BEE BETTER CERTIFIED®

Xerces Society for Invertebrate Conservation

Production Standards

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Cover photo: Long-horned bee (Melissodes sp.) foraging on plains coreopsis (Coreopsis tinctoria) 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

Version 1.6 (January 2026)

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.

Photo: Xerces Society / Kelly Gill

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Contents

Photo: Xerces Society / Jennifer Hopwood

Getting Started

This document outlines the Production 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 Bee Better elements that influence farming practices. It can help clarify what information you'll need to develop a Bee Better Certified® Farm Plan, the prerequisite to applying for certification.

The Bee Better Certified® Farm Plan (BBCFP) 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 them 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 BBCFP will be "certified" and subject to the Standards.

The Production Standards are divided into four sections (1–4):

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

These sections are organized into subsections numerically (e.g., 1.1 Habitat Minimums) with each individual Standard indicated by a lowercase letter (a–z) or Roman numerals (e.g., iv). References to specific Standards throughout this document are in the format #.#, #.#.a, or #.#.a.i.

To achieve certification, all four sections of the Production Standard requirements must be met.

Definitions of significant terms or phrases are included with each Standard. For explanations of additional terms or phrases, please see the glossary in Appendix T.

Note: One acre is equivalent to 0.42 hectares. One mile is equivalent to 1.6 kilometers.

1

Pollinator Habitat

1.1 Habitat Minimums

a. At least 5% of certified acreage must be in pollinator habitat.

   i. At a minimum, one-fifth (⅕) of the required habitat (i.e., 1% of the certified acreage) must be permanent habitat; the remainder may be in temporary habitat (see Appendix A). 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 (⅘) of the required habitat, and it must include one (1) or more flowering, pollinator-attractive plant species. If the 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 the temporary habitat fails.

   iii. Temporary habitat must achieve at least 50% bloom before termination.

   iv. Temporary habitat cannot consist of resident vegetation; it must be intentionally planted.

   v. If mass-flowering, pollinator-attractive crops are identified as part of the temporary habitat, they may not account for more than one-fifth (⅕) of the required habitat (i.e., no more than 1% of the certified acreage).

   vi. Habitat measurements must follow the Habitat Measurement Guidelines in Appendix B.

   vii. The land identified as habitat (permanent and temporary) within an operation's BBCFP must be owned or controlled by the operator and available for habitat management and inspection.

   viii. All temporary and permanent pollinator habitats must meet pesticide standards. See subsection 2.4 Pesticide Use in Pollinator Habitat.

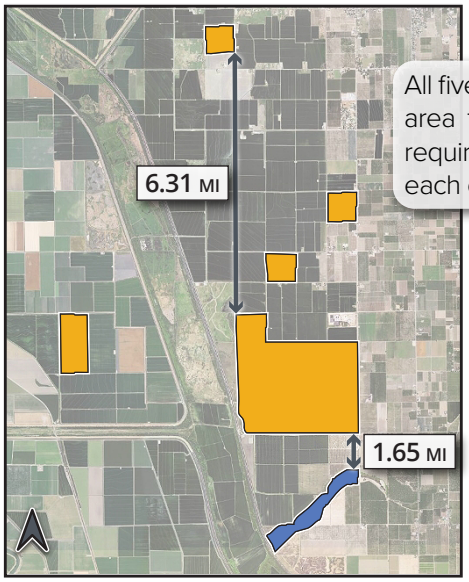
   ix. Permanent pollinator habitat can not be counted towards habitat totals if prohibited systemic, persistent pesticides listed in Appendix N were applied in the previous two (2) years. Application includes the planting of seeds treated with any systemic, persistent pesticides listed in Appendix N.

   x. All certified pollinator habitat should be within 10 miles of certified crop fields. This is measured from the edge of the certified field to the edge of the certified habitat.

   xi. If certified acreage consists of disconnected parcels farther than 10 miles from each other, the habitat on the parcels must meet the 5% minimum.

Meeting permanent habitat requirements.

Map 1.1.a.viii. Discontinuous Permanent Habitat



LEFT

All five (5) parcels can use the permanent habitat area to meet the minimum permanent habitat requirement because they are within **10 MILES** of each other and the permanent habitat area.

RIGHT

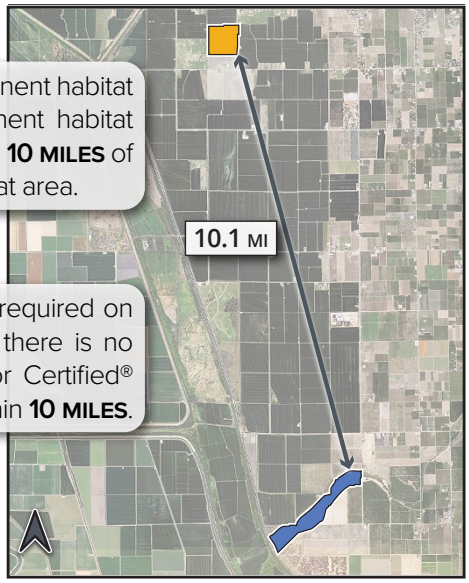
Minimum habitat of 5% is required on the crop parcel because there is no permanent habitat area or Certified® crop fields located within **10 MILES**.

SAMPLE FARM MAPS LEGEND

- Bee Better Certified® Crop Field
- Permanent Habitat Area

Source: ESRI, USDA–FSA

Map 1.1.a.ix. Permanent Habitat Acreage Increase



Definitions

Certified acreage | Crop production acreage and all pollinator habitat not in a production field.

Pollinator | An animal that moves pollen from a flower's male part (anther) to its female part (stigma), enabling fertilization.

Pollinator habitat | Areas containing flowering plants 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 | The natural growth period of native vegetation in the area. This varies by region.

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.

Permanent habitat examples (L–R): beetle banks, filter strips, hedgerows.

Photos: Xerces Society / Sarah Foltz Jordan; Xerces Society / Katharina Ullmann, Xerces Society / Jessa Kay Cruz.

Temporary habitat examples (L–R): cover crops, insectary strips, mass-flowering crops.

Photos (L–R): Xerces Society / Jessa Kay Cruz; Xerces Society / Sarah Foltz Jordan; Xerces Society / Karin Jokela.

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 before termination. Temporary habitat must be within 10 miles of certified crop fields.

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: 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 across all habitat areas 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 across all habitat areas.

    i. For new permanent habitat areas, 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 habitat areas, 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. A protocol for assessing remnant vegetation cover is provided 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).

Examples of bloom abundance in the same location over time:

Photos: Xerces Society / Jessa Kay Cruz

Definitions

Flowering / pollinator-attractive species | Plants (including trees, shrubs, or forbs) known to provide pollen or nectar to pollinators.

Native plants | Species that are indigenous to a region; i.e., those that occurred historically in an area without human intervention. In the United States, see the USDA PLANTS database for native status. plants.usda.gov/

New habitat | Any habitat less than three (3) 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 A: On-Farm Habitat Practices That Can Be Managed to Support Pollinators

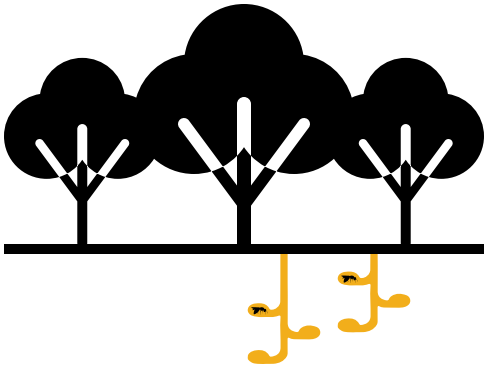
§ Appendix C: Recommended Protocol for Assessing Remnant Vegetation

§ 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. For more information on how to identify native bee nesting sites, see Appendix E.

b. At least 5% of plants in new permanent pollinator habitat plantings must be composed of pithy-stemmed plants (Appendix F) and plants that are used for nest cell materials (Appendix G); some of each category must be included. Operations are encouraged to prioritize larval host plants for species of butterflies shown to be in decline, such as, in appropriate areas, milkweed (Asclepias spp.) for monarch butterflies (Danaus plexippus).



