

# Cover Crops, Herbs, and Cut Flowers for Pollination and Pest Management

Alina Harris  
Integrated Pest and Pollinator Management Specialist  
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NRCS Partner Biologist



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Photo: Mike Madden, Scooters Farm of Woodmont, Hollis, NH

# Logistics

## Computer Speaker Status



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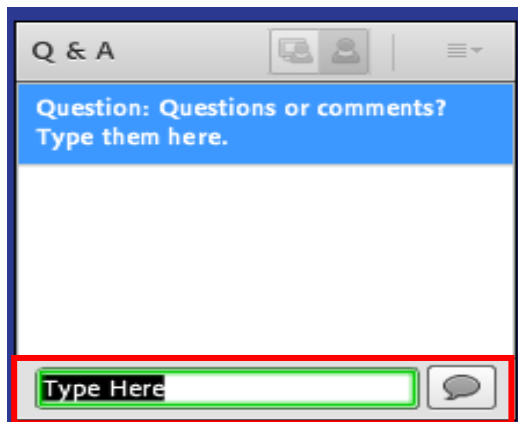
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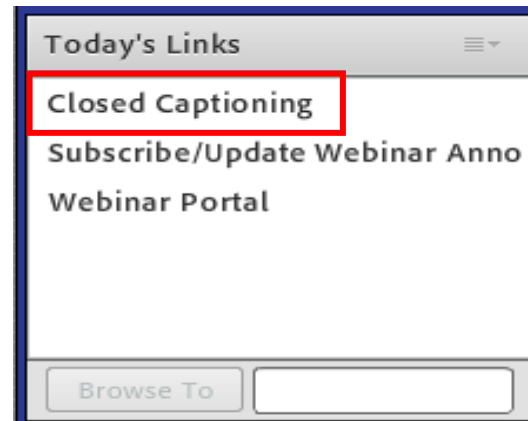
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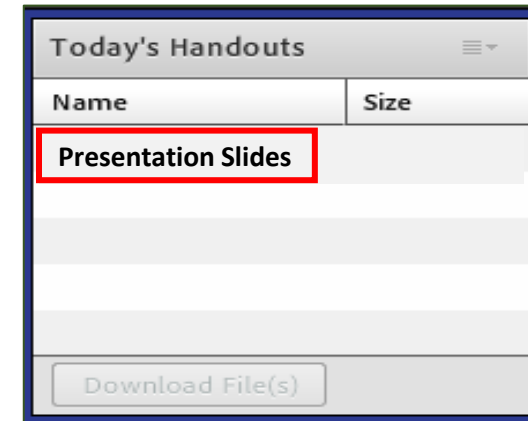
## Q&A Pod




## Today's Links



## Today's Handouts





# Cover Crops, Herbs, and Cut Flowers for Pollination and Pest Management

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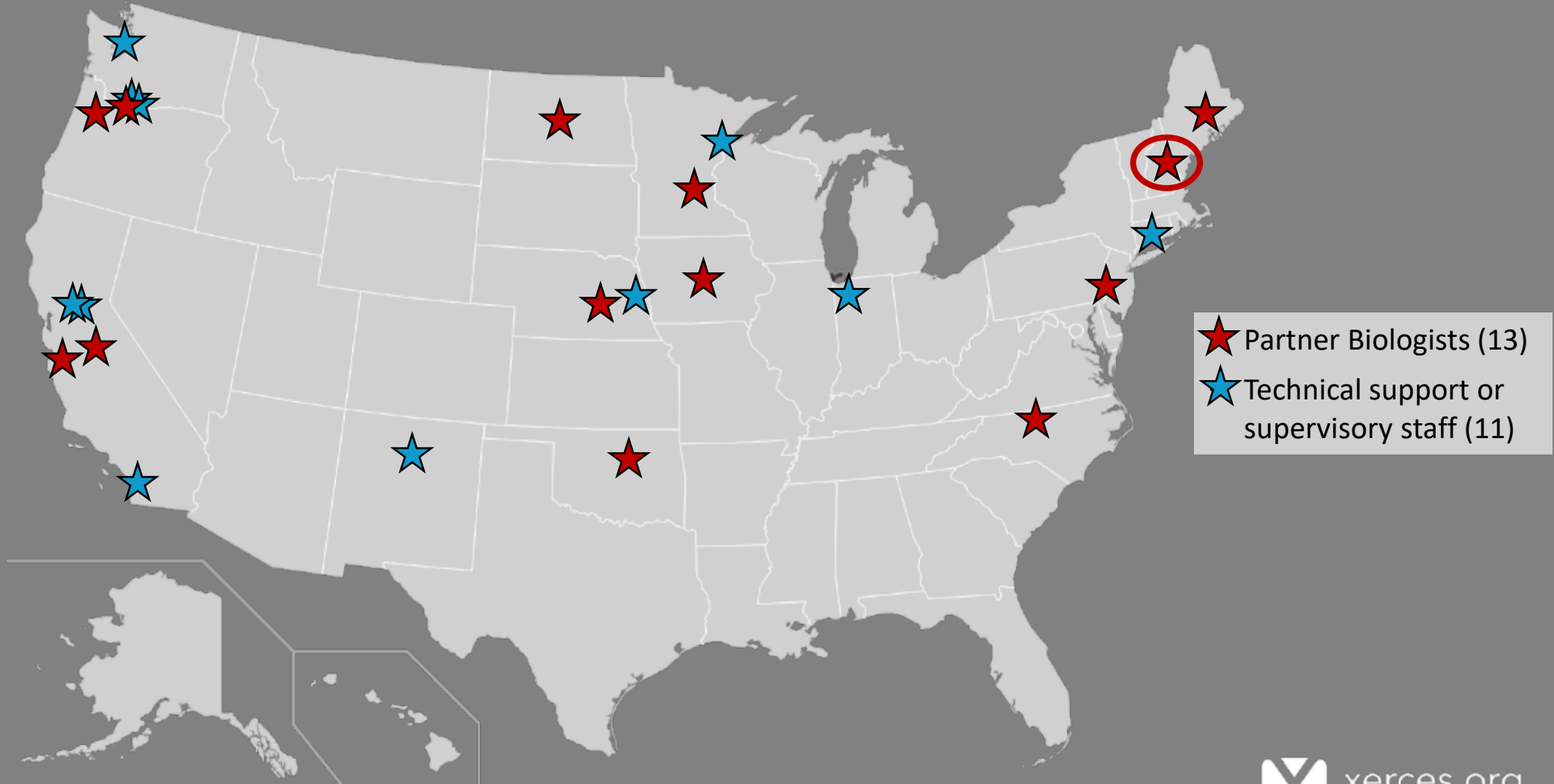
# The Xerces Society for Invertebrate Conservation

A science based nonprofit organization that engages in education, outreach, applied research, policy, and **restoration to protect invertebrates and their habitats.**



(Photos: Xerces blue butterfly, Larry Orsak; San Francisco, Damian Gadal / Flickr Creative Commons 2.0)

# The Xerces Society and NRCS Partnership



# Resources: Xerces Society Publications



[www.xerces.org](http://www.xerces.org)



# Acknowledgements

Thank you to these Xerces Society supporters:

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Photo: Alina Harris / University of Hawaii

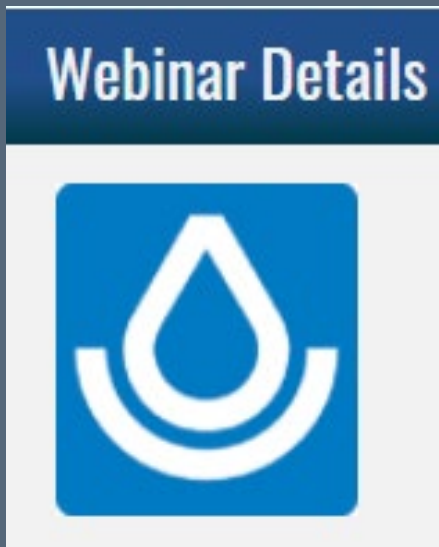
# Outline

- Diversity of:
  - Native pollinators
  - Beneficial insects
- Habitat needs of:
  - Native pollinators
  - Beneficial insects
  - Pesticide protection
- Biological Control
- Conservation Biological Control
- Cover crops, insectary strips, cut flowers, woody ornamentals, herbs
- NRCS Practices

# Slow Note Taker or Bad Connection?

No Problem. We've got you covered!

ConservationWebinars.net  
"Today's Handouts"



This webinar is presented by **USDA NRCS Science and Technology**. Contact **Jennifer Ryan**, Science & Technology Training Library content manager, for more information about this webinar.

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**NOTE:** A "view" button will be available within one week of the live presentation date to access the on-demand recording of this webinar.



Blue bachelor's buttons in bloom mixed with nitrogen-fixing partridge pea in the alleyways of a young, establishing organic orchard. Photo by Mike Madden.

#### Related URLs

- <https://www.xerces.org/pollinator-resource-center>
- <https://www.xerces.org/pesticides/ecological-pest-management/conservation-biological-control>
- <https://www.usda.gov/pollinators>
- <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/pollinate/>
- <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/invasive/pests/>
- <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/climatechange/?cid=stelprdb1077238>



# Pollinators



moths, hoverflies, butterflies, bees, beetles, hummingbirds



Photos: Bryan E. Reynolds (2); Sarah Foltz Jordan; David Inouye; Bruce Newhouse; Mace Vaughan. Bottom right: Ruby-throated Hummingbird. Photo: Will Stuart/Audubon Photography Awards.

