

# Farming for Beneficial Insects:

## Conservation of Native Pollinators, Predators, and Parasitoids



Photo: YoungDoo M. Carey

← **Presented by Nancy Lee Adamson**  
Pollinator Conservation Specialist  
Xerces Society for Invertebrate Conservation &  
NRCS East National Technology Support Center

**Moderated by Sudie Daves Thomas** →  
Wildlife Biologist, South Carolina NRCS



Photo: Sue Griggs



Since 1971, the Society has worked to protect wildlife through the conservation of invertebrates and their habitat.



Xerces blue butterfly  
(*Glaucopsyche xerces*),  
the first U.S. butterfly to  
go extinct due to human  
activities.



# What is the Xerces Society?

Endangered species



Pollinator conservation



Aquatic conservation



Butterfly conservation





- **Pollinators a priority for all USDA land managers & conservationists**
- **Encouraging inclusion of pollinators in all USDA conservation programs--*adding diversity to plant mixes & promoting IPM***





Recent webinar available at [ConservationWebinars.net](https://www.conservationswebinars.net) in "FOTG & Planning" outlining current USDA Natural Resources Conservation Service pollinator programs

Several other pollinator webinars, including *Common Bees & Best Bee Plants of the East*, in "Insects & Pollinators" and "Fish & Wildlife"



## Conserving Pollinators While Addressing Other Resource Concerns

### Mace Vaughan

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**Predators & parasitoids use the same habitat as bees**



**mason/potter wasp and  
sweat bee on goldenrod**



## **Benefits of diversity**

- Sustainable agriculture

## **Beneficial arthropods & nematodes**

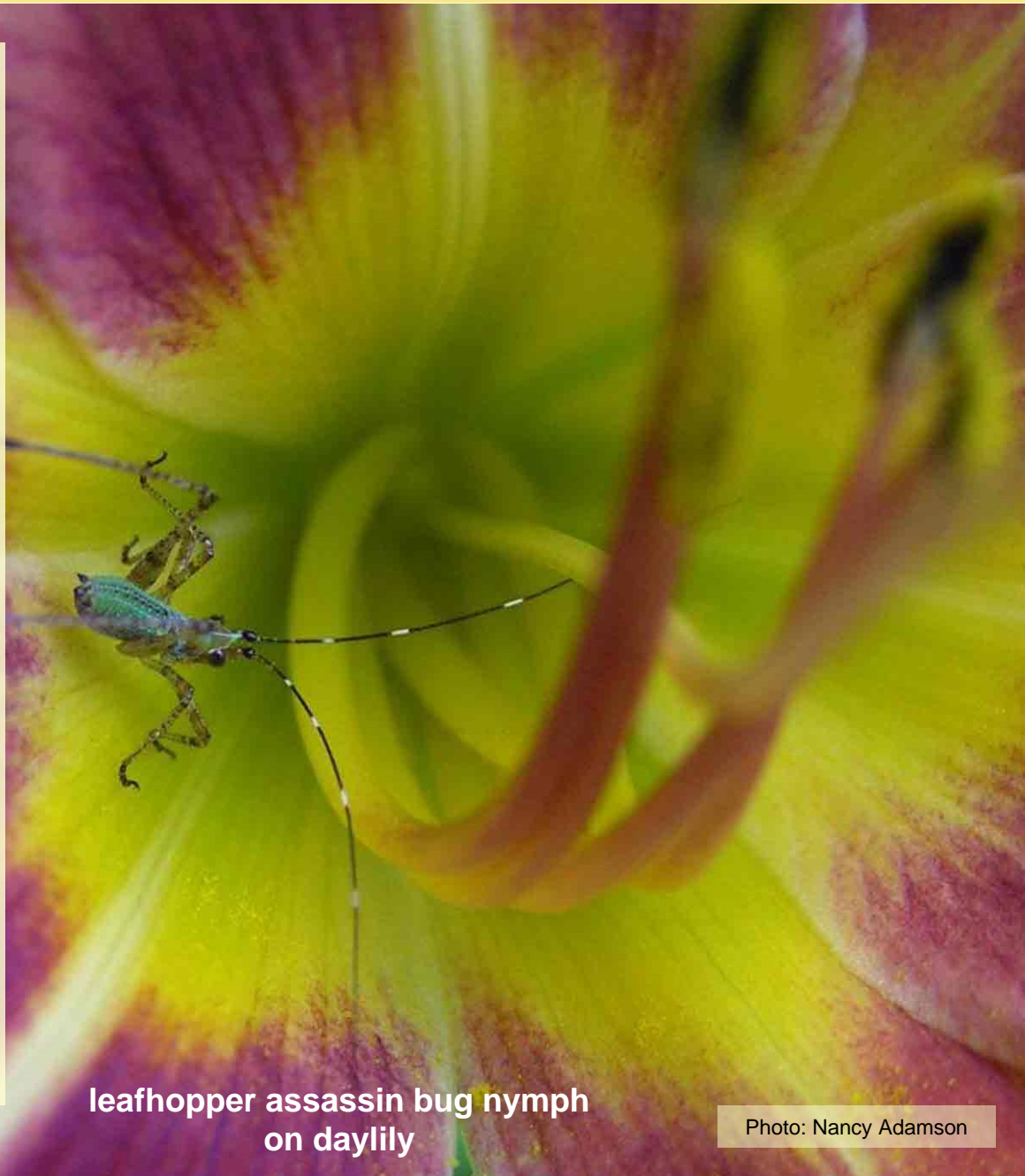
- Natural enemies of pests
  - Predators & parasitoids
- Pollinators