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

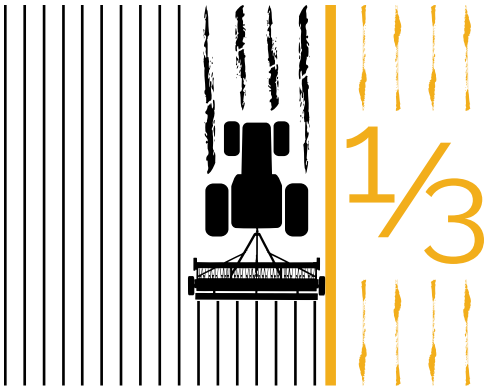
a. Develop a standard operating procedure (SOP) for how to reduce the impact of tillage activities on ground-nesting bee nests located within crop fields and in non-crop areas (see Appendix E & Appendix H).

   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 (⅓) 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 Appendices

§ Appendix E: Identifying Native Bee Nests

§ 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 occur regularly through the growing season on all certified acreage (Appendix II). This requirement may be waived for 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 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 (1) 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. Once certified, records must be kept and maintained to document all approved preventive non-chemical pest management strategies (refer to Appendix J for guidance).

Relevant Appendices

- Appendix I: Pest Scouting and Monitoring Guidance
- Appendix J: List of Approved Non-Pesticide Management Strategies

2.2 Pesticide Application

a. Use of any pesticide (except herbicides), including all pesticides approved by the Organic Materials Review Institute (OMRI), must be justified as described in subsection 2.2.

    i. A justified use must be supported by evidence that an economically damaging pest or disease outbreak exists or has a 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 2.2.a 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 and temporary habitat areas that are visited or pollinated by insects, do not apply, or allow to drift, to any flowering plants (including weeds) products containing any pesticide, including all OMRI-approved pesticides, rated as Level I under the Bee Precaution system maintained by the University of California Statewide Agricultural and Natural Resources IPM Program (UC IPM). See Appendix K.

i. Certain crops are exempt from this Standard (see Appendix L).

c. Never apply, within three (3) days of each other, pesticides that jointly may increase toxicity to bees.

i. Use the online Bee Precaution pesticide rating tool from UC IPM to determine if there is potential for a pesticide combination to increase toxicity. See Appendix M for instructions.

d. The use or application of the following pesticides (active ingredients) is prohibited on certified land:

1. Neonicotinoids: Clothianidin, Dinotefuran, Imidacloprid, Thiamethoxam
2. Butenolides: Flupyradifurone
3. Avermectins: Emamectin benzoate
4. Diamides: Cyantraniliprole
5. Organophosphates: Diazinon, Dicrotophos, Fosthiazate, Phorate
6. Carbamates: Methomyl, Oxamyl
7. This includes the use of seeds treated with nitroguanidine neonicotinoids. See Appendix N.

e. Do not use genetically modified crops that express pesticides or are resistant to herbicides.

f. The use or application of conventional soil fumigants is prohibited on certified land. See Appendix O.

g. The use or application of avicides, other than those that only act as repellents and do not cause injury, illness, or death to wild birds, is prohibited on certified land.

h. Do not use pesticides that are not currently registered for use in the US Environmental Protection Agency (EPA) Pesticide Product and Label System (PPLS) in the United States (see Appendix O).

Definitions

Bloom | The time period from when the 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).

Pesticides | 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, nematicides, avicides, repellents, and piscicides. Pesticides may be conventional, biopesticides, or antimicrobials.

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. Note: planting pesticide-coated or -treated seed is considered a pesticide application.

Pesticide Product and Label System (PPLS) | A collection of pesticide product labels and their active ingredients that have been accepted by EPA under Section 3 of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

Pre-bloom | The period that begins 10 days before bloom is expected to occur.

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: Pesticides Not Permitted for Use on Bee Better Certified® Farms
- § Appendix O: How to Confirm a Pesticide is Registered in the US

2.3 Minimizing Off-Site Movement of Pesticides

a. Aerial application of pesticides is prohibited (see Appendix P) except aerial applications of fungicides under the following conditions (see Appendix Q):

    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 BBCFP before any aerial application of fungicides (Appendix Q).

    iv. Aerial applications of fungicides are not allowed within 60' (feet) 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.

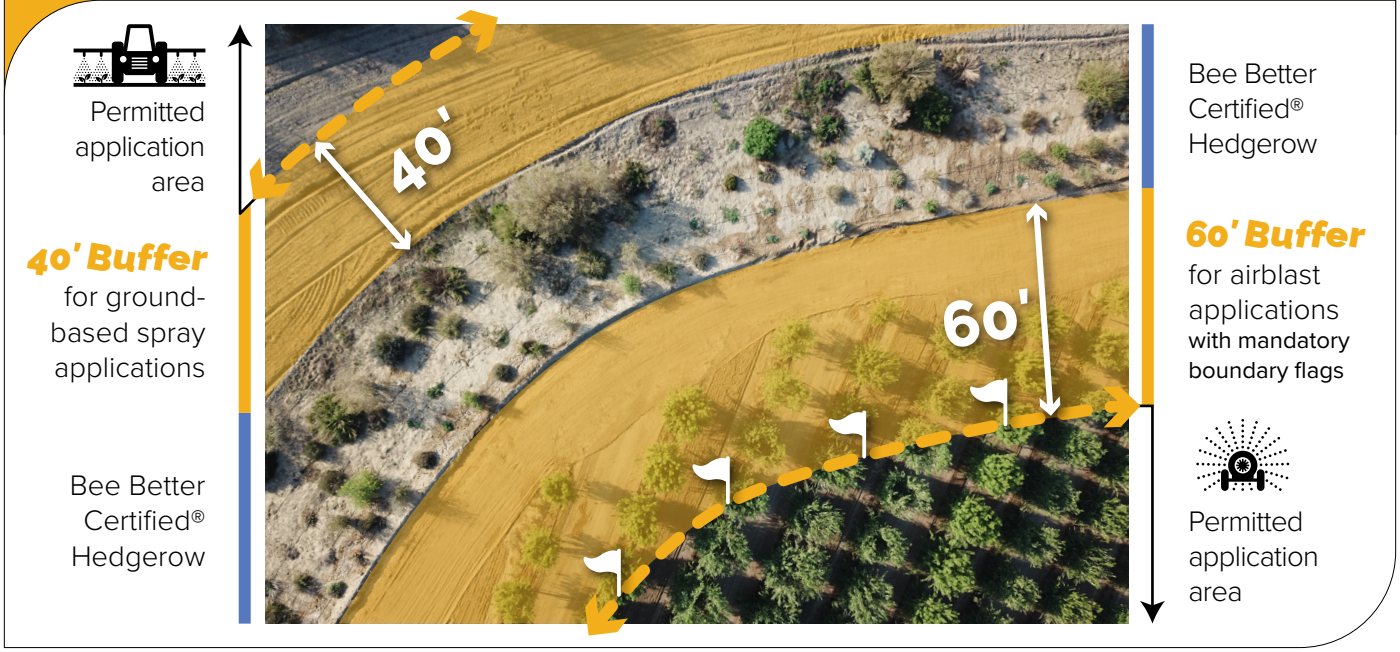
    vi. Operators must adhere to their aerial application/ drift prevention plan and maintain records of aerial applications per the plan.

b. Calibrate application equipment according to manufacturer specifications at least on an annual basis.

c. In order to protect permanent habitat, establish a spatial buffer around permanent pollinator habitat on land 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:

Standard 2.3.c.i. Minimum spatial buffers for ground-based applications vs. airblast applications



1. 40’ for ground-based applications, except airblast sprayer applications.
2. 60’ for airblast application of any pesticide, and aerial application of fungicides.

- If spatial buffers consist of an unsprayed section of a crop field, then the buffer must be clearly delineated via physical markers or GPS polygons.
- See Appendix P: Definition of Ground-Based and Airblast Spray Equipment

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. (See Appendix R.)