# Pollinators: Native Bees

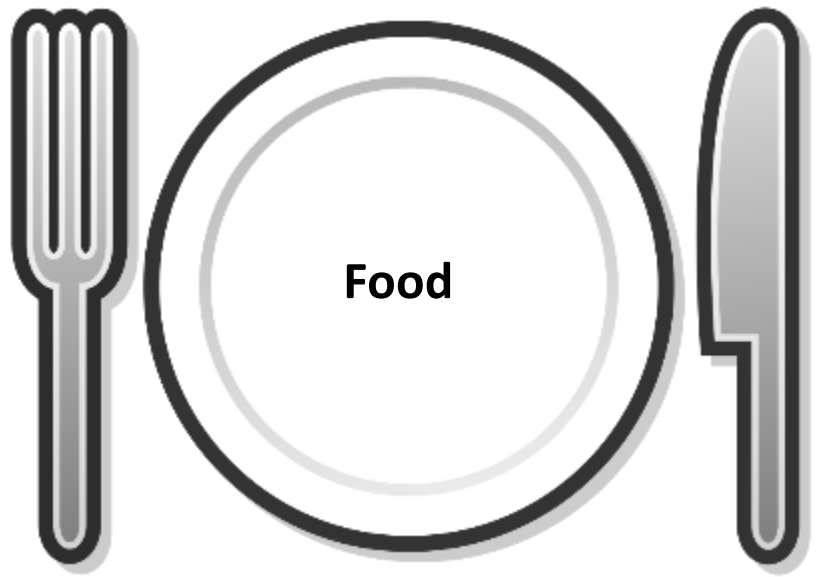
Nearly 3,600 species of native bees in the United States



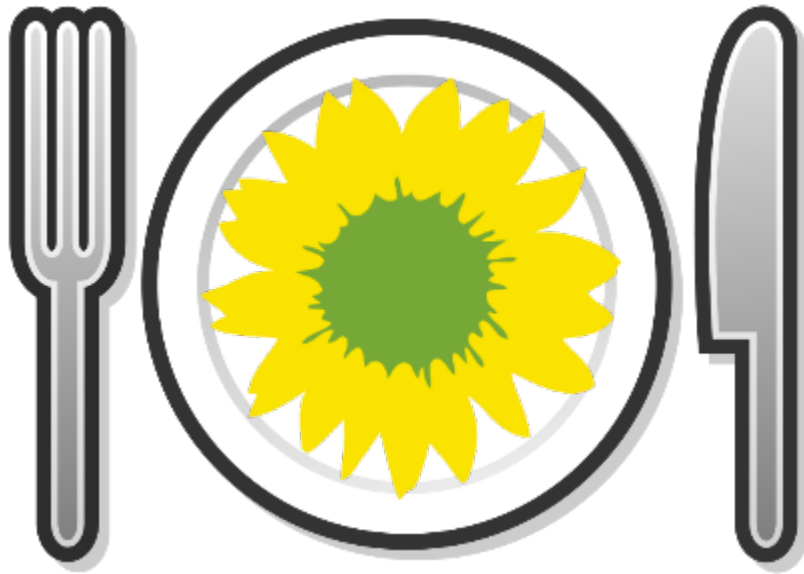
Photos: Rollin Coville, Betsy Betros, Jason Gibbs, Emily May



# Habitat Needs for Pollinators and Invertebrates



# Habitat Needs for Pollinators and Invertebrates



**Food:** Nectar, pollen, host plants



# Require “permanent” undisturbed habitat to complete lifecycle

Cavity Nesting



Ground Nesting



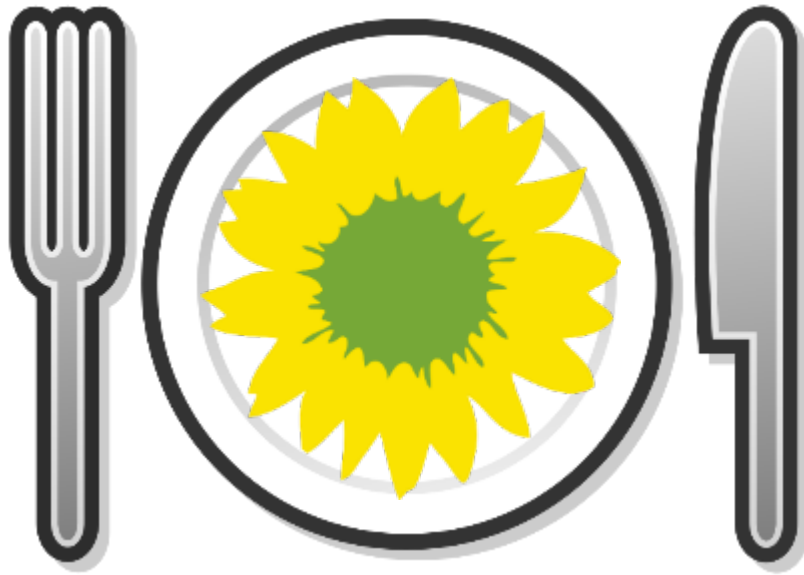
Stem/Wood Nesting



Photos: Kent McFarland-flickr-CC, Kelly Gill, Nancy Lee Adamson

## Don't be a flower weather friend!

# Habitat Needs for Pollinators and Invertebrates



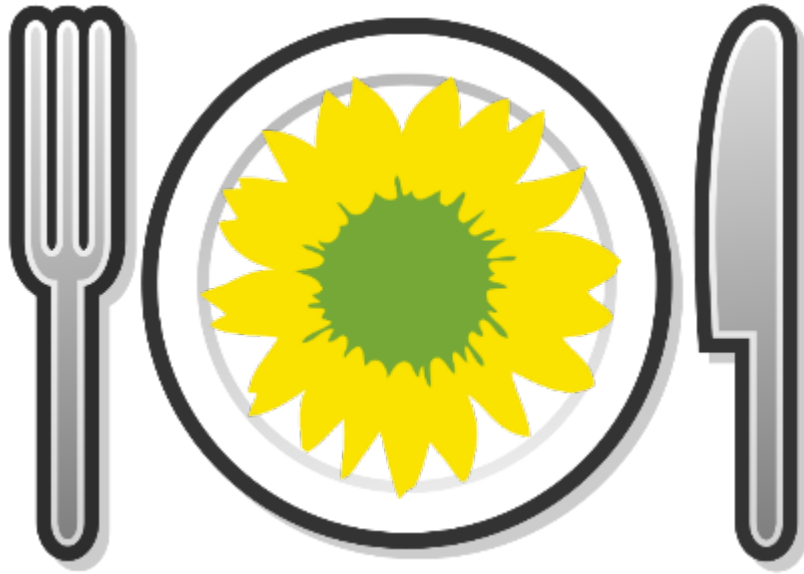
**Food:** Nectar, pollen, host plants



**Shelter:** Nest sites, overwintering sites



# Habitat Needs for Pollinators and Invertebrates



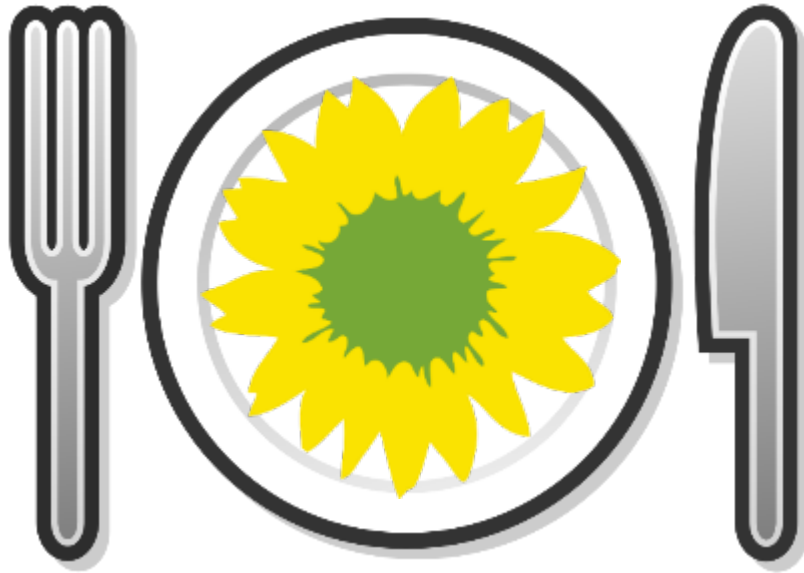
**Food:** Nectar, pollen, host plants



**Shelter:** Nest sites, overwintering sites



# Habitat Needs for Pollinators and Invertebrates



**Food:** Nectar, pollen, host plants



**Shelter:** Nest sites, overwintering sites



# Over-Wintering and Nesting Habitat

A permanent, undisturbed and protected area is necessary to sustain beneficial insect populations.

Brush piles



Photos: all by Sarah Foltz Jordan



Bunch grasses

Hollow and pithy stems



# Tillage destroys nesting and over-wintering sites



Photo: Alina Harris

# Herbaceous Pollinator Meadows

NRCS practices (327) Conservation Cover or (420) Wildlife habitat Planting



Photos: The Xerces Society/Sarah Foltz Jordan, Kelly Gill

# Flowering Trees and Shrubs

(612) Tree Shrub Establishment, (422) Hedgerow planting, or (420) Wildlife habitat Planting

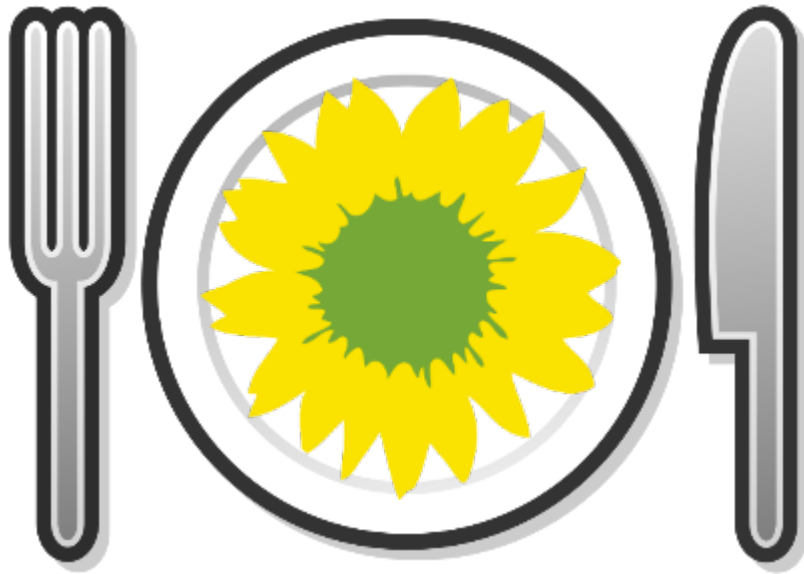


Southeastern blueberry bee on red bud  
(Photo: Nancy Adamson)



