Washington State Managed Pollinator Protection Plan for Alfalfa Seed Production

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Alfalfa Seed Pollinators in the Pacific Northwest

Alfalfa grown as a seed crop seed is produced in the low rainfall (<12 inches / <30 cm) inland shrub steppe habitat of the Pacific Northwest. In Washington State, production areas are centered in the Walla Walla Valley and Columbia River Basin. Alfalfa leafcutting bees *(Megachile rotundata)* are deployed to provide pollination services in both of these alfalfa seed production regions. Traditional release rates have been approximately 4 gallons per acre (16,000 females per acre / 40,000 females per ha), but increased costs for alfalfa leafcutting bees, which are purchased from Canadian merchants, has resulted in reduced rates of deployment by some growers.

Alfalfa leafcutting bee is a key pollinator of alfalfa produced for seed in Washington State.

In addition to alfalfa leafcutting bees, alkali bees *(Nomia melanderi)* are an important region-specific managed pollinator in the Walla Walla Valley. Population surveys conducted by Vinchesi and Walsh (2014) provide an estimate that roughly 7 to 18 million alkali bees persist among 23 managed "bee beds" interspersed among the alfalfa seed production region of the Walla Walla Valley.

Alkali bees also provide pollination services for alfalfa seed produced in the Walla Walla Valley.

Honey bees *(Apis mellifera)* are inefficient pollinators of alfalfa produced for seed in the Pacific Northwest and are therefore not used as a managed pollinator for this crop in Washington State. Managed hives of honey bees are often placed by commercial beekeepers near fields of alfalfa produced for seed, however, either to over-summer the bees or to pollinate other crops adjacent to the alfalfa being grown for seed. Many producers of alfalfa seed in this region consider honey bees a nuisance to their managed pollination service; within Walla Walla County, specific ordinances limit the number and geographic placement of honey bee hives when fields of alfalfa produced for seed are in bloom.

Managed alfalfa leafcutting bees are incubated to ensure their emergence coincides with alfalfa bloom in mid-June. In early June, the bees are placed in domiciles spaced roughly 300 feet (91 m) from the field edge and 700 feet apart (213 m) within fields. Domicile design varies substantially among growers.

Alkali bees are solitary, ground-nesting pollinators. Their emergence in Walla Walla County can begin as early as late May but will typically peak in mid- to late June, similar to that of the alfalfa leafcutting bees. Both managed bee species typically forage for 4 to 6 weeks and foraging activity declines rapidly as July progresses.

Leafcutting bees are typically purchased from Canada's Prairie Provinces. Bee boards such as these are stacked and placed in cold storage in the off-season. INSET: Female leafcutting bees provisioning brood cells with cut leaves and pollen.

The best quality alfalfa leafcutting bees are those that are newly purchased from bee vendors in the Canadian provinces of Saskatchewan and Alberta. These bees can be purchased as loose cells or in "bee boards" (artificial nests). Presently, most bees available for purchase come in Styrofoam bee boards. Growers have developed management techniques to help ensure that alfalfa leafcutting bee emergence is synchronized with the beginning of the alfalfa flower bloom. Just prior to the onset of bloom, bee boards containing a few thousand artificial nest cavities are placed in domiciles in alfalfa seed fields. Female alfalfa leafcutting bees use these cavities for their nests, each being able to find her nest among thousands of others.

Alfalfa seed producers have developed techniques for preserving bee populations and helping to ensure that bee emergence coincides with bloom. When bloom is complete, the bee boards are removed from fields and transported to storage facilities. During the late fall or early winter, some growers remove nest cells from the bee boards using special equipment made for this purpose, and then tumble the cells to filter out those that are empty or diseased. The viable loose cells are then placed into cold storage (41°F / 5°C) for several months. In late spring, the bee cells are placed into screen-topped trays and subjected to warm temperatures (86°F / 30°C) inside incubators, where each bee completes development from the diapausing prepupa to pupa to adult. Once adult emergence is imminent, the soon-to-emerge bees are taken to the blooming alfalfa fields and are placed in domiciles with empty bee boards. Here the bees will emerge and mate so that the life cycle begins anew.