1. Vegetative buffers should be composed of densely planted, small-needled evergreen species.
2. Airflow must be maintained within vegetative buffers.
3. Vegetative buffers should be designed to grow above the 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. Minimum pesticide-free 30’ spatial buffers around permanent pollinator habitat must be established on land controlled by the certified farming operation along boundaries with neighboring cropland (including nurseries and livestock feedlots) and golf courses. Spot treatments of herbicides (except paraquat dichloride) within this 30’ buffer are allowed.
2. The minimum buffer may be waived if the certified operation can obtain written documentation that pesticides are either not used on the neighboring property or are only applied by handheld equipment. A waiver may also apply if the permanent habitat was installed in compliance with these requirements or if the neighboring land use later changes in a way that would put the habitat out of compliance.

Definitions

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

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.

Relevant Appendices

- § Appendix K: List of Pesticides Prohibited During Bloom in Crops and Temporary Habitat Areas Under Bee Better Certified®
- § Appendix N: Pesticides Not Permitted for Use on Bee Better Certified® Farms
- § Appendix P: Definition of Ground-Based and Airblast Spray Equipment
- § Appendix Q: Justification of Aerial Application of Fungicides; Including Drift Prevention Plan Guidance
- § Appendix R: Vegetative Pesticide Buffer Recommended Species

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 UC IPM (see Appendix K), the habitat must be mowed 24 hours before the application to disperse pollinators.

    i. Herbicides can only be used in designated temporary habitats 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.

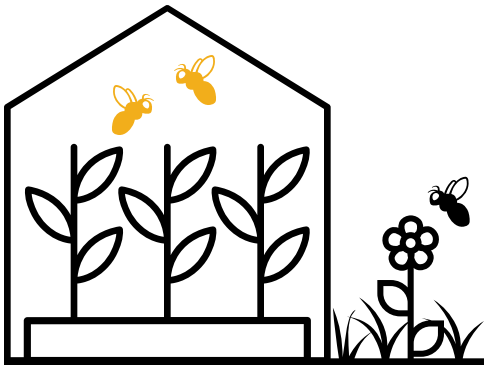
b. Only use native managed bumble bee species that are produced within their native ranges (Appendix S). Ensure commercial bumble bees do not impact wild bumble bees as follows: .

    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; dispose of it in sealed trash bags.



c. Retain all receipts and documentation concerning management of commercial bumble bee colonies to meet Standard 4.1.c. Commercial bumble bee records (if applicable).

Relevant Appendix

§ Appendix S: Native Distribution Maps of Commercially Managed Bumble Bees

4

Record Keeping

4.1 Required Records

The following records must be submitted with your BBCFP and provided to inspectors during on-site inspections 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 another 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 the location of crop production requested for Bee Better Certification)
- Location of areas where prohibited systemics listed in Appendix K were used in the past two (2) years
- Location of greenhouses where commercial bumble bees are housed, as applicable

Other items that can be included on the BBCFP map:

- Locations of spatial and vegetative buffers
- Neighboring land uses to permanent habitat areas
- Useful landmarks (e.g., other buildings such as barns, sheds, packing houses, access roads, etc.)
- Location of tillage practices described in this plan

ii. Provide evidence, such as plant order invoices, to document plant material origin and native status for new habitat areas.

iii. Include planting specifications or seed mixes. Operations need to submit either a completed plant list using the BBCFP Plant List Template or a plant list in another format that contains the same information as the BBCFP 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 Bee Better Pesticide Use Record in the Bee Better Certified® Document 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 the action threshold defined in the protocol was reached

iv. Maintain records of preventative non-pesticide management strategies using the Non-Pesticide Management Record in the BBCFP and in the Bee Better Certified® Document Center. See Appendix J: List of Approved Non-Pesticide Management Strategies.

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 USDA 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. Commercial bumble bee records (if applicable):

i. Maintain records of all commercial bumble bee colony purchases, steps taken to secure greenhouses (Standard 3.1.a.i), and disposal dates/ procedures (Standard 3.1.b.iii). These records must be submitted with the BBCFP for farms.

Relevant Appendices

§ Appendix I: Pest Scouting and Monitoring Guidance

§ Appendix J: List of Approved Non-Pesticide Management Strategies

§ Appendix K: List of Pesticides Prohibited During Bloom in Crops and Temporary Habitat Areas Under Bee Better Certified®

5

Temporary Variance from the Production Standards

A temporary variance from the requirements as outlined the Bee Better Certified® 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 or 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 its 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 other 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 how impacts from the variance may be mitigated.

The formal process, required documentation, and additional information can be found in the Document Center.

6

Appendices

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 to maintain their value. The US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) provides access to technical advice and cost-share funding for on-farm conservation practices within the United States, 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 can catch drift droplets (see Appendix R: 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 *Pollinator Conservation Farm Bill Programs (2018-2023) 190-TN-B-78(4)*. All practices are as defined by the Natural Resources Conservation Service (NRCS).

= Practice is likely to also bolster nest sites.

Permanent Pollinator Habitat

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

Upland Wildlife Habitat Management

Vegetative Barriers

Wetland Enhancement

Wetland Restoration

Wetland Wildlife Habitat Management

Wildlife Habitat Planting

Windbreak/Shelterbelt Establishment or Renovation

Temporary Pollinator Habitat

Alley Cropping (if crop blooms)

Cover Crop (including insectary strips)

Herbaceous Wind Barrier

Mass-flowering Crops

Multi-Story Cropping

Additional Practices That Augment or Protect Nesting Habitat

Residue and Tillage Management

No-Till/Strip

Till/Direct Seed

References

Vaughan, M., K. Gill, N. L. Adamson, and C. Taliga. 2023. Pollinator Conservation Farm Bill Programs (2018-2023) 190-TN-B-78(4). Greensboro, NC: U.S. Department of Agriculture, Natural Resources Conservation Service, National Plant Data Team.

Appendix B: Habitat Measurement Guidelines

US customary to metric conversion

1 foot (') = 0.305 meters

1. Calculate habitat in square feet as follows:
    - 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.

2. Convert all measurements from square feet to acres following the initial calculation:
    - _____ square feet ÷ 43,560

Appendix C: Recommended Protocol for Assessing Remnant Vegetation

Monitoring for plants within your on-farm remnant habitat is a simple way to determine if the plant community meets BBC habitat standards. This is helpful information you will need to complete the BBCFP Plant List, but it will also help you determine whether or not you may need to plant more native plants on your farm to meet the minimum bloom requirements. Using the iNaturalist app, you can easily identify plants on your property, and all you will need is a phone with a camera and the iNaturalist app! Your photos will then be shared within the private Bee Better Certified® Habitat Monitoring Project, so a Bee Better Certified® Team member can review your submissions.

Important standards that must be met across all permanent habitat areas:

- A minimum of three (3) flowering species present during the early, mid, and late sections of the growing season (Standard 1.2.a)
- The combined vegetative cover of plant species in bloom across all permanent habitat must be classified as abundant or common in each section of the growing season (Standard 1.2.c)
- In remnant/ mature permanent habitat areas (older than three [3] years), at least 35% of the plant species must be native; whereas, in newly planted areas, at least 70% of the plant species must be native (Standard 1.2.b.ii)
- In new permanent habitat areas (three [3] years or less), at least 5% of plant species must be either pithy-stemmed and provide nest cell materials to above-ground-nesting bees (Standard 1.3.b)

Planning Ahead:

Monitoring for your remnant habitat should be done at least twice (2×) per season to capture what plants are blooming throughout the growing season. One (1) survey should take about 30 minutes to an hour to complete (depending on the size of your habitat). When choosing ideal monitoring times, select times when different plants are blooming, such as:

- Once earlier in the growing season (as your crops are starting or becoming established), and
- Later in the season (as you are approaching harvest or are harvesting)

If you are in the northern hemisphere, we recommend scheduling your surveys for mid/ late June and late August or early September.

Step 1: Download the App

- The iNaturalist app is a platform used for identifying and recording observations of plants, fungi, and animals. It allows users to take photos of organisms and receive AI-powered and community-based identifications. Growers using this application to complete habitat surveys will contribute their observations to the private Bee Better Certified® Habitat Monitoring Project, a shared collection of data that can then be used to complete the BBCFP Plant List and application.
    - Make sure to download iNaturalist and NOT iNaturalist Classic.
- After you download the app and create an account, reach out to the BBC Team (info@beebettercertified.org) to add you to the private Bee Better Certified® Habitat Monitoring Project. Make sure to let them know your account username!

