Pollinator Habitat in Agriculture

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BEE FRIENDLY FARMING® CERTIFIED

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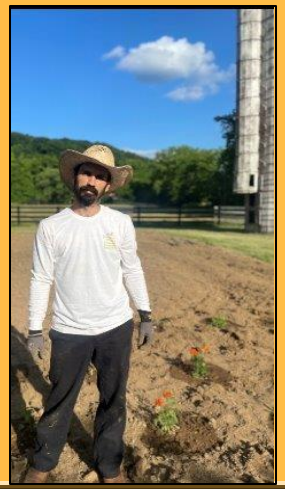

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Sam Hubert

Today's Webinar:

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

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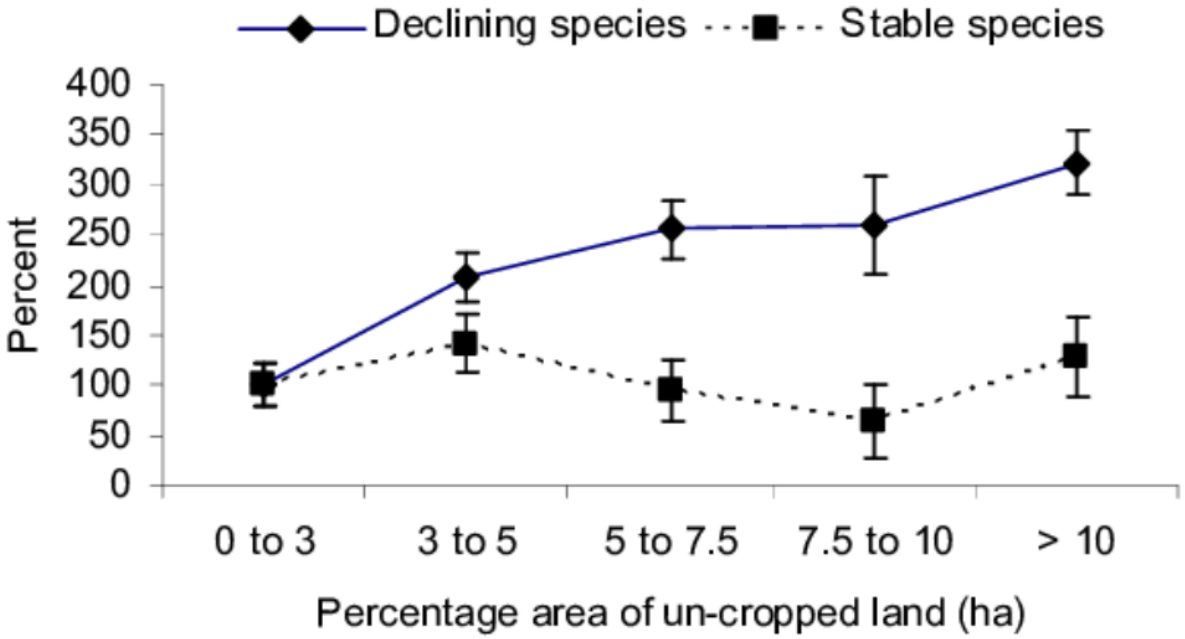
What do pollinators need?

- 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

- 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

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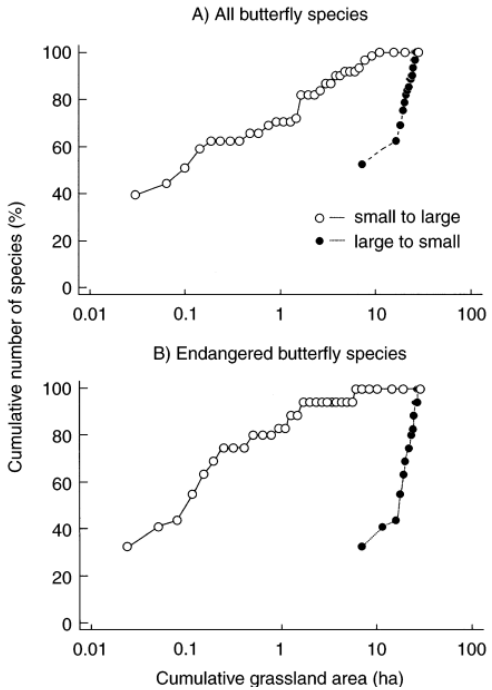
Pollinator Health



