



# Pollinator Habitat in Agriculture

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**POLLINATOR  
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# POLLINATOR PARTNERSHIP



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Sam Hubert, One Green World

## Today's Webinar:

- 1) What Pollinators Need
- 2) What Producers Need
- 3) Bee Friendly Farming
- 4) Additional Resources

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## What do pollinators need?

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- Diverse, preferably native floral resources rich in pollen and nectar
- Continuous bloom of host plants
- Mix: woody, herbaceous, grasses
- Nesting areas
- Habitat connectivity
- Clean drinking water
- Area with reduced pesticide use

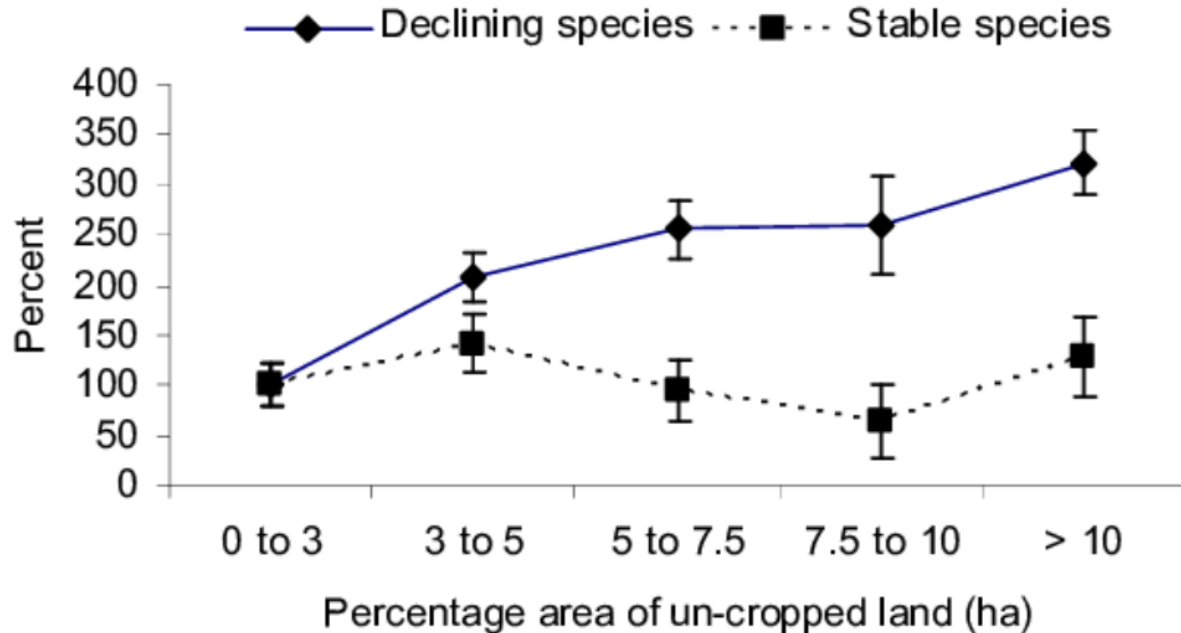
# Benefits of pollinator habitat

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- Environmental stewardship
- Biodiversity
- Pollinator health
- Pest management
- Pollination and production
- Soil health
- Water health



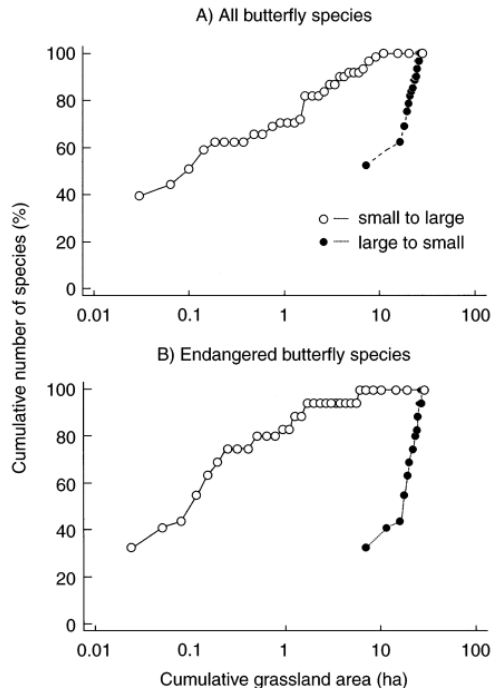
# Pollinator Health



- Increase in the number of bee groups between 0–3% and 3–5% uncropped land, but no [significant] increase beyond this
- Farms with habitat approximately 2x the biomass of invertebrates per unit area as the control farms

Holland *et al.* 2013

# Pollinator Health



- Small fragments supported more butterfly species (even when only endangered species were considered) than the same area composed of only one or two fragments.
- Species numbers of parasitoids, but not of herbivores, benefited from habitat subdivision in landscapes
- Small habitat fragments should be scattered enough to cover a range of geographical area wide enough to maximize beta diversity and the spreading of risk
- Large habitat fragments should be close enough to allow dispersal among fragments, to reduce the extinction probability of area sensitive species, and to stabilize predator–prey interactions.

Tscharntke et al. 2002

# Pest Control

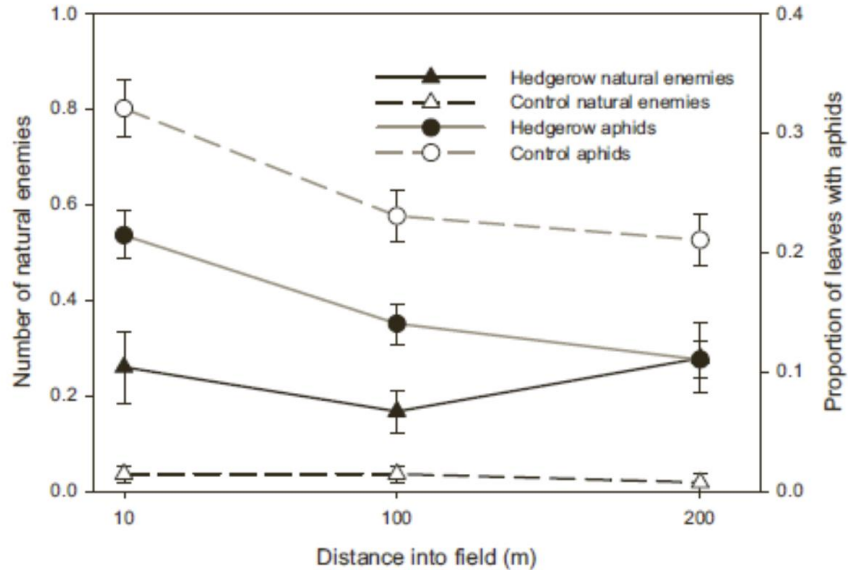
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- Abundance of natural enemies and hoverfly richness was enhanced in flower strips.
- A reduction in the number of aphids by 75% in adjacent potato crops.
- 40% reduction of pest-induced crop damage near flower strips.  
Tschumi et al. 2016
- Flower strips can benefit pest control services in adjacent fields by 16% on average.
- Pollination decreased with distance from plantings
- Perennial and older flower strips with higher diversity enhanced pollination more effectively.