- Once you have been added to the private project, you can complete your survey!

Step 2: Walk Your Habitat

- 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.
    - Do you have mostly woodland habitat, or are there wetter areas and drier areas with very different-looking plants?
    - If the area is not uniform, decide how best to break it up into sub-sections based on these differences (e.g., survey the 'wetter' area and the 'drier' area separately)
    - For a very large area where it is not possible to easily assess the entire habitat, choose a smaller, representative area to estimate percent cover based on this area.

Step 3: Choose Plants to Document

- For each area (or subsection), look for the 15–20 most common plants you see growing.
    - Focus on different kinds of plants (e.g., shrubs, trees, flowers, and grasses),
    - Prioritize plants that are flowering or close to flowering!
    - Include non-native and invasive species, even though invasive species will not count towards the bloom requirements.

Step 4: Take Photos

- Use the iNaturalist app to take a clear photo of each plant.
- You will want to try your best to capture:
    - Leaves,
    - Flowers, and
    - Overall shape of the plant
- Save each plant as an 'observation' and add each observation to the BBC project. On the upload screen, look for the 'Projects' option and select "Bee Better Certified® Habitat Monitoring".
    - After selecting the project, iNaturalist will prompt you to fill out the additional required field, "Abundance Category".
    - For each plant you photograph, assign a corresponding abundance category for that plant. See Appendix D to get a better understanding of what each abundance category looks like.
- Each photo will automatically record the date and the location.
- Do this for each of the 15–20 most common plants you see growing.
- If you are finding that at least half (½) of the plants are invasive or non-native, make it a goal to look for another 5–10 of the most common plants you see growing (to ensure your plant community will meet the minimum bloom requirements).

Step 5: Inform BBC Team & Check Your Results

- Once your first survey is complete, please notify the BBC team.
- Afterwards, the BBC team will conduct a quick review of your submitted uploads to the project to ensure accurate plant identifications were made.

Step 6: Repeat Steps 3–5 Later in the Season

- Make a quick assessment of your habitat. Do you see some different plants in bloom? Perfect!
- For each area (or subsection), once again, look for the 15–20 most common plants you see growing.
- Use iNaturalist to take a clear photo of each plant. Repeat this for all of the most common plants you see, and make sure to upload your observations to the Bee Better Certified® Habitat Monitoring Project.
- Inform the BBC team that your surveys are complete and check your observations afterwards.

Step 7: Transfer Survey Information Into BBCFP Plant List Template

- As part of your application package, you will need to complete and submit a BBCFP Plant List Template. Transfer the information from your completed BBC Remnant Habitat Monitoring Survey Templates (from earlier and later in the season) into the BBCFP Plant List Template. You will likely need to look up additional information to complete the template, such as bloom time/ window and whether the plant is pithy-stemmed or provides nest cell materials for above-ground-nesting bees.
- You can find the template on the BBC document center.

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).

Improving bloom abundance over time:

ABUNDANT (51–100%)
2016

COMMON (11–50%)
2015

SPARSE (1–10%)
2015

ABSENT (0%)
2013

Photos: Xerces Society / Jessa Kay Cruz

Appendix E: Identifying Native Bee Nests

Ground-Nesting Bees

Ground-nesting bees can be found along field margins and within fields themselves, particularly if the field contains 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 have loose soil around the entrance, similar to an ant nest, but the soil circle is composed of soil of varying grain sizes. 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 the 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.

Photos: Xerces Society / Eric Lee-Mäder; Xerces Society / Hillary Sardiñas; Xerces Society / Mace Vaughan.)

Above-Ground-Nesting Bees

Above-ground-nesting bees nest in woody 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 (Sambucus spp.) or blackberry (Rubus spp.). If you are pruning a pithy-stemmed plant (for a list of plants bees nest in, see Appendix F), leave long branches, as most bees need at least 6" to complete their nest.

The Xerces Society / Jennifer Hopwood

Bumble Bees (*Bombus* spp.)

Bumble bee nests 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 create cavities beneath them as 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.

Wild bumble bee nests can be difficult to locate as they're usually hidden well. The entrance to this B. impatiens nest was located under dense clumps of bunchgrasses.

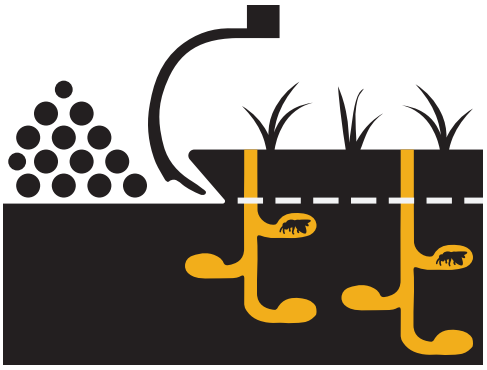
Photo: Sarah Bailey, Bumble Bee Watch

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 that 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 1.4 Tillage). 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	Agave spp.	We, So	native
Allegheny blackberry	Rubus allegheniensis	We, Ea, MW, So	native
American black elderberry	Sambucus nigra ssp. canadensis	PNW, We	native
Beardtongue	Penstemon spp.	N.A.	native
Bee balm	Monarda spp.	N.A.	native
Black raspberry	Rubus occidentalis	Ea, MW, So	native
Blackberry	Rubus spp.	We	native
Blue elderberry	Sambucus nigra ssp. cerulea	We (TX)	native
Boneset	Eupatorium spp.	Ea, MW, So	both
Boxelder	Acer negundo	N.A.	native
Common reed	Phragmites australis	N.A.	both
Coneflower	Echinacea spp.	Ea, MW, So	native
Cow parsnip	Heracleum spp.	N.A.	both
Culver's root	Veronicastrum spp.	Ea, MW, So	native
Cup plant/ rosinweed	Silphium spp.	So	native
Elderberry	Sambucus spp.	We, PNW	native
Eryngo	Eryngium spp.	N.A.	both
Evening primrose	Oenothera spp.	N.A.	both
False-indigo bush	Amorpha fruticosa	N.A.	native
Field thistle	Cirsium discolor	MW, SE, NE	native
Golden Alexanders	Zizia spp.	N.A.	native
Goldenrod	Solidago spp.	N.A.	native
Horseweed	Conyza canadensis	N.A.	native
Hydrangea	Hydrangea arborescens	Ea	native
Hydrangea	Hydrangea spp.	N.A.	non-native
Ironweed	Vernonia spp.	MW, So	native
Joe-Pye weed	Eutrochium spp.	N.A.	native
Lobelia	Lobelia spp.	N.A.	both
Meadow-rue	Thalictrum spp.	N.A.	both

*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
Mountain mint	Pycnanthemum spp.	We, Ea, MW, So	native
Poison sumac	Toxicodendron vernix	MW, NE, SE	native
Pokeweed	Phytolacca americana	We, Ea, So	native
Raspberry	Rubus idaeus	We	both
Rose	Rosa spp.	N.A.	both
Salmonberry	Rubus spectabilis	We, PNW	native
Smooth sumac	Rhus glabra	N.A.	native
Snowberry	Symphoricarpos spp.	N.A.	native
St. John's-wort	Hypericum spp.	N.A.	both
Sumac	Rhus spp.	N.A.	native
Thimbleberry	Rubus parviflorus	We, MW, PNW	native
Thistle	Cirsium spp.	N.A.	both
Ticktrefoil	Desmodium spp.	Ea, MW, So	both
Twinberry	Lonicera involuncrata	We	native
Wild sunflower	Helianthus spp.	N.A.	native
Yucca	Yucca 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)

Left to right: Rose (Rosa sp.); sumac (Rhus sp.); yucca (Yucca sp.).