- 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

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Pest Control

- 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

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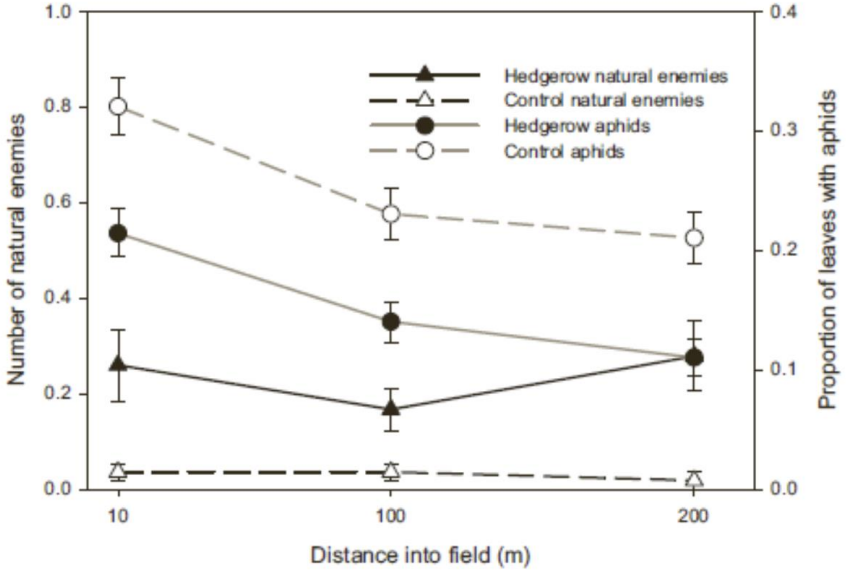
Pest Control



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

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

Morandin et al. 2014

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Pest Control

- 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

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Pollination and Production

- 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

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Pollination and Production

- 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

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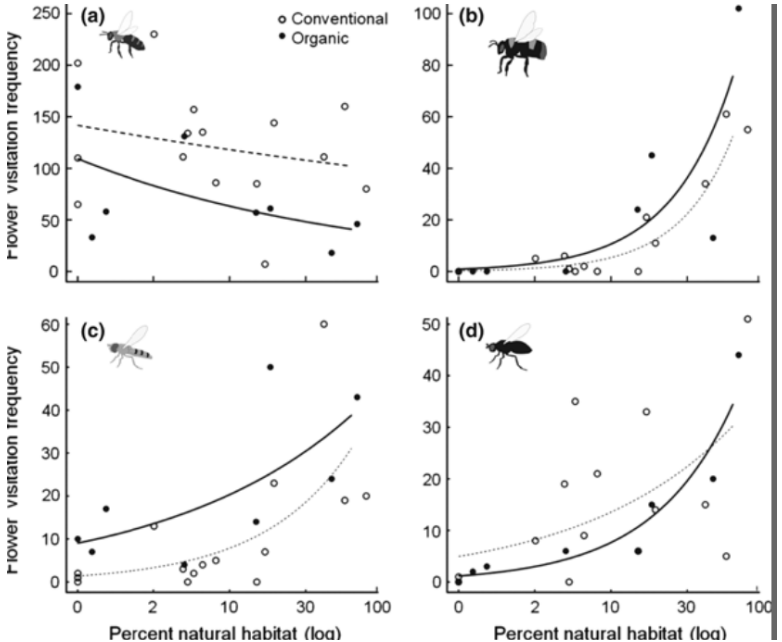
Pollination and Production



- 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

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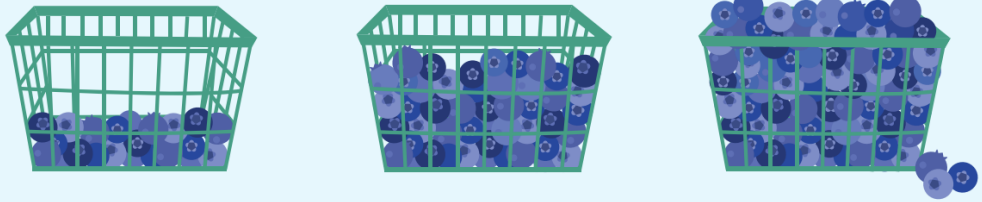
Pollination and Production

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[1,8]

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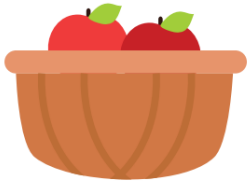
Pollination and Production

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.

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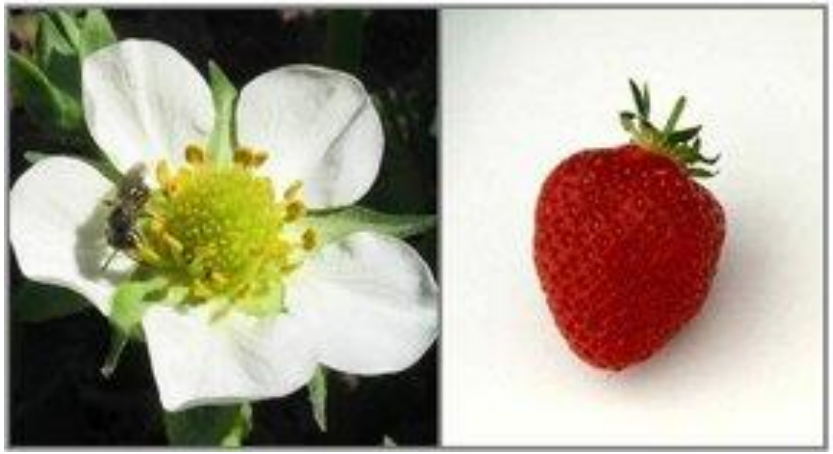
Pollination and Production

Cross-pollination by insects



VS.