Unfortunately, a cascade of factors can impact the abundance of "returning" bees. Natural enemies including avian, mammalian, and arthropod predators as well as arthropod parasites can reduce bee populations. Other major concerns for this bee are the occurrence of chalkbrood (a disease caused by fungal infections) and "pollen balls" (the informal term for a phenomenon in which eggs fail to hatch or larvae die shortly after hatching, leaving a pollen-provisioned cell but no viable larval bee). Chalkbrood can account for up to 20% mortality within immature bee populations, while pollen balls (which may be caused by a variety of factors) can account for up to 60%. Bees raised in Canada are mostly free of chalkbrood disease and pollen balls and, thus, are very important for supplementing the annual release of alfalfa leafcutting bees for alfalfa seed production in Washington State.

Alfalfa Seed Production in Washington State

Alfalfa produced for seed is grown on contract. Seed companies contract with growers to produce seed for them. Contracts are typically written for three years. This includes an establishment year that, if fall-planted, will yield a substantial partial crop the subsequent season. If the crop is spring-planted, yields during this establishment year are low. In the subsequent two years, fields will be in full production. Stands can be maintained beyond three years but productivity decreases and genetic heterogeneity increases in the harvested seed. Growers are paid per pound of clean seed. Prices have averaged roughly $2.50 per pound ($5.51 per kg) in recent years. On a mature stand, yields average 800 to 1,000 pounds per acre (900 to 1125 kg per ha) in the Columbia Basin and 1,200 to 1,500 pounds per acre (1,344 to 1,680 kg per ha) in the Walla Walla Valley. This disparity in yields is anecdotally attributed to the increased pollination services provided by the managed alkali bees endemic in the Walla Walla Valley.

Alfalfa fields grown for seed are mechanically planted in stands at a lower seeding rate than forage alfalfa. A typical seed field will be planted in 22-inch (142-cm) rows with 1-5/8-inch (4.13-cm) seed spacing within the row. This results in an initial stand establishment of approximately 175,000 plants per acre (435,000 per ha). By the second year, stands fill in and plants per acre increase substantially. New stands are typically fall-established in September and irrigated through fall and winter. Established stands are irrigated in spring with hook-and-latch piped impact-head sprinklers in the Walla Walla Valley and by center-pivot sprinklers in the Columbia Basin. Alfalfa seed produced in Washington State is grown as a non-food/non-feed crop under state statute in the Washington Administrative Code (WAC 16-228-1270). State laws prohibit the use of tailings or stubble as an animal feed. Alfalfa seed grown in the Washington State under regulations imposed by WAC 16-228-1270 must bear language on storage containers stating “Not for Human or Animal Consumption.”

Senescent blooms and seed-filled pods on alfalfa.

Where permitted, burning stubble confers many benefits.

Fertilizer in the form of natural phosphorus is applied in the fall at rates averaging 50 pounds per acre (123.5 Kg per ha). Where permitted, typically outside of urban boundaries, straw stubble and field residues are burned in late winter; where burning is not permitted, residues are often soil-incorporated by tillage. Research has demonstrated substantial production benefits arise from the sanitation practice of burning. These include improved rodent, weed, and pest insect control.

This little Lygus bug is a big problem.

Pest control on alfalfa produced for seed is concentrated on weeds and pest insects and mites; fungicides and nematocides are applied less frequently then herbicides and insecticides. Pre-emergent herbicides are applied for weed suppression in late winter and spot treatments are applied with grass or contact broadleaf herbicides as needed during the growing season. Gramoxone is applied pre-harvest as a desiccant harvest aid to improve seed pod shattering during combining.

