffer.

iv. Herbicides (except paraquat dichloride) may be applied within buffers to non-flowering plants.



Definitions

- A **spatial buffer** is an unsprayed space, such as roads or equipment turnarounds, or a section of crop that remains unsprayed.
- A **vegetative buffer** is a border of plants not attractive to pollinators, such as conifers, grown between pollinator habitat and crop fields. It is designed to capture pesticide drift.

Relevant Appendices

§ [Appendix O: Aerial Application of Fungicides Justification and Application/Drift Prevention Plan Guidance](#)

2.4 Pesticide Use in Pollinator Habitat

- a. Do not use pesticides other than herbicides in designated permanent pollinator habitat.
 - i. Do not apply herbicides to plants in bloom, including weeds. Outside of bloom, if herbicides are used, apply with targeted methods only (e.g., spot-spraying rather than blanket applications)
 - ii. Paraquat dichloride herbicide must not be used within permanent pollinator habitat at any time.
- b. If a justified use must occur where in-field designated temporary habitat is in bloom and the chemical used is rated as Level I under the Bee Precaution system maintained by the University of California IPM Program (see [Appendix K](#)) the habitat must be mowed 24 hours prior to the application to disperse pollinators.
 - i. Herbicide can only be used in designated temporary habitat in a targeted manner to counter weeds of concern.

Relevant Appendix

§ [Appendix K: List of Pesticides Prohibited During Bloom in Crops and Temporary Habitat Areas Under Bee Better Certified](#)

3

Managed Bumble Bees

3.1 Use of Commercial Bumble Bees

a. Do not use commercial bumble bees for open field pollination. Commercial bumble bees may only be used in secure indoor facilities, such as screened greenhouses, in which they are not able to interact with wild bumble bees.

i. Carefully screen or seal vents and other greenhouse entrances to prevent individual bumble bees from entering or exiting the facility.

b. Only use native managed bumble bee species that are produced within their native ranges.

i. Use queen excluders on all colonies.

ii. After crop bloom, do not release any individuals from commercially acquired bumble bee colonies into the wild.

iii. Properly dispose of all individuals through incineration, freezing, or hot soapy water (complete submersion for at least two [2] minutes).

iv. Dispose of materials (pollen, nectar, bedding, and cardboard) through incineration. Do not burn plastic materials, but dispose of in sealed trash bags.



Relevant Appendix

§ [Appendix Q: Distribution Maps of Commercially Managed Bumble Bees](#)

4 Record Keeping

4.1 Required Records

The following records must be submitted with your Bee Better Certified Plan and provided to inspectors during on-site inspections and/or provided to the certifier upon request.



a. Habitat records

- i. Provide 8.5" x 11" map(s) of the parcels to be certified. The map may be an Assessor's Parcel Map, an aerial photo, or other map that clearly shows the boundaries of the parcel. The following information must also be included on the map:
 - Parcel name or code
 - Indication of north
 - Locations of temporary habitat with identifiers
 - Locations of permanent habitat with identifiers (must be shown in relation to location of crop production requested for Bee Better certification)
 - Locations of spatial and vegetative buffers
 - Neighboring land uses to permanent habitat areas
 - Useful landmarks (e.g., other buildings, distinctive features, etc.)
 - Location of known nest sites, as applicable
 - Location of tillage practices described in this plan
 - Location of greenhouses where commercial bumble bees are housed, as applicable
- ii. Provide evidence, such as plant order invoices, to document plant material origin and native status for new habitat areas.
- iii. Include planting specifications and/or seed mixes. Operations need to submit either a completed plant list using the Bee Better plant list template or a plant list in another format that contains the same information as the Bee Better plant list template.

b. Pesticide use and mitigation records

- i. Pesticide use records must be submitted and maintained for any certified acreage.
 - Where a state requires reporting, if the forms capture all necessary

information, you may use those forms. Otherwise, use the Pesticide Use Record form in the Bee Better Certified Documents Center.

- ii. Pest scouting and monitoring protocol. Additional information can be found in [*Appendix I: Pest Scouting and Monitoring Guidance*](#).
 - iii. Records must be maintained for pest monitoring and scouting. Examples are provided in [*Appendix I: Pest Scouting and Monitoring Guidance*](#). Records must contain the following information:
 - Crop
 - Pest
 - Date
 - Number counted or severity category (low/moderate/high; define how categories relate to action threshold)
 - Unit (e.g., per leaf, per plant, per row)
 - Whether action threshold defined in protocol was reached
 - iv. Maintain records of preventative non-pesticide management strategies using the Non-Pesticide Management Record in the BBCP or the form located in the Bee Better Certified Documents Center. See also [*Appendix J*](#).
 - v. All of the above listed records must be maintained for all areas within the certified acreage, including any buffer areas that may be outside of certified acreage but within controlled lands for permanent pollinator habitat.
 - vi. Other documentation to support a justified use, including the name, license number (if applicable) and contact information for experts used to provide certified operations with pesticide use recommendations. For more details on required information and expert qualifications, see [*Appendix I: Pest Scouting and Monitoring Guidance*](#).
 - vii. Maintain all seed purchase records and make them available upon request from the certifier and at inspection.
 - viii. If similar records are maintained for Organic or other third party verified certification programs, these records can be accepted by the certifier pending review (examples include seed orders and pesticide use records)
- c. Bumble bee records
- i. Maintain records of all colony purchases, steps taken to secure greenhouses, and disposal dates/procedures. These records must be submitted with Bee Better Certified Plan for farms.

Relevant Appendix

§ [*Appendix I: Pest Scouting and Monitoring Guidance*](#)

5

Temporary Variance from the Production Standards

A temporary variance from the requirements as set forth in the Bee Better Production Standards may be granted by the Xerces Society for Invertebrate Conservation (Xerces). Temporary variances may be granted for production standards when there is a declared natural disaster, state of emergency within the region of an operation or conditions leading to large scale crop loss. Any temporary variances will be granted for a specified period of time and subject to extension as Xerces deems necessary.

A certified operation must submit the request for a temporary variance to their certifier. The request must include the following:

- a. Formal request in writing, including supporting documentation justifying the need for the variance and any preventative steps taken leading up to the off standard practice. Supporting documentation should include appropriate public records showing the declared natural disaster, state of emergency or state/city records justifying the claim, or reputable & relevant third party documentation.
- b. Description of how records and any procedures or practices impacted by the temporary variance will be maintained, if the variance were granted.
- c. Description of the ways in which impacts from the variance may be mitigated.

The formal process, required documentation and additional information can be found in the document center at beebettercertified.org/docs.

Appendices

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L	Crops That Are Exempt from Bloom-Time Pesticide Application Standard	<i>page 39</i>
M	Bee Precaution Use Instructions	<i>page 40</i>
N	List of Soil Fumigants Prohibited Under Bee Better Certified	<i>page 43</i>
O	Aerial Application of Fungicides Justification and Application/Drift Prevention Plan Guidance	<i>page 44</i>
P	Vegetative Pesticide Buffer Recommended Species	<i>page 46</i>
Q	Distribution Maps of Commercially Managed Bumble Bees	<i>page 47</i>
R	Glossary	<i>page 49</i>

Appendix A:

On-Farm Habitat Practices That Can Be Managed to Support Pollinators

Native flowering plants must be a major component of habitat plantings for it to be considered pollinator habitat. It is critical to manage pollinator plantings over time in order for them to maintain their value. The USDA Natural Resources Conservation Service (NRCS) provides access to technical advice and cost-share funding for on-farm conservation practices, many of which can be used to benefit pollinators. Some practices listed below, such as Pasture and Hay Planting, need to be managed specifically to benefit pollinators; if they are hayed during bloom, pollinators could be harmed or killed by equipment. If a planting is being added to control pesticide drift, do not include flowering species. Instead include non-attractive vegetation such as pine trees whose needles are capable of catching drift droplets (see [Appendix P: Vegetative Pesticide Buffer Recommended Species](#)). Specific guidance on pollinator habitat management will be provided in Bee Better Certified™ Conservation Plans.

The following list is adapted from Table 3 in “Using Farm Bill Programs for Pollinator Conservation” USDA Technical Note No. 78. All practices are as defined by the Natural Resource Conservation Service (NRCS).

[N] = Practice likely to also bolster nest sites.