Self & Wind pollination

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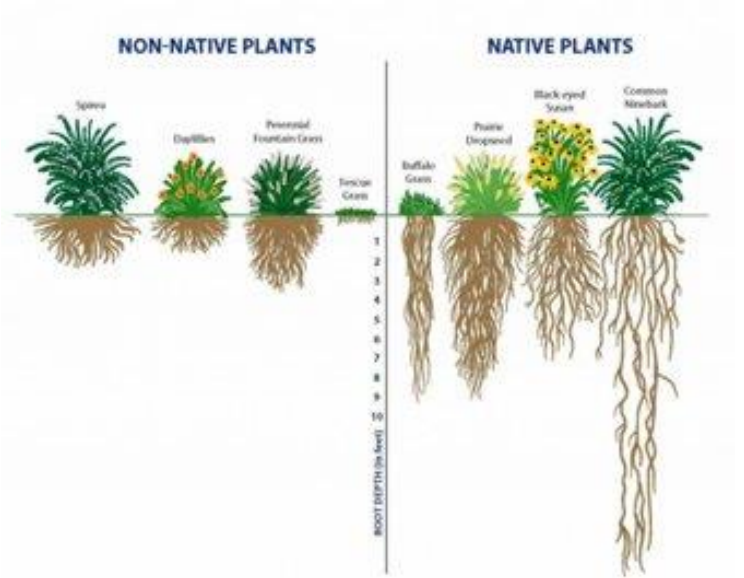
Soil Health

- 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

- 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

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Soil Health

- 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

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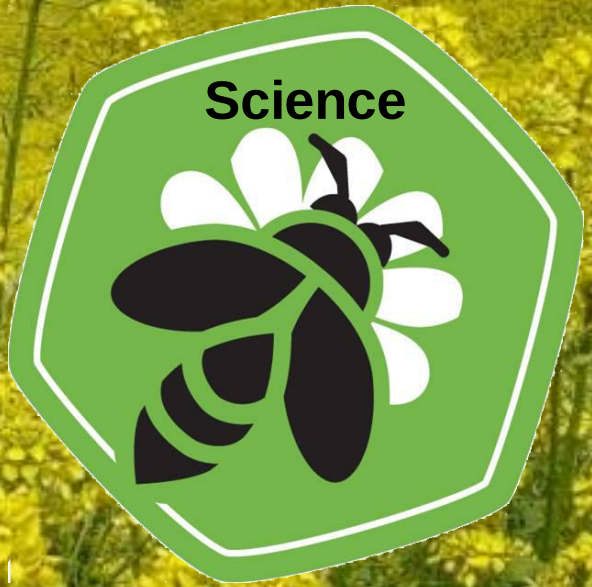
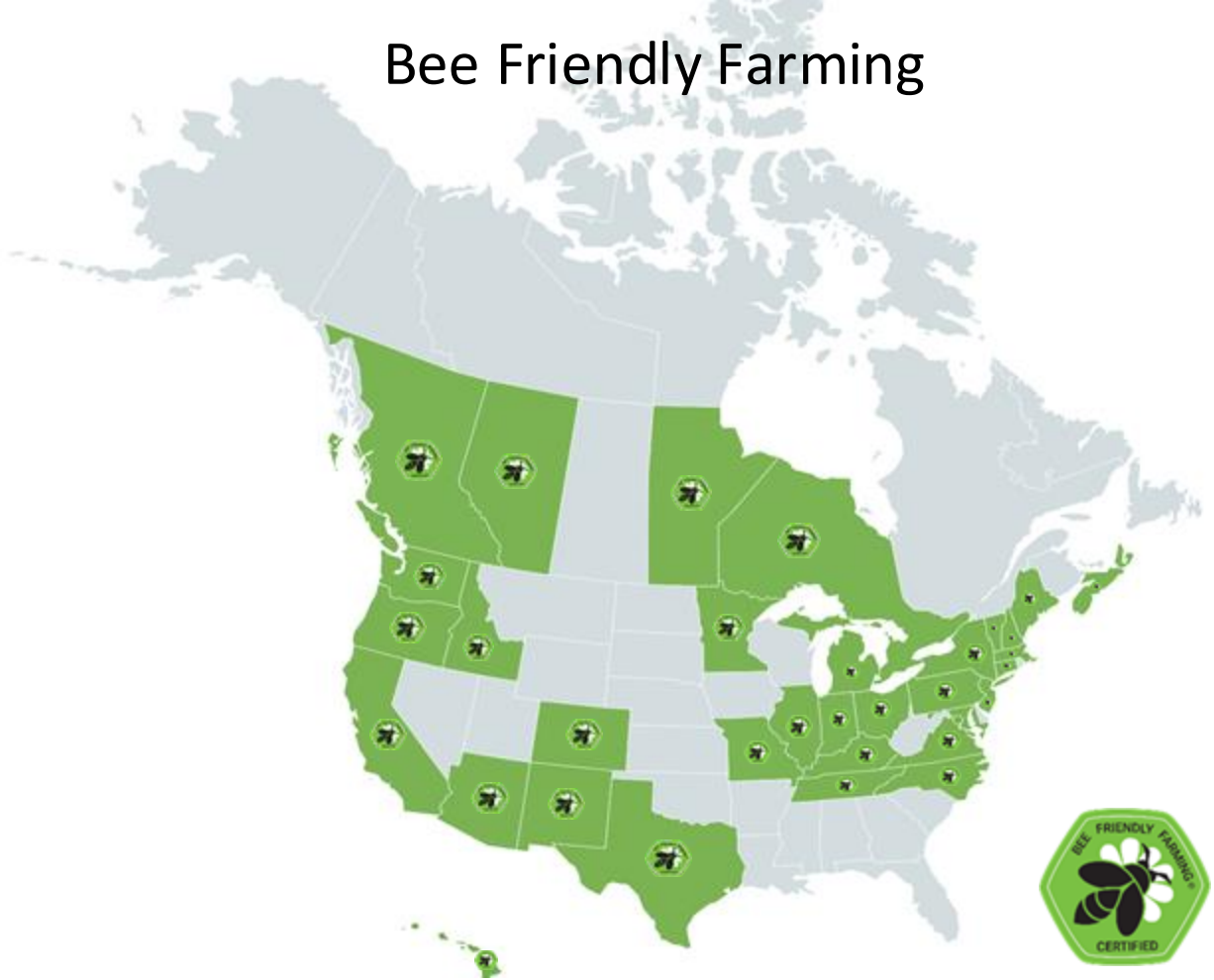
Bee Friendly Farming