Albrecht et al. 2020



# Pest Control



- Pest control greater in hedgerow sites than weedy edge sites.

- Hedgerows benefits can extend 100–200 m into crops.

Morandin et al. 2014

# Pest Control

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- IPM can reduce insecticide applications by 95% while maintaining or enhancing crop yields through wild pollinator conservation

Pecenka et al. 2021

- Diversification schemes generally achieve
  - Natural enemy enhancement,
  - Reduction of herbivore abundance,
  - Reduction of crop damage, from a combination of bottom-up and top-down effects

Letourneau et al. 2011



# Pollination and Production

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- Soybean yields increased between 6% to 18% with bees

Rocha & Freitas 2013

- Soybean yields were increased by 18%

Bletter et al. 2017

- Benefits of native and honey bee populations on self-pollinating crops
  - 15% increase in cotton yields
  - 12.3% to 15.8% increase in canola yields

Esquivel et al. 2021



# Pollination and Production

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- Presence of bees can increase pollen yield, decrease risk of *Botrytis*, can decrease shot berries.

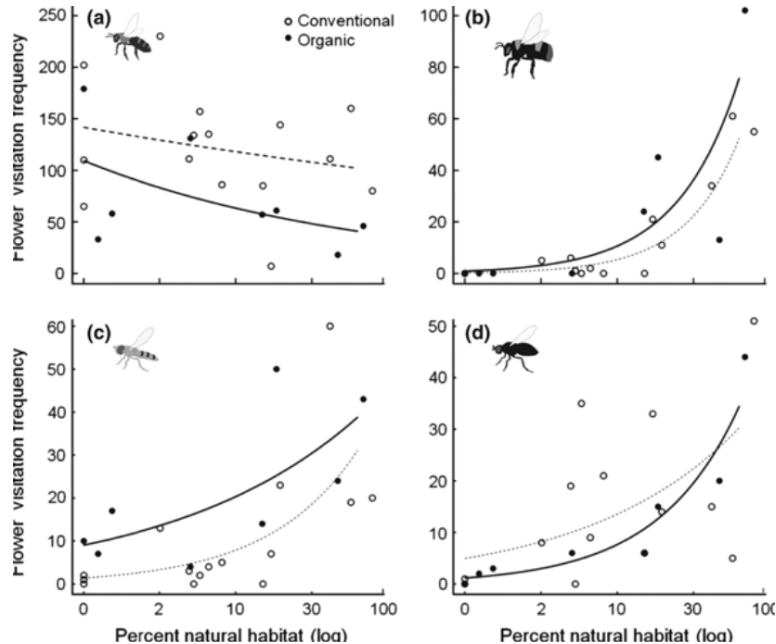
Hogendoorn *et al.* 2016

- Bee pollen can enhance fermentation kinetics without affecting wine quality

Amores- Arrocha *et al.* 2020



# Pollination and Production



- Wild bee species visited almond flowers in orchards with adjacent semi-natural habitat or vegetation strips.
- Wild bee species richness and flower visitation frequency, but not honeybee frequency, were related to fruit set.
- Fruit set increased with increasing percentage of natural habitat surrounding the orchards.

Klein et al. 2012

# Pollination and Production

## WILD AND MANAGED POLLINATORS' IMPACT ON PRODUCTION



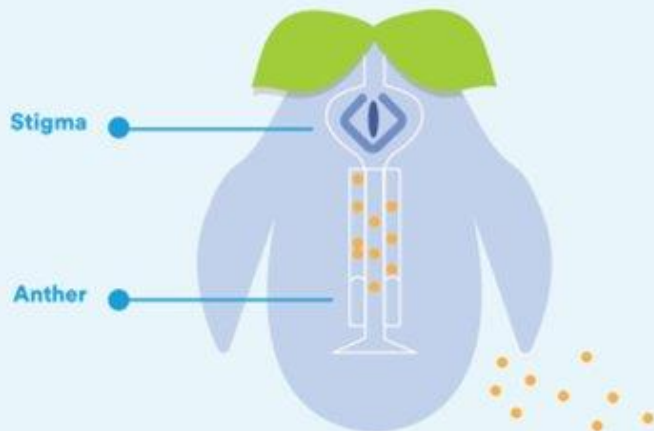
**Low production:**  
No pollinators



**Typical production:**  
Managed honey bees  
and typical ambient wild  
pollinators in BC



**Potential production:**  
Full pollination with managed  
honey bees and increased  
wild bee presence from  
habitat management. This can  
potentially increase revenue by  
\$15,000-\$18,000/ha<sup>1,8</sup>



*Poricidal anthers on a blueberry flower (figure adapted from University of Maine Fact Sheet No. 630, UMaine Extension No. 2111)*

# Pollination and Production

## PRODUCTION BENEFITS FROM WILD AND MANAGED POLLINATORS



### Little/no pollination

Heavy pollen and the need for a compatible partner tree. No pollinators (pollinator exclusion), results in little to no yield.



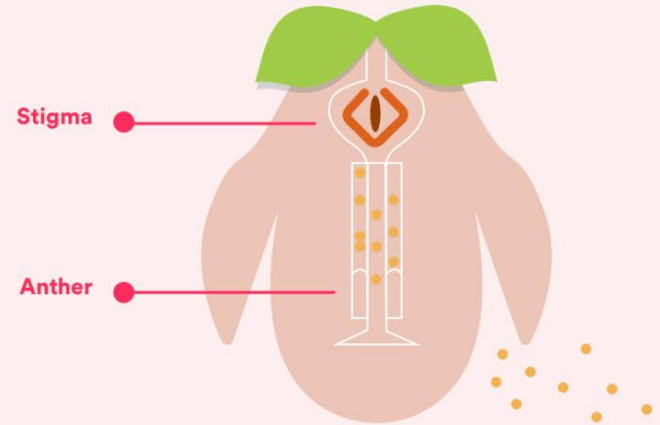
### Limited pollination

When pollen is not sufficiently transferred to all five carpels, fruit will be small, malformed, and less marketable.



### Robust pollination:

Full pollination resulting from diverse wild bee visits and correctly timed honey bee stocking results in larger, more even fruit, as well as more fruits per tree.