## **Habitat needs**

- Food & shelter
- Protection from pesticides

## **Establishment & long term management tips**

## **Additional resources**



leafhopper assassin bug nymph  
on daylily



## Greater plant diversity

- Increased forage
- Less herbicide use
- Greater insect diversity

## Lower pesticide use

- More beneficial insects
- Better crop pollination
- Fewer pest outbreaks on diversified farms

## Nesting & refuge from harvest & pesticides

- Patchwork habitat
- Patchwork disturbance



USDA Organic certification  
requires farms to enhance  
biodiversity

“A production system that is managed...by integrating cultural, biological, & mechanical practices that foster cycling of resources, **promote ecological balance, and conserve biodiversity**” (*Organic Food Production Act, 1990*)

# Beyond Organic: Local & Reduced Pesticides

Knowing the farmers, supporting local production, reduced pesticide use, and agri-tourism increasingly valued





- **Agri-tourism is a growing part of “go-local” efforts**
- **Beneficial insect field borders & hedgerows add**
  - “curb appeal”
  - income with cut flowers or berries

Pollinator planting at vineyard in Cherokee County, NC, with technical support provided by Glenn Carson, NC NRCS

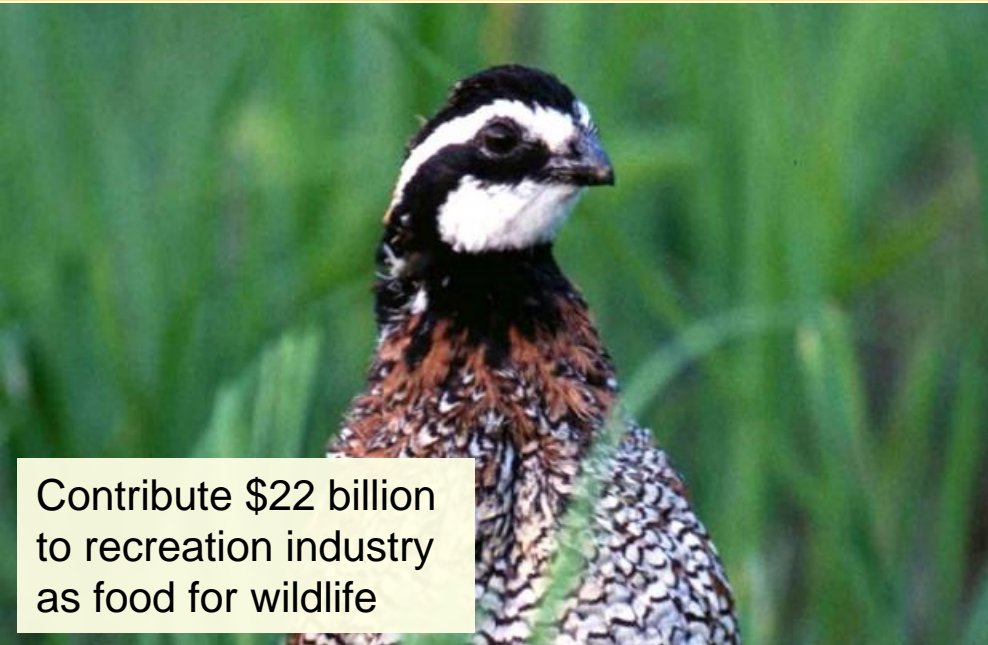


- **Protect watersheds**
- **Provide wildlife habitat--*especially species needing open, early-successional habitat***

Plantings around sinkholes, with technical support provided by Robin Mayberry, NRCS Area Biologist in Cookeville, TN



# Insects Sustain Our Ecosystems



Contribute \$22 billion to recreation industry as food for wildlife



Wild natural enemies protect more than \$4.5 billion in crop production in the U.S.