Photos: Xerces Society / Sara Morris; Xerces Society / Sarah Foltz Jordan, Xerces Society / Jennifer Hopwood

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	Medicago sativa	N.A.	agricultural	leaves	Megachile rotundata
Alsike clover	Trifolium hybridum	N.A.	non-native	leaves	M. rotundata
American beautyberry	Callicarpa americana	So	native	leaves	Megachile spp.
American buckwheat vine	Brunnichia ovata	So	native	leaves	unknown
Bird's-foot trefoil	Lotus corniculatus	N.A.	non-native	leaves	M. rotundata
Buckwheat	Eriogonum spp.	N.A.	native	leaves	M. rotundata
Buttonbush	Cephalanthus occidentalis	We, Ea, So	native	leaves	unknown
California redbud	Cercis orbiculata	We	native	leaves	Megachile spp.
Checkerbloom	Sidalcea spp.	We, PNW, SW	native	leaves & petals	Megachile & Heriades spp.
Cicer milkvetch	Astragalus cicer	We, No	non-native	leaves	M. rotundata
Clarkia	Clarkia spp.	We, PNW	native	petals	Megachile spp.
Cranberrybush	Viburnum opulus	Ea, No, MW	both	leaves	unknown
Crown vetch	Securigera varia	N.A.	non-native	leaves	M. rotundata
Cusick's checkerbloom	Sidalcea cusickii	PNW	native	petals & leaves	Megachile spp.
Dogwood	Cornus florida	Ea, So, MW	native	leaves	unknown
Eastern redbud	Cercis canadensis	We, MW, So	native	leaves	Megachile spp.
Evening primrose	Oenothera spp.	N.A.	native	petals	Megachile spp.
Farewell-to-spring	Clarkia amoena	We, PNW	native	petals	Megachile spp.
Giant flutter mill (evening primrose)	Oenothera macrocarpa	MW, So	native	petals	unknown
Globemallow	Sphaeralcea spp.	N.A.	both	leaves	unknown
Maple	Acer spp.	Ea	both	leaves	Megachile spp.
Marsh gentian	Eustoma exaltatum	We, MW, So	native	petals	Megachile spp.
Mountain laurel	Kalmia latifolia	Ea	native	leaves	unknown
Nootka rose	Rosa nutkana	We, PNW	native	leaves	unknown
Rose	Rosa spp.	N.A.	both	leaves	Megachile 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
Rugosa rose	Rosa rugosa	Ea	non-native	leaves	Osmia pumila
Sage	Salvia spp.	N.A.	both	fibers	Anthidinii
Sainfoin	Onobrychis spp.	N.A. (exc. So)	agricultural	leaves	M. rotundata
Showy ticktrefoil	Desmodium canadense	Ea, MW, So	native	leaves	unknown
Small bayberry	Morella caroliniensis	Ea, So	native	leaves	Megachile spp.
Strawberry	Fragaria spp.	N.A.	both	leaves	Osmia spp.
Thistle	Cirsium spp.	SW, We, PNW	native	fibers	Anthidinii
Virginia sweetspire	Itea virginica	Ea, So	native	leaves	unknown
White clover	Trifolium repens	N.A.	non-native	leaves	M. rotundata
Zigzag clover	Trifolium medium	NE	non-native	leaves	M. rotundata

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

Redbud (*Cercis*)
Photo: Xerces Society / Mace Vaughan

Checkermallow (*Sidalcea*)
Photo: Xerces Society / Sara Morris

Evening primrose (*Oenethera*)
Photo: Xerces Society / Sara Morris

Sage (*Salvia*)
Photo: John Kehoe, flickr CC-BY-ND 2.0

Appendix H: Example Tillage Standard Operating Procedures (SOPs)

Types of SOPs

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

Timing of tillage: In half (½) 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 the farm (field or edges) left untilled every year.

Equipment type: Will use chisel plows instead of moldboard 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 (2×) 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.
2. Fallow fields will be mowed instead of tilled.
3. Field edges will be mowed instead of cultivated.

For perennial crop:

1. Every other alley between rows will be scraped annually instead of tilled.

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 their control). Evidence of scouting and monitoring must also be provided to justify the 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	2× / 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)	1× / week
Raspberry	Cane Blight (cane disease)	1–3% of canes are infected with the disease	Washinton 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 a 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, outbreak locations, etc.)
- Recommendations for control
- Alternatives to the 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 | × 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 (3rd) to address fungal concerns if fungicides are being used during pre-bloom 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 non-target organisms like bees (Naranjo et al. 2015). Long-term pest prevention is a basic principle of Integrated Pest Management (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 being, or will be, utilized. We recognize that not all methods apply to all producers or cropping systems. If you are not currently practicing any non-pesticide management strategies, select at least two (2) 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.

Naranjo, S.E., P. C. Ellsworth, and Frisvold, G. B. 2025. Economic value of biological control in integrated pest management of managed plant systems. Annual Review of Entomology 60:621-45.

Lee-Mader, E., J. Hopwood, and Vaughan M. 2014. Farming With Native Beneficial Insects. North Adams, MA: Storey Publishing.

Habitat Enhancement Practices for Conservation Biocontrol

PRACTICE	PRESENT USE		FUTURE USE	
	Currently used?	Description of how practice *is applied* (WHERE/WHEN)	To be adopted?	Description of how the practices *will be applied* (WHEN/WHERE)
Conservation cover (In perennial crop sytems, 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 *is applied* (WHERE/WHEN)	To be adopted?	Description of how the practices *will be applied* (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)*				
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)†*				

(continued on next page)

PRACTICE	PRESENT USE		FUTURE USE	
	Currently used?	Description of how practice *is applied* (WHERE/WHEN)	To be adopted?	Description of how the practices *will be applied* (WHEN/WHERE)
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 breed 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®

Use of any pesticide, including all organic OMRI-approved pesticides (except herbicides), must be justified as described in Standard 2.2.b. There must be no unjustified use of pesticides employed against insects, mites, and diseases.

During bloom of crops and temporary habitat areas, Bee Better Certified® prohibits application of products containing any pesticide rated as Level I under the Bee Precaution system maintained by the University of California Integrated Pest Management (UC 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 2026. For a current Level I list at any time, see https://www2.ipm.ucanr.edu/beeprecaution/. Bee Precaution ratings are subject to change as UC IPM updates its guidance based on new information about pesticide toxicity and associated risks. This list is intended as a general guide and may not reflect the most current data. Always consult the Bee Precaution tool to confirm the latest ratings.

Note: Under Standard 2.2.d, persistent systemic pesticides and conventional soil fumigants are prohibited on all Bee Better Certified® lands. See Appendix N.

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
FIPRONIL*	(—)	Insecticide

ACTIVE INGREDIENT	EXAMPLE TRADE NAME(S)	TYPE
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
PROPHENOFOS	(Curacron)	Insecticide
PYRETHRINS	(PyGanic)	Insecticide
PYRIDABEN	(Nexter)	Acaricide; Insecticide
QUINTOZENE	(Autilus, Terraclor)	Fungicide
RESMETHRIN	(—)	Insecticide
SULFOXAFLOR	(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
- Barley
- Kamut
- Millet
- Oats
- Rice
- Rye
- Sorghum
- Spelt
- Teff
- Triticale
- 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.

Note: 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.:
  - Broccoli
  - Brussels sprouts
  - Cabbage
  - Cauliflower
  - Choi
  - Collards
  - Kale
  - Kohlrabi
  - Radish
  - Turnip
- Asparagus
- Basil
- Beets and chard
- Carrots
- Chives
- Chicory
- Cilantro
- Dill
- Endive
- Fennel
- Garlic
- Lettuce
- Onions
- Parsley
- Parsnip
- Spinach

Appendix M: Bee Precaution Use Instructions

Toxicity Ratings

The Bee Precaution tool (www2.ipm.ucanr.edu/beeprecaution/) 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 Environmental Protection Agency (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.