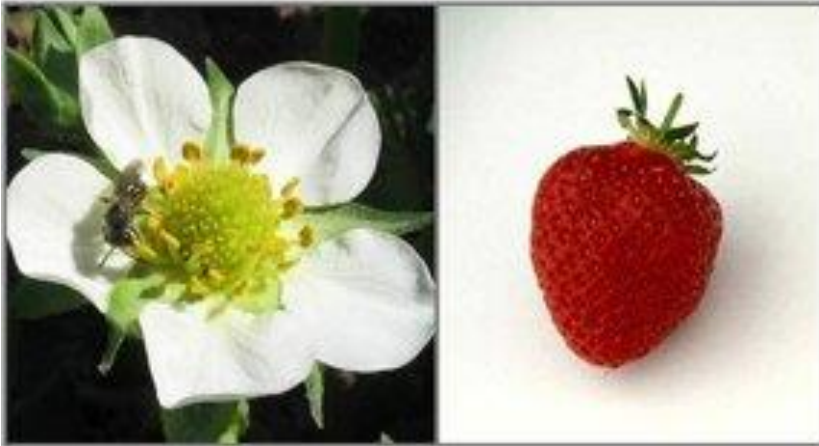


*Poricidal anthers on a n apple flower (figure adapted from University of Maine Fact Sheet No. 630, UMaine Extension No.2111)*

# Pollination and Production

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**Cross-pollination by insects**



**VS.**

**Self & Wind pollination**



# Soil Health

- Increased plant diversity improves soil microbial biodiversity in natural systems

Tiemann et al. 2015

- Microbial interactions in the rhizosphere of mycorrhizal plants improve plant fitness and soil quality

Barea et al. 2002

- Increased diversity facilitates increased functional contribution to soil health services and magnitude

Ferris & Tuomisto 2015

- Plant composition has dramatic effects on soil fertility and produces feedback for nutrient cycling

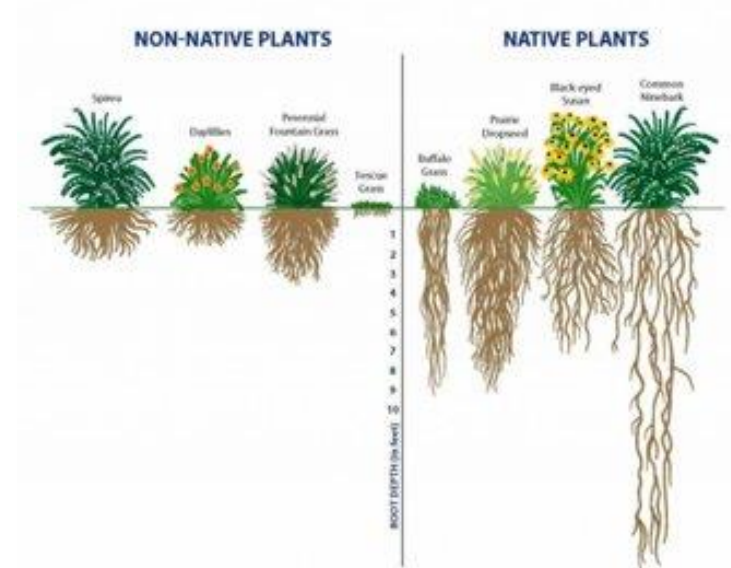
Hobbie 2015



# Soil Health

- Stabilized sites experienced significantly less stream bank erosion than unstabilized sites
- Suspended sediment and dissolved nutrient concentrations increased in the downstream direction
- Increased riparian macrophyte diversity and density at stabilized sites
- Increased macroinvertebrate families and individuals at stabilized sites
- Increased fish species and native fish species at the stabilized sites

Prachiel, 2010



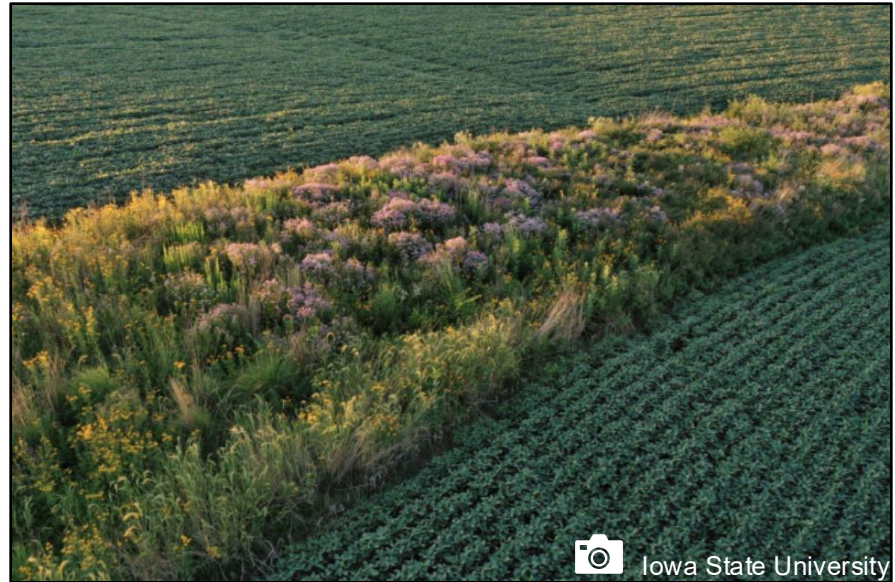
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# Soil Health

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- 44% reduction in water runoff
- 95% reduction in soil loss
- 90% reduction in phosphorus runoff
- 84% reduction in nitrate-nitrogen runoff
- No change in per acre corn and soybean yields
- No increase in weed abundance
- Reduced emissions of heat-trapping gases, especially nitrous oxide