Native pollinators contribute at least \$3 billion in pollination



Clean up grazing lands, saving ranchers more than \$380 million & help retain nutrients



“The greatest single factor in preventing insects from overwhelming the rest of the world is the internecine warfare which they carry out among themselves.” *Robert Metcalf, entomologist & chemical ecologist*



tomato hornworm larva  
parasitized by braconid wasps



## Conservation Biological Control, Conservation Biocontrol, or Biocontrol

- Beneficial Insects
- Natural Enemies (of pests)
- Biological Control Agents

### For up-to-date local info, contact

- Local NRCS & Extension offices
- Visit <http://www.eXtension.org>
- Find regional Integrated Pest Management (IPM) center

This manual will be available soon, as well as a new book from the Xerces Society & Storey Publishers.

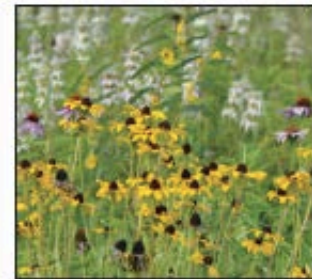


THE XERCES SOCIETY  
FOR INVERTEBRATE CONSERVATION



## Conservation Biological Control

Providing habitat for predators and parasitoids of crop pests



January 2013

The Xerces Society for  
Invertebrate Conservation

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



**Slow pest population  
growth rates**

**If both predator & prey  
are wiped out, it takes  
predators much longer  
to recover**

**wheel bug (assassin bug) nymph  
eating a Colorado potato beetle**





The estimated value of biocontrol by natural enemies is \$4.5–12 billion for U.S. crops and \$100 billion worldwide—but *they are easy to miss!*



**mottled tortoise beetle with chalcid parasitoid wasp (parasitizes eggs)**



**Many predators are generalists, feeding on anything they can catch:**  
*Spiders; some beetles; assassin, damsel, & minute pirate bugs; lacewings...*



lynx spider  
with sweat bee  
on rosinweed



## Parasitoids

***Parasitoids are parasites that kill their hosts & are often "specialists" (some wasps, flies, nematodes)***

**braconid wasp parasitizing  
a tarnished plant bug nymph**



## Predatory Wasps

**Adults are omnivorous & catch prey to provide to their carnivorous young—she will lay one egg on this cicada after placing it in an underground nest**

cicada killer (solitary wasp)  
providing for her young



## Parasitic/Parasitoid Wasps

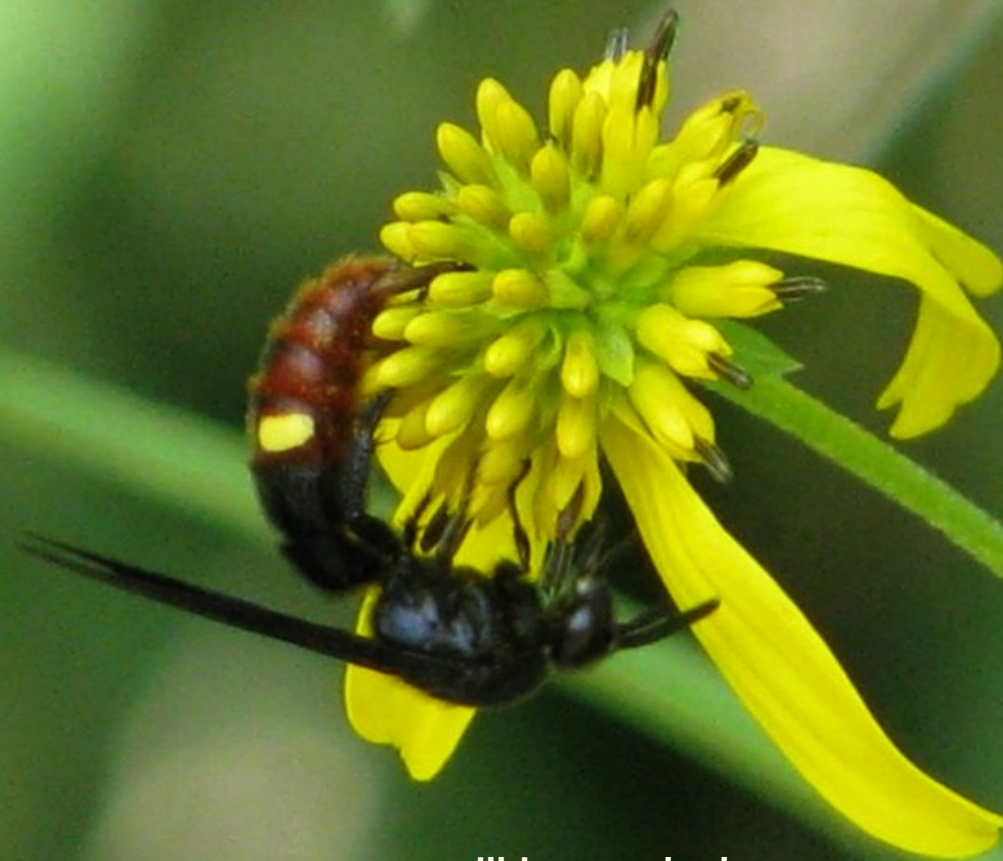
**Adult parasitic wasps lay eggs on host;  
Larvae eat host from the inside out**