Red bud, dogwood, serviceberry, and other spring blooming plants  
(Photo: Kelly Gill)

# Habitat Needs for Pollinators and Invertebrates



**Food:** Nectar, pollen, host plants

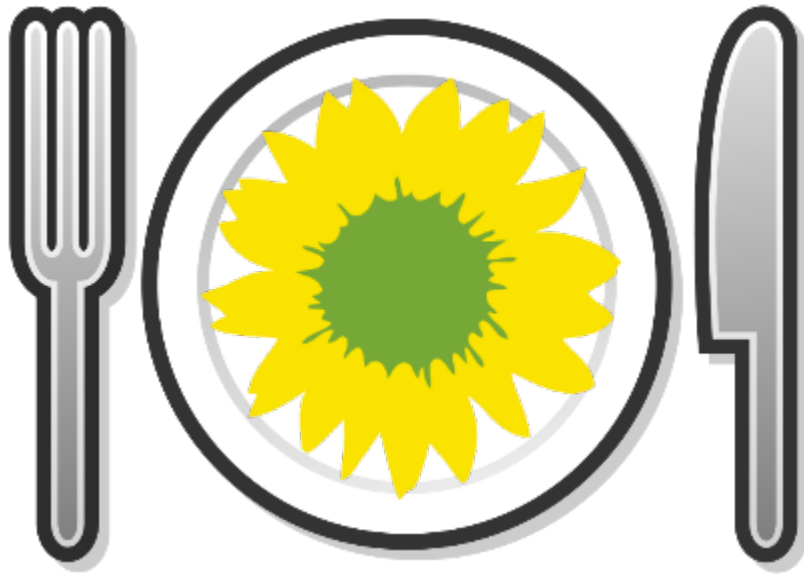


**Shelter:** Nest sites, overwintering sites



**Protection** from pesticides

# Habitat Needs for Pollinators and Invertebrates



**Food:** Nectar, pollen, host plants



**Shelter:** Nest sites, overwintering sites



**Protection** from pesticides

# Pesticide Protection

## Non-flowering vegetative barriers

Spruce (*Picea* spp.)

Juniper (*Juniperus* spp.)

Fir (*Abies* spp.)

Arborvitae (*Thuja* spp.)

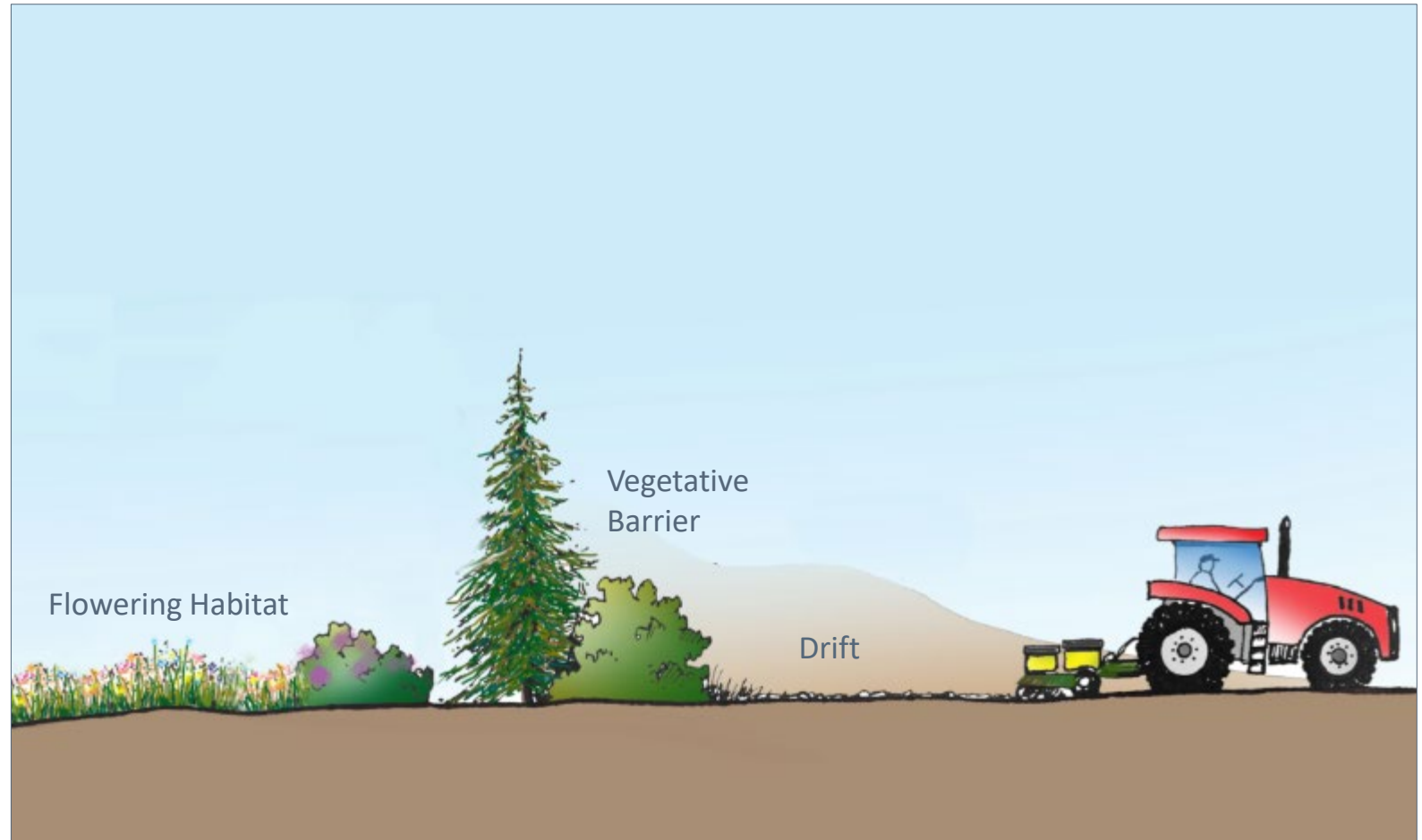


Illustration: USDA National Agroforestry Center

# Pesticide Protection

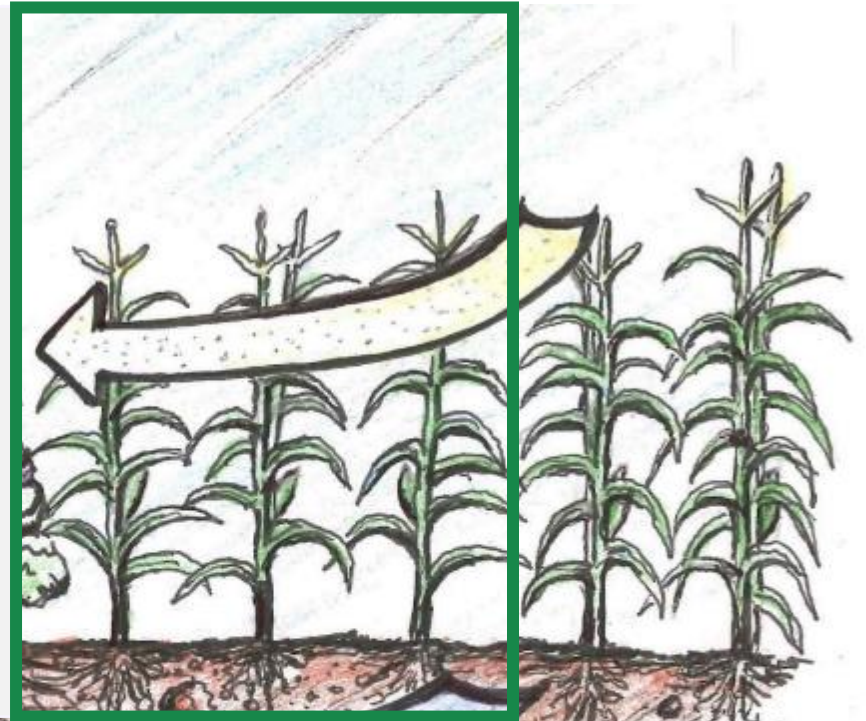
(595) Pest Management Conservation System

## SPATIAL BUFFER

aka

## SET BACK

- 40' wide for ground-based applications
- 60' wide for air blast sprayers
- 125' wide from crops treated with neonicotinoids



# Priority Concerns: Neonicotinoids

## Commonly

## Treated Seeds:

Corn

Soybean

Sunflower

Canola



Photo: Treated soybean seed, by Adam Varenhorst; Sunflowers by Alina Harris



Water soluble – move easily

Systemic - Can persist months to years in plants and soil

Highly toxic to bees and many other beneficial insects



# Neonicotinoids

- Sometimes be high enough to kills bees outright
- Impact foraging and flight in honey bees
- Reduce reproduction of native bees.