The key arthropod pests of alfalfa produced for seed in the Pacific Northwest include Lygus bugs, alfalfa weevils, cowpea and spotted alfalfa aphids, and spider mites. Integrated pest management (IPM) programs are evolving as new insecticides are being registered via Section 24c Special Local Need (SLN) registrations. Until 2010, a typical insect management spray program involved a mid-spring application of chlorpyrifos for weevils if necessary and a late May or early June application of dimethoate, chlorpyrifos, bifenthrin, or lambda-cyhalothrin (or some combination of these or other organophosphate and pyrethroid insecticides) in what was colloquially called a "pre-bloom clean-up spray." Applied prior to placement of alfalfa leafcutting bees into field domiciles and emergence of alkali bees, these clean-up sprays targeted Lygus bugs, weevils, and cowpea aphids.

After placement of alfalfa leafcutting bees in the domiciles and subsequently during bloom, growers have historically limited themselves to evening applications of short-residual organophosphate insecticides, predominantly naled for Lygus control and fipronil for aphid control. These clean-up sprays with organophosphates and pyrethroids and bloom sprays of naled often disrupted the agroecosystem; spider mite outbreaks were common. In response to mite flare-ups, an acaricide, typically propargite, was applied in mid- to late June. In late July or early August, a final post-bloom application, typically with a pyrethroid, took place to protect the developing seed crop from Lygus through harvest.

The aforementioned SLN registrations for reduced-risk insecticides including indoxcarb, novaluron, and flonicamid have dramatically shifted the IPM program. These insecticides tend to have greater selectivity in the range of pest insects they kill than the broad-spectrum organophosphate and pyrethroid insecticides they are replacing. Indoxcarb is now the recommended insecticide for weevil control in spring and use is increasing. At present, most growers still apply a broad-spectrum organophosphate or pyrethroid at the end of May as a clean-up spray. However, most growers are now applying flonicamid twice per season in evening applications during bloom for managing Lygus bugs. Research has documented that flonicamid is safe when applied during bloom for foraging bees. Sulfoxaflor is also a recommended insecticide that can be applied in evenings and at night up to 4 hours before sunrise, when bees are not actively foraging and a sufficient period of time is provided for insecticide residues to dry. The SLN registration for sulfoxaflor was cancelled by the registrant in fall 2015 (due to litigation) and it was not sold in 2016. Sulfoxaflor's use on alfalfa grown for seed in 2017 was authorized by a Section 18 emergency exemption from registration that was issued by the USEPA. Novaluron is another reduced-risk insecticide that can be applied during bloom. It is an insect-growth-regulating insecticide that can provide good control of immature Lygus bugs. However, after several years of use it was determined that the use of novaluron, particularly when fields of alfalfa being produced for seed were in early bloom, was reducing brood development in nests of alfalfa leafcutting bees. Consequently, our current recommendation is to use novaluron specifically during late bloom to minimize any negative impacts on bee brood development. Novaluron use has decreased signigicantly in Washington and the SLN registration for use on alfalfa grown for seed in Washington was cancelled by the registrant in 2017.

Challenges Faced by Beekeepers

Most growers of alfalfa produced for seed in Washington State manage their own alfalfa leafcutting bees and some manage alkali bee beds. Technically, alfalfa leafcutting and alkali bees are not providing pollination services under contract. Alfalfa leafcutting bees are usually the property of the grower in whose field they are placed and most harm from pesticide exposure experienced by these bees can be attributed directly to the grower.

Alkali bee exposure is more complicated, due to the greater foraging distance they fly as they seek pollen and nectar to provision their brood. They differ from alfalfa leafcutting bees and honey bees in that their nests are extant and cannot be transported or closed. Alkali bees are solitary; if a female is killed or harmed the consequences are always negative to the brood. Alkali bees exhibit no altruistic behaviors. Their populations have been historically sensitive to insecticide exposure. Alkali bees were common in many alfalfa-seed-producing areas into the 1960s, but as chlorinated hydrocarbon-based insecticides were replaced with organophosphates, the distribution and prevalence of alkali bee populations was diminished.