Permanent Pollinator Habitat

- Channel Bank Vegetation [N]
- Conservation Cover (a.k.a. wildflower meadow) [N]
- Constructed Wetland [N]
- Contour Buffer Strips [N]
- Critical Area Planting [N]
- Field Border [N]
- Grassed Waterway
- Hedgerow Planting [N]
- Pasture and Hay Planting
- Range Planting [N]
- Restoration and Management of Declining Habitats [N]
- Riparian Forest Buffer [N]
- Riparian Herbaceous Cover [N]
- Silvopasture Establishment
- Stream Habitat Improvement and Management

Streambank and Shoreline Protection
Tree/Shrub Establishment [N]
Upland Wildlife Habitat Management [N]
Vegetative Barriers
Wetland Enhancement [N]
Wetland Restoration [N]
Wetland Wildlife Habitat Management [N]
Windbreak/Shelterbelt Establishment or Renovation [N]

Temporary Pollinator Habitat

Alley Cropping (if crop blooms)
Cover Crop (including insectary strips)
Herbaceous Wind Barrier
Mass-flowering crops [N]
Multi-Story Cropping

Additional Practices That Augment or Protect Nesting Habitat

Residue and Tillage Management, No-Till/Strip Till/Direct Seed

Appendix B:

Habitat Measurement Guidelines

Convert all measurements from feet to acres following initial calculation.

Linear habitat features (e.g., hedgerows, beetle banks)

Single row: Length (in linear feet) × 10'

Double row: Length (in linear feet) × 20'

Other habitat areas (e.g., wildflower meadows, insectary strips)

Length × width

Note: if the habitat has non-linear edges, you can approximate measurements

Individual plants

Expected mature plant size, squared

For example, a shrub expected to reach 4' width at maturity would take up 16' sq. of space.

Understory habitat (e.g., alley crops)

Length × width

Note: This covers where the habitat is actually located; do not include cropped areas between habitat rows.

Appendix C:

Recommended Protocol for Assessing Remnant Vegetation

Recommended Protocol for Assessing Potential Remnant Habitat Under Bee Better:

1. Walk the proposed habitat area and conduct a quick visual assessment to decide if the area is relatively uniform in the composition of its plant community.
 - i. If the area is not uniform, decide how to break it up into sub-sections.
2. For each area (or subsection), list all species present and attaining greater than 2% cover in the habitat.
 - i. If there are species of significance (for example, pithy-stemmed species) with less than 2% cover, you should list these but are not required to do so.
3. Estimate the percent each plant species covers when viewed from above.
 - i. For a riparian area, forest, or multi-layer shrubland, total percent cover may be greater than 100%.
 - ii. Include non-native species.
 - iii. For a large area where it is not possible to easily assess the entire habitat, choose a smaller, representative and make percent cover estimation based off of that area. Indicate the area on the farm map in your Bee Better Plan.

Appendix D:

Bloom Abundance Categories

Abundance Categories:

Abundant: Numerous individuals of the flowering species are present (51-100%).

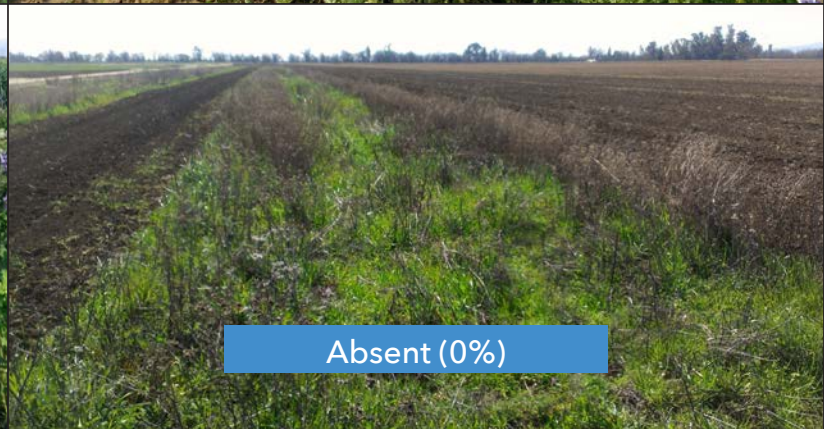
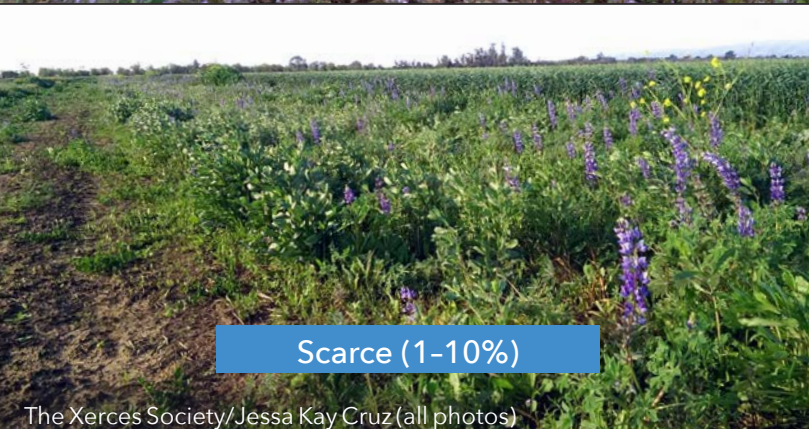
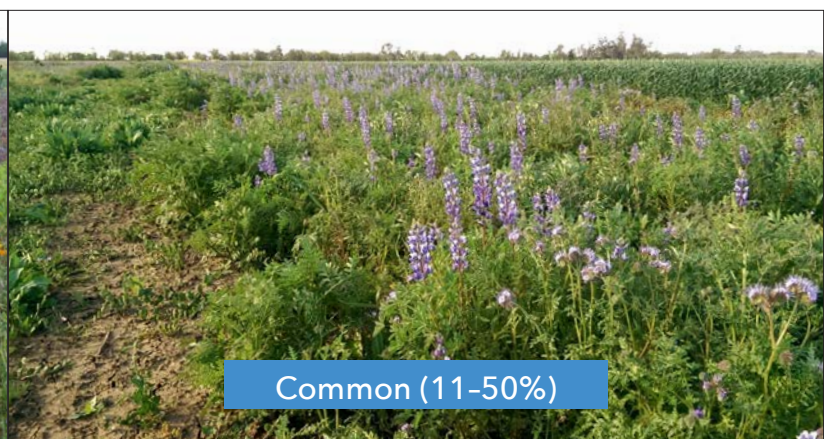
Common: Several individuals of the flowering species are present (11-50%).

Sparse: Only a few individuals of the flowering species are present (1-10%).

Absent: No flowering species are present (0%).

Examples of Application of This Standard

- a. A wildflower meadow in spring has six (6) native species in bloom, with a combined cover of 70% (classification = abundant);
- b. A hedgerow in fall has three (3) species in bloom with a combined cover of 15% (classification = common).



The Xerces Society/Jessa Kay Cruz (all photos)

Appendix E:

Identifying Native Bee Nests

Ground-Nesting Bees

Ground-nesting bees can be found along field margins as well as within fields themselves, particularly if the field contained bee-attractive crops. They even nest on compacted dirt roads. Bees nest in both flat areas and on slopes. They prefer well-drained soils that don't contain too much sand or clay. Sandy soils tend to cause nest collapse while clay soils can get too wet.

To find nests in the ground, look for circular holes in bare or lightly vegetated areas. Hole sizes range from the diameter of a pencil eraser to the width of a pencil tip. Another indicator of a bee nest is a tower of excavated mud—called a tumulus—around the entrance. Some nests that are being actively excavated may contain loose soil around the entrance similar to an ant nest, but the circle of soil is comprised of soil of varying grain size. This loose soil often blows away over time.

While most ground-nesting bees are solitary, some bee species will nest in close proximity to one another. These nest aggregations can be easy to locate because they are abuzz with activity of hundreds of bees excavating and provisioning their nests. Sometimes aggregations appear in the same location year after year, but in some cases, the bees may move locations periodically to avoid building up too many parasites. If you notice bees have disappeared from a known nesting site, look around to see whether they have moved to a different area of your farm.



The Xerces Society/Eric Lee-Mäder



The Xerces Society/Hillary Sardiñas



The Xerces Society/Mace Vaughan

Above-Ground Nesting Bees

Above-ground nesting bees nest in wood or pithy-stemmed plants. Examine dead wood, such as rafters, fence posts, or snags for open circular cavities, holes capped with mud, leaves, or a resin-like material. This indicates finished nests. Be aware that some native wasps will also cap their nests with mud. You can also look for holes in the tops or sides of hollow-stemmed plants such as elderberry or blackberry. If you are pruning a pithy-stemmed plant (for a list of plants bees nest in, see [Appendix E](#)), leave long branches as most bees need at least 6" in order to complete their nest.



Bumble Bees

Bumble bee nest can be challenging to find, in fact, in England they have trained dogs to sniff out nest locations. Abandoned rodent burrows, especially at the base of woody plants or trees tend to be preferred locations. Native bunchgrasses can also create cavities beneath them when they mature, which can also host bumble bee colonies. Less frequently, bumble bees nest in cavities in trees or houses. Bumble bee colonies tend to move locations every year, so if you found a nest location in one year, it might not get occupied again for a few years.