For sources, see Hopwood et al. 2016



Photo: Nancy Adamson/Xerces Society

# Corn is wind pollinated... ...is pesticide protection still needed?



*Toxomerus politus*, a hoverfly. It's larvae eat corn pollen, corn sap, and caterpillar pests of corn during their egg and very small caterpillar stages

Photo: Alina Harris

## Yes!

- Avoid spraying corn when in flower
- Avoid using neonic-treated corn seed (very common)
- Set back



## Managing Pesticide Risks: Avoid spraying blooms

---

- Crops, cover crops and weeds
- Mow flowers in understory or row middles before spraying crop
- Create no-spray buffer areas around flowering habitat



Photo: Jessa Kay Cruz

Photo: Xerces Society / Alina Harris



# Managing Pesticide Risks: Avoid spraying blooms

- Crops, cover crops and weeds
- Mow flowers in understory or row middles before spraying crop
- Create no-spray buffer areas around flowering habitat



Photo: Xerces Society / Alina Harris



# Biological Control

Use of living organisms to provide pest control

## 3 Types of Biological Control:

- Classical/Introduced
- Augmentative
- Conservation (CBC)



Photo: Theilma Heide-Baker

# Augmentative Biological Control

- Purchase and release of mass-reared insects
- Useful in greenhouses, confined spaces
- Temporary measure; without habitat and management, populations won't necessarily stick around



Photos: David James; Wikipedia

# What is Conservation Biological Control?

‘Attracting and conserving natural enemies of crop pests by providing habitat’



Photo: Alina Harris / Sideman Lab / University of New Hampshire

# Conservation Biological Control

Support naturally occurring (or even augmented) beneficial insects



Photo: Hoverfly on brassica flower, Thelma Heidel-Baker

# Natural enemies that attack crop pests

AKA beneficial insects



Photos: Alina Harris / Sideman Lab / University of New Hampshire. Spider: home garden in Durham, NH

# Natural enemies that attack crop pests

AKA beneficial insects, AKA biocontrol agents



Photo credits: Sarah Foltz Jordan; John Roberson; squamatologist via flickr; Russ Ottens and David Cappaert (Bugwood.org), Thelma Heidel-Baker; Katja Schulz via flickr

# Diversity of Natural Enemies



Natural Enemy	Crop Pest Preyed Upon
Green lacewing	Aphids, leafhoppers, lygus bugs, mealybugs, mites, psyllids, small caterpillars, soft scale thrips, whiteflies, eggs of pest insects
Lady beetle	Aphids, mealy bugs, mites, soft scale, whiteflies, eggs of pest insects
Minute pirate bug	Leafhoppers, mites, small caterpillars, thrips, eggs of pest insects
Parasitic wasp	Many pest insects (host-specific)
Predaceous wasp	Caterpillars, soft bodied insects
Spider	Aphids, leafhoppers, cucumber beetles, flea beetles, lygus bugs
Syrphid fly	Aphids, soft bodied insects



# Diversity of Natural Enemies

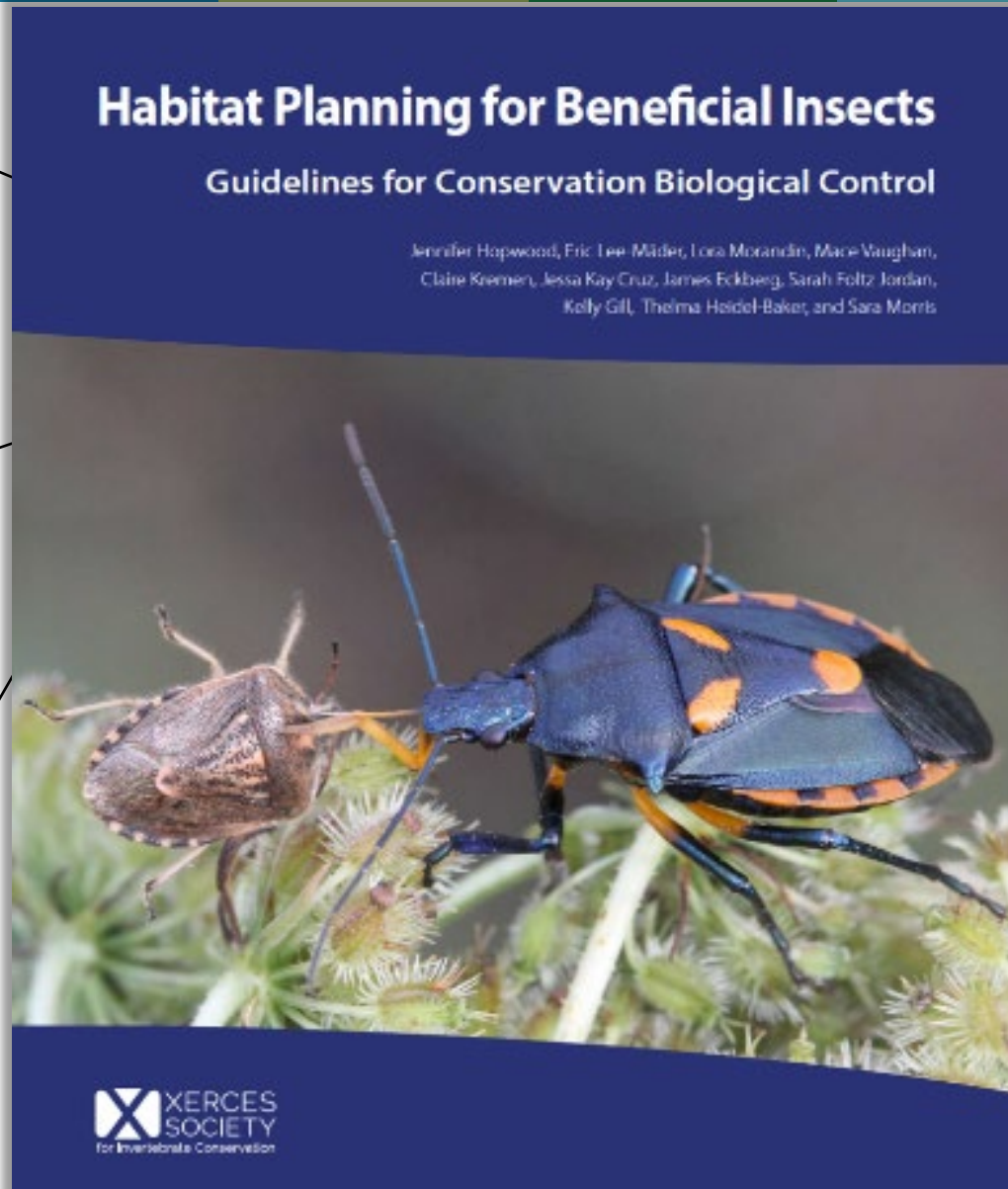




Photo: Lacewing larva consuming aphid by Alex Wild

# Natural Enemy Groups

Insect Predators

Insect Parasitoids

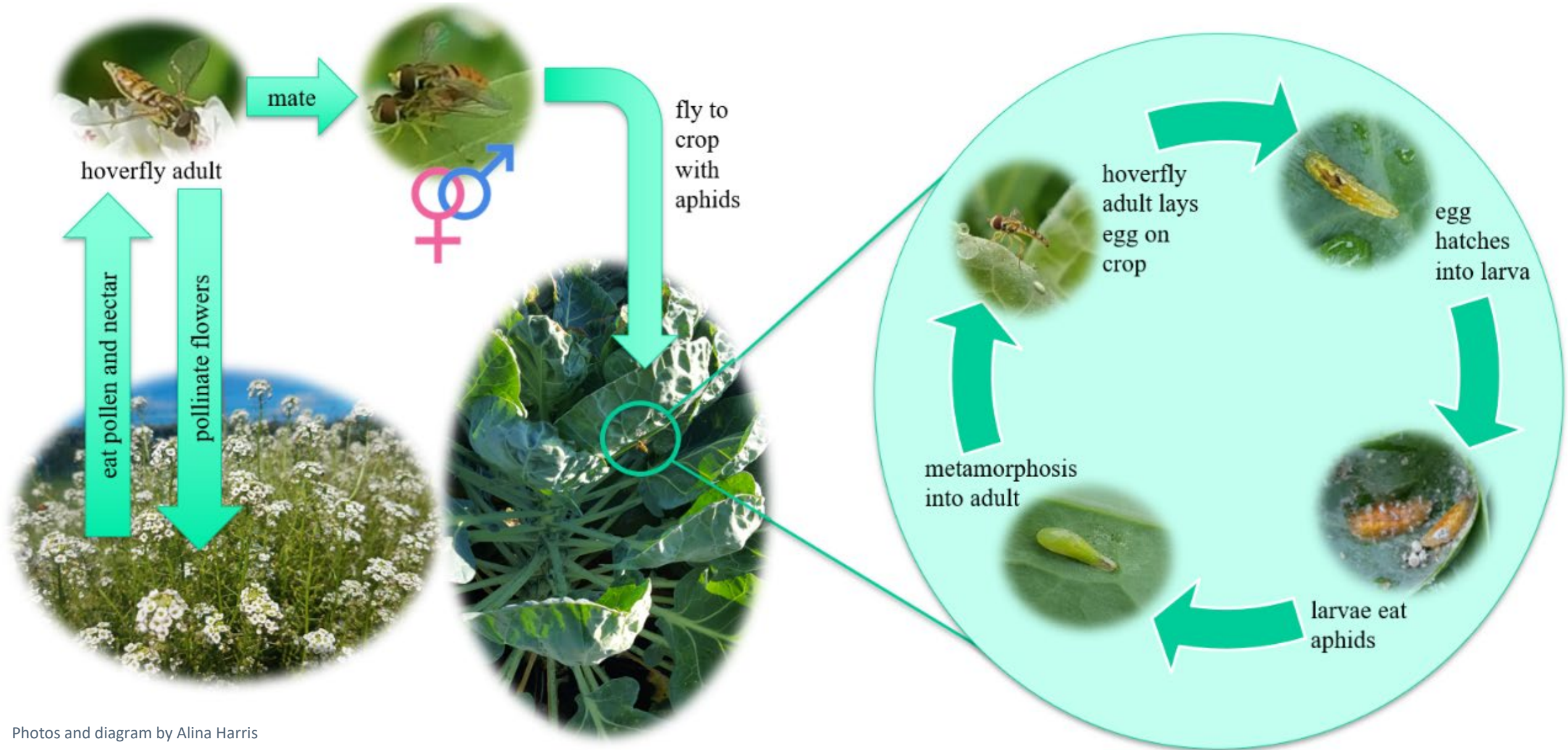
Non-insects

- Spiders, harvestmen, centipedes, mites, nematodes

Some are also pollinators:

- Flies, wasps, beetles

# Hoverfly larvae eat crop pests, but adults require floral resources first



# Parasitoid Wasps and Flies

Lay eggs on or in hosts or host eggs



Adults are nectar-feeding

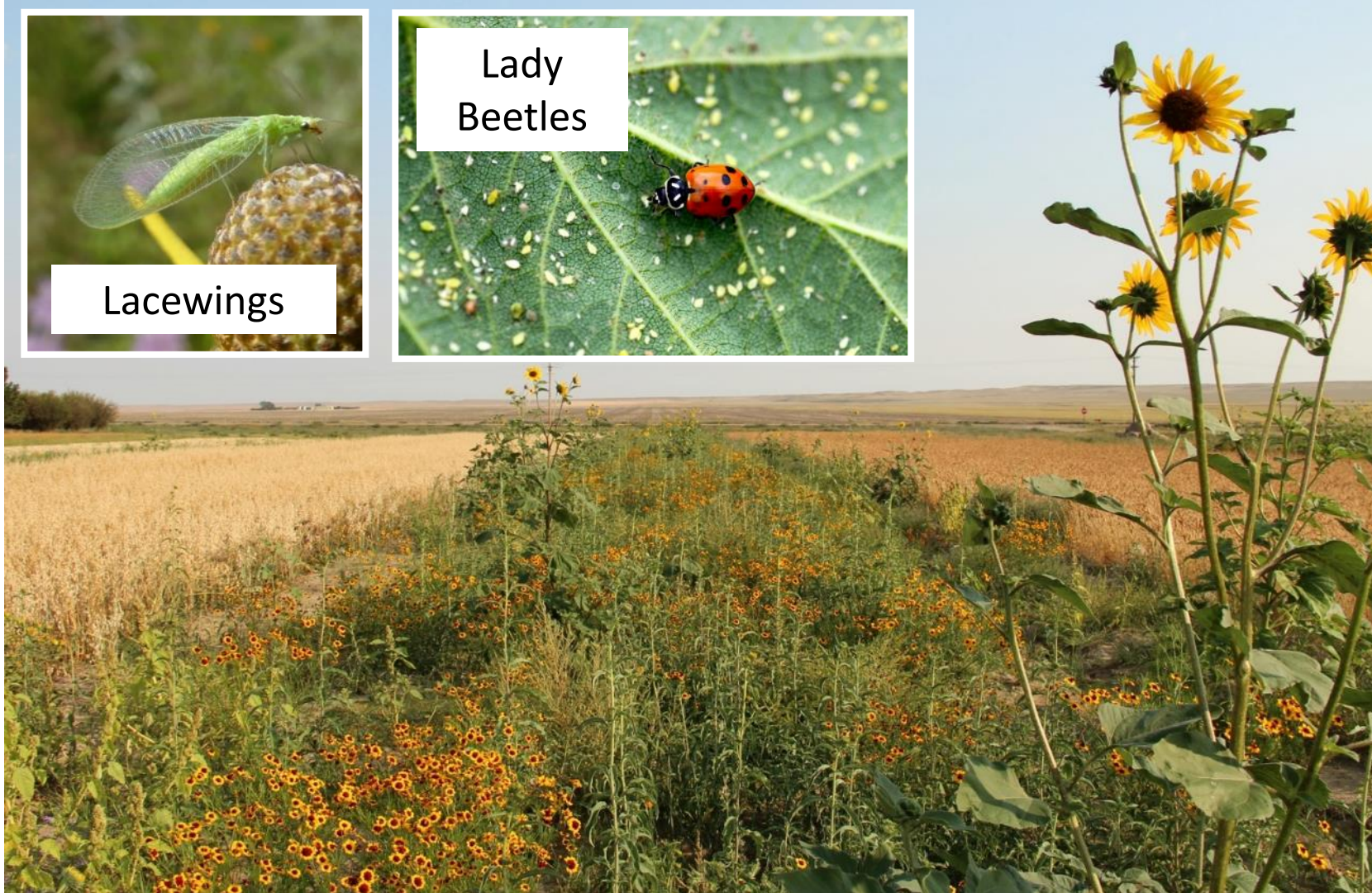


Larval stage feeds and eventually kills host



Photos: Hornworm caterpillar with parasitoid wasp pupae attached externally, by Thelma Heidel-Baker; Tiny wasp (*Trissolcus euschisti*) emerged from stink bug egg, by Elijah Talamas / USDA-ARS; Wasp parasitizing an aphid, by Alex Wild.

# Diverse habitat supports beneficial insects



If more than 20% of a farm is diverse habitat, pest control by beneficial insects is observed throughout fields (Tscharntke et al. 2002).

# Interrelated benefits of cover crops

## Supports:

- Natural enemies
- Pollinators
- Soil life

## Increases:

- Water filtration
- Biodiversity

## Reduces:

- Weeds
- Erosion
- Chemical fertilizers
- Pesticides

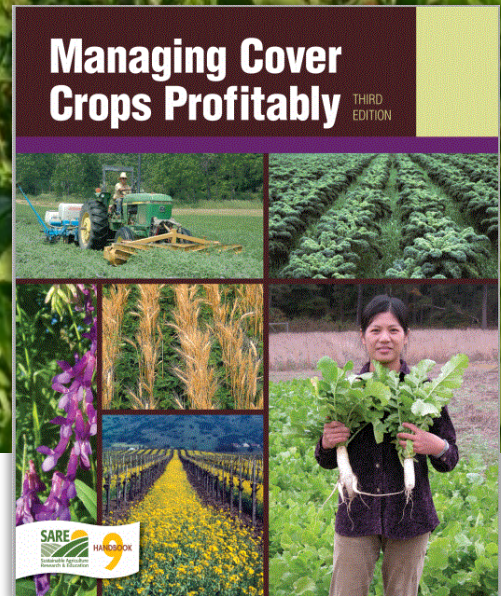


Photo: Thelma Heidel-Baker



## Cover Crop Services and Examples of Suitable Pollinator-Friendly Plants [1, 13]

Conservation Service	Pollinator-Friendly Cover Crops
✓ Nitrogen source	alfalfa, white clover, red clover, cowpea, lupin, partridge pea, sunn hemp, vetch
✓ Nitrogen scavenger	phacelia, canola, sunflower
✓ Erosion control	canola, cowpea, crimson clover, white clover
✓ Forage value	crimson clover, canola, white clover, forage radish
✓ Weed management	buckwheat, canola, cowpea, sunn hemp, sunflower
✓ Nematode management	canola, other brassicas and mustards
✓ Reducing compaction	canola, radish, lupines, brassicas and mustards

## Sample Cool Season Cocktail (formulated for one acre at 10-15 seeds per sq. ft.)

Species		Percent of Mix	Quantity (pounds per acre)
Phacelia	Nitrogen scavenger	8	0.2
Crimson clover	Nitrogen source	8	0.3
Radish (daikon)	Compaction/forage	8	0.6
Hairy vetch	Nitrogen source	8	2.2
Field pea	Nitrogen source	8	17
Turnip	Compaction/forage	8 (let go to flower for pollinators)	0.2
Fava bean	Nitrogen source	2	29
Rye	Erosion	25	6
Oat	Nurse crop	25	7
<b>Totals</b>		<b>100 percent</b>	<b>62 pounds per acre</b>



## Cover Cropping for Pollinators and Beneficial Insects

### Sample Warm Season Cocktail (formulated for one acre at 15-20 seeds per sq. ft.)

Species		Percent of Mix	Quantity (pounds per acre)
Buckwheat	Smother crop	16	7
Soybean	Nitrogen source	16	34
Sunflower	Weed management	16	3.5
Cowpea	Nitrogen source	16	28
Sudangrass		12	2.5
Millet		12	1.5
Teff		12	0.1
<b>Totals</b>		<b>100 percent</b>	<b>77 pounds per acre</b>

# Single Species: Buckwheat Smother Crop

(328) Conservation Crop Rotation  
(340) Cover Crop



Hover fly (bee mimic)



Native lady beetle



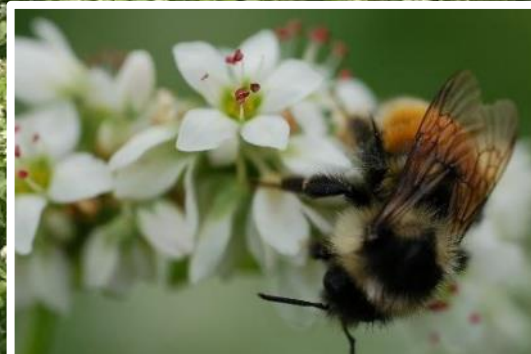
Soldier beetle



Monarch butterfly



Native mining bee



Native bumble bee



European honey bee



# Phacelia



# Common cover crops: Legumes



# Cover Crop

## Planting Specification Guide

**NH-340**

Table 2a - NH 340	Purpose								
Cover Crop	Reduce Erosion	Increase SOM	Recycle Nutrients	Fix Nitrogen Save Energy	Improve Biodiversity	Suppress Weeds	Remove Excess Soil Moisture	Loosen Topsoil	Reduce Subsoil Compaction
Legumes									
Red Clover	✓ -	✓	✓	✓	✓ +	✓ -	✓	✓ -	✓
White or Alsike Clover	✓	✓		✓	✓	✓	✓	✓	
Berseem Clover	✓	✓ +	✓ +	✓ +	✓ -		✓ +	✓	
Sweetclover	✓	✓ +	✓ +	✓ +	✓ +	✓	✓	✓ +	✓ +
Crimson Clover	✓	✓		✓	✓ +		✓ -	✓ -	
Subterranean Clover	✓	✓		✓	✓	✓ +	✓ +	✓ -	

Rating: Above Average (✓+); Average (✓); Below Average/Unknown (✓-). Blank = Not Recommended

