

# Pollinator Cover Crops in Hazelnut Orchards



Hazelnuts are commonly grown in the Willamette Valley with bare ground underneath the orchard. Bare ground is traditionally maintained in hazelnut orchards to allow for machine harvest. Young orchards are particularly susceptible to soil erosion because of a lack of cover and tree roots to help hold the soil. Cover crops or other plantings between the rows of hazelnuts can prevent soil erosion in addition to providing benefits for soil health, water infiltration, and beneficial insect conservation. Cover crops also can reduce soil compaction and allow growers to access the orchard to make applications during moist weather.

Although hazelnuts are wind-pollinated, and therefore, don't require pollinators to produce nuts, cover cropping can be designed to benefit pollination in nearby crops that do require insect pollination. In addition, these plantings could help local beekeepers and native bees that are lacking in forage resources, as well as important beneficial insects. Beneficial insects such as parasitoids and generalist predators like lacewings and lady beetles can benefit from floral resources (pollen and nectar) provided by some cover crops. These parasitoids and predators could help control filbertworms, leafrollers, and aphids, potentially reducing the need for some insecticide applications in hazelnuts.

## Selecting a Pollinator Cover Crop

There are several options for establishing ground cover that prevents soil erosion and provides habitat for pollinators and beneficial insects (see Table 1 for a list of species). Young orchards that are not being harvested have opportunities to grow many different plants in the alleys. Some growers choose to grow a crop that is harvested (alley cropping) such as grass seed, crimson clover, or even row crops such as strawberries. Annual cover crops such as clovers, vetch, and phacelia can provide habitat for pollinators and other beneficial insects. Some annual cover crops can reseed and grow in subsequent years but others may need to be replanted each year. For this reason, annual



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TOP TO BOTTOM—*Halictus* bee on yarrow; crimson clover in hazelnut orchard; California poppies (photos: Sara Morris; Xerces Society / Mace Vaughan; Xerces Society / Eric Lee-Mäder).

cover crops are easier to use in newly planted orchards before harvests have begun. Perennial cover crops can persist for many years and don't need to be replanted. Creeping red fescue can be used in hazelnuts to prevent erosion and has been used successfully in newly planted and mature hazelnut orchards. Creeping red fescue could be planted in combination with forbs that are beneficial for pollinators. Mixes of creeping red fescue and annual and perennial clovers and other flowering species are currently undergoing trials at the USDA Natural Resources Conservation Service (NRCS) Plant Materials Center (PMC) in Corvallis, Oregon, to evaluate their utility. One goal of the work at the NRCS PMC is to find species compatible with management in bearing hazelnut orchards, though this information could apply to non-bearing orchards as well.

Cover crops used in hazelnuts have to tolerate the production and harvest process. Hazelnuts are harvested off the orchard floor which requires preparation before harvest. Many orchards are flail mowed three times followed by leveling (scraping) to

**Table 1. Plants that can be used as pollinator-resource cover crops in hazelnut orchards.**

COMMON NAME	LATIN NAME	LIFE HISTORY	RATE (LB/ACRE) <sup>1</sup>	POTENTIAL USES <sup>2</sup>	SHADE TOLERANCE <sup>3</sup>
<b>NATIVE SPECIES</b>					
Common yarrow	<i>Achillea millefolium</i>	perennial	0.5	NBH, BH, FCH	moderate
Menzies' fiddleneck	<i>Amsinckia menzezii</i>	annual	9	NBH	low
Farewell to spring <sup>4</sup>	<i>Clarkia</i> sp.	annual	2	NBH	low
Oregon sunshine	<i>Eriophyllum lanatum</i>	perennial	3	NBH, BH, FCH	moderate
California poppy <sup>4</sup>	<i>Eschscholzia californica</i>	annual/ perennial	5	NBH, BH, FM	moderate
Globe gillia <sup>4</sup>	<i>Gilia capitata</i>	annual	2	NBH	low
Douglas meadowfoam	<i>Limnanthes douglasii</i>	annual	20	NBH, BH, FCH, FM	moderate
Bicolor lupine	<i>Lupinus bicolor</i>	annual	20	NBH, BH, FM	low
Baby blue eyes	<i>Nemophila menziesii</i>	annual	8	NBH, BH, FCH, FM	moderate
Bristly phacelia	<i>Phacelia nemoralis</i>	perennial	3	NBH, BH, FCH, FM	moderate
Rosy plectritis	<i>Plectritis congesta</i>	annual	2	NBH, BH	low
Slender cinquefoil	<i>Potentilla gracilis</i>	perennial	2	NBH, BH, FCH	moderate
Selfheal	<i>Prunella vulgaris</i> var. <i>lanceolata</i>	perennial	4	NBH, BH, FCH, FM	moderate
<b>NON-NATIVE SPECIES</b>					
Five spot	<i>Nemophila maculata</i>	annual	20	NBH, BH, FCH, FM	high
Lacy phacelia <sup>4</sup>	<i>Phacelia tanacetifolia</i>	annual	9	NBH, BH	low
Balansa clover	<i>Trifolium michelianum</i>	annual	8	NBH, BH, FCH, FM	moderate
Arrowleaf clover	<i>Trifolium vesiculosum</i>	annual	15	NBH, BH, FM	low
Common vetch	<i>Vicia sativa</i>	annual	60	NBH, BH, FCH	high
Hairy vetch <sup>4</sup>	<i>Vicia villosa</i>	annual	40	NBH, BH	low