What to Do if You Find Nests

You are most likely to find nests during the growing season, when bees actively enter and exit their nests to provision their young with pollen. If nests are discovered they should be marked, identified to farm workers, and protected from disturbance.

What if You Don't Find Any Nests

If you don't find nests, it does not indicate bees are not nesting on your property; bee nests can be extremely challenging to locate. Ground nests can be obscured by pebbles or light vegetation. Sometimes ground-nesting bees use cracks in the soil to initiate a nest entrance to facilitate digging. Nests of above-ground nesting bees may not be visible because they are inside plant stems. Make sure your tillage Standard Operating Procedure leaves potential nesting areas undisturbed ([Standard 1.5](#)). Avoid heavy mulching, which can cover prime ground-nest sites (though mulch can also be a great weed management tool when establishing hedgerow habitat).

Appendix F:

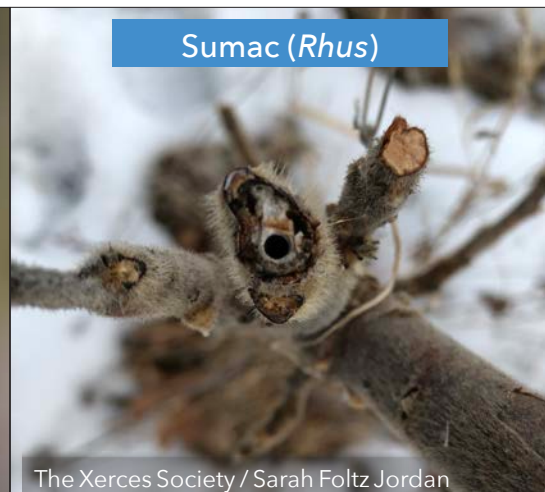
Pithy-Stemmed Plants That Above-Ground Nesting Bees Use for Nest Sites

This list includes plant species in which bees have been observed to nest. It is a living document and is continually added to, based on additional documentation.

Common name(s)	Scientific name	Region*	Status
Agave/Century plant	<i>Agave</i> spp.	WE, So	native
Allegheny blackberry	<i>Rubus allegheniensis</i>	WE, EA, MW, So	native
American black elderberry	<i>Sambucus nigra</i> ssp. <i>canadensis</i>	PNW, WE	native
Beardtongue	<i>Penstemon</i> spp.	N.A.	native
Bee balm	<i>Monarda</i> spp.	N.A.	native
Black raspberry	<i>Rubus occidentalis</i>	EA, MW, So	native
Blackberry	<i>Rubus</i> spp.	WE	native
Blue elderberry	<i>Sambucus nigra</i> ssp. <i>cerulea</i>	WE (TX)	native
Boneset	<i>Eupatorium</i> spp.	EA, MW, So	both
Boxelder	<i>Acer negundo</i>	N.A.	native
Common reed	<i>Phragmites australis</i>	N.A.	both
Coneflower	<i>Echinacea</i> spp.	EA, MW, So	native
Cow parsnip	<i>Heracleum</i> spp.	N.A.	both
Culver's root	<i>Veronicastrum</i> spp.	EA, MW, So	native
Cup plant/Rosinweed	<i>Silphium</i> spp.	So	native
Elderberry	<i>Sambucus</i> spp.	WE, PNW	native
Eryngo	<i>Eryngium</i> spp.	N.A.	both
Evening primrose	<i>Oenothera</i> spp.	N.A.	both
False-indigo bush	<i>Amorpha fruticosa</i>	N.A.	native
Field thistle	<i>Cirsium discolor</i>	MW, SE, NE	native
Golden Alexanders	<i>Zizia</i> spp.	N.A.	native
Goldenrod	<i>Solidago</i> spp.	N.A.	native
Horseweed	<i>Conyza canadensis</i>	N.A.	native
*Region—Transcontinental (N/A), North (NO), Northeast (NE), East (EA), Southeast (SE), South (So), Midwest (MW), Southwest (SW), West (WE), Pacific Northwest (PNW)			

Common name(s)	Scientific name	Region*	Status
Hydrangea	<i>Hydrangea arborescens</i>	EA	native
Hydrangea	<i>Hydrangea</i> spp.	N.A.	nonnative
Ironweed	<i>Vernonia</i> spp.	MW, So	native
Joe-pye weed	<i>Eutrochium</i> spp.	N.A.	native
Lobelia	<i>Lobelia</i> spp.	N.A.	both
Meadow-rue	<i>Thalictrum</i> spp.	N.A.	both
Mountain mint	<i>Pycnanthemum</i> spp.	WE, EA, MW, So	native
Poison sumac	<i>Toxicodendron vernix</i>	MW, NE, SE	native
Pokeweed	<i>Phytolacca americana</i>	WE, EA, So	native
Raspberry	<i>Rubus idaeus</i>	WE	both
Rose	<i>Rosa</i> spp.	N.A.	both
Salmonberry	<i>Rubus spectabilis</i>	WE, PNW	native
Smooth sumac	<i>Rhus glabra</i>	N.A.	native
Snowberry	<i>Symphoricarpos</i> spp.	N.A.	native
St. John's-wort	<i>Hypericum</i> spp.	N.A.	both
Sumac	<i>Rhus</i> spp.	N.A.	native
Thimbleberry	<i>Rubus parviflorus</i>	WE, MW, PNW	native
Thistle	<i>Cirsium</i> spp.	N.A.	both
Ticktrefoil	<i>Desmodium</i> spp.	EA, MW, So	both
Twinberry	<i>Lonicera involunrata</i>	WE	native
Wild sunflower	<i>Helianthus</i> spp.	N.A.	native
Yucca	<i>Yucca</i> spp.	N.A.	native

*Region—Transcontinental (N/A), North (NO), Northeast (NE), East (EA), Southeast (SE), South (SO), Midwest (MW), Southwest (SW), West (WE), Pacific Northwest (PNW)



Appendix G:

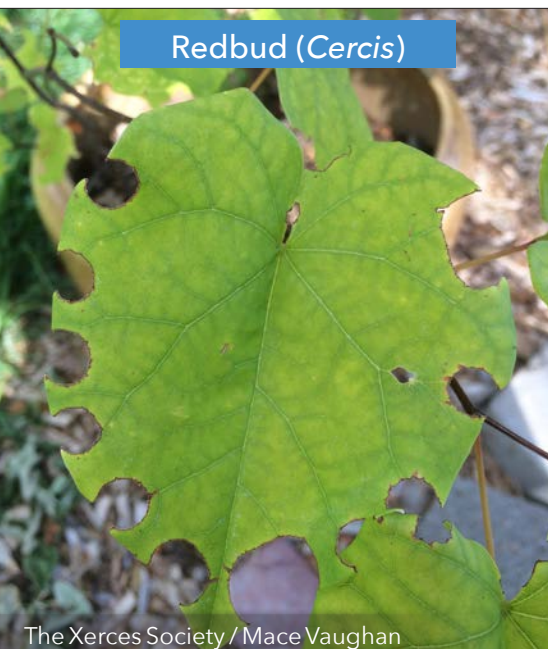
Plants That Above-Ground Nesting Bees Use as Nesting Materials to Create Cell Divisions

This list based upon records of bees gathering nesting materials. It is a living document and is continually added to, based on additional documentation.