Bee Friendly Farming



Bee Friendly Farming



BEE FRIENDLY FARMING CERTIFIED

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Bee Friendly Farming

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

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BEE FRIENDLY FARMING: CRITERIA

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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

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

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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

Perennial native cover crop,
Phoenix Habitats

Cover crop,
Waterdam Ranch

Cover crop,
Patterson

Cover crop,
Billy Synk

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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

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BEE FRIENDLY FARMING: CRITERIA

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

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BEE FRIENDLY FARMING: CRITERIA

3. Offer clean water for bees (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

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BEE FRIENDLY FARMING: CRITERIA

4. Provide permanent habitat for nesting through features such as hedgerows, natural brush, buffer strips, or bare ground

Wooded areas,
Tamarack Farms

Hedgerows,
Capay Hills Orchard

Natural perimeters,
Bluff Ranch

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BEE FRIENDLY FARMING: CRITERIA

4. Provide permanent habitat for nesting through features such as hedgerows, natural brush, buffer strips, or bare ground

Undisturbed woody debris,
LaHave River Berry Farm Inc

Snags,
Huckleberry Hollow

Undisturbed bare ground,
Sierra Pac Farms- Heritage Ranch

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BEE FRIENDLY FARMING: CRITERIA

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

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BEE FRIENDLY FARMING

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Funding Opportunities

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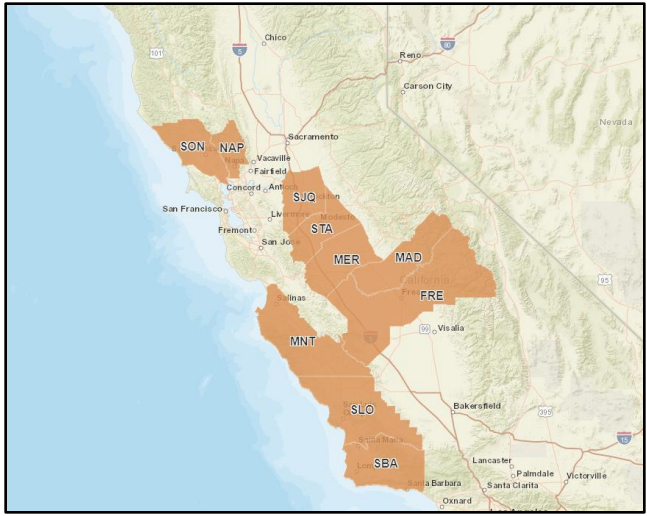
NRCS Resource Conservation Partnership Program (RCPP)



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california almonds
Almond Board of California

California DAIRIES inc.