Grudens-Schuck et al. 2017



Iowa State University

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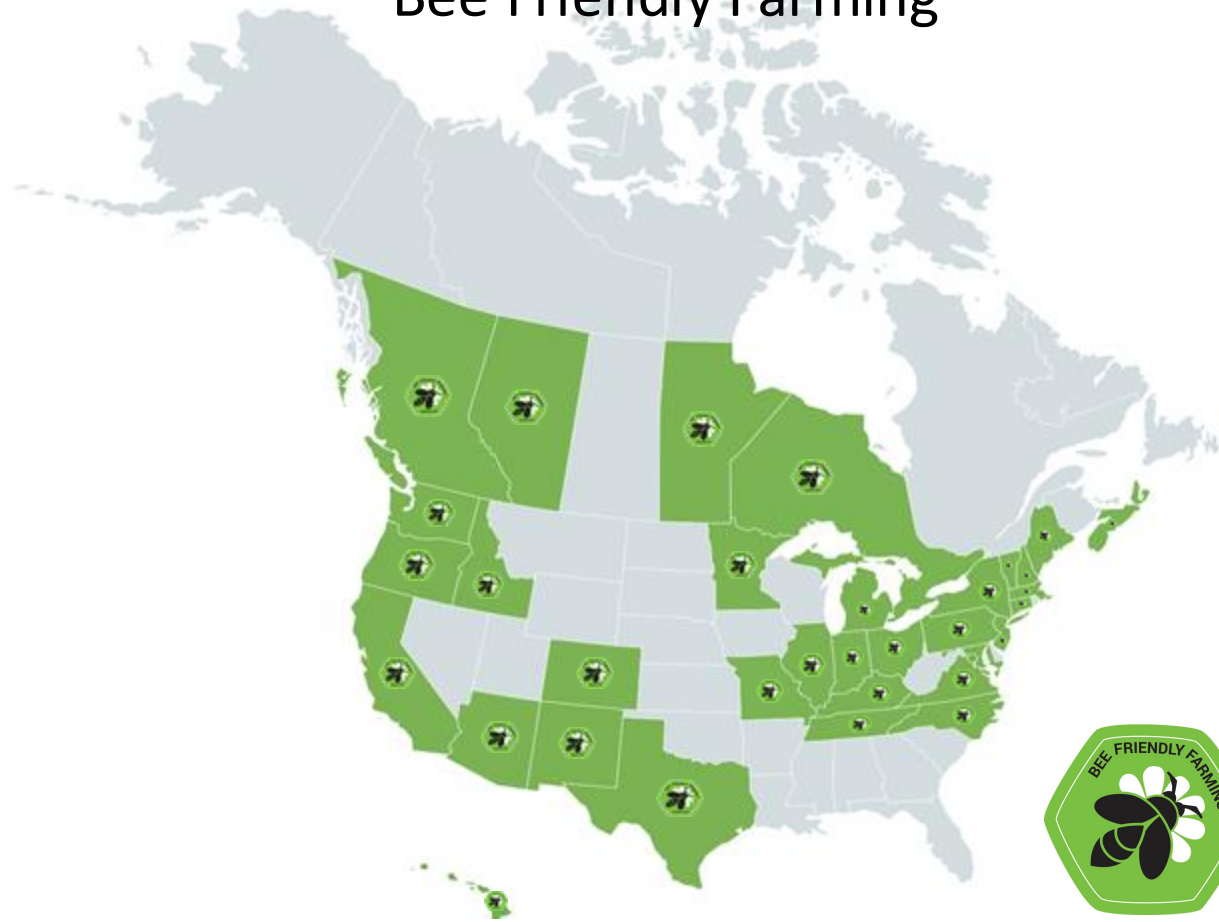


# Bee Friendly Farming

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# Bee Friendly Farming



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# Bee Friendly Farming



- More than 365,000 acres currently enrolled
- More than 156,000 acres of pollinator forage and habitat managed

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# BEE FRIENDLY FARMING: CRITERIA



# BEE FRIENDLY FARMING: CRITERIA

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1. Offer forage providing good nutrition for bees on at least 3% of cropped land. Forage can be temporary, including cover crops



Conservation Cover,  
Woolf Farming



Annual set aside areas,  
Art Hill



Natural habitat areas,  
Stemilt

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# BEE FRIENDLY FARMING: CRITERIA

---

1. Offer forage providing good nutrition for bees on at least 3% of cropped land. Forage can be temporary, including cover crops



Flower strips,  
Anthony John



Hedgerows,  
Emily Carlson



Field borders,  
Emily Carlson

# BEE FRIENDLY FARMING: CRITERIA

---

1. Offer forage providing good nutrition for bees on at least 3% of cropped land. Forage can be temporary, including cover crops



Perennial native cover crop,  
Phoenix Habitats



Cover crop,  
Waterdam Ranch



Cover crop,  
Patterson

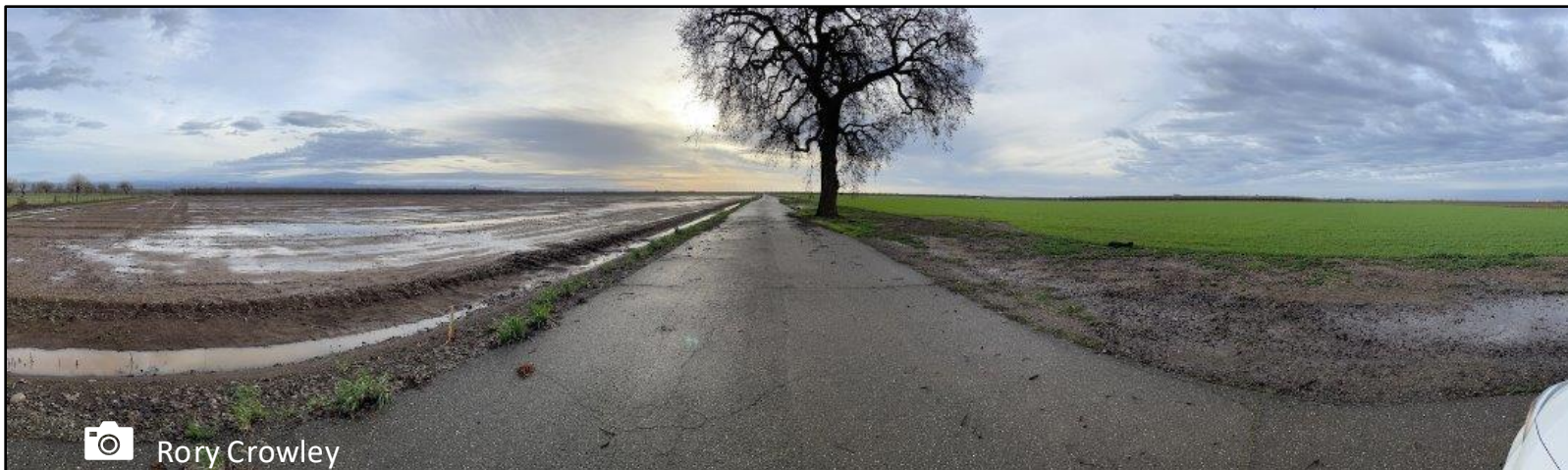


Cover crop,  
Billy Synk

# BEE FRIENDLY FARMING: CRITERIA

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1. Offer forage providing good nutrition for bees on at least 3% of cropped land. Forage can be temporary, including cover crops



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# BEE FRIENDLY FARMING: CRITERIA

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2. Provide bloom of different flowering plants throughout the growing season, especially in early spring and late autumn.



Western blue flax  
*Linum lewisii*



Western yarrow  
*Achillea millefolium*



Western Goldenrod  
*Euthamia occidentalis*

# BEE FRIENDLY FARMING: CRITERIA

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3. Incorporate permanent pollinator habitat, which contains pollinator forage features, equivalent to 0.5% of their total cropped area.



Wooded areas,  
Tamarack Farms



Hedgerows,  
Capay Hills Orchard



Natural perimeters,  
Bluff Ranch

# BEE FRIENDLY FARMING: CRITERIA

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4. Offer clean water for bees when managed honey bees are present on-site, if not inhibited by government-mandated water restrictions.