Common name(s)	Scientific name	Region*	Native	Plant part	Documented bee use
Alfalfa	<i>Medicago sativa</i>	N.A.	agricultural	leaves	<i>Megachile rotundata</i>
Alsike clover	<i>Trifolium hybridum</i>	N.A.	nonnative	leaves	<i>M. rotundata</i>
American beautyberry	<i>Callicarpa americana</i>	So	native	leaves	<i>Megachile</i> spp.
American buckwheat vine	<i>Brunnichia ovata</i>	So	native	leaves	unknown
Bird's-foot trefoil	<i>Lotus corniculatus</i>	N.A.	nonnative	leaves	<i>M. rotundata</i>
Buckwheat	<i>Eriogonum</i> spp.	N.A.	native	leaves	<i>M. rotundata</i>
Buttonbush	<i>Cephalanthus occidentalis</i>	WE, EA, So	native	leaves	unknown
California redbud	<i>Cercis orbiculata</i>	WE	native	leaves	<i>Megachile</i> spp.
Checkerbloom	<i>Sidalcea</i> spp.	WE, PNW, SW	native	leaves & petals	<i>Megachile</i> & <i>Heriades</i> spp.
Cicer milkvetch	<i>Astragalus cicer</i>	WE, NO	nonnative	leaves	<i>M. rotundata</i>
Clarkia	<i>Clarkia</i> spp.	WE, PNW	native	petals	<i>Megachile</i> spp.
Cranberrybush	<i>Viburnum opulus</i>	EA, NO, MW	both	leaves	unknown
Crown vetch	<i>Securigera varia</i>	N.A.	nonnative	leaves	<i>M. rotundata</i>
Cusick's checkerbloom	<i>Sidalcea cusickii</i>	PNW	native	petals & leaves	<i>Megachile</i> spp.
Dogwood	<i>Cornus florida</i>	EA, So, MW	native	leaves	unknown
Eastern redbud	<i>Cercis canadensis</i>	WE, MW, So	native	leaves	<i>Megachile</i> spp.
Evening primrose	<i>Oenothera</i> spp.	N.A.	native	petals	<i>Megachile</i> spp.
Farewell-to-spring	<i>Clarkia amoena</i>	WE, PNW	native	petals	<i>Megachile</i> spp.
*Region—Transcontinental (N/A), North (NO), Northeast (NE), East (EA), Southeast (SE), South (So), Midwest (MW), Southwest (SW), West (WE), Pacific Northwest (PNW)					

Common name(s)	Scientific name	Region*	Native	Plant part	Documented bee use
Giant flutter mill (evening primrose)	<i>Oenothera macrocarpa</i>	MW, So	native	petals	unknown
Globemallow	<i>Sphaeralcea</i> spp.	N.A.	both	leaves	unknown
Maple	<i>Acer</i> spp.	EA	both	leaves	<i>Megachile</i> spp.
Marsh gentian	<i>Eustoma exaltatum</i>	WE, MW, So	native	petals	<i>Megachile</i> spp.
Mountain laurel	<i>Kalmia latifolia</i>	EA	native	leaves	unknown
Nootka rose	<i>Rosa nutkana</i>	WE, PNW	native	leaves	unknown
Rose	<i>Rosa</i> spp.	N.A.	both	leaves	<i>Megachile</i> spp.
Rugosa rose	<i>Rosa rugosa</i>	EA	nonnative	leaves	<i>Osmia pumila</i>
Sainfoin	<i>Onobrychis</i> spp.	N.A. (exc. So)	agricultural	leaves	<i>M. rotundata</i>
Showy ticktrefoil	<i>Desmodium canadense</i>	EA, MW, So	native	leaves	unknown
Small bayberry	<i>Morella caroliniensis</i>	EA, So	native	leaves	<i>Megachile</i> spp.
Strawberry	<i>Fragaria</i> spp.	N.A.	both	leaves	<i>Osmia</i> spp.
Thistle	<i>Cirsium</i> spp.	SW, WE, PNW	native	fibers	Anthidini
Virginia sweetspire	<i>Itea virginica</i>	EA, So	native	leaves	unknown
White clover	<i>Trifolium repens</i>	N.A.	nonnative	leaves	<i>M. rotundata</i>
Zigzag clover	<i>Trifolium medium</i>	NE	nonnative	leaves	<i>M. rotundata</i>

*Region—Transcontinental (N/A), North (No), Northeast (NE), East (EA), Southeast (SE), South (So), Midwest (MW), Southwest (SW), West (WE), Pacific Northwest (PNW)



Appendix H:

Example Tillage Standard Operating Procedures (SOPs)

Types of SOPs

Tillage depth: No till or reduced tillage depth—ideally no deeper than 4"—following planting of crops known to be attractive to pollinators.

Timing of tillage: In half of the fields, tillage will only occur during time periods when bees are actively building nests in the spring and summer (not during time periods when bees are developing in their nests and unable to create new nests).

Frequency of tillage: Crop fields containing crops known to be attractive to bees will only be tilled 1-2× per year for the year following planting.

Location of tillage: Some fields or strips within fields left untilled each year and 50% of field edges are managed through mowing instead of tilling.

Proportion of farm tilled: At least 1% of farm (field and/or edges) left untilled every year.

Equipment type: Will use chisel plows instead of mold board ploughs.

Examples

For row crop:

1. Crop fields containing crops known to be attractive to bees will only be disked at 4" depth no more than twice during the year following planting. Examples of crops that are attractive to bees include, but are not limited to, pumpkins, squash, sunflowers, strawberries, tomatoes, and peas. Fallow fields will be mowed instead of tilled.
2. Field edges will be mowed instead of cultivated.

For perennial crop:

1. Every other alley between rows will be scraped annually instead of tilled.
2. Use chemical fallow in field edges.

If already using no-till system:

1. No-till will continue to be practiced throughout the farm.

Appendix I:

Pest Scouting and Monitoring Guidance

Scouting and Monitoring Protocol Table

Bee Better Certified requires producers to develop a monitoring and scouting protocol for all pests that are controlled using both pesticidal and non-pesticidal options (not including weeds and the use of herbicides for control of them). Evidence of scouting and monitoring must also be provided to justify use of pesticides. Records of these activities must be submitted during inspection. This appendix contains guidance on how to compile suitable records.

The table below is an example of how a monitoring and scouting protocol could be recorded and presented.

CROP(S) AFFECTED	PEST OR DISEASE	THRESHOLD		MONITORING		
		ACTION*	SOURCE	START DATE	END DATE	FREQUENCY†
Leafy vegetable	Aphids	2 per plant (seedling) or 7 per plant (established plants)	Midwest Vegetable Production Guide for Commercial Growers	When plants emerge	Harvest	2x/ week
Pistachio	Mealybug	1 adult female per 10 clusters	University of California IPM	Mid-May (if evidence of presence was found during the dormant season)	June (late season treatments are not effective)	1x/ week
Raspberry	Cane Blight (cane disease)	1-3% of canes are infected with the disease	Washington State University Extension	Dormant period	Harvest	Check every crop stage for disease symptoms

*E.g. # eggs/plant

†E.g., daily, weekly, etc.

Scouting and Monitoring Records

In addition to the outline monitoring and scouting plan, you are required to submit scouting and monitoring records indicating the implementation of the protocol(s). Bee Better Certified does not have a standard form for this. You may use your own form or one of the following examples. At minimum the form must include the following information:

- Crop
- Pest
- Date
- Number (#) counted or severity (low/moderate/high; define how categories relate to action threshold)
- Unit (e.g., per leaf, per tree, per row)
- Whether the action threshold was reached

When no established economic threshold exists, supply expert opinion related to the severity of the pest or disease outbreak. Experts may include a certified pest control adviser, accredited crop consultant, extension agent, or other credentialed independent pest management specialist. You may also provide additional documentation (e.g., extension publications, newspaper articles) that supports the severity of the issue.

When providing information from an expert, please include the following:

- Name of expert
- Title
- Company
- Accreditation # (if applicable)
- Phone number
- Email address

Experts must provide the following information when recommending control efforts:

- The nature of the outbreak (severity, locations of outbreaks, etc.)
- Recommendations for control
- Alternatives to control option recommended (if available)

Example Form 1

FIELD IDENTIFIER	SAMPLE NUMBER	CROP	PEST	DATE	# COUNTED	UNIT	THRESHOLD REACHED?

(Add rows as necessary)

Example Form 2

FIELD IDENTIFIER	SAMPLE NUMBER	PLANT	# LEAVES/ PLANT	# OF TARGET PEST		OTHER INSECT	INSECT DAMAGE	DISEASE (Dis.)	% LEAVES AFFECTED BY DIS.
				1 PER PLANT	2 PER PLANT				
		1							
		2							
		3							
		4							
		5							

(Add rows as necessary)

Threshold reached? _____

Example Form 3 (with sample information)

FIELD IDENTIFIER: Back 40

SAMPLE NUMBER: 2

(Circle one)

CROP STAGE New leaves | Flower buds | First bloom | Full bloom | Green fruit | Harvest | Post-harvest

SCOUTING METHOD Beat sheet | 5 minute visual | x leaflets/ site | Pheromone trap | Sticky trap

PEST OR DISEASE	THRESHOLD	COUNTS				
		1	2	3	4	5
Pest 1						
P2...						
Disease 1						
D2...						

Appendix J:

List of Approved Non-Pesticide Management Strategies

Bee Better Certified requires producers to record, implement, and maintain at least two (2) non-pesticide preventive pest management strategies as part of the certification process and a third to address fungal concerns if fungicides are being used during pre-bloom and/or bloom time. Incorporating preventive management strategies such as biological, cultural, mechanical, and physical control can reduce reliance on pesticide control as well as minimize pesticide risks to the environment and nontarget organisms like bees (Landis and Orr 2000; Naranjo et al. 2015). Long-term pest prevention is a basic principle of IPM, and incorporating a combination of different pest management options can help achieve this IPM goal.