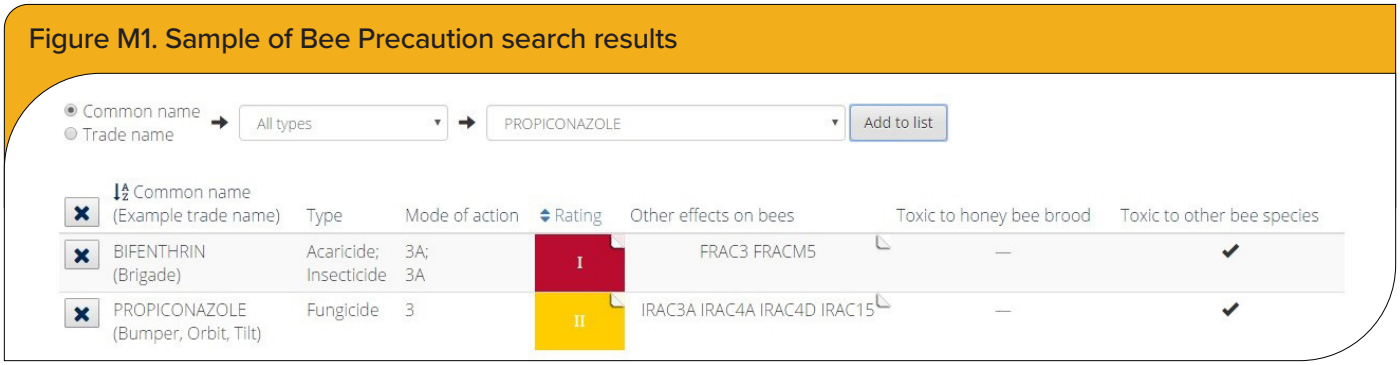
The Bee Precaution rankings are based on current scientific information primarily for adult honey bees (Apis spp.), but where available, include information on toxic to honey bee brood and toxicity to non-Apis bees.
Bee Better Certified® requires that Level I under Bee Precaution (see Appendix K) not 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 M1. Sample of Bee Precaution search results



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 the 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 (1) pesticide to the list at a time, but you may need to change the pesticide class in step 2. To remove a pesticide, click the blue “×” next to its name. To clear the entire table, click the blue “×” on the top line of the table.
6. To determine potential synergies, compare the number in the “Mode of action” column for one (1) pesticide with the “FRAC” or “IRAC” number in the “Other effects on bees” column of another. The sample table in Figure M1 includes two (2) 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 (2) chemicals should not be applied within three (3) days of each other. 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 (Command+P on Mac) and then either print it or save the page as a PDF file by changing the “destination” to “Save as PDF” under printers.

Instructions for Pesticides Not Listed in Bee Precaution

While the Bee Precaution pesticide rating tool is a relatively comprehensive and accessible resource, not every pesticide active ingredient (a.i.) has a toxicity rating listed in Bee Precaution. First, make sure that you have the correct spelling. If you're searching for a trade name (i.e., brand name), most are not listed; look for the name of the product's a.i. (e.g., glyphosate).

When the above steps to locate an a.i. in Bee Precaution have been followed, but the pesticide does not appear to be listed, contact the Bee Better team (info@beebettercertified.org) for assistance and a final determination.

Our staff will take the following steps to approximate the Bee Precaution level for Bee Better purposes:

1. Identify the acute contact LD_{50} for honey bees for the a.i. using the Pesticide Properties Database (PPDB); https://sitem.herts.ac.uk/aeru/ppdb/en/search.htm), as well as the acute oral LD_{50} if available. The LD_{50} is the ‘lethal dose’ that kills 50% of the test population of adult honey bees in the standard laboratory toxicity testing required for most pesticide registrations.
2. If the contact or oral LD_{50} falls into the ‘highly toxic’ category as determined by the US EPA, it will be treated as a Level I pesticide.
    a. Highly toxic: the LD_{50} is less than 2 µg a.i./ bee.
    b. Moderately toxic: the LD_{50} is 2 to less than 11 µg a.i./ bee.
    c. Practically non-toxic: the LD_{50} is 11 µg a.i./ bee or greater.
3. If the LD_{50} falls into the moderately toxic category, it will be treated, at a minimum, as a Level II pesticide

under Bee Precaution ratings. However, some moderately toxic pesticides by EPA classification are rated as Level I pesticides under Bee Precaution ratings due to impacts on bee brood or non-Apis bees. Some 'practically non-toxic' pesticides are also rated as Level II for this reason. The best available information will be used to make these determinations.

4. If a honey bee LD_{50} is not available on PPDB (for example, for a brand new pesticide registration), it may be able to be located in US EPA, European Union, and Canadian government agency registration reports, or a Material Safety Data Sheet for the active ingredient.
5. If no record for an LD_{50} can be located in PPDB or other resources listed above, a literature review will be conducted, and the best available information will be used to guide final determinations.

To determine synergism risk:

6. We will identify the IRAC or FRAC code for insecticide or fungicide a.i. These codes are groupings or classifications for the mode of action of different pesticides.
    a. Insecticide chemical classes: www.irac-online.org/mode-of-action/classification-online/
    b. Fungicide chemical classes: https://www.frac.info/publications/downloads
7. An alternative a.i. from the same IRAC or FRAC code will be used to screen for pesticide modes of action with synergistic toxicity to bees in Bee Precaution.
    a. For example, the IRAC 15 growth regulator flufenoxuron is not listed in Bee Precaution, but diflubenzuron, a more common a.i. with the same mode of action grouping (IRAC 15), is listed in Bee Precaution and can be used to screen for IRAC or FRAC code interactions.

Pesticides that are not listed on the Bee Precaution tool will then be added to an internal database, and our findings will be communicated to the UC IPM team.

Resources

Insect Resistance Action Committee: http://www.irac-online.org/

- 2017 IRAC code list: http://www.irac-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/fraccode-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: Pesticides Not Permitted for Use on Bee Better Certified® Farms

Certain systemic, persistent pesticides and conventional soil fumigants are prohibited for use on BBC farms. These pesticides are highly toxic to both adults and larvae of ground-nesting bees and have properties that could lead to exposure concerns in nectar and pollen of the crop and nearby flowering weeds, including application as seed treatments.

- **Systemic** is defined as pesticides with a relative systemic index greater than 0.75, under the Systemic Insecticides database maintained by The Xerces® Society.
- **Persistent** is defined as pesticides with a half-life of greater than 16 days, equivalent to a persistence rating of Medium or High by the National Pesticide Information Center.

The systemic, persistent pesticides prohibited under Bee Better Certified® include:

ACTIVE INGREDIENT		EXAMPLE TRADE NAME(S)	TYPE
Avermectins	Emamectin benzoate	Denim, Exclaim, Proclaim	Acaricide; Insecticide
Butenolides	Flupyradifurone	Altus, Sivanto	Insecticide
Carbamates	Methomyl	Lannate, Nudrin	Acaricide;Insecticide; Nematicide
	Oxamyl	ReTurn, Vydate	Acaricide; Insecticide; Nematicide
Diamides	Cyantraniliprole	Exirel, Verimark, Minecto Pro, Kradan	Insecticide
Neonicotinoids	Clothianidin	Belay, Clutch, Poncho, Arena	Insecticide
	Dinotefuran	Safari, Venom	Insecticide
	Imidacloprid	Admire, Gaucho, Marathon, Provado	Insecticide; Nematicide
	Thiamethoxam	Actara, Cruiser, Centric, Endigo, Platinum	Acaricide; Insecticide; Nematicide
Organophosphates	Diazinon	AG 500, Basudin, Diazinon AG	Acaricide; Insecticide; Nematicide
	Dicrotophos	Bidrin, Carbicron, Dicromax 8	Acaricide; Insecticide
	Fosthiazate	Nemathorin 10G, Fosthiazate 900 EC	Acaricide; Insecticide; Nematicide
	Phorate	Thimet	Acaricide; Insecticide; Nematicide

Soil fumigants can have a negative impact on the underground life stages of many native bee species. For that reason, conventional soil fumigants are prohibited under Bee Better Certified®. Soil fumigants prohibited under Bee Better Certified® are listed as follows:

ACTIVE INGREDIENT	EXAMPLE TRADE NAME(S)	TYPE
Chloropicrin	Ally 33, Tri-Form 80, Pic-Clor, Pic Plus, Strike, Telone	Bactericide; Fumigant; Fungicide; Herbicide; Insecticide; Nematicide
Dazomet	Basamid	Fumigant; Fungicide; Herbicide; Insecticide; Nematicide