CALIFORNIA CATTLEMEN'S ASSOCIATION
CCA

WINE INSTITUTE

BEE FRIENDLY FARMING

CALIFORNIA SUSTAINABLE WINEGROWING ALLIANCE

FB California Farm Bureau

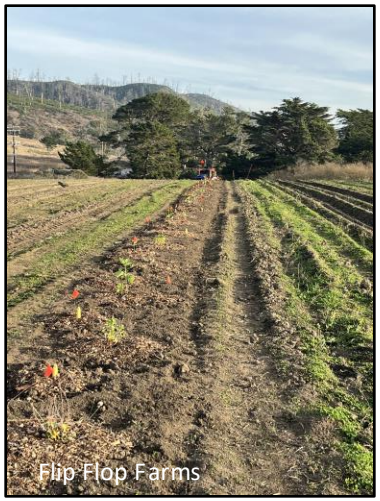
BLUE DIAMOND GROWERS

BAYER

USDA United States Department of Agriculture

seeds for bees®
Project Apis m.

CDFA Pollinator Habitat Program (PHP)



WILD FARM ALLIANCE

COMMUNITY ALLIANCE WITH FAMILY FARMERS

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Monarch Wings Across California – Almonds (MWAC)


Robert Suseland


Sara Gardner

National Fish and Wildlife Foundation

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MonarchWings AcrossAmerica

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Additional Resources

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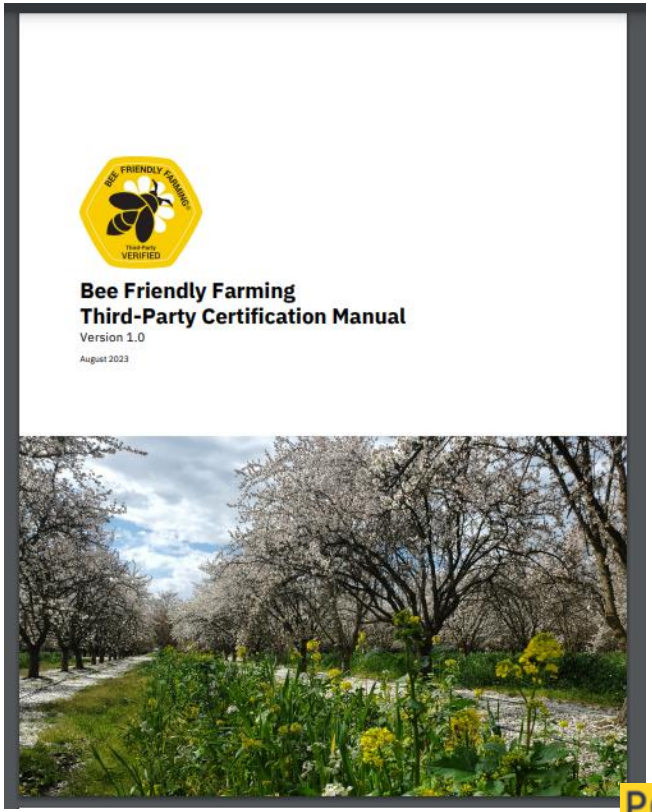
Bee Friendly Farming



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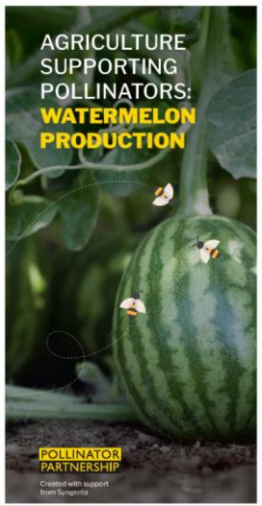
Agricultural Supporting Pollinators