Conservation biological control (CBC)—the creation of habitat that supports populations of natural enemies of crop pests—is another effective preventive management strategy. CBC has been shown to augment natural enemies of crop pests while reducing pest populations that tend to thrive in weedy, unmanaged borders (Landis et al. 2000). Habitat designed to protect pollinators also benefits natural enemies of crop pests, and has been shown to contribute to crop pest control (Morandin et al. 2014). To further enhance natural enemy populations consider adding insectary plants to pollinator habitat. *Farming With Native Beneficial Insects* (Storey Publishing, 2014) is a good source of information on insectary plants and the beneficial insects they support.

In the tables that follow, please indicate which of the named practices are or will be utilized. We recognize that not all methods are applicable to all producers or cropping systems. If you are not currently practicing any non-pesticide management strategies, select at least two that are well-suited to your farm and describe how they will be implemented.

References

- Landis, D. A., S. D. Wratten, and G. M. Gurr. 2000. Habitat management to conserve natural enemies of arthropod pests in agriculture. *Annual Review of Entomology* 45(1):175-201.
- Morandin, L. A., R. F. Long, and C. Kremen. 2014. Hedgerows enhance beneficial insects on adjacent tomato fields in an intensive agricultural landscape. *Agriculture, Ecosystems & Environment* 189:164-170.

Habitat Enhancement Practices for Conservation Biocontrol

PRACTICE	PRESENT USE		FUTURE USE	
	Currently used?	Description of how practice <i>is applied</i> (WHERE/WHEN)	To be adopted?	Description of how the practices <i>will be applied</i> (WHEN/WHERE)
Conservation cover (In perennial crop systems, maintain permanent ground covers of native grasses and forbs for weed control and natural enemy refuge.)				
Beetle banks (Establish bunchgrasses to promote predatory ground beetles.)				
Companion planting (Plant species next to one another that enhance one another's growth and protect on another from pests.)				
Intercropping (Use crops that are attractive or useful to beneficial insects)				
Other (Please describe)				

Additional Preventive Practices (Physical, Cultural, Mechanical, or Biological)

PRACTICE	PRESENT USE		FUTURE USE	
	Currently used?	Description of how practice <i>is applied</i> (WHERE/WHEN)	To be adopted?	Description of how the practices <i>will be applied</i> (WHEN/WHERE)
Timing of planting or harvest to avoid pest damage (including choice of crop maturity date)*				
Physical barriers (e.g., floating row covers, fruit bagging)				
Mechanical pest removal (e.g., hand-picking, vacuuming, or pure water sprays to remove pests)				
Cultural practices to improve air flow (e.g., plant spacing, row orientation, pruning)*				

(continued on next page)

PRACTICE	PRESENT USE		FUTURE USE	
	Currently used?	Description of how practice <i>is applied</i> (WHERE/WHEN)	To be adopted?	Description of how the practices <i>will be applied</i> (WHEN/WHERE)
Trap-cropping (note that flowering trap crops are not permitted to be sprayed during bloom)				
Crop rotation*				
Use of resistant varieties (for insect pest and disease control)†*				
Use of cover crops, green manures, and composts (for improved soil fertility)				
Mating disruption (including use of pheromone traps for pest reduction)				
Mulching, hand-weeding, mechanical weeding, or grazing (for weed control)				
Mulching plant material (for disease control)*				
Sanitation—removal of debris/infested plant material*				
Sanitation—equipment*				
Eliminate alternate hosts or sites for pests and disease*				
Soil solarization (for nematodes, soil-borne diseases, or weed seeds)				
Strip-cropping (to disrupt pest movement)				
Late water (cranberries)*				
Other (please describe)				
Additional Preventive Practices (Physical, Cultural, Mechanical, or Biological)				

*Denotes fungal preventive non-chemical pest management strategies.

(† Herbicide resistant crops are not permitted on Bee Better Certified farms, and therefore do not count as resistant varieties. We refer to crop varieties that have been bred to be insect and/or disease resistant.)

Appendix K:

List of Pesticides Prohibited During Bloom in Crops and Temporary Habitat Areas Under Bee Better Certified

During bloom of crops and temporary habitat areas, the Bee Better Certified program prohibits application of products containing any pesticide rated as Level I under the Bee Precaution system maintained by the University of California IPM Program, if the crop is visited by or pollinated by insects. See Standard 2.2.b. Crops listed under Appendix L are exempt from this standard.

The list of Bee Precaution Level I active ingredients below is current as of January 2020. For a current Level I list at any time, see <https://www2.ipm.ucanr.edu/beeprecaution/>

Note that all nitro-guanidine neonicotinoids (clothianidin, dinotefuran, imidacloprid, and thiamethoxam) are always prohibited on all Bee Better Certified lands.

ACTIVE INGREDIENT	EXAMPLE TRADE NAME(S)	TYPE
ABAMECTIN*	(Agri-Mek)	Acaricide; Insecticide
ACEPHATE	(Orthene)	Acaricide; Insecticide
ALDICARB soil-applied	(Temik)	Acaricide; Insecticide; Nematicide
ALLETHRIN	(-)	Insecticide
ALPHA-CYPERMETHRIN	(-)	Insecticide
AZINPHOS-METHYL	(Guthion)	Acaricide; Insecticide
BETA-CYFLUTHRIN	(Baythroid)	Insecticide
BIFENTHRIN	(Brigade)	Acaricide; Insecticide
CARBARYL*	(Sevin)	Acaricide; Insecticide
CARBOFURAN	(Furadan)	Acaricide; Insecticide
CHLORPYRIFOS	(Lorsban)	Acaricide; Insecticide
CYANTRANILIPROLE	(Exirel, Verimark)	Insecticide
CYFLUTHRIN	(Baythroid)	Acaricide; Insecticide
CYPERMETHRIN	(Ammo)	Acaricide; Insecticide
DELTAMETHRIN	(DeltaGard)	Insecticide
DIAZINON	(Diazinon AG)	Acaricide; Insecticide
DIMETHOATE	(Dimate)	Acaricide; Insecticide
EMAMECTIN BENZOATE	(Proclaim)	Acaricide; Insecticide
ESFENVALERATE	(Asana)	Acaricide; Insecticide
FENPROPATHRIN	(Danitol)	Acaricide; Insecticide

ACTIVE INGREDIENT	EXAMPLE TRADE NAME(S)	TYPE
FIPRONIL*	(-)	Insecticide
GAMMA-CYHALOTHRIN	(Bolton Insecticide, Cobalt)	Insecticide
INDOXACARB	(Avaunt)	Insecticide
LAMBDA-CYHALOTHRIN	(Warrior)	Acaricide; Insecticide
MALATHION	(Malathion)	Acaricide; Insecticide
METAFLUMIZONE	(-)	Insecticide
METHAMIDOPHOS	(Monitor)	Acaricide; Insecticide
METHIDATHION	(Supracide)	Acaricide; Insecticide
METHOMYL	(Lannate)	Acaricide; Insecticide
METHYL PARATHION	(Penncap-M)	Insecticide
MILBEMECTIN	(-)	Acaricide
NALED	(Dibrom)	Acaricide; Insecticide
NOVALURON	(Diamond, Rimon)	Insecticide
OXAMYL	(Vydate)	Acaricide; Insecticide
PCNB	(Autilus, Terraclor)	Fungicide
PERMETHRIN*	(Ambush, Pounce)	Acaricide; Insecticide
PHORATE^	(-)	Insecticide
PHOSMET	(Imidan)	Acaricide; Insecticide
PROPENOFOS	(Curacron)	Insecticide
PYRETHRINS	(PyGanic)	Insecticide
PYRIDABEN	(Nexter)	Acaricide; Insecticide
QUINTOZENE	(Autilus, Terraclor)	Fungicide
RESMETHRIN	(-)	Insecticide
SULFOXAFLOL	(Closer)	Insecticide
TOLFENPYRAD	(Hachi SC Insecticide)	Acaricide; Fungicide; Insecticide
ZETA-CYPERMETHRIN	(Mustang)	Acaricide; Insecticide

* Baits with this active ingredient are acceptable at any time

^ If soil-applied, this active ingredient is acceptable during bloom

Appendix L:

Crops That Are Exempt from Bloom-Time Pesticide Application Standard

This list includes crops that are wind pollinated or self-pollinated. We excluded crops that insects visit, such as corn (many bees collect pollen from corn tassels despite the fact that it is wind pollinated) and soybean (which is mostly self-pollinated, but benefits from insect pollination and is visited by bees).

Amaranth	Rye
Barley	Sorghum
Kamut	Spelt
Millet	Teff
Oats	Triticale
Rice	Wheat

The following crops either do not need to bloom or are not allowed to bloom before harvest and are therefore not pollinated by insects. When these crops are grown for seed production, then they do bloom and the bloom-time pesticide application standard does apply to them.