ACTIVE INGREDIENT	EXAMPLE TRADE NAME(S)	TYPE
1,3-Dichloropropene	Telone, Tri-Form 80	Fumigant; Fungicide; Insecticide; Herbicide
Dimethyl disulfide (DMDS)	Paladin	Fumigant; Fungicide; Insecticide; Herbicide; Nematicide
Metam potassium	AMV 540, METAM KLR, Sectagon-K54	Acaricide; Fumigant; Fungicide; Herbicide; Insecticide; Nematicide
Metam sodium	METAM CLR, Sectagon-42, Vapam	Acaricide; Fumigant; Fungicide; Herbicide; Insecticide; Nematicide
Methyl bromide	Terr-O-Gas, Pic-Brom, Tri-Con	Acaricide; Fumigant; Fungicide; Herbicide; Insecticide; Nematicide

References

The Xerces Society for Invertebrate Conservation. Systemic Insecticides Database. xerces.org/systemic-insecticides/list

National Pesticide Information Center. Pesticides - What's My Risk? npic.orst.edu/factsheets/WhatsMyRisk.html

Appendix O: How to Confirm a Pesticide is Registered in the US

Only active ingredients (a.i.) and products registered with the United States Environmental Protection Agency (EPA) may be used on farms that are Bee Better Certified®. If a product is being used outside of the US or you are unsure about a product's registration status, the Pesticide Product and Label System (PPLS) provides a collection of pesticide product labels that have been accepted by EPA under Section 3 of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

To confirm whether an a.i. is registered with the EPA:

1. Go to the EPA Pesticide Product and Label System (PPLS).
2. In the "Search by Chemical Name" field, enter the a.i. (for example, imidacloprid or spinosad).
3. Confirm that the a.i. appears in at least one (1) currently EPA-registered product under Section 3 of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

Minimum-risk pesticides that are exempt from registration under FIFRA 25(b) will not appear in PPLS. These may be used only if their a.i. are included on EPA's list of allowed a.i. for minimum-risk pesticide products.

Any questions related to products not listed in the PPLS, refer to the EPA how-to guide or contact the Bee Better Certified® team at info@beebettercertified.org.

Resources

- United States Environmental Protection Agency (EPA): www.epa.gov
- Active Ingredients Allowed in Minimum Risk Pesticide Products: www.epa.gov/minimum-risk-pesticides/active-ingredients-allowed-minimum-risk-pesticide-products
- How to Search for Information about Pesticide Ingredients and Labels: www.epa.gov/ingredients-used-pesticide-products/how-search-information-about-pesticide-ingredients-and-labels#chemical%20search
- Pesticide Labels: www.epa.gov/pesticide-labels
- Summary of the Federal Insecticide, Fungicide, and Rodenticide (FIFRA) Act: www.epa.gov/laws-regulations/summary-federal-insecticide-fungicide-and-rodenticide-act

Appendix P: Definition of Ground-Based and Airblast Spray Equipment

Airblast sprayers are high-velocity, air-assisted sprayers that use a fan or multiple fans to direct spray volumes out or upwards into crop canopies. They are typically used in orchard and vineyard settings to penetrate dense foliage and have a higher drift risk relative to other ground-based spray equipment.

- Examples of sprayers in this higher-drift-risk category include:
  - » Conventional radial airblast sprayers
  - » Cannon sprayers
  - » Tower sprayers (with air-assist)
  - » Multi-head fan sprays where air is directed out/ upward
  - » Pneumatic air shear sprayers

Ground-based applications include all other spray equipment operating from the ground, which poses a lower drift risk than airblast sprayers.

- Examples of sprayers in this lower-drift-risk category include:
  - » Backpack sprayers
  - » ATV- and tractor-mounted sprayers
  - » Hydraulic boom sprayers
  - » Electrostatic sprayers
  - » Hooded and tunnel sprayers with air-assist (where air is directed downwards or into the tunnel rather than out/ up)
  - » Other low-velocity air-assist sprayers

Appendix Q: Justification of Aerial Application of Fungicides; Including Drift Prevention Plan Guidance

Certified growers who foresee the need to use aerial fungicide applications must develop a justification and drift prevention plan as part of their BBCFP. A 60' (foot) buffer must be implemented 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 pest control advisor (PCA) who 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. Geographic Positioning Systems (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 habitats must be entered into the GPS to avoid overspray.
   c. Aircraft should be equipped with 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 the direction of spray drift and the avoidance of habitat.
   d. Spray only when the wind is blowing away from the designated pollinator habitat and when the speed is between 2–8 miles per hour (mph) / 1.7–7 knots. Do not apply when winds are gusting above 8 mph.
   e. Avoid application during temperature inversions (**see Appendix T: Acronyms & 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 R: 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 (2–4×) as effective as broadleaf plants in capturing spray droplets and provide year-round protection. Two (2) 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 the 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)

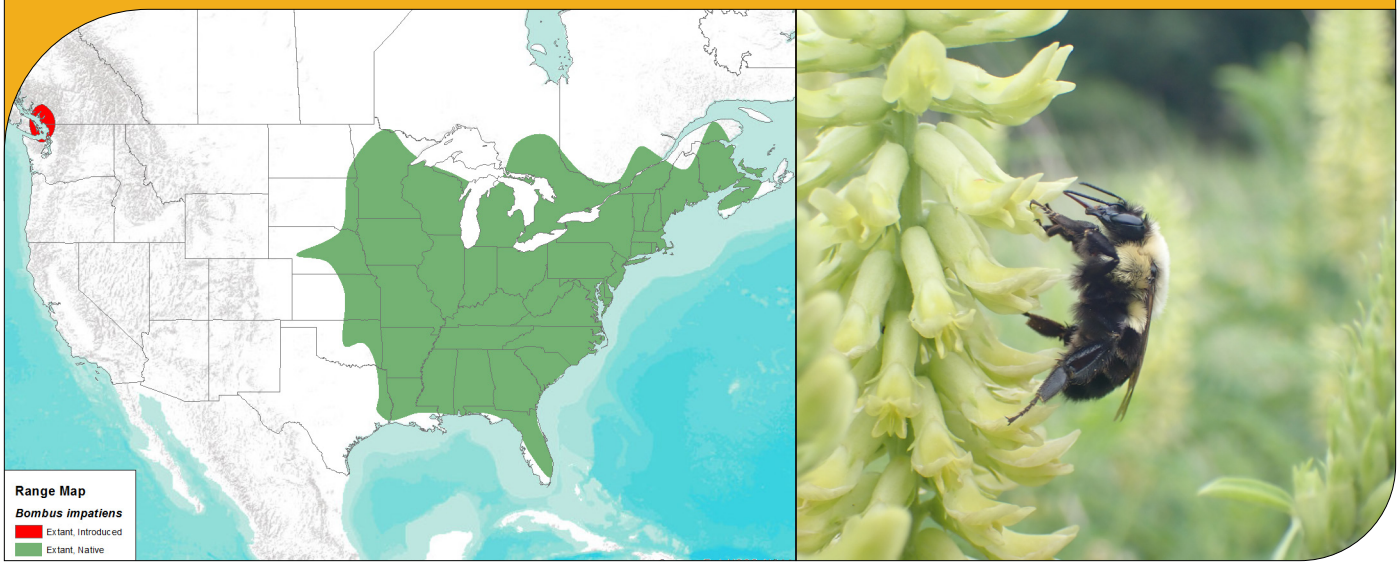
Spruce

Thuja (Arborvitae)