Alfalfa seed is one of the few crops that can be grown profitably in the Walla Walla Valley due to water limitations. Managers of alkali bee beds have learned to communicate with and educate growers of nearby crops such as sweet onions and potatoes (which typically receive a fairly intensive insecticide load to control pest insect populations), doing their best to dissuade them from using highly toxic insecticides during the times that alkali bees are actively foraging.

Alkali bees nest in holes in the ground in natural or managed "bee beds" and are relatively strong fliers.

Alfalfa leafcutting bees stay close to their grower-provided domiciles. They cut disks from leaves to partition their nesting holes.

Nectar and pollen resources are somewhat limited in the shrub steppe habitats of eastern Washington State, resulting in relatively few locations appropriate for commercial honey bee managers to over-summer their bees. Some locations where honey bees are placed during the summer months in the Columbia Basin and Walla Walla Valleys result in the bees foraging in fields of alfalfa produced for seed. The pollination services these honey bees provide for alfalfa seed producers are limited; they are much less efficient pollinators of this particular crop than the alfalfa leafcutting or alkali bees. Inadvertent honey bee kills can occur late in the alfalfa seed bloom cycle when alfalfa leafcutting and alkali bees have ceased foraging for the but honey bees are still foraging the final dregs of late-season bloom.

Honey bee "ball" in late-season alfalfa produced for seed.

Growers traditionally apply insecticides in the evening or at night.

Best Management Practices (BMPs)

Ideally pesticide use and specifically insecticide use during bloom when pollinators are foraging should be avoided. Unfortunately, aphid, Lygus, and spider mite populations can build to damaging levels during bloom. Control of these insects typically requires an insecticide intercession.

Insecticides applied in recent years have included the organophosphate insecticide naled and the pyridinecarboxamide insecticide flonicamid. The sulfoxamine insecticide sulfoxaflor was registered under a Section 18 emergency exemption in 2017 and a Section 3 registration on alfalfa is pending. Acetamiprid was available for use on alfalfa grown for seed via SLN registration for approximately 5 years, but lack of grower interest in its continued use led the registrant to cancel the SLN registration for acetamiprid in 2012. Novaluron was demonstrated to have some negative impact on bee return and the SLN registration for its use on alfalfa grown for seed was cancelled in 2017.

The mainstay insecticides used for insect pest control at present include flonicamid and naled. Naled has been used for pest control for over 30 years. It was demonstrated that if residues of naled were still wet on mornings with dew on plants, bees could be exposed and this exposure could prove toxic. Hence growers avoid applying naled to blooming alfalfa if temperatures are expected to drop below the dew point.

With naled and other insecticides, a tradition of applying insecticides in the evening or at night has been adopted by producers of alfalfa produced for seed. Early morning applications of the current grower standard flonicamid have been demonstrated as safe to foraging bees, but most growers—out of force of habit—apply flonicamid in the evening or at night as well. It is likely that a statement such as, "do not apply [new insecticide] to blooming alfalfa within 4 hours of sunrise" will be in future labeling language on insecticide products such as sulfoxaflor registered for use on alfalfa produced for seed.

Growers of alfalfa produced for seed in the Walla Walla Valley have late spring cutoffs between May 23 and June 6 (depending on the area) for applying certain insecticides as a cleanup spray (refer to WAC 16-230-010 thru 079).

Because pest populations can build to damaging levels during bloom, insecticide intercession can be required during this sensitive time.

The Plan

Our goal is to provide recommendations to producers of alfalfa seed that enable continued use of the insecticides they now use as well as access to and integrated use of new insecticides as they are commercialized by the agrichemical industry. To this end specific Best Management Plans (BMPs) are being recommended.