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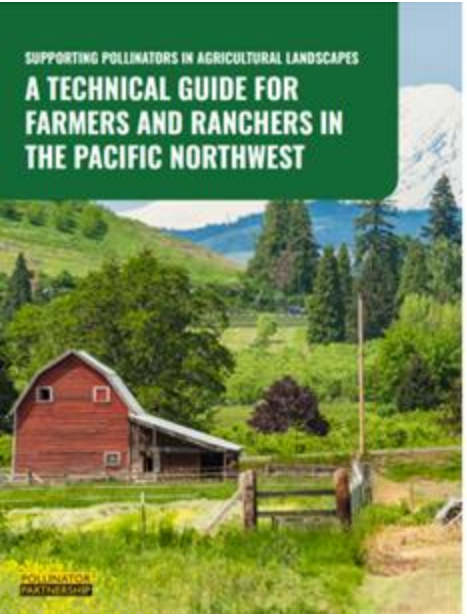
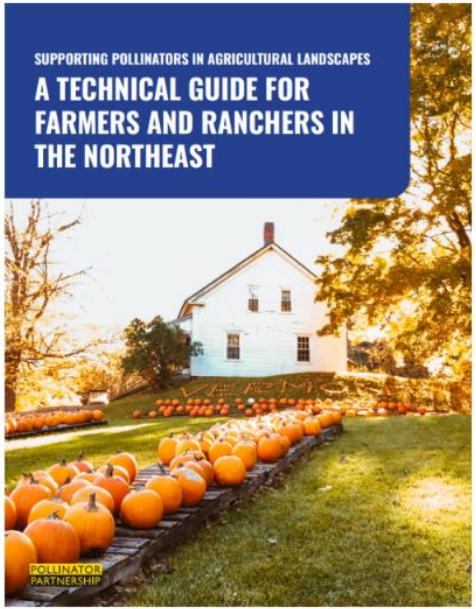
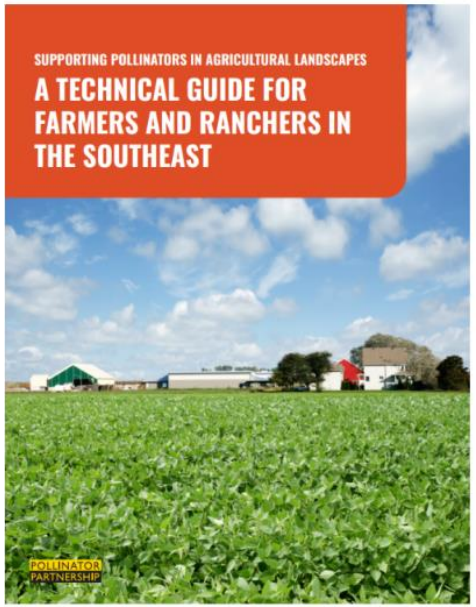
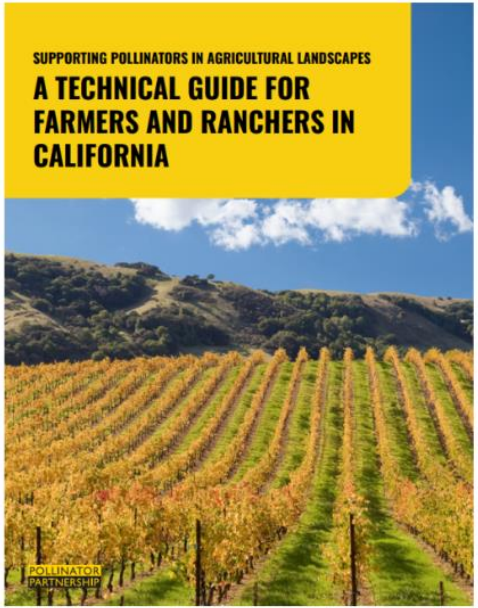
Supporting Pollinators in Agricultural Landscapes









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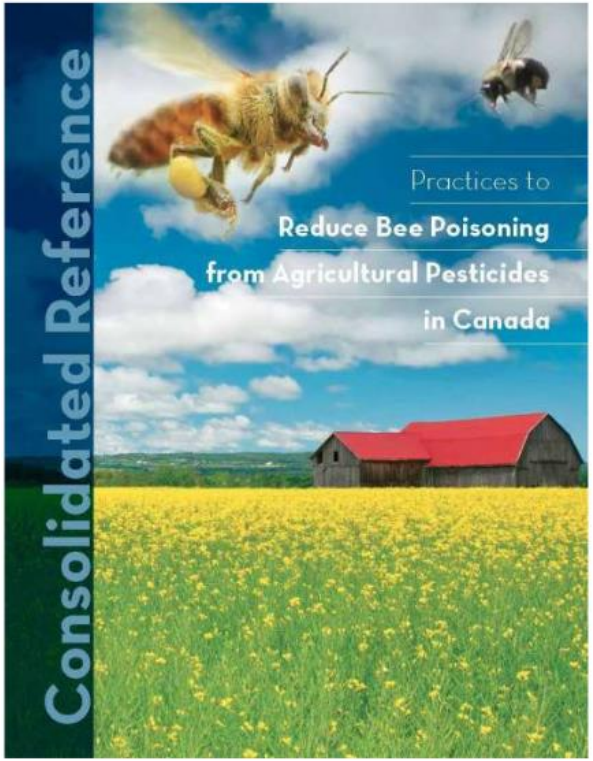
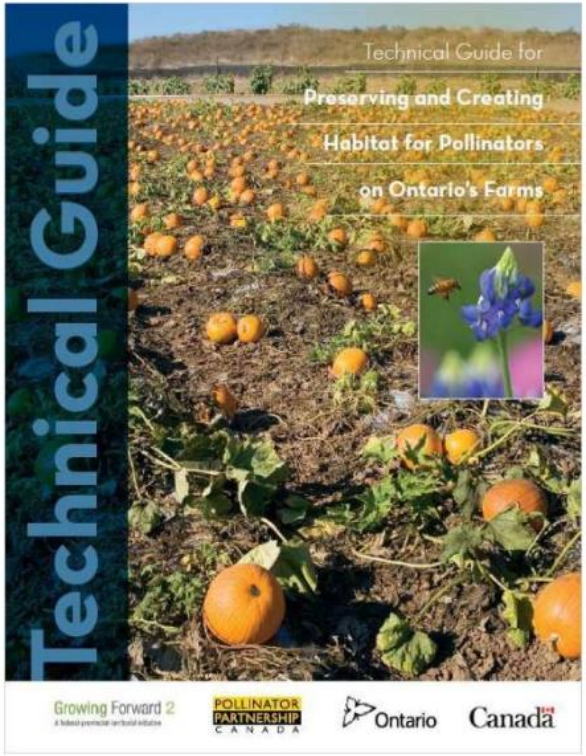
Additional Regional Agricultural Guides