Appendix S: Native Distribution Maps of Commercially Managed Bumble Bees

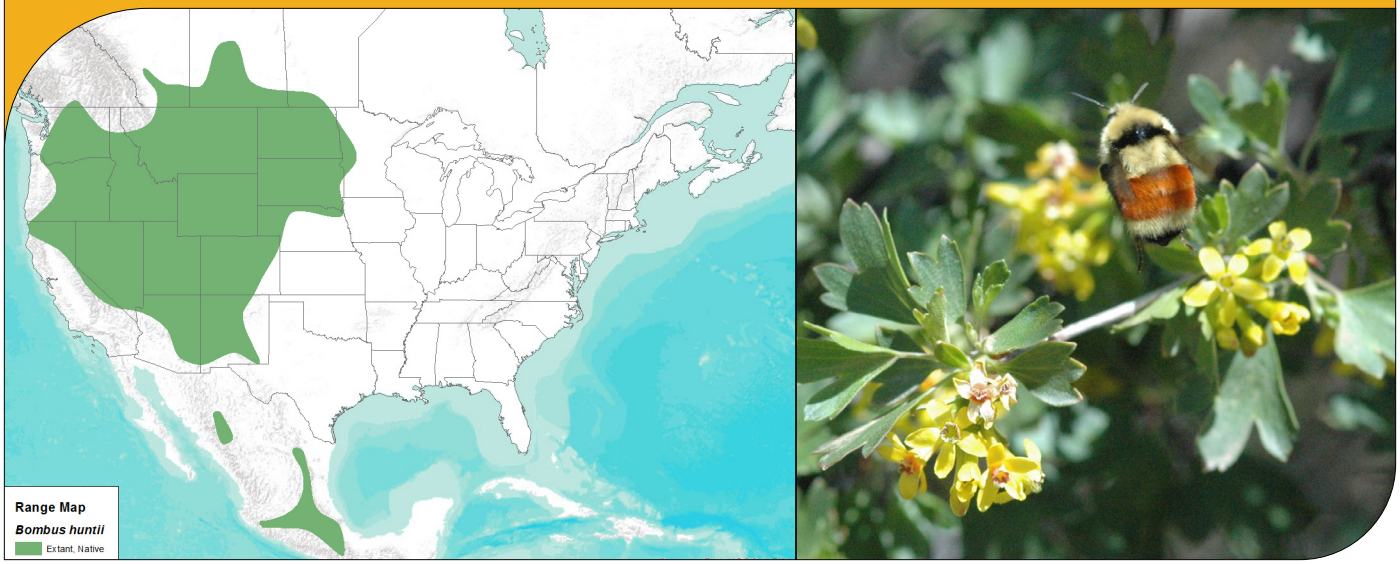
The common eastern bumble bee (Bombus impatiens) is the principal species native to North America that is commercially managed for crop pollination (see Map S1). Two (2) other species, Hunt's bumble bee (B. huntii; Map S2) and the yellow-faced bumble bee (B. vosnesenskii; Map S3), are being developed for commercial use in the United States. Maps for other native species can be found at Bumble Bee Watch.

Map S1. Distribution of the common eastern bumble bee (B. impatiens).



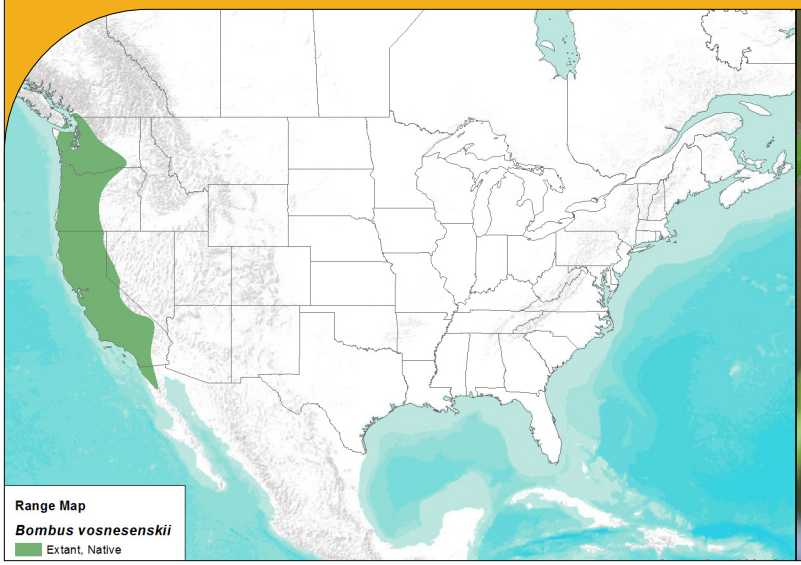
Map: ESRI, USGS, NOAA. Photo: Xerces Society / Katie Lamke.

Map S2. Distribution of Hunt's bumble bee (B. huntii).



Map: ESRI, USGS, NOAA. Photo: Bob Hammon, Colorado State University / Bugwood.org.

Map S3. Distribution of the yellow-faced bumble bee (B. vosnesenskii).



Map: ESRI, USGS, NOAA. Photo: Xerces Society / Mace Vaughan.

Appendix T: Acronyms & Glossary

Acronyms

a.i.	Active ingredient(s)
AI	Artificial Intelligence
APHIS	Animal and Plant Health Inspection Service [USDA]
ATV	All Terrain Vehicle
BBC	Bee Better Certified®
BBCFP	Bee Better Certified® Farm Plan
CBC	Conservation Biological Control
DMI	DeMethylation Inhibitor
EPA	Environmental Protection Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FRAC	Fungicide Resistance Action Committee
GPS	Geographic Positioning Systems
IPM	Integrated Pest Management
IRAC	Insect Resistance Action Committee
LD_{50}	Lethal dose to 50% of the test population
MPH	Miles per hour
NRCS	Natural Resources Conservation Service [USDA]
OMRI	Organic Materials Review Institute
PCA	Pest Control Advisor
PPDB	Pesticide Properties Database
PPLS	Pesticide Product and Label System [EPA]
SOP(s)	Standard Operating Procedure(s)
UC IPM	University of California Integrated Pest Management
USDA	United States Department of Agriculture

Glossary

Airblast sprayers | High-velocity, air-assisted sprayers that use a fan or multiple fans to direct spray volumes out or upwards into crop canopies. They are typically used in orchard and vineyard settings to penetrate

dense foliage and have a higher drift risk relative to other ground-based spray equipment.

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 the 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 L for a list of exempt crops—crops that are not visited by insects and crops that do not bloom (i.e., leafy greens not grown for seed production).

Certified | A farm entity that has received certification from an approved Bee Better Certifying Body.

Certified acreage | Crop production acreage and all pollinator habitat not in a production field.

Classical biological control | Permanent suppression of a pest over a large area through the introduction of a predator, parasite, or disease. 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 the USDA Animal and Plant Health Inspection Service (APHIS) to ensure the biological control agent will not itself become a pest or attack native non-target organisms.

Companion planting | Planting beneficial plant species next to crops to augment pest control, pollination, weed suppression, and overall crop productivity.

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 conserves natural enemies in and around crop fields and enhances pest control. One of the leading practices for enhancing populations of natural enemies on farms is the conservation of natural habitat and the creation of diverse, native habitat. (Bianchi et al. 2006; Tscharntke 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 is defined as 10% or greater loss to the harvest.

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

Economic threshold | The pest density at which management action should be taken 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 (3) 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 / pollinator-attractive species | Plants (including trees, shrubs, or forbs) known to provide pollen or nectar to pollinators.

Growing season | The natural growth period of native vegetation in the area. This varies by region.

Ground-based applications | Include all other spray equipment operating from the ground, which poses a lower drift risk than airblast sprayers.

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 SER International Primer on Ecological Restoration 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 | Species that are indigenous to a region; i.e., those that occurred historically in an area without human intervention. In the United States, see the USDA PLANTS database for native status: plants.usda.gov/

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

New habitat | Any habitat less than three (3) years old or habitat created following initial certification by a farm entity.

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 plants.usda.gov/

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; 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, nematicides, avicides, repellents, and piscicides. Pesticides may be conventional, biopesticides, or antimicrobials.

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. Note: planting pesticide-coated or -treated seed is considered a pesticide application.

Pesticide Product and Label System (PPLS) | A collection of pesticide product labels and their active ingredients that have been accepted by EPA under Section 3 of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

Pollinator | An animal that moves pollen from a flower's male part (anther) to its female part (stigma), enabling fertilization.

Pollinator habitat | Areas containing flowering plants 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.

Pre-bloom | The period that begins 10 days before bloom is expected to occur.

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

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

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 frost has 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 before termination. Temporary habitat must be within 10 miles of certified crop fields.

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.

Resources

- United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Plant List of Attributes, Names, Taxonomy, and Symbols (PLANTS) Database: https://plants.usda.gov/
- United States Environmental Protection Agency (EPA): https://www.epa.gov/
- Pesticide Labels: https://www.epa.gov/pesticide-labels
- Summary of the Federal Insecticide, Fungicide, and Rodenticide (FIFRA) Act: https://www.epa.gov/laws-regulations/summary-federal-insecticide-fungicide-and-rodenticide-act

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