Buckets of water with burlap,  
J & R Ranches



Ponds and lakes,  
Vineyard 7 and 8 Estates



Creeks and canals,  
WSU Mt. Vernon  
Extension

# BEE FRIENDLY FARMING: CRITERIA

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## 5. Practice Integrated Pest Management (IPM); reduce or eliminate the use of chemicals



Seven major components are common to all IPM programs:

- Pest identification
- Monitoring
- Guidelines for when management action is needed
- Preventing pest problems
- Using a combination of biological, cultural, physical/mechanical and chemical management tools
- After action is taken, assessing the effect of pest management
- Resistance management

# Bee Friendly Farming® Report



TIER **3** Producer

## My Bee Friendly Farm

12 Main St  
Petaluma, California 94954

## Effective Date

Jan 6, 2026 – Jan 6, 2027

## Initial Enrollment Date

Jan 6, 2026

BFF SCORES

## HABITAT

54

Forage: 24  
Nesting: 9  
Permanent Habitat: 21

## IPM

62

Monitoring / Identification: 16  
Decision Making: 4  
Prevention: 8  
Intervention: 21  
Evaluation: 7  
Resistance: 6

My Bee Friendly Farm has met the Tier 3 standards of the Bee Friendly Farming® Program as verified by Pollinator Partnership and the North American Pollinator Protection Campaign Agriculture and Pollinators Task Force.



Protect their lives. Preserve ours.

Kelly Bills  
Executive Director  
Pollinator Partnership

Miles Dakin  
Co-Director of Agricultural Programs  
Pollinator Partnership

This report is issued by Pollinator Partnership. For any questions please contact [bff@pollinator.org](mailto:bff@pollinator.org).  
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# BEE FRIENDLY FARMING

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# BEE FRIENDLY FARMING CERTIFICATION

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- Currently 30 BFF Certified Products
- Almost 1,900 Habitat Acres
- More than 7,300 Farm Acres
- Soon to certify 316 New Farms for a total of 328 Farms
- Soon to launch a new website



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# BEE FRIENDLY FARMING CERTIFICATION

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 Abbey Road Farm



 Jordan Winery

# Funding Opportunities

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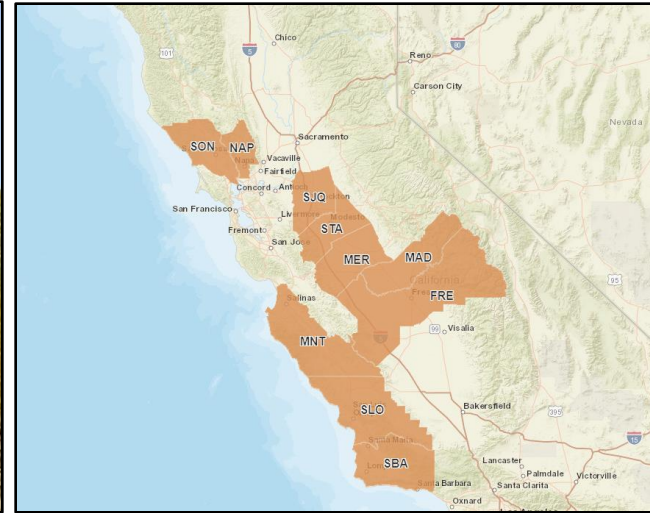
# NRCS Resource Conservation Partnership Program (RCP)



Amber Barnes



Sara Gardner



United States Department of Agriculture

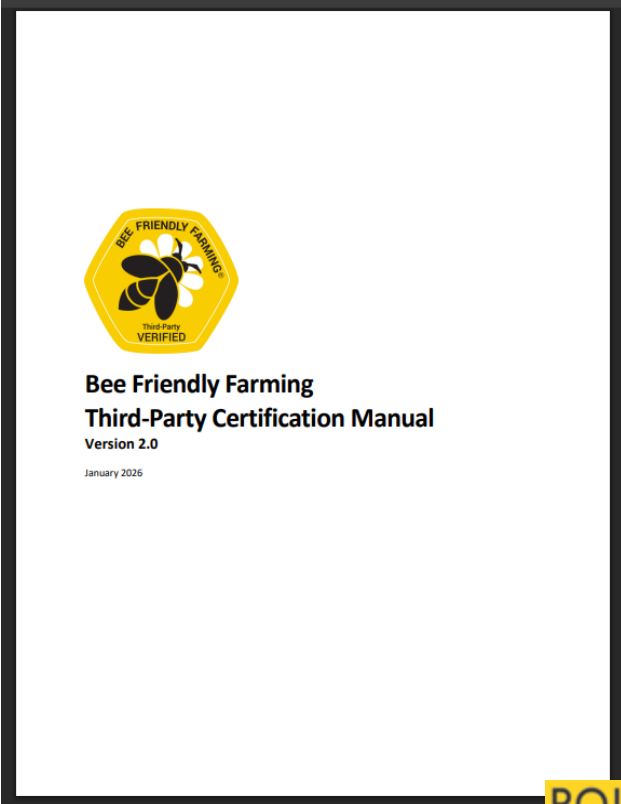




# Additional Resources

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# Bee Friendly Farming



# Agricultural Supporting Pollinators

## AGRICULTURE SUPPORTING POLLINATORS: POTATO PRODUCTION

POLLINATOR PARTNERSHIP

Created with help from Syngenta

### SUPPORTING POLLINATORS NEAR POTATOES

This guide is intended for growers and applicators supporting pollinators and pollination services in field-grown potato production systems.

Potatoes have perfect flowers and propagate clonally via tubers. While potatoes do not require pollinators to reproduce, their flowers provide nutrients, drawing pollinators into fields.<sup>1</sup> When properly protected and supported, pollinators enhance farming systems. In practice, planting potatoes year after year in the same field is inadvisable. To avoid associated pest and pathogen risks, growers should implement appropriate crop rotations, many of which are dependent on or benefit from pollinators. Establishing pollinator habitat helps promote healthy soil and crop production.<sup>2</sup>

### ON-FARM ACTION GUIDE

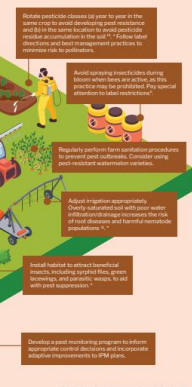
#### Habitat and forage

Establishing habitat provisions on your farm is crucial for supporting pollinators.<sup>3,4</sup> Consider these elements when incorporating pollinator habitat into your farming operation:



#### Integrated Pest Management (IPM)

IPM involves a long-term, preventative practice through ecosystem functions. Below is a list of strategies you can use to manage pests and mitigate risks to pollinators:



<sup>1-29</sup> This strategy aligns with regenerative agricultural practices.