**THIS TABLE INCLUDES GENERAL SUGGESTIONS FOR LIKELY USES. MANY OF THESE SPECIES ARE STILL BEING EVALUATED FOR THEIR SUITABILITY FOR USE IN HAZELNUT SYSTEMS. SOME PLANTS MAY PRODUCE RESIDUE OR STUBBLE THAT MAY AFFECT HAZELNUT HARVEST.**

**1 RATES ARE FOR BROADCAST SEEDING OF A SINGLE SPECIES, REDUCE THE RATE WHEN PLANTING IN A MIX.**

**2 NBH = NON-BEARING HAZELNUTS; BH = BEARING HAZELNUTS; FCH = FULL CANOPY HAZELNUTS; FM = FESCUE MIXES.**

**3 MODERATE OR HIGH SHADE TOLERANCE PLANTS MAY SURVIVE IN MATURE ORCHARDS WITH A FULL CANOPY.**

**4 THESE SPECIES WERE TESTED FOR HERBICIDE TOLERANCE. SEE TABLE 2 OPPOSITE FOR THE DETAILS ON HERBICIDE TOLERANCE.**

prepare for harvest. Alternatively, some orchards are just flail mowed three times low enough to allow for harvest equipment to pick up the nuts. Some growers have established creeping red fescue cover and have successfully harvested by preparing for harvest with flail mowing only. It is important to select cover crops that do not produce excessive residue or thatch that will contaminate or impact the ability to harvest nuts off the floor. Pollinator cover crops are currently being evaluated for thatch/residue in trials at the NRCS Plant Materials Center.

Gopher and vole pressure may be affected by cover crop choice in orchards. Cover crops may provide a food source or shelter for pest rodents. The risk to the orchard is greater in the establishment years because rodents can kill or damage young trees. Legumes, particularly perennial clovers, are preferred by rodents. Monitor the crop closely and proactively control rodent populations before damage occurs to young trees. Providing nesting opportunities for rodent predators such as owls (owl boxes) or other raptors (perches) can be part of a holistic approach to reducing rodent pressure in orchards.

The selection of cover crops can be influenced by herbicide use history in the orchard. Herbicides are commonly applied in mature hazelnuts in the alleys or tree rows to maintain a weed-free ground surface for sweeping hazelnuts at harvest. These herbicides may or may not be compatible with a cover crop planted in the alleys. It is especially important to understand the tolerance of cover crops to pre-emergent herbicides. Some pre-emergent herbicides can have residual activity up to 2 years after application. Depending on what pre-emergent herbicide products were applied in the orchard, a producer may use the information below to select a cover crop. Table 2 outlines the effect of some commonly used pre-emergent herbicides on a select number of pollinator cover crops. Most cover crops, however, have not been tested for herbicide resistance. Use caution when planting cover crops after a history of pre-emergent herbicide use, and use herbicides that have a short residual before planting cover crops.