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Protecting Pollinators from Pesticides

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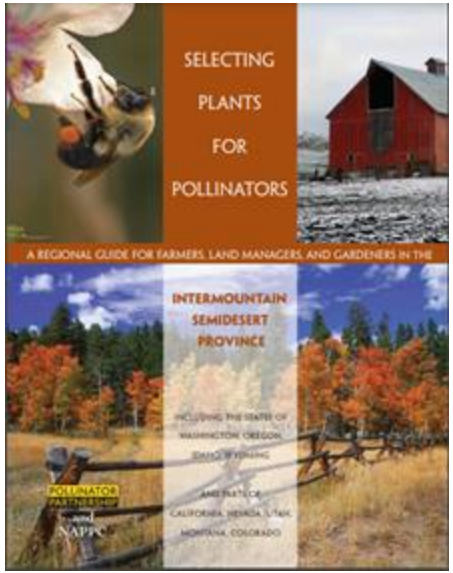
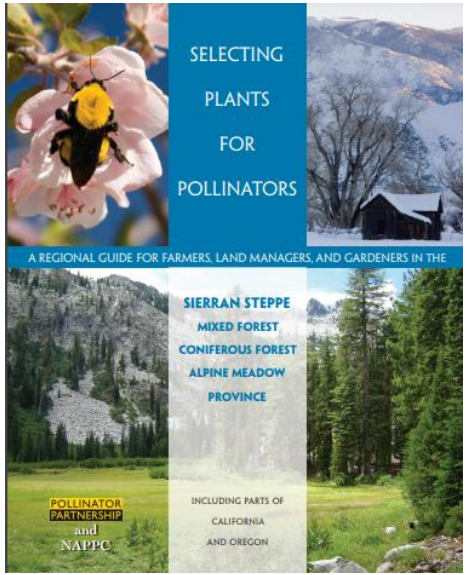
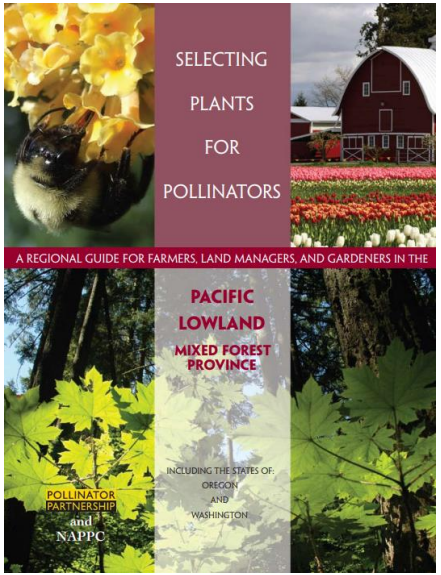
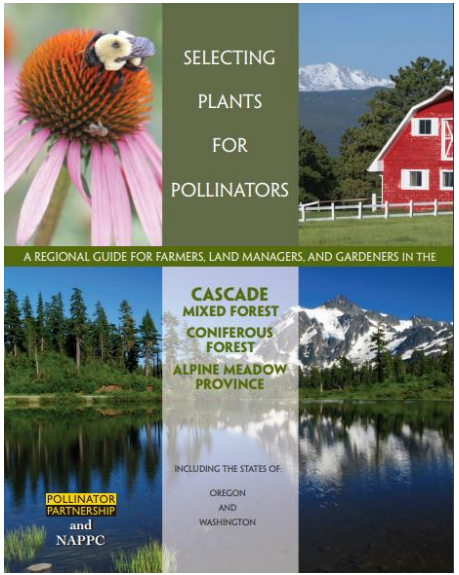
Ecoregional Planting Guides