# Cover Crop

## Planting Specification Guide

## NH-340

Table 2b - NH 340 Cover Crop	Seeding Rate (lbs/acre)		Seeding Depth Inches	Planting Season								Termination Method						
	Broadcast	Drilled		Spring	Early Summer	Summer	Early Fall	Fall	Late Fall	Dormant	Frost	Mow	Till	Crimp	Frost	Winter	Chemical	
<b>Legumes</b>																		
Red Clover	15	10	¼-½	✓+			✓+				✓	✓					✓	
White or Alsike Clover	12	8	¼-½	✓+	✓		✓+				✓	✓					✓	
Berseem Clover	20	15	¼-½	✓+	✓+	✓	✓-				✓-	✓-		✓-	✓		✓	
Sweetclover	20	15	¼-½	✓			✓				✓-	✓-	✓-	✓			✓	
Crimson Clover	30	20	¼-½	✓+	✓+	✓	✓				✓-	✓-				✓-	✓	
Subterranean Clover	30	20	¼-½	✓	✓+	✓								✓-	✓		✓	
Alfalfa	20	15	¼-½	✓+			✓							✓			✓-	✓
Hairy Vetch	35	25	½-1½				✓+				✓-	✓-	✓-	✓-	✓+	✓-	✓	✓
Chickling Vetch	70	50	½-1½	✓+	✓	✓-							✓-	✓-	✓		✓	✓
Field Pea	100	70	1-3	✓+	✓		✓+						✓+	✓+	✓		✓	✓
Soybean	120	90	1-2	✓	✓								✓	✓+	✓-		✓	✓
Cowpea	140	100	¾-1½		✓	✓+							✓-	✓+	✓-	✓-	✓	✓
<b>Brassicas</b>																		
Radish or Turnip	15	10	¼-½				✓+				✓	✓	✓	✓+	✓	✓-	✓	✓
Mustard or Canola	15	10	¼-¾	✓+	✓		✓+				✓	✓	✓-	✓	✓	✓-	✓	✓
Arugula	4	3	¼-½				✓+							✓+				✓

Rating: Above Average (✓+); Average (✓); Below Average/Unknown (✓-). Blank = Not Recommended



# Scooters Farm of Woodmont, Organic Orchard and Vineyard



Photo: Mike Madden, Hollis, NH

# Insectary Seed Mixes

## (1) Annual Complex

## (2) Simple Annual

## (3) Perennial Complex



Protecting the Life that Sustains Us

### New Hampshire Job Sheet for Insectary Strips (Cover Crop 340): ANNUAL COMPLEX



Photo Credit: Eric Venturini, The Xerces Society. Taken at Temple-Wilton Community Farm in August, 2017.

#### Purpose

This mixture should be used to provide pollen and nectar for beneficial insects<sup>1</sup> to enhance pest control and pollination. To be implemented via the practice, Cover Crop (340) to support a greater abundance and diversity of beneficial insect natural enemies and pollinators, in cropping systems.

#### Where Used

- Annual row crops or other field use
- In areas where easy site preparation is desired
- At sites where the time frame is a single season

Sweet alyssum is an alternative host for the crucifer flea beetle. Unless sweet alyssum is removed, do not plant where (cabbage, bok choy, etc...) will be planted the following year.

#### Operations and Maintenance

**Site Prep and Planting:** Soil should be prepped the same as any annual, spring-planted vegetable crop. The planting area can then be pressed down with boots, lawn roller, or other implement to increase seed to soil contact. After compacting soil, lightly water in.

To achieve early flowering, direct seed as soon as possible. Direct seed once the average frost date has passed. In northernmost NH, frosts are still possible until June 5. In southern New Hampshire the average last frost date is May 15. Alternatively, wait to plant until soil temperatures are about 55-60 °F.

The mixture should begin flowering within 40 days of planting.

Do not treat this planting with pesticides. Do not allow pesticides to drift into this planting from pest management activities carried out in adjacent crops.

**Termination:** If concerned about volunteers in subsequent crops, first mow and bag clippings for removal offsite, then incorporate stubble. Do not terminate until flowering has ceased in the fall.

Common Name	Scientific Name	% BULK	oz/1000 ft <sup>2</sup>	oz/100 ft <sup>2</sup>	lbs/ac	Bloom
<b>ANNUAL COMPLEX</b>						
Lanceleaf Coreopsis	<i>Coreopsis lanceolata</i>	12.0%	0.43	0.04	1.18	Early-Mid
Santo cilantro	<i>Coriandrum sativum</i>	12.0%	2.50	0.25	6.81	Mid
Bouquet dill	<i>Anethum graveolens</i>	12.0%	0.34	0.03	0.94	Mid
German chamomile	<i>Matricaria recutita</i>	12.0%	0.02	0.00	0.05	Early-Mid
Bachelor button	<i>Cyanus centaurea</i>	12.0%	0.97	0.10	2.64	Early-La
Annual Sunflower	<i>Helianthus annuus</i>	4.0%	0.68	0.07	1.85	Late
Sweet alyssum	<i>Lobularia maritima</i>	26.0%	0.18	0.02	0.50	Early-La
Plains coreopsis	<i>Coreopsis tinctoria</i>	10.0%	0.02	0.00	0.07	Mid-Late
<b>TOTALS:</b>		<b>100.0%</b>	<b>5.1</b>	<b>0.5</b>	<b>14.0</b>	



Protecting the Life that Sustains Us

### New Hampshire Job Sheet for Insectary Strips (Cover Crop 340): SIMPLE ANNUAL



Photo Credit: Kitty Kerner, Wintergreen Farm and Aquaponics

#### Purpose

This mixture should be used to provide pollen and nectar forage for beneficial insects<sup>2</sup> to enhance pest control and pollination.

To be implemented via the practice, Cover Crop (340) - to support a greater abundance and diversity of beneficial insects, including natural enemies and pollinators, in cropping systems.

#### Where Used

- Where space is limited, (e.g., tunnels, greenhouses, and row crops)
- Where easy site preparation is desired
- Where the time frame is a single season

Sweet alyssum is an alternative host for the crucifer flea beetle. Unless sweet alyssum is removed, do not plant where brassicas (cabbage, bok choy, etc...) will be planted the following year.

#### Operations and Maintenance

**Site Prep:** Soil should be prepped the same as any annual, spring-planted vegetable crop.

**Planting:** Seeds should be broadcast on the soil surface. The planting area can then be pressed down with boots, lawn roller, or other implement to increase seed to soil contact. After compacting soil, lightly water in.

To achieve early flowering, direct seed as soon as possible. If sowing in the field: direct seed once the average frost date has passed. In northernmost NH frosts are still possible until June 5. In southern New Hampshire the average last frost date is May 15. Alternatively, wait to plant until soil temperatures are about 55-60 °F. If sowing in a greenhouse, tunnel, or other extended season area: Direct seed as soon as soil temperatures are 55-60 °F.

The mixture should begin flowering within 40 days of planting.

Do not treat this planting with pesticides. Do not allow pesticides to drift into this planting from pest management activities carried out in adjacent crops.

**Termination:** If concerned about volunteers in subsequent crops, first mow and bag clippings for removal offsite, then incorporate. Do not terminate until flowering has ceased in the fall.

Common Name	Scientific Name	% BULK	oz/5000 ft <sup>2</sup>	oz/100 ft <sup>2</sup>	lbs/ac	Bloom
<b>ANNUAL SIMPLE MIX</b>						
Bachelor button	<i>Cyanus centaurea</i>	25.0%	9.44	0.19	5.48	Mid
Sweet alyssum	<i>Lobularia maritima</i>	25.0%	0.82	0.02	0.48	Early-Mid-Late
Plains coreopsis	<i>Coreopsis tinctoria</i>	25.0%	0.29	0.01	0.17	Mid
Partridge pea	<i>Chamaecrista fasciculata</i>	25.0%	14.41	0.29	8.37	Early-Mid-Late



Protecting the Life that Sustains Us

### NH Job Sheet for Insectary Strips Conservation Cover (327), Field Border (386): PERENNIAL SIMPLE

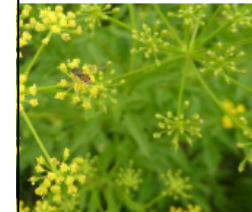


Photo Credit: Sara Foltz Jordan, The Xerces Society. Taken at Temple-Wilton Community Farm in August, 2017.

#### Purpose

This mixture should be used to provide pollen and nectar forage for beneficial insects<sup>4</sup> to enhance pest control and pollination for multiple years.

To be implemented via the practice, Conservation Cover (327) or Field Border (386) - to support a greater abundance and diversity of beneficial insects, including natural enemies and pollinators, in cropping systems.

Once established, this mixture will bloom very early, providing pollen and nectar to beneficial insects at a time when little to none is available in your fields.

**Where Used:** This mixture should be used in tunnels (or similar) and row crops where a short-statured, early blooming, permanent conservation cover is desired. It is also suitable for use in either weed pressure is very low, or where there is capacity for significant weed control efforts.

#### Operations and Maintenance

**Site Prep and Planting:** Site should be prepped for a full season prior to a fall planting. Use black plastic (e.g. silage tarp or clear plastic (e.g., greenhouse plastic) to solarize or smother plot to achieve adequate weed control. For more specific guidance on site preparation. If weed pressure is extremely low, less weed control methods may also work.

**Planting:** In fall (November), seeds should be broadcast on the soil surface. These seeds must be stratified (be stratified in winter conditions) before they can germinate. Therefore, if planting in a high tunnel or similar, sow the seeds in the fall to give them the greatest exposure to cold. After sowing seed, press the seed into the soil with boots, or other implement to increase seed to soil contact. After compacting soil, lightly water in.

Components of the mixture should flower during the first season of growth (lanceleaf coreopsis and possibly spotted bee balm). Spotted bee balm and golden Alexander should flower by their second season of growth.

Do not treat this planting with pesticides. Do not allow pesticides to drift into this planting.

**Termination:** This planting is intended to last multiple years. Unless overtaken by weeds, or if desired once the fall has passed, terminate by incorporating into the soil.