## AGRICULTURE SUPPORTING POLLINATORS: WATERMELON PRODUCTION

POLLINATOR PARTNERSHIP

Created with support from Syngenta

This guide is intended for growers and applicators supporting pollinators and pollination services in field-grown watermelon production systems. Watermelon producers have the ability to support pollinator health.

### WATERMELON POLLINATION

For successful watermelon production, pollinators must facilitate pollen transfer. Honey bees are one example of efficient, steady managed pollinators. They spend an average of 6.8 seconds visiting a female flower, suspending individual flowers are rich in resources.<sup>1</sup> Fruitful pollination requires at least 1,000 pollen grains across the flower's three stigma lobes, necessitating a minimum of 8 honey bee visits per flower.<sup>2</sup> The recommended honey bee stocking rate is 2-5 hives/acre. Bumble bees, another efficiently managed pollinator, have the recommended stocking rate of 0.5-3 colonies/acre. Where wild bees are abundant, stocking managed bees may be unnecessary or reduced.<sup>3,4</sup>

### ON-FARM ACTION GUIDE

#### Habitat and forage

Establishing habitat provisions on your farm is crucial for supporting pollinators.<sup>5,6</sup> Consider these elements when incorporating pollinator habitat into your farming operation:



#### Integrated Pest Management (IPM)

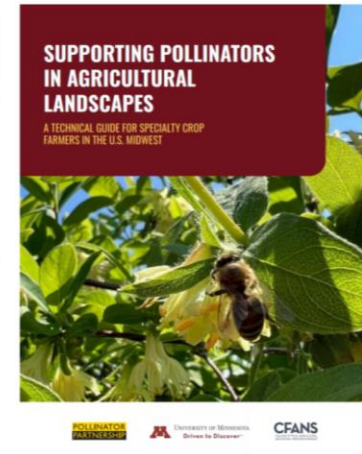
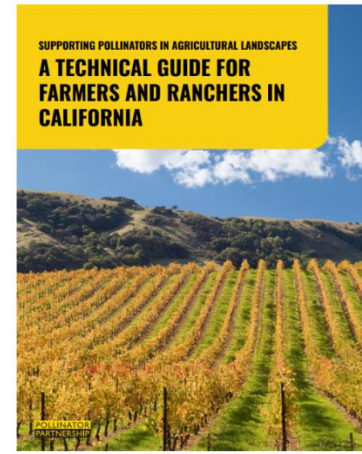
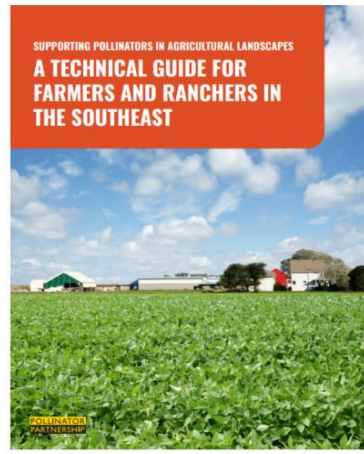
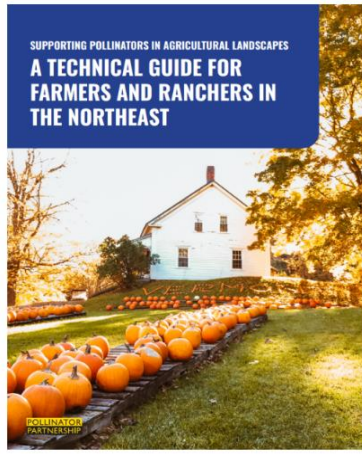
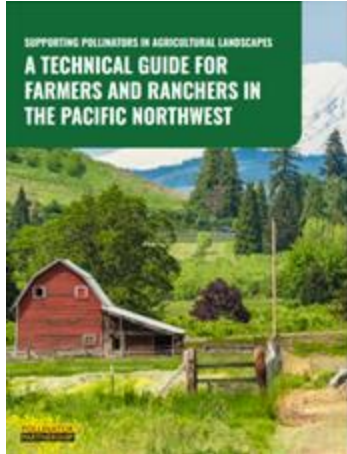
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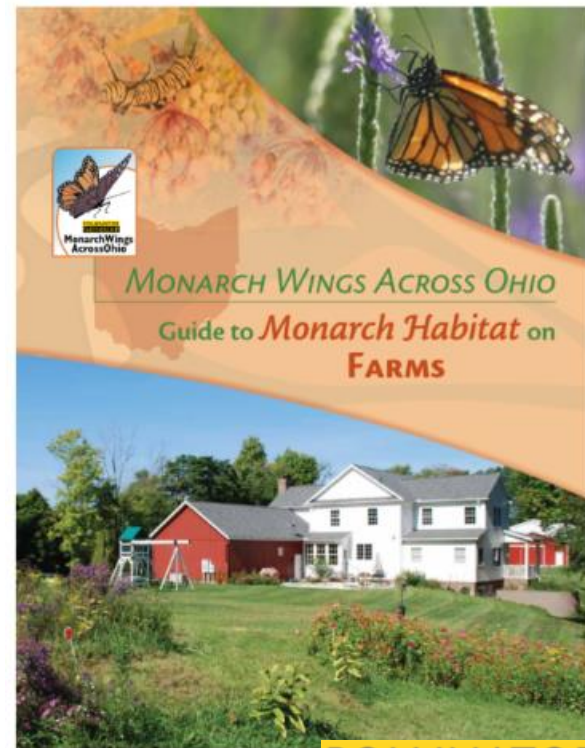
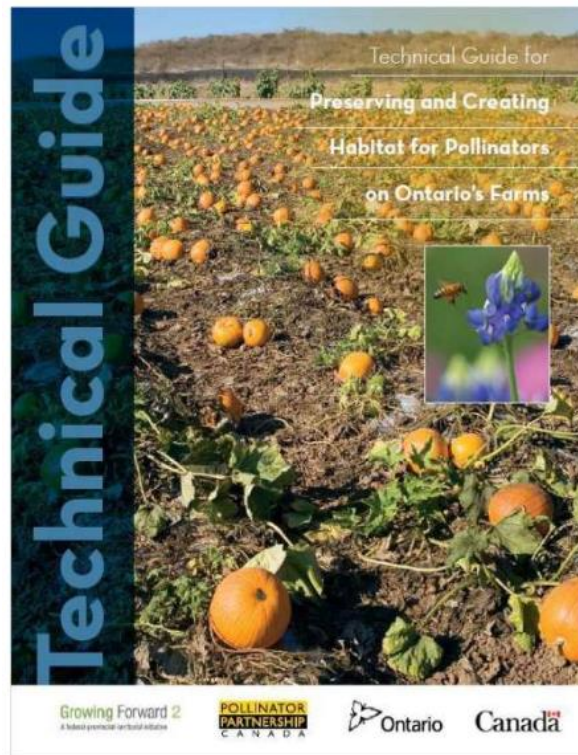
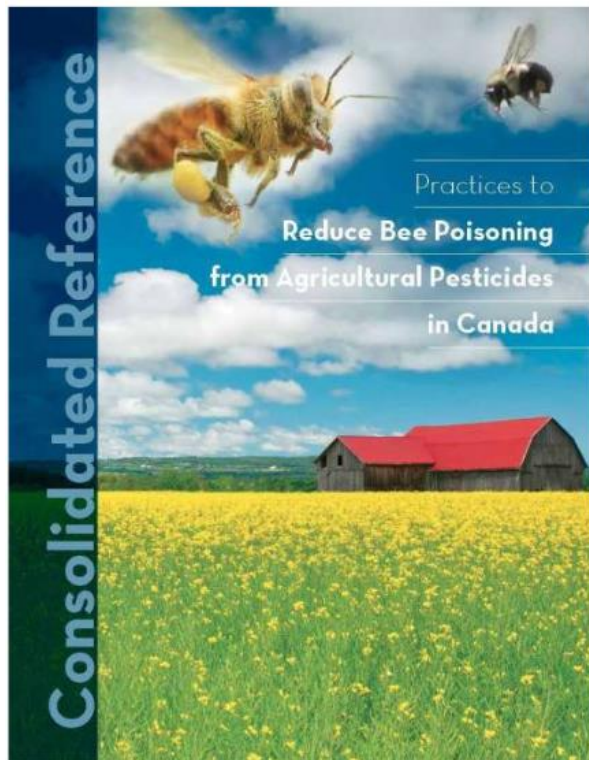
<sup>1-31</sup> This strategy aligns with regenerative agricultural practices.