All brassicas, e.g.:

<i>Broccoli</i>	<i>Brussels sprouts</i>
<i>Cabbage</i>	<i>Cauliflower</i>
<i>Choi</i>	<i>Collards</i>
<i>Kale</i>	<i>Kohlrabi</i>
<i>Radish</i>	<i>Turnip</i>
Asparagus	Endive
Basil	Fennel
Beets and chard	Garlic
Carrots	Lettuce
Chives	Onions
Chicory	Parsley
Cilantro	Parsnip
Dill	Spinach

Appendix M:

Bee Precaution Use Instructions

Website

<http://www2.ipm.ucanr.edu/beeprecaution/>

Toxicity Ratings

The Bee Precaution tool was developed by the University of California Statewide Agricultural & Natural Resources Integrated Pest Management Program (UC IPM) to identify pesticides that can harm pollinators. Bee Precaution developed three categories for pesticides, which follow both the US EPA designations as well as the Oregon State University publication, *How to Reduce Bee Poisoning from Pesticides* (Johansen et al. 2013).

CATEGORY	RECOMMENDATION
I- Highly toxic	Do not apply or allow to drift to plants that are flowering.
II- Moderately toxic	Do not apply or allow to drift to plants that are flowering, except when the application is made between sunset and midnight if allowed by the pesticide label and regulations.
III- Practically non-toxic	No bee precaution, except when required by the pesticide label or regulations.

The Bee Precaution rankings are based on current scientific information primarily for adult honey bees (*Apis* spp.), but where available, includes information on toxic to honey bee brood and toxicity to non-*Apis* bees.

Bee Better Certified requires that Level I under Bee Precaution (see Appendix K) not be applied during crop bloom (see Standard 2.2.b). We recommend that products containing pesticides classified as Level II by the Bee Precaution index be applied in the manner instructed by the index.

Synergistic Effects

Bee Better Certified also prohibits use of pesticides that jointly may increase toxicity if applied within three days of one another (Standard 2.2.c). The Bee Precaution database includes information that indicates whether two pesticides used in combination are more toxic to bees than they are when applied separately. This risk of increased toxicity

is indicated in both the “Mode of action” column (which lists the pesticide’s chemical group designated by a “FRAC” or “IRAC” number) and the “Other effects on bees” column (which lists the pesticide group codes that can increase toxicity when combined; see the image of a sample list in figure H1, below). The FRAC and IRAC codes refer to Mode of Action codes developed by the Fungicide Resistance Action Committee and the Insect Resistance Action Committee.

If a code appears in the “Other effects on bees” column and cross-references to the “Mode of action” column of the other pesticide listed—indicating that two pesticide groups can cause increased toxicity—then the pesticides in question cannot be applied within three days of one another. Example of pesticide groups that cannot be applied jointly are pyrethroid insecticides (IRAC3A) and DeMethylation Inhibitor (DMI) fungicides (FRAC3).

Figure L1. Sample of Bee Precaution search results

Common name (Example trade name)	Type	Mode of action	Rating	Other effects on bees	Toxic to honey bee brood	Toxic to other bee species
BIFENTHRIN (Brigade)	Acaricide; Insecticide	3A; 3A	I	FRAC3 FRACM5	—	✓
PROPICONAZOLE (Bumper, Orbit, Till)	Fungicide	3	II	IRAC3A IRAC4A IRAC4D IRAC15	—	✓

How to Use the Tool

To determine whether any pesticide combinations synergize, add the chemicals in question to the list of chemicals on the Bee Precaution webpage.

1. Select “Common name” or “Trade name”.
2. Leave the selection in first drop-down list as “All types” or, to narrow down the options, select a pesticide class from that list.
3. Select the pesticides from the second drop down list.
4. The pesticide name, trade name, type, mode of action, rating, other effects, and toxicity information will populate the table below.
5. You may add more than one pesticide to the list at a time, but may need to change the pesticide class in step 2. To remove a pesticide, click the blue “x” next to its name. To clear the entire table, click the blue “x” on the top line of the table.
6. To determine potential synergies, compare the number in the “Mode of action” column for one pesticide with the “FRAC” or “IRAC” number in the “Other effects on bees” column of another. The sample table in Figure L1 includes two pesticides, the insecticide Bifenthrin and the fungicide Priopiconazole. Bifenthrin

has a “Mode of action” number of 3A. The IRAC number in the “Other effects of Bees” column for Priopiconazole is “IRAC3A” (along with three other IRAC codes). This indicates that these two chemicals should not be applied within three days of one another. This synergy is also indicated because Bifenthrin has a FRAC3 designation and Priopiconazole has a listed “Mode of action” of 3.

7. To save the result of your Bee Precaution query, you can access the print menu by typing Control+P and then either print it or, by changing the “destination” to “Save as PDF”, save the page as a PDF file.

Resources

Insect Resistance Action Committee: <http://www.irc-online.org/>

- 2017 IRAC code list: <http://www.irc-online.org/documents/moa-classification/> (accessed June 7, 2017)

Fungicide Resistance Action Committee: <http://www.frac.info/>

- FRAC code list: https://www.frac.info/docs/default-source/publications/frac-code-list/frac-code-list-2020-finalb16c2b2c512362eb9a1eff00004acf5d.pdf?sfvrsn=54f499a_2
- Downloads: <https://www.frac.info/knowledge-database/downloads>

References

Johansen, E., L. A. Hooven, and R. R. Sagili. 2013. *How to Reduce Bee Poisoning from Pesticides*. Corvallis, OR: Oregon State University Extension Service. Available at <https://catalog.extension.oregonstate.edu/pnw591> (accessed June 7, 2017)

Appendix N:

List of Soil Fumigants Prohibited Under Bee Better Certified

Aluminum phosphide
Magnesium phosphide
Phosphine
Chloropicrin
Dazomet
1,3 Dichloropropene
Dimethyl disulfide (DMDS)
Methyl isothiocyanate (MITC)
Metam sodium/potassium
Methyl bromide

Appendix O:

Aerial Application of Fungicides Justification and Application/ Drift Prevention Plan Guidance

Certified growers who foresee the need to use aerial fungicide applications must develop a justification and application/drift prevention plan as part of their Bee Better Certification Plan and adhere to a 60' buffer for all applications near permanent pollinator habitat. The plan must include the following components:

- I. A description of how the operator will determine that aerial application is necessary and how justification will be documented. Where equipment shortages are the cause, the grower must provide proof of the lack of equipment.
- II. A record-keeping template for aerial applications that includes:
 - a. Map of the treated area
 - b. Name of PCA that recommended the application
 - c. Flight and application parameters: height of the flight, width of the effective deposition range, temperature range, wind speed and direction
 - d. Time of application
 - e. Measured wind speed and direction
 - f. Spray height
 - g. Spray pressure
 - h. GPS data where available
- III. A plan for drift reduction actions that will be taken when conducting aerial applications. Unless they conflict with label requirements, the following drift reduction actions are required for aerial application of fungicides and must be addressed in the operator's plan:
 - a. A plan to coordinate with the operation's PCA or the person directing the application to ensure the location of adjacent and nearby pollinator habitat is communicated to the aerial applicator. An application is not allowed within 60' of non in-field certified pollinator habitat.
 - b. Coordinates for all non in-field certified pollinator habitat must be entered into GPS to avoid overspray.
 - c. Aircraft should be equipped with Geographic Positioning Systems (GPS), if not, the habitat needs to be clearly marked on the ground and where safe a person must be present on the ground to verify direction of spray drift and avoidance of habitat.
 - d. Spray only when the wind is blowing away from designated pollinator habitat

and when speed is between 2-8 miles per hour (1.7-7 knots). Do not apply when winds are gusting above 8 mph.

- e. Avoid application during temperature inversions (**see Glossary for more information).
 - f. Avoid application when conditions are likely to cause evaporation - when temperatures during or after application will exceed 70°F (21° Celsius) and relative humidity is below 40%.
 - g. Use the lowest spray pressures recommended for the nozzle that will give acceptable coverage. Use the largest droplets that provide sufficient coverage and control.
 - h. Do not release spray at a height greater than 10' above the crop canopy unless a greater height is required for aircraft safety or special weather conditions.
 - i. Adjust for cross-winds swath displacement.
- IV. If more protective drift reduction measures are in the product label those measures must be followed instead of the above stated requirements (see label sections such as "Spray Drift Management" or "Advisory Information").