Name	Scientific Name	% BULK	oz/5000 ft <sup>2</sup>	oz/100 ft <sup>2</sup>	lbs/ac	Bloom
<b>PERENNIAL TUNNEL MIX</b>						
Coreopsis	<i>Coreopsis lanceolata</i>	33.3%	6.03	0.12	3.28	Early-Mid
Bee Balm	<i>Monarda punctata</i>	33.3%	0.90	0.02	0.49	Mid-Late
Golden Alexander	<i>Zizia aurea</i>	33.3%	7.74	0.15	4.22	Very Early
<b>TOTALS:</b>		<b>100.0%</b>	<b>14.7</b>	<b>0.3</b>	<b>8.0</b>	

# Annual (or short-lived) forbs for cut flowers & beneficials



Bachelor's button and plains coreopsis within an unsprayed establishing grape vineyard

Photo: Mike Madden, Scooters Farm of Woodmont in Hollis, NH

Photo: Xerces Society (Agapostemon female on Bachelor's button)

- Bachelor's button\*
- Plains Coreopsis



\*Can be aggressive

# Annual (or short-lived) forbs for cut flowers & beneficials



Photo: Xerces Society / Alina Harris

- Lance leaf Coreopsis
- Plains Coreopsis



# Annual (or short-lived) forbs for cut flowers & beneficials



Photo: Xerces Society / Alina Harris

- Bachelor's button\*
- Plains Coreopsis
- **Annual blanket flower**

\*Can be aggressive

# Annual (or short-lived) forbs for cut flowers & beneficials



Photo: Sara Morris / Xerces Society

- Bachelor's button\*
- Plains Coreopsis
- Annual blanket flower
- **Cosmos\***



Photo: Nancy Lee Adamson (bees on cosmos)

\*Can be aggressive

# Annual (or short-lived) forbs for cut flowers & beneficials



- Bachelor's button\*
- Coreopsis
- Annual blanket flower
- Cosmos\*
- Zinnia

\*Can be aggressive

# Annual (or short-lived) forbs for cut flowers & beneficials



- Bachelor's button\*
- Coreopsis
- Annual blanket flower
- Cosmos\*
- Zinnia
- **Ammi majus**

\*Can be aggressive

# One of the most studied and utilized insectary plants



Photo: Alina Harris, University of New Hampshire College Campus

**Sweet alyssum**  
(*Lobularia maritima*)



Photo: Erny Photo CO  
(Fischer Landscape Designs)

(King)

# Purple Alyssum



Photo: Alina Harris, Market Basket, Lee, NH



# Insectary Habitat Plant



Photos: Alina Harris



Sweet alyssum  
(*Lobularia maritima*)



# Beware:

## Some insectary plants may support crop pests



Photos: Alina Harris

**Sweet alyssum**

(*Lobularia maritima*)

**Crucifer fleabeetle**

(*Phyllotreta cruciferae*)

Fleabeetles feed on alyssum

Pest of brassicas

(Brussels sprouts, cabbage, broccoli, tatsoi)

# Natural enemies of flea beetles supported by alyssum



Lady beetle larvae = predators  
(little alligators)

Tachinid flies = parasitoids  
(two wings)

Photos: Alina Harris

# Annual (or short-lived) forbs for cut flowers & beneficials



- Bachelor's button\*
- Coreopsis
- Annual blanket flower
- Cosmos\*
- Zinnia
- Ammi majus
- Sweet Alyssum
- **Calendula officinalis**

\*Can be aggressive



# Beware:

## Some insectary plants may support crop pests



*Calendula officinalis*

Imported Cabbageworm  
(*Pieris rapae*)

Adult moth feeds on  
calendula flowers

Larval form is a caterpillar  
pest of brassicas

# Sunflowers

(328) Conservation Crop Rotation  
(340) Cover Crop



Photo: Alina Harris (8 bumble bees on sunflowers)

- Bachelor's button\*
- Coreopsis
- Annual blanket flower
- Cosmos\*
- Zinnia
- Ammi majus
- Sweet Alyssum
- Calendula officinalis
- **Sunflower**

\*Can be aggressive

# Sunflowers

(328) Conservation Crop Rotation  
(340) Cover Crop



*Dicyphus Hesperus* - Generalist predator  
Preys on: Whitefly, thrips, moth eggs and mites

Photo: Alina Harris

- Bachelor's button\*
- Coreopsis
- Annual blanket flower
- Cosmos\*
- Zinnia
- Ammi majus
- Sweet Alyssum
- Calendula officinalis
- **Sunflower**

\*Can be aggressive

# Priority Concerns: Neonicotinoids

## Commonly

## Treated Seeds:

- Corn
- Soybean
- Sunflower
- Canola



Highly toxic to bees and many other beneficial insects

Water soluble – move easily

Systemic - Can persist months to years in plants and soil



Photo: Treated soybean seed, by Adam Varenhorst; Sunflowers by Alina Harris

# Woody Ornamental Cut Branch Crops



Growing Woody Cut Branch Crops



All images pulled from Growing Woody Cut Branch Crops by Cathy Neal, UNH Extension Professor/Specialist Emerita, Nursery and Landscape Horticulture

# Edible annual\* herbs or seeds

- Dill



Photo: Karin Jokela © (bolting dill)



Photo: Alina Harris  
(swallow tail caterpillar  
on flowering dill)



Photo: Alina Harris (swallow  
tail butterfly foraging on mock orange)

\*Perennials also excellent

# Edible annual\* herbs or seeds

- Dill
- Fennel



Photo: Alina Harris (fennel leaves)



Photo: Nancy Adamson (assassin bug on fennel flowers)

\*Perennials also excellent

# Edible annual\* herbs or seeds

- Dill
- Fennel
- **Cilantro**



Photo: Alina Harris (cilantro)

\*Perennials also excellent

# Edible annual\* herbs or seeds

- Fennel
- Dill
- Cilantro



Photos: Alina Harris (cilantro)

\*Perennials also excellent

# Edible annual\* herbs or seeds

- Dill
- Fennel
- Cilantro
- **Borage**



\*Perennials also excellent

Photos: Pixabay (honey bee and hoverfly), Nancy Adamson (bumble bee)

# Edible annual\* herbs or seeds

- Dill
- Fennel
- Cilantro
- Borage
- **Holy basil, tulsi**



\*Perennials also excellent

Photos: Nancy Lee Adamson (Mirid bug on holy basil leaf, Megachile leaf cutter bee on holy basil flower)

# Edible annual\* herbs or seeds

- Dill
- Fennel
- Cilantro
- Borage
- Holy basil, tulsi
- **Thai Basil**



Photos: Nancy Lee Adamson (Bombus foraging on thai basil flowers)

\*Perennials also excellent

# Edible annual\* herbs or seeds

- Dill
- Fennel
- Cilantro
- Borage
- Holy basil, tulsi
- Thai Basil
- **Genovese Basil**
  
- Caraway
- Cumin
- Sesame



Photo: Two spotted longhorn bee (*Melissodes bimaculata*) on basil

\*Perennials also excellent

# Edible flowering legumes

## Warm season

- Soybeans (edamame)
- Cowpeas
- Fava beans
- Field peas

## Cool season

- Austrian winter pea  
(good for pea tips)



Photos: Matt Flint, NRCS ENTSC

**Example: Flint Farm in NC**

**Extrafloral nectaries** provide nectar that attracts predators such as wasps and ants



Photo: Alina Harris (Lablab or purple hyacinth bean, Hawaii)

For more on extrafloral nectaries:  
<http://www.extrafloralnectaries.org/>

# Let cash crops bloom: brassicas



Photos (from left to right)

- Alina Harris (Tatsoi flowering in Kaneohe, Hawaii)
- Alina Harris (Brassica seed crops gone to flower at Johnny's Selected Seeds, ME)
- Karin Jokela (Flowering Brassica)

# Cool and warm season grasses

(327) Conservation Cover, (340) Cover Crop



Photo: Dwight Sipler, Small Farm in Massachusetts

Multipurpose: Fibrous-rooted, some deep-rooted, green manure & living mulch, attract beneficials—**grasses can be especially important for beetles & spiders**

Example: Small Farm in MA  
Annual ryegrass and white clover between pick-your-own vegetables and flowers

# EQIP Practice for Pollinators

## Description

✓ 327	Conservation Cover (Consider 420)	Herbaceous Pollinator Meadow (grasses+forbs)
✓ 328	Conservation Crop Rotation	Include pollinator friendly (cover) crops
329	Residue and Tillage Management, No-Till	Semi-undisturbed nesting habitat
✓ 340	Cover Crop	Multi species pollinator friendly cover crop; break pest cycles
391	Riparian Forest Buffer	Nectar and pollen-rich trees/shrubs
✓ 420	Wildlife Habitat Planting	Herbaceous Pollinator Meadow or flowering shrub
512	Pasture and Hay Planting	Seed with legumes or native grasses
528	Prescribed Grazing	Improve monarch habitat
570	Stormwater Runoff Control	Rain garden for wildlife
✓ 595	Pest Management Conservation System	Using PAMs (Prevention, Avoidance, Monitoring) to reduce pesticides and invertebrate exposure
✓ 612	Tree/Shrub Establishment	Native woody plants for pollinators and beneficials
666	Forest Stand Improvement	Patch cuts for flowering understory; Snags for nesting habitat

✓ = discussed in this webinar. Other practices also support pollinators



**Native Trees**  
*Food and Shelter*

612 ✓

Alone or in windbreaks, trees such as conifers, willows, or maples provide resources, travel routes, and safe haven for predators, parasites, and insect-feeding birds year-round.



**Cover Crops**  
*Food and Shelter*

340 ✓

Including cover crops such as buckwheat and clover in planting rotations helps to build soil and add nutrients while providing patches of flowers to support predator and parasite populations.



**Sunflowers**  
*Food and Shelter*

328 ✓

Sunflowers support alternative prey and provide nectar and pollen for predators and parasites. They also offer escape cover for insect-feeding birds.



**Insectary Blocks**  
*Food and Shelter*

340 ✓

Blocks planted with a variety of annuals and perennials such as rose, elderberry, or yarrow can provide resources throughout the year.