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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
	*Dicentra uniflora*	steer's head	Perennial Flower	bees	0.1	0.3
	*Lewisia rediviva*	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, Acyrthosiphon 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

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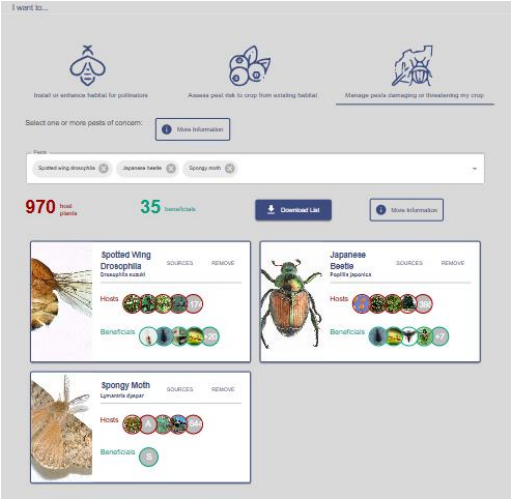
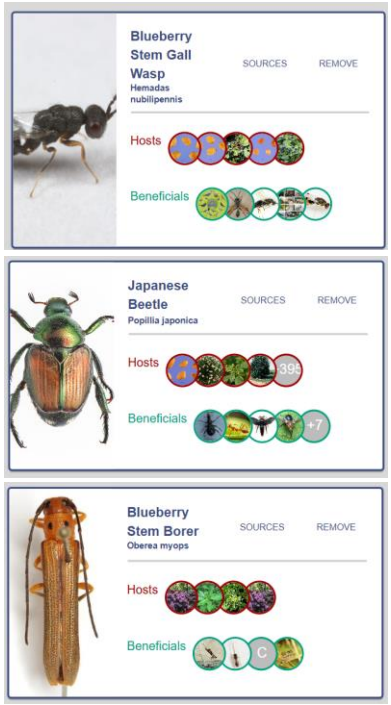
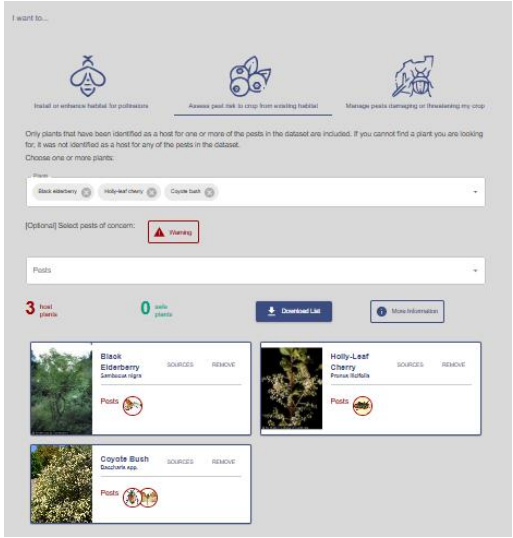
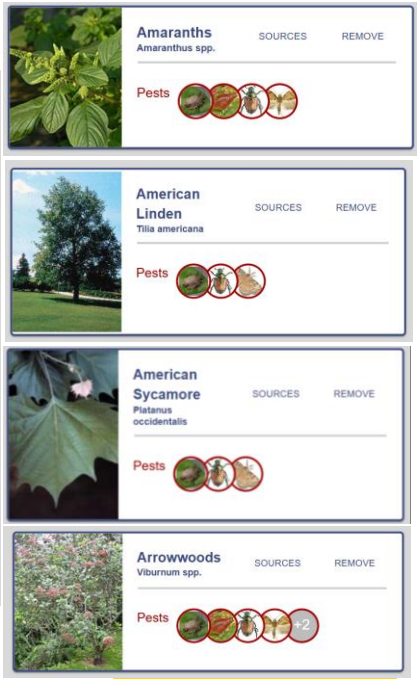
SCMS Blueberry Tool

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









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Farmer/ Rancher Award

North American Pollinator Protection Campaign

CFA Canadian Federation of Agriculture

FCA Fédération canadienne de l'agriculture

National Association of Conservation Districts

CFGA Canadian Forage & Grassland Association
Association canadienne pour les plantes fourragères

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Blueberry Producer/ Advisor Survey

The University of Vermont

Michigan State University

Washington State University

Oregon State University

Pollinator Partnership

Pollinator Partnership
NRCS Partner Biologists

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USDA

NRCS
Natural Resources Conservation Service

POLLINATOR PARTNERSHIP

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Thank you

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