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# Supporting Pollinators in Agricultural Landscapes



# Additional Regional Agricultural Guides



# Protecting Pollinators from Pesticides

Protecting pollinators  
from pesticides

**APPLES**



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CANADA

Protecting pollinators  
from pesticides

**HIGHBUSH BLUEBERRY**



POLLINATOR  
PARTNERSHIP  
CANADA

Protecting pollinators  
from pesticides

**CUCURBIT CROPS**



POLLINATOR  
PARTNERSHIP  
CANADA

**POLLINATOR  
PARTNERSHIP**

# Best Management Practices For Pollinators In California

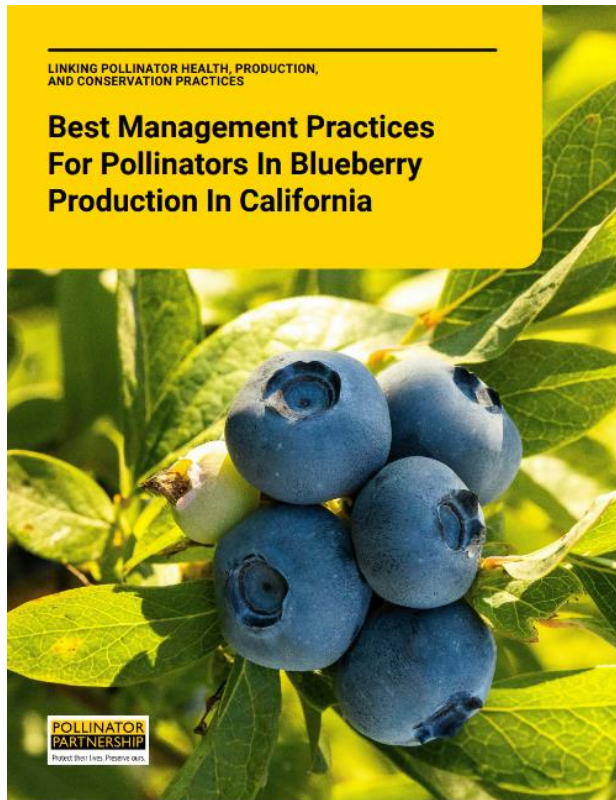
LINKING POLLINATOR HEALTH, PRODUCTION,  
AND CONSERVATION PRACTICES

## Best Management Practices For Pollinators In Apples Production In California



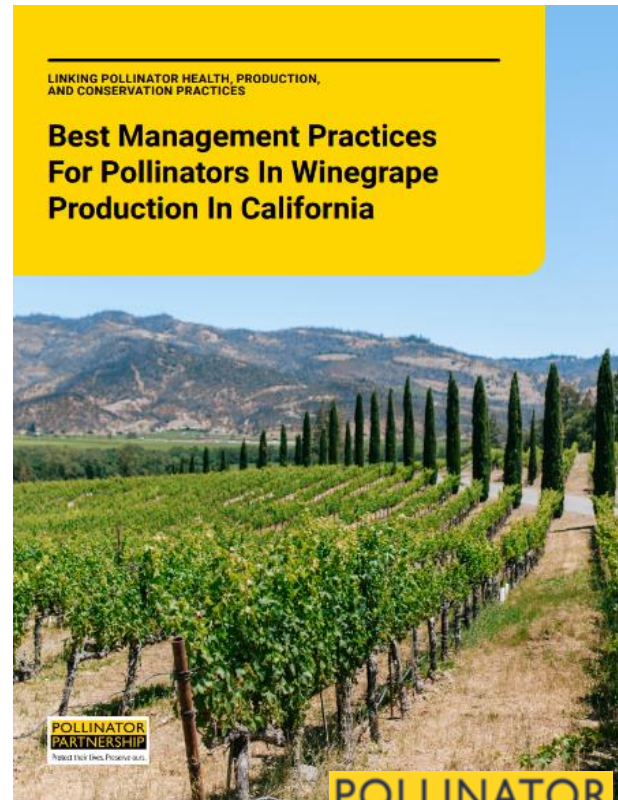
LINKING POLLINATOR HEALTH, PRODUCTION,  
AND CONSERVATION PRACTICES

## Best Management Practices For Pollinators In Blueberry Production In California



LINKING POLLINATOR HEALTH, PRODUCTION,  
AND CONSERVATION PRACTICES

## Best Management Practices For Pollinators In Winegrape Production In California



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# Ecoregional Planting Guides



A REGIONAL GUIDE FOR FARMERS, LAND MANAGERS, AND GARDENERS IN THE



**INTERMOUNTAIN  
SEMIDESERT  
PROVINCE**

INCLUDING THE STATES OF  
WASHINGTON, OREGON,  
IDaho, WYOMING,  
AND PARTS OF  
CALIFORNIA, NEVADA, UTAH,  
MONTANA, COLORADO