In June 2015, the Washington State Department of Agriculture, working with the Washington Alfalfa Seed Commission, the Touchet-Gardena Alfalfa Seed Growers Association, and other affiliated and affected stakeholders, conducted a multi-faceted discussion focused on pollinator-associated issues. This provided alfalfa seed growers, nearby growers of other crops, managers of alkali bee beds, and honey beekeepers along with pest control applicators, consultants, public and private researchers, and regulators a forum to discuss practices that could protect managed and endemic pollinators while minimizing impacts on crop producers.

Our pollinator protection plan prescribes voluntary actions and BMPs for pesticide users, landowners or leasers of farms in alfalfa seed production, managers of alkali bee beds, and honey beekeepers with the objective of creating positive outcomes.

- Ensuring positive relationships and peaceful co-existence among seed grower/pesticide applicators, alkali bee bed managers, and honey beekeepers,
- Reducing pesticide exposure and subsequent risk of pesticides to pollinators,
- Ensuring both a robust alfalfa seed growing industry and local agriculture economy alongside honey bee production and management, and
- Continuing compliance with state pesticide and apiary requirements.

Alfalfa Leafcutting Bee BMPs

Typically, the alfalfa seed grower is the direct manager of the alfalfa leafcutting bees in his or her alfalfa seed field. Care should be taken in choice of pesticides, particularly insecticides that will be applied during the bloom cycle when bees are actively foraging during daylight hours. All pesticide label instructions must be followed and it is prudent to make all applications during the evening or at night to avoid exposing the bees to wet residues of pesticides.

Alkali Beekeeper BMPs

Alkali beekeepers should strive to maintain open lines of communication with nearby landowners and growers of crops besides alfalfa seed. They should post signs on roads near alkali bee beds indicating daytime speeds of 20 mph maximum during daylight hours when bees are actively foraging. In communicating with growers of other nearby crops, they should ask that insecticides be applied to any blooming crops on which bees are foraging in the evening, night, or early morning to ensure that residues are dry before bees fly in the morning. They should further request that other growers avoid spraying pesticides if an inversion is predicted or when temperatures are predicted to fall below the dew point.

Honey Beekeeper BMPs

Honey beekeepers should communicate with alfalfa seed growers when choosing apiary locations and determining the number of colonies they will place in a particular location. Ideal apiary locations will have minimal impact on seed production but will provide bees with adequate access to alternative forage and open water sources. Low spots should be avoided to minimize impacts from drift or temperature inversions.

Beekeepers should also request contact information for applicators, renters, and neighbors (if applicable) that may be applying pesticides. Beekeepers should refrain from blocking rights-of-way or placing hives so close to rights-of-way, structures, or equipment that they could cause problems for other land users. They should ensure that their managed honey bees have sufficient resources throughout their stay at each location the hives are placed. If water or forage sources become limited, they should ensure that bees are not watering or foraging at or near locations that could be bothersome for landowners or interfere with agricultural practices (e.g., bees utilizing livestock tanks for water sources); they should be cognizant of available water sources and provide water if natural sources become depleted or unacceptable. Water sources that do not serve as breeding sites for mosquitoes are preferable. When forage is diminished, colonies should be moved to a new location to ensure that bees don't become an inconvenience to others in the area.

Honey beekeepers should work constructively with applicators when notified of upcoming pesticide applications. One of the recommended BMPs for pesticide applicators is to contact nearby beekeepers prior to making pesticide applications. Thus informed, honey beekeepers should use this opportunity to block, move, or net hives when applicators inform them of a pending pesticide application, or find another strategy to allow pesticide applicators to manage pests while minimizing pesticide exposure to bees.

Apiary site selection, hive placement, and communication are important components of honey beekeper BMPs.

Honey beekeepers should notify nearby pesticide applicators and landowners when placing or moving beehives. By ensuring that neighbors are aware of current apiary locations, beekeepers help enable them to give proper notification about their pesticide applications. Contact information for nearby pesticide applicators can usually be obtained from landowners. Honey beekeepers should site their apiaries in locations that can be identified and ownership of the colonies including a name and cellphone number should be on all hives.