Appendix P:

Vegetative Pesticide Buffer Recommended Species

When planting a vegetative buffer to intercept chemical drift, use evergreen species that are not attractive to pollinators (do not bloom) to prevent pollinator exposure to any chemicals the buffer may intercept. The best pesticide drift protection comes from multiple rows of vegetation that include small-needled evergreens. Small-needled evergreens are two to four times as effective as broadleaf plants in capturing spray droplets and provide year-round protection. Two rows of evergreens can provide 60% density (40% porosity) which is recommended for capturing drift. A porous buffer is preferable to a solid buffer, which can push drift up and over it instead of capturing most of it. The buffer should be designed to grow as tall as the spray release height of the pesticide application equipment. To assist with rapid establishment of buffer plants, we recommend selecting bare root or container plants (e.g., in 5 gallon containers) that are at least 4' tall with an extensive root system.

Recommended Species

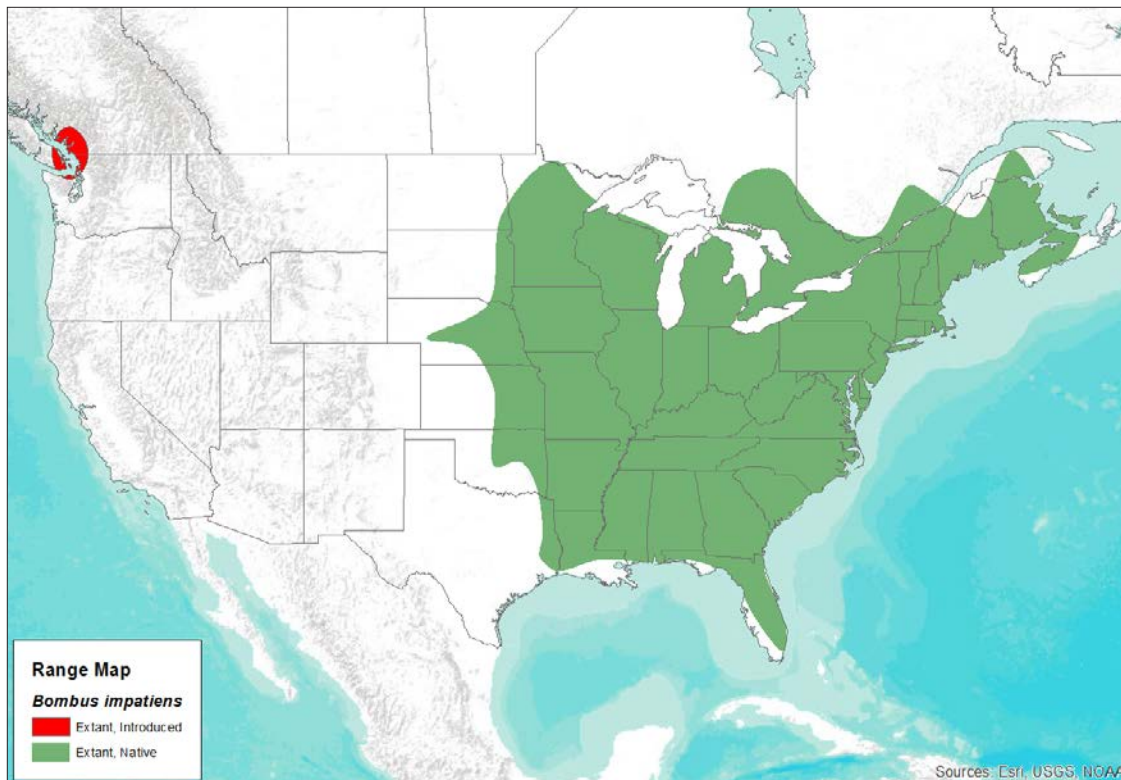
- Cypress
- Fir
- Juniper
- Pine (less preferred)
- Spruce
- Thuja (Arborvitae)

Appendix Q:

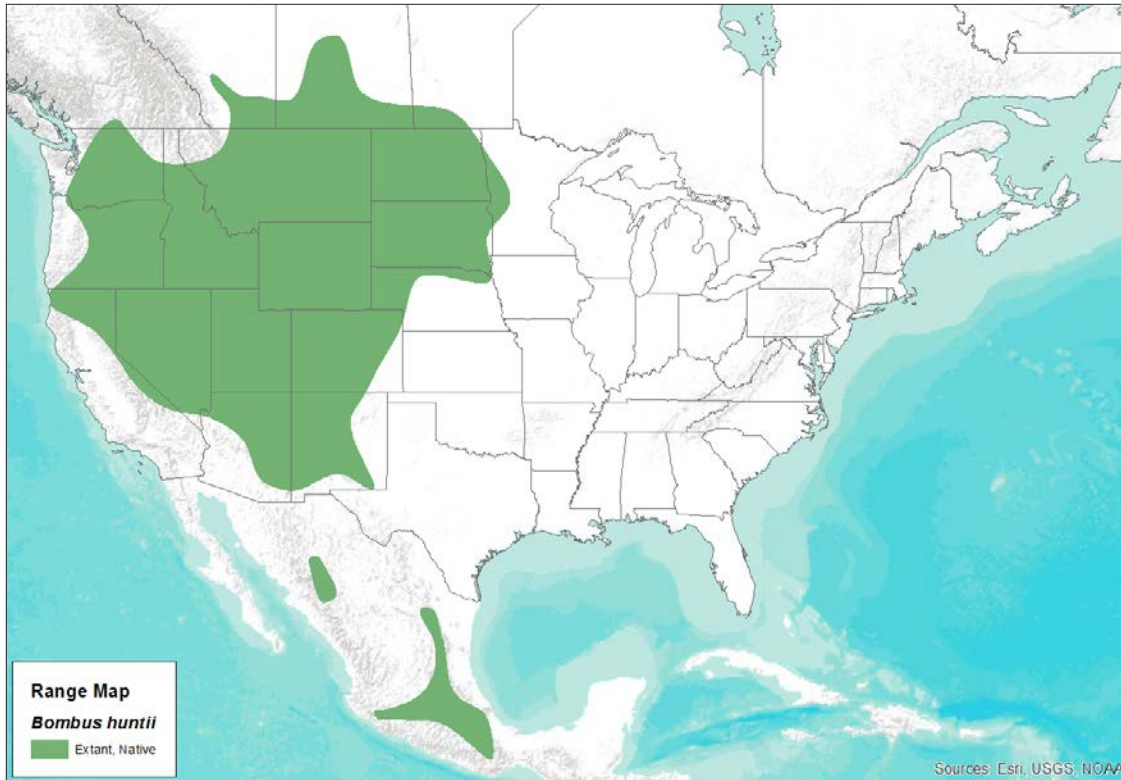
Distribution Maps of Commercially Managed Bumble Bees

The common eastern bumble bee (*Bombus impatiens*) is the principle species native to North America that is commercially managed for crop pollination (see Map Q1). Two other species, Hunt's bumble bee (*Bombus huntii*; Map Q2) and the yellow-faced bumble bee (*Bombus vosnesenskii*; Map Q3) are being developed for commercial use in the United States. Maps for other native species can be found at Bumble Bee Watch, <https://www.bumblebeewatch.org/app/#/species/profile>

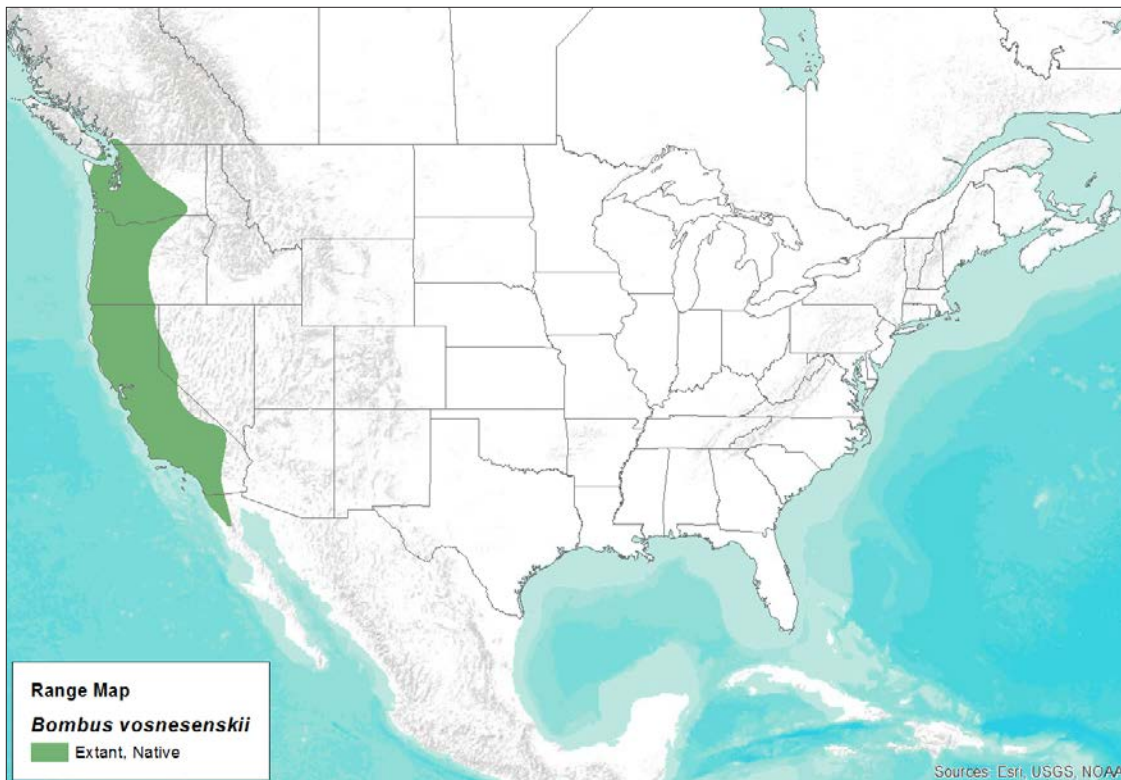
Map Q1. Distribution of the common eastern bumble bee (*Bombus impatiens*).