**Perennial Shrubs**  
*Food and Shelter*

420 ✓

Native shrubs such as oceanspray, elderberry, or rose provide pollen, nectar, and homes for non-pest prey—as well as undisturbed habitat—for predators and parasites.

**Harmful Practices**

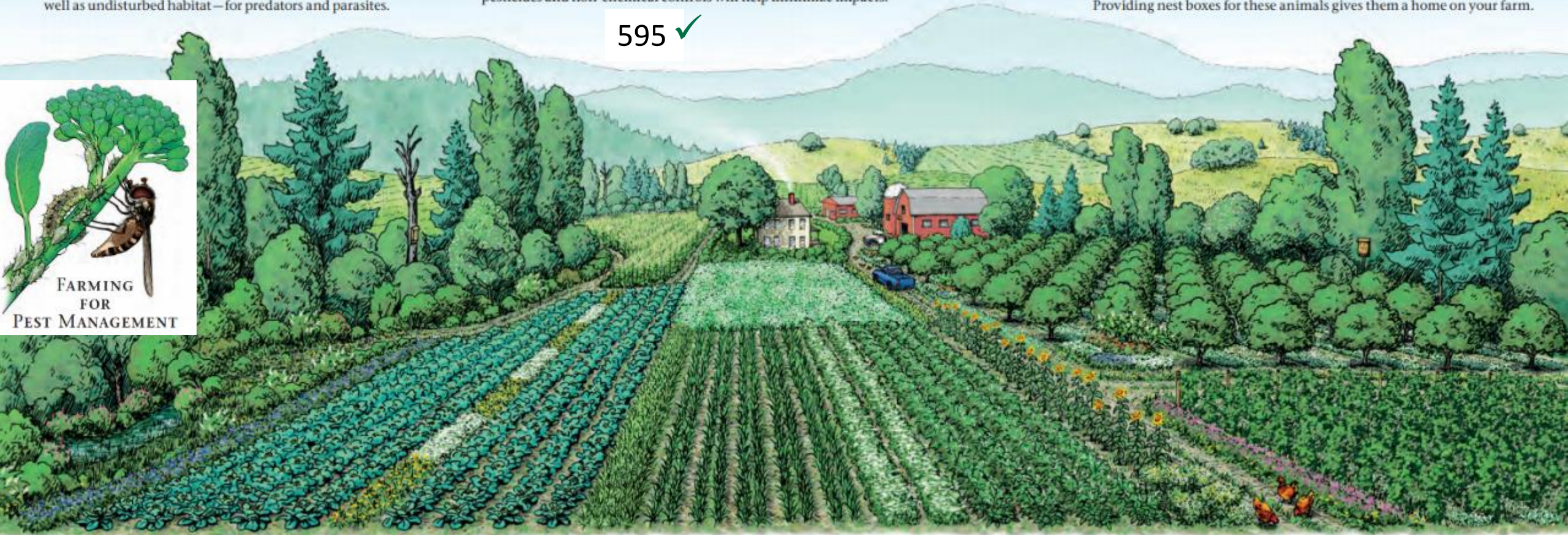
Cultivation, field burning, and broad-spectrum pesticides disturb or kill natural enemies and their non-pest prey. Reducing disturbance and using selective pesticides and non-chemical controls will help minimize impacts.

595 ✓



**Bat and Bird Nest Boxes**  
*Shelter*

Bats forage in the air above crops, where they feed upon the flying stages of insects, including pest species. Birds may eat insects and rodents. Providing nest boxes for these animals gives them a home on your farm.



Artwork: Andrew Holder, Xerces Society



**Riparian Buffers**  
*Food and Shelter*

391

Habitat along streams should contain a diversity of plants. Willows, in particular, will nourish bumble bee queens in the spring so that large numbers of workers are available when crops begin to bloom.



**Fallow Fields and Set-Asides**  
*Food and Shelter*

Even small areas of fallow or unproductive land, especially when sown with native flowers, can offer important resources for native bees.



**Hedgerows or Windbreaks**  
*Food and Shelter*

612 ✓

Creating hedgerows with a wide variety of plants that have overlapping flowering periods will provide bee habitat throughout the growing season and strengthen populations of natural enemies of crop pests.



**Natural or Undeveloped Areas**  
*Food and Shelter*

Nearby natural areas may harbor all the native bees needed to pollinate your farm's crops. Consider inviting your neighbors to help with safeguarding these habitats.



**Snags**  
*Shelter*

666

Keeping dead trees standing provides shelter for native bees. Some solitary bees build nests in abandoned beetle tunnels in snags.

595 ✓

**Pesticides**

Insecticides kill pollinators outright, and herbicides may destroy plants important for both food and shelter. It is preferable to minimize your use of pesticides and to carefully choose products and application methods.



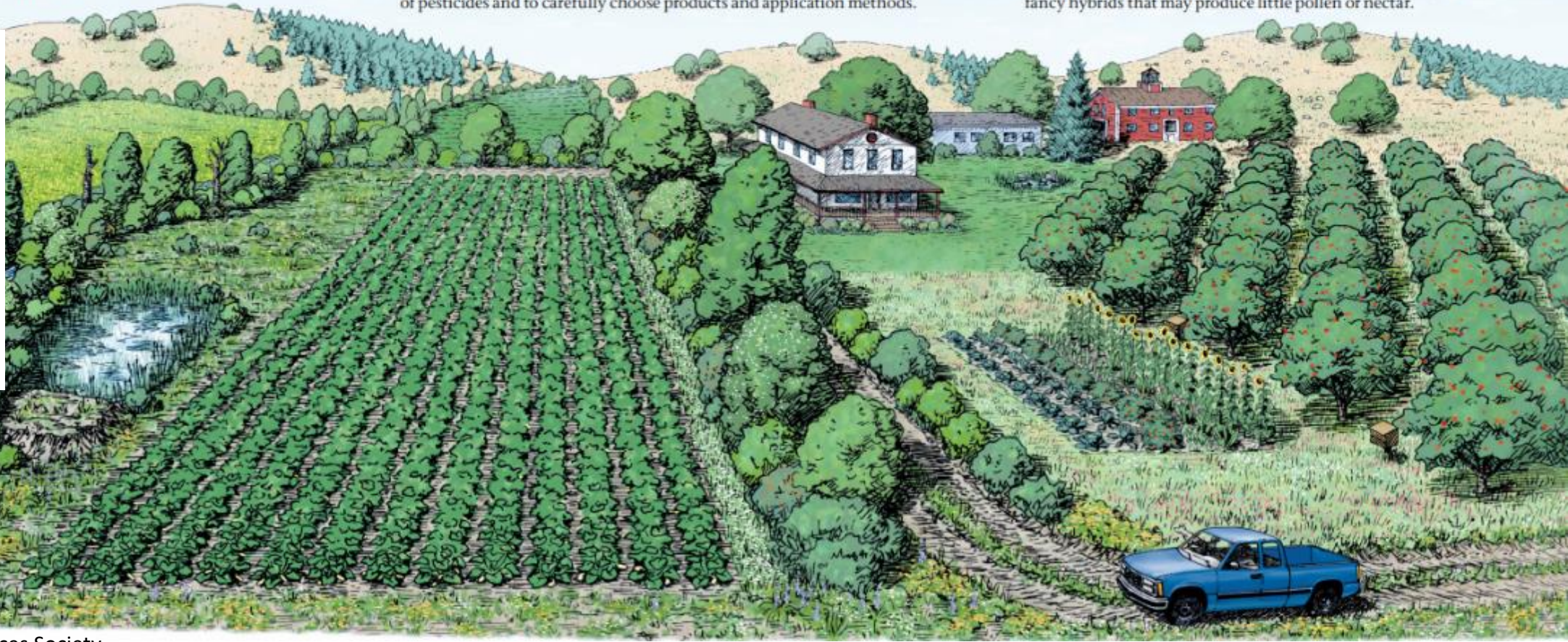
**Gardens**  
*Food*

328 ✓

A vegetable, flower, or herb garden, with a diverse assortment of plants, is a good source of food for pollinators. Be wary of fancy hybrids that may produce little pollen or nectar.

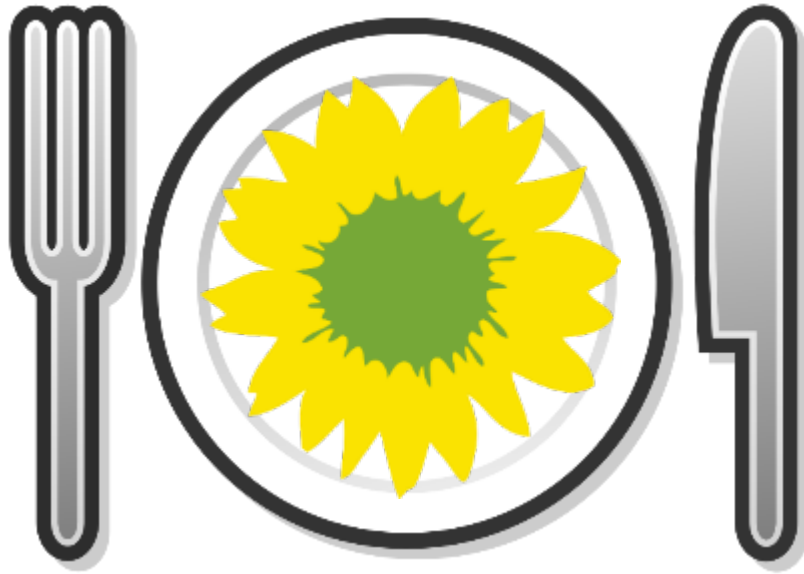


FARMING FOR POLLINATORS



Artwork: Andrew Holder, Xerces Society

# Habitat Needs for Pollinators and Invertebrates



**Food:** Nectar, pollen, host plants



**Shelter:** Nest sites, overwintering sites



**Protection** from pesticides

Thank you!



Photo: John Flannery

Predatory stink bug feeding on a brown marmorated stink bug