**braconid wasp  
parasitizing aphids**



## Parasitic/Parasitoid Wasps

**Some larger wasps are also parasitoids**—*scoliid wasps* paralyze & lay eggs on white grubs (ex. June beetle larvae), but as adults consume pollen & nectar



scoliid wasp sipping  
wingstem nectar



## Parasitic/Parasitoid Flies

**Wasp and fly parasitoids often eat nectar & pollen as adults—*their* young may parasitize eggs, larvae, or adults (including crop pests)**



tachinid fly, *Trichopoda pennipes*,  
sipping goldenrod nectar



Many adult flies feed  
on flower pollen



syrphid fly (bee mimic)  
on spiderwort



## Predatory Fly Larvae

**Some fly larvae are voracious predators of aphids & other crop pests**

**syrphid fly larva eating  
an aphid (*twice its size!*)**



## Predatory & Parasitic Flies

**They overwinter in leaf litter or under soil layer--*maintain undisturbed natural areas adjacent to farm land to support them***



**hover fly larvae eating an aphid**



## Some predatory flies mimic bees

Compared with bees,  
flies have

- Bigger eyes
- Short antennae
- 1 pair of wings

robber fly  
on apple



# Predatory Beetles

**Both larvae & adult ladybugs  
eat crop pests**



Photo: David Cappaert

DGA5255037



Photo: SABeebe (bugguide.net)



## Predatory Beetles

**Overwinter in leaf litter, soil, rotting wood--*maintain undisturbed natural areas adjacent to farm land to support them***



ladybird beetle larva



**Lacewings are predaceous as adults and larvae**



**green lacewing adult**



## Lacewing Egg & Larva



lacewing egg  
on blueberry

Photo: Nancy Adamson



green lacewing larva  
eating whitefly larvae

Photo: Jack Dykinga



It's not always easy to recognize "good" vs. "bad"



assassin bug eating  
twice-stabbed stink bug  
on raspberry



## Predators: Mantids (Praying Mantis)

**Habitat near crops provides harborage & food for predators & parasitoids when crops are harvested**



praying mantis on  
perennial sunflower



# Beneficial Nematodes

- **Supporting beneficial nematodes is part of maintaining healthy soil**
- **Help control soil pest problems in greenhouse production**



# Pollinators

4,000 species of native bees; ~700 in the east,  
greatest diversity in the dry southwest

bumble bee  
on blueberry

Photo: Nancy Adamson





## Diverse native bees pollinating crops:

- 100+ species visit apples in GA, NY and PA
- 100+ species visit blueberry in Michigan
- 100+ species visit WI cranberries
- 80+ species visit berry crops in New England
- 60+ species visit CA tomato, sunflower, or watermelon

andrenid bee  
on apple



## Wild Pollinators: Better Quality Pollination

In a study of 41 crops around the globe, fruit set in **all** crops significantly increased with flower visits by wild pollinators vs. only 14% with honey bees



digger bee  
on apple



## Wild Pollinators: Better Quality Pollination

Wild bees improved fruit set **twice** as much as honey