Map Q2. Distribution of Hunt's bumble bee (*Bombus huntii*).



Map Q3. Distribution of the yellow-faced bumble bee (*Bombus vosnesenskii*).



Appendix R:

Glossary

Beneficial insects Insects that contribute to farm or ecosystem functioning, including crop pollination and pest control. Pollinators and natural enemies (see definition below) are collectively referred to as “beneficial insects.” Other arthropods, including spiders, are also beneficial.

Biological control The use of natural enemies (predators, parasites, pathogens) to suppress pest insect populations.

Bloom The time period from when first blooms open until petal drop or closure of all blooms (e.g., squash blossoms are open for a single day, but spent flowers can remain attached for a long period after they cease to be viable). See [Appendix F](#) for a list of exempt crops—crops that are not visited by insects and crops that do not bloom (e.g., leafy greens not grown for seed production).

Certified A farm entity that has received certification from an accredited Bee Better certifying body.

Classical biological control Permanent suppression of a pest over a large area through the introduction of a predator, parasite, or disease from the pest’s native homeland. The idea is to re-establish the pest’s natural enemy complex to provide continual pest control. Natural enemies are only released following a thorough vetting process by USDA APHIS to ensure the biological control agent will not itself become a pest or attack native non-target organisms.

Companion planting Planting species next to crops that attract pest insects away from the crop.

Conservation biological control The protection and enhancement of insects and other organisms that provide natural pest control on a farm. This is accomplished by incorporating farm practices that create a favorable environment that conserve natural enemies in and around crop fields and enhance pest control. One of the leading practices for enhancing populations of natural enemies on farms is the conservation of natural habitat and creation of diverse, native habitat. (Bianchi et al. 2006; Tscharrntke et al. 2007; Landis et al 2000; Chaplin-Kramer et al 2011)

Controlled land Land that is either owned or leased by the certified entity.

Cover cropping Seasonal vegetative cover. In this case, we are referring to flowering cover crops, or mixes that contain flowering species.

Crop rotation Alternating different crops in fields or areas of a farm over time. Benefits include disrupting diseases and pest spread and maintaining soil fertility.

Damage to ripe crops Crops at a stage where ground-based applications will cause unacceptable economic damage to the harvestable crop. Unacceptable economic damage being defined as 10% or greater loss to harvest.

Ecologically appropriate source Plant materials are considered “ecologically appropriate” when they are collected from similar climatic or ecological region to the one present on property where pollinator habitat is being established.

Economic threshold The pest density at which management action should be taken in order to prevent pest populations from reaching levels where they could cause economic injury. Note that thresholds do not exist for all pests in all crops, and expert opinion coupled with thorough scouting and monitoring records can assist with pest management decisions.

Economic injury level The number of pests that will cause yield losses equal to the potential costs of management actions.

Equipment shortages Equipment not available or not financially feasible to do a ground-based application of fungicide. Verification of the grower seeking machinery through three sources must be provided. Inoperable equipment due to verified mechanical failure also qualifies.

Field Conditions Damp conditions that make ground application impractical due to excessive field or crop damage or a safety risk.

Flowering species Plants (including trees, shrubs, or forbs) known to provide pollen and/or nectar to pollinators.

Intercropping Growing two (2) or more crops in proximity to one another, often in adjacent rows.

Integrated pest management (IPM) An ecological approach to pest management that focuses on pest prevention and relies on treatment measures only when there is a demonstrated need. IPM incorporates a combination of biological, cultural, mechanical/physical, and chemical management tools.

Habitat restoration Defined in the Society for Ecological Restoration Primer as, “The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.”

Mass-flowering crops Crops that provide abundant floral resources during their bloom period, which is often short. Examples of mass-flowering crops: almond, blueberry, canola, and sunflower. When differentiating between mass-flowering crops and temporary habitat, we consider whether the crop a) was already a core part of the crops planted, and b) whether the primary purpose of the crop is revenue.

Native plants Plant species that are indigenous—occur naturally without human intervention—to a region. The time period within an area for a species to be considered native is typically before European settlement of the Americas.

Natural enemies Predators, parasites, and pathogens of crop pests. Many natural enemies are insects.

New habitat Any habitat created following initial certification by a farm entity or any habitat created after June 19th, 2023.

Noxious weed Noxious weeds are classified by USDA NRCS as, "A weedy or invasive plant that has the potential to become invasive in all or part of its range within the US." State lists can be found at <http://plants.usda.gov/java/noxiousDriver>.

Permanent habitat Habitat that is present year-round, although the plants may be in a vegetative or dormant state during the winter. Examples of permanent habitat: hedgerows, perennial or re-seeding wildflower strips, riparian forests, and filter strips.

Pest control advisor (PCA) Licensed professionals certified in pest management. When selecting an advisor, make sure they are familiar with IPM practices and the nonchemical pest management standards and pesticide mitigation standards required by Bee Better Certified.

Pesticides Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating a pest or disease. Pesticides can also be plant regulators, defoliant, desiccant or nitrogen stabilizers. The term pesticide includes bactericides, fungicides, herbicides, insecticides, miticides, molluscicides, nematocides, and piscicides.

Pesticide applications Any activity that introduces a pesticide into the environment for the purposes of controlling pests, including but not limited to spraying, dusting, and chemigation. We also consider the planting of pesticide-coated seed a pesticide application.

Polyculture A farming practice that incorporates multiple crops into the same farm, avoiding monocultures (single stands of a specific crop).

Pre-bloom The period 10 days prior to when bloom is expected to occur.

Prophylactic use Preventative use of pesticides that is not in response to a demonstrated pest problem. For example, spraying on a schedule without monitoring to confirm a pest is present. Many seed treatments are prophylactic.

Spatial buffer An unsprayed space, such as roads or equipment turnarounds, or a section of crop that remains unsprayed.

Structural diversity The presence of multiple strata of crops (for example, row crops and orchards) in proximity to one another.

Systemic pesticide When an active ingredient is water soluble and therefore can be transported throughout plant tissues. These pesticides can also be expressed in pollen and nectar. Systemic pesticides are often used as a seed coating.

Temperature inversion A layer of cool, still air that is trapped below warmer air. The height above the ground where the temperature stops increasing and begins to decrease is the top of the inversion layer. A surface temperature inversion is likely to be present if:

- i. Mist, fog, dew or a frost have occurred
- ii. Smoke or dust hangs in the air and moves sideways, just above the surface
- iii. Cumulus clouds that have built up during the day collapse towards evening
- iv. There is a large difference between the observed maximum and overnight minimum temperatures
- v. Wind speed is constantly less than 6 mph in the evening and overnight
- vi. Cool, off-slope breezes develop during the evening or overnight
- vii. Distant sounds become easier to hear
- viii. Aromas are more distinct during the evening than during the day

Temporary habitat Habitat that typically dies back annually. It may remain in one location or move around the certified parcels (as is the case with rotating cover crops). Temporary habitat must be allowed to bloom. Examples of temporary habitat: cover crops, insectary strips, mass-flowering crops. For cover crops, at least 50% bloom must be achieved prior to termination.

Trap crop A plant that attracts a pest insect away from another nearby crop. Note that flowering trap crops cannot be sprayed during their bloom period.

Vegetative buffer A border of plants not attractive to pollinators, such as conifers, grown between pollinator habitat and crop fields. It is designed to capture pesticide drift.

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Bee Better Certified™ works to give bees a healthy place to live.

beebettercertified.org