**Table 2. Cover crop compatibility depending on pre-emergent herbicide application timing.**

HERBICIDE	PLANTING CONCURRENT WITH APPLICATION	PLANTING 6 MONTHS AFTER APPLICATION
<b>Flumioxazin (Chateau)</b>	California poppy	California poppy, farewell to spring, sainfoin
<b>Indaziflam (Alion)</b>	No compatible species	Sainfoin
<b>Isoxaben (Trellis)</b>	Farewell to spring	Farewell to spring, hairy vetch
<b>Mesotrione (Motiff)</b>	No compatible species	No compatible species
<b>Napropamide (Devrinol)</b>	Phacelia, globe gilia, sweet alyssum, sainfoin	Farewell to spring, globe gilia, phacelia, sainfoin
<b>Pendimethalin (Prowl)</b>	California poppy	California poppy
<b>Rimsulfuron (Simazine)</b>	Hairy vetch, sainfoin	California poppy, farewell to spring, globe gilia, hairy vetch, phacelia, sainfoin, sweet alyssum

## Planting a Pollinator Cover Crop

Cover crops are typically planted after harvest in the fall. Some years this can be difficult due to rainy weather. Planting occurs ideally in early October after preparing the soil for planting. Seedbed preparation typically involves disking, harrowing, and ring rolling. Many cover crop seeds are small and can be seeded with drop seeders or broadcast seeding. After surface seeding use a cultipacker, roller, or similar equipment to increase seed-to-soil contact. Larger seeds (e.g., legumes and grass) can be drill-seeded as well. When planted with forbs, creeping red fescue can be planted at 8 lb./acre. When a flowering cover crop is used in combination with red fescue, seed at approximately half the rate shown in Table 1. If more than one flowering species is added to a fescue mix then decrease the rate proportionally to the percentage cover desired for each species in the mix.

## Managing a Pollinator Cover Crop

Cover crops can be managed to reduce weeds and protect pollinators. High mowing (3–6 inches high) can help prevent weeds from setting seed, and increase diversity by letting more light penetrate the cover crop so species that otherwise may be out-competed can thrive. Mowing, however, can prevent some cover crops from blooming, thus affecting their attractiveness to pollinators. Partially mowing cover crops by leaving strips of unmowed cover crop or mowing alternate alleys will help maintain habitat for pollinators and beneficial insects while cover crops are still blooming. Delaying fall mowing before harvest until cover crops have set seed will maximize their ability to reseed for the following year.

Integrated pest management (IPM) monitoring can help minimize insecticide applications and their effects on pollinators and beneficial insects in cover crops. It is important to mow blooming cover crops prior to insecticide applications to minimize impacts to pollinator populations. Refer to the references below for more information on pesticide mitigation and bee safety.

## NRCS funding opportunities for cover crops in hazelnut orchards

The USDA NRCS provides technical and financial assistance to help producers and landowners make conservation improvements on their land that benefit natural resources. Two NRCS programs can provide financial assistance, EQIP (Environmental Quality Incentives Program) which provides cost-share assistance, and CSP (Conservation Stewardship Program) which provides further incentives for producers that have made conservation an important part of their operation. Erosion management and pollinator habitat are two priority resource concerns for the NRCS in Oregon. NRCS is currently providing opportunities for funding pollinator habitat in hazelnut orchards. Hazelnut growing regions of the Willamette Valley have targeted funding for the implementation of the cover cropping practice (340) in hazelnut orchards for erosion control. Although the primary resource concern being addressed with this funding is erosion control, these cover crops can be designed and managed with pollinator needs as a secondary resource concern. Ask your local NRCS field office about the Cover Crop practice (340) and the opportunity for additional technical and financial assistance.

## References and Additional Resources

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UCIPM Bee Precaution Pesticide Rating Website: [ipm.ucanr.edu/bee-precaution-pesticide-ratings/](https://ipm.ucanr.edu/bee-precaution-pesticide-ratings/)

Mitigation Techniques to Protect Habitat: [xerces.org/publications/fact-sheets/guidance-to-protect-habitat-from-pesticide-contamination](https://xerces.org/publications/fact-sheets/guidance-to-protect-habitat-from-pesticide-contamination)

Organic Pesticides and Pollinators: [xerces.org/publications/fact-sheets/common-organic-allowed-pesticides](https://xerces.org/publications/fact-sheets/common-organic-allowed-pesticides)

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