Honey beekeepers should stay current, obtaining landowner permission for colony placement every year. Landowners and

Comply with all requirements of Washington State beekeeping laws and rules.

https://agr.wa.gov/PlantsInsects/Apiary/

To register as a beekeeper or broker, go to this URL:

https://agr.wa.gov/FP/Forms/PP/docs/6116-Beekeeper-BrokerRegistration.pdf

contact information can change, therefore it is important to ensure relevant parties are aware and bees are not placed without permission, creating an opportunity for the bees to become a nuisance.

Regarding public land access, these parcels typically do not practice crop production or large-scale insecticide use. Some state, federal, and other public agencies allow beekeepers to place honey bees on lands. Contact the relevant agency responsible for specific public lands.

Inspect bee behavior regularly. The WSDA, as the lead pesticide regulatory agency in the state, will respond to complaints, including collecting samples and analyzing the location for pesticide residues. Some pesticides degrade rapidly, and timely reporting will aid the pesticide investigation.

Use of pesticides is required to be in compliance with the most up-to-date label. When pesticide use is necessary to manage pests within hives, applicators should use registered pesticides and comply with all restrictions, precautions, and directions found on the pesticide label to help minimize risk to bees. Failure to comply with label directions may decrease the effectiveness of pesticides, increase the risk of adverse effects to bees, cause unsafe pesticide residues in honey and other products, and potentially lead to pesticide resistance in the target pests. Contact the WSDA Pesticide Management Division with any questions on pesticide labeling or to determine whether a pesticide is registered in the state.

Ensure that hives are easily visible to applicators so applicators can locate them before spraying. It is strongly suggested that hives be painted white or another color that stands out from the surrounding area.

White is a recommended color for hives.

Beekeepers and other involved parties should immediately report all suspected pesticide-related bee kills to the Washington State Department of Agriculture (WSDA) Pesticide Management Division, Compliance section:

Toll free statewide:

1-877-301-4555

Landowner/Grower BMPs

Landowners and growers of alfalfa seed and other crops need to communicate with beekeepers in choosing apiary locations. Ideal locations for apiaries will have minimal impact on farming/ranching operations, but will still allow bees to access forage and water. Landowners can advise beekeepers as to which roads/trails can be problematic when wet, for example, and can apprise beekeepers of any preferred traffic routes. Landowners may also want to provide contact information for applicators, renters, and neighbors (if applicable).

Landowners should communicate with renters about bee issues. Renting land for agricultural production is a common practice and renters should be made aware of pending constraints resulting from the presence of bees prior to endorsing contracts and leases. Landowners and renters should discuss bee issues, such as who has authority to allow bees, how long they will be allowed, and apiary placement.

Landowners should communicate with pesticide applicators as to who has the responsibility to look for hives and notify neighbors. When contracting with commercial pesticide applicators, make sure that there is a clear understanding of who has the responsibility to identify apiary locations and communicate with beekeepers. Applicators may do this as part of their standard procedures, but some landowners may prefer to make beekeeper contacts themselves.

University-based Extension faculty and private contract consultants and agronomists should consider pollinator impacts when making pesticide and crop management recommendations, including product choices and pesticide timing decisions.

Landowners should plant flowering plants, trees, and shrubs to improve bee forage quality and quantity, especially in non-farmable or non-crop areas. Doing so provides forage and it may also draw bees away from fields that might be treated with pesticides, thereby minimizing potential impacts to pollinators.

Many pesticide labels require untreated vegetative buffer strips around sensitive sites. Landowners are encouraged to plant flowering plants in those buffer strips to provide additional bee forage.

If planting cover crops, landowners should add flowering plants into the mix. Even a small percentage of flowering plants can provide a considerable amount of forage for pollinators.