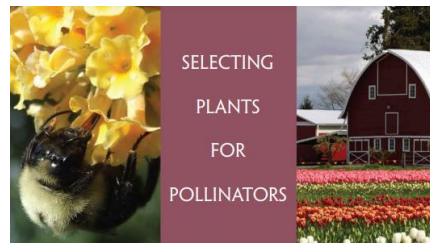


A REGIONAL GUIDE FOR FARMERS, LAND MANAGERS, AND GARDENERS IN THE

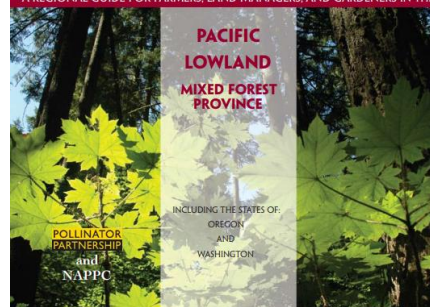


**SIERRAN STEPPE  
MIXED FOREST  
CONIFEROUS FOREST  
ALPINE MEADOW  
PROVINCE**

INCLUDING PARTS OF  
CALIFORNIA  
AND OREGON



A REGIONAL GUIDE FOR FARMERS, LAND MANAGERS, AND GARDENERS IN THE

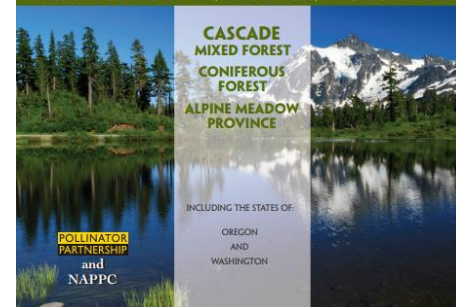


**PACIFIC  
LOWLAND  
MIXED FOREST  
PROVINCE**

INCLUDING THE STATES OF  
OREGON  
AND  
WASHINGTON



A REGIONAL GUIDE FOR FARMERS, LAND MANAGERS, AND GARDENERS IN THE



**CASCADE  
MIXED FOREST  
CONIFEROUS FOREST  
ALPINE MEADOW  
PROVINCE**

INCLUDING THE STATES OF  
OREGON  
AND  
WASHINGTON



# Find Your Roots



A tool for creating pollinator-friendly native plant lists for your habitat project



- 1 Welcome! — 2 Select your ecoregion — 3 Filter by plant characteristics — 4 View plant list

Next

Export Columns Filters

Image	Botanical Name	Common Name	Plant type	Pollinators	Min Height (ft)	Max H
	<i>Dicentra uniflora</i>	steer's head	Perennial Flower	bees	0.1	0.3
	<i>Lewisia rediviva</i>	bitterroot	Perennial Flower	bees, insects	0.2	0.3

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# PEST: Pollinator Enhancement Security Tool

A tool to help weed out plants that may support common crop pests in  
Canada



## Ash

**Pests that preferentially choose this plant:** *Sitobion avenae*, *Rhopalosiphum padi*, *Aphis pomi*, *Eriosoma lanigerum*, *Aphis glycines*, *Chaetosiphon fragaefolii*, *Aphis gossypii*, *Acyrtosiphon pisum*, *Rhopalosiphum maidis*, *Macrosiphum euphorbiae*, *Mysus persicae* (aphids)

**Pests that incidentally choose this plant:** *Halyomorpha halys* (brown marmorated stink bug)

**Crops at risk:** apple, strawberry



## Dogwood

**Pests that preferentially choose this plant:** *Drosophila suzukii* (spotted-wing drosophila)

**Pests that incidentally choose this plant:** *Halyomorpha halys* (brown marmorated stink bug)

**Crops at risk:** strawberry





# SCMS Blueberry Tool

A tool to help weed out plants that support common blueberry pests.



I want to...

Install or enhance habitat for pollinators | Assess pest risk to crop from existing habitat | Manage pest damage or threatening my crop

Select one or more pests of concern: [More Information](#)

Filter:

**970** host plants | **35** beneficials | [Download List](#) | [More Information](#)

**Spotted Wing Drosophila** *Drosophila suzukii* SOURCES REMOVE

Hosts:

Beneficials:

**Japanese Beetle** *Popillia japonica* SOURCES REMOVE

Hosts:

Beneficials:

**Spongy Moth** *Litaneutorna spawordi* SOURCES REMOVE

Hosts:

Beneficials:

**Blueberry Stem Gall** *Hemadas rubilipennis* SOURCES REMOVE

Hosts:

Beneficials:

**Japanese Beetle** *Popillia japonica* SOURCES REMOVE

Hosts:

Beneficials:

**Blueberry Stem Borer** *Oberia myops* SOURCES REMOVE

Hosts:

Beneficials:

I want to...

Install or enhance habitat for pollinators | Assess pest risk to crop from existing habitat | Manage pest damage or threatening my crop

Select one or more pests of concern: [More Information](#)

Filter:

[Optional] Select pests of concern:  Warning

**3** host plants | **0** beneficials | [Download List](#) | [More Information](#)

**Black Elderberry** *Sambucus nigra* SOURCES REMOVE

Hosts:

**Holly-Leaf Cherry** *Prunus hirsuta* SOURCES REMOVE

Hosts:

**Coyote Bush** *Escallonia spp.* SOURCES REMOVE

Hosts:

**Amaranths** *Amaranthus spp.* SOURCES REMOVE

Pests:

**American Linden** *Tilia americana* SOURCES REMOVE

Pests:

**American Sycamore** *Platanus occidentalis* SOURCES REMOVE

Pests:

**Arrowwoods** *Viburnum spp.* SOURCES REMOVE

Pests:

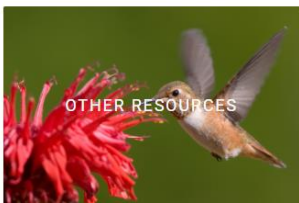
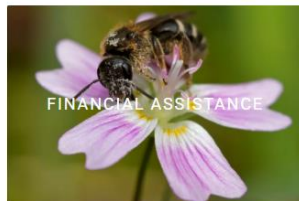
# North American Pollinator Protection Campaign NAPPC

## NAPPC Agriculture and Pollinators Task Force

### OUR MISSION

The Agriculture and Pollinators Task Force is built on a mission with mutually inclusive goals: supporting agriculture and preserving pollinators.

## Pollinator-Friendly Farmer and Rancher Resource Hub



# Farmer/ Rancher Award





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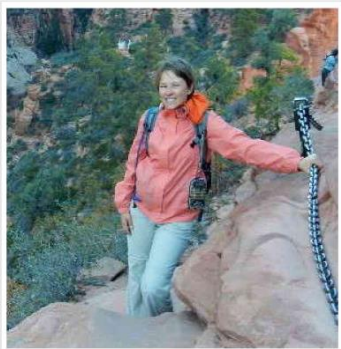


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**Thank you**

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