Those planting seeds should utilize alternatives to talc/graphite in planters. Talc/graphite can abrade the insecticide coating off of treated seeds, thereby creating insecticide-containing dust that can drift onto hives and flowering plants.

Landowners using bees in other crops should communicate with adjacent growers, renters, and other parties.

When possible, apply pesticides (especially insecticides/miticides) in the evening, night or early morning, when bees are less active.

Pesticide Applicator BMPs

Applicators should use integrated pest management (IPM) principles and practices including scouting and economic thresholds to determine if insecticides are required to manage pests. When insecticides are required, they should consider choosing insecticides with low toxicity to bees, short residual toxicity, or repellent properties towards bees.

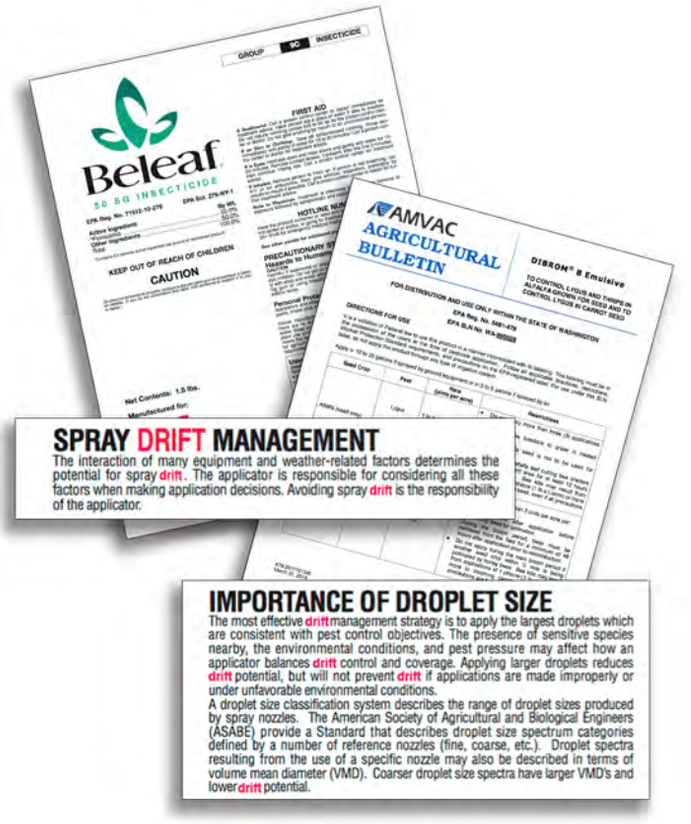
Registered pesticides must be used according to the label. Pesticide label language is developed to ensure that pesticides will not pose a risk of unreasonable adverse effects to human health or the environment. Failure to comply with the label not only puts humans and the environment at risk, it is also a violation of state and federal law. Many pesticides, especially insecticides, have use restrictions prohibiting applications when bees are foraging in the treatment area. Some labels prohibit applications when crops are blooming and require that the applicator notify beekeepers in the area prior to application. Applicators should always comply with these and other label restrictions to reduce risks. Applicators are bound by all directions, precautions, and restrictions on pesticide labeling, even when following other BMPs. The WSDA Pesticide Compliance staff can answer questions regarding pesticide label language.

Pollinators are most active during daylight hours and when the temperatures exceed 55°F. When possible, pesticides should be applied in the evening, at night, or in the morning when bees are less active to reduce the chances that bees will be foraging in or near the treatment site. Applicators should be cognizant of temperature restrictions on pesticides. The efficacy of some pesticides is reduced at certain temperatures and when temperature inversions occur.

Pesticide applicators should do everything possible to avoid drift, which is the off-site movement of pesticides through the air from the treatment site to adjacent areas, either in the form of mist, particles, or vapor. Drift reduces the effectiveness of the chemical applied since only part of the applied amount reaches the target. Drifting chemicals also pose a risk to non-target organisms that come in contact with the off-target residues. These insecticides can negatively affect bees and other beneficial insects by direct contact or by contaminating their forage and habitat. Drifting herbicides have the potential to further reduce quality forage available to pollinators. WSU Extension can provide more information on how to reduce pesticide drift.

Applicators should identify and notify beekeepers in the area prior to pesticide applications. Bees can fly several miles in search of quality forage. Therefore, beekeepers within two miles of a site to be treated should be notified at least 48 hours prior to application or as far in advance as possible. Timely notification will help ensure ample time for the beekeeper and applicator to develop a mutually acceptable strategy to manage pests while mitigating risk to honey bees. This may include covering hives, moving hives, or choosing the time of day to apply. Notifying beekeepers does not exempt applicators from complying with pesticide label restrictions. Many insecticide labels prohibit use if pollinators (bees) are present in the treatment area.

Applicators can further help by choosing products and formulations with lower risk to bees. Dusts and wettable powders, for example, can leave a powdery residue that sticks to hairs on bees, endangering not only the foraging bee but potentially the entire hive when the bee returns. These formulations should be avoided. Granular and liquid formulations are safer for pollinators since granules are not typically picked up by bees, and liquids dry onto plant surfaces. When possible, applicators should choose products with lower residual toxicity to bees. Note that the WSDA will be working with WSU scientists and Extension faculty to develop guidance on product choices to reduce risk to bees.



Read and follow label directions. Labels contain a wealth of information that can increase a product's safety and efficacy, including ways to avoid pesticide drift.

Integrated pest management principles such as scouting/ sampling are part of best management practices for applicators.

Supporting Pollinator Forage & Habitat

Everyone can plant forage for bees. Plants that support pollinators are also beneficial for other wildlife, are often visually attractive, and can help improve soil health. Flowers often come to mind when thinking about bees, but bees also utilize trees, shrubs, and other less-noticeable plants for pollen and nectar sources. It is important to consider diversity when choosing plants to ensure adequate forage for the entire growing season. Diversity will also ensure pollinators have access to all of the nutrients they require to be healthy. Following are some easy, efficient ways to improve pollinator forage.

Municipalities can plant trees, shrubs and flowers that provide good forage for all types of pollinators. Diversity is important; the pollen and nectar of each species carries a different nutrient load for the pollinators. Benefiting bees can be worked into a planting strategy: every time a plant is added or replaced, the planter can choose a variety that will contribute to pollinator forage. Foraging honey bees are typically not aggressive.

Counties can create bee forage along secondary roads. Secondary road ditches often contain several species of plants that provide forage for pollinators. It is a common practice to mow ditches for the safety of motorists and to prevent drifting snow. Counties can consider spot spraying noxious weeds and mowing ditches later in the year to ensure that bee forage is available for a longer period of time. Those responsible for planting choices can incorporate short forbs into secondary road ditches to minimize attracting large wildlife.

Homeowners can put out flower pots, create flowerbeds, plant trees or shrubs, or establish gardens to provide forage. Homeowners should also use caution when applying pesticides; pesticide user BMPs apply to anyone using pesticides. Homeowners should understand that the pesticide label is the law and it is in place to minimize risk to the environment and human health.

A bumble bee (Bombus *spp.) seeks a meal.*

Anyone can create habitat for beneficial, wild pollinators. Roughly 70 percent of native bees nest in the ground (Grula 2016, Jordan 2014). They burrow into areas of well-drained, bare, or partially vegetated soil. Other bees nest in abandoned beetle houses in snags or in soft-centered, hollow twigs and plant stems. Bees will also utilize dead trees and branches. Habitats can be created by leaving deadfalls and brush piles as nesting habitat. Those wishing to create pollinator habitat should consider the type of habitat (being aware that certain structures might attract other animals such as fox, coyote, skunks, and porcupines) as well as the type of pollinators they want to attract.

Flowering herbs and shrubs are among many types of plants that can provide forage and habitat for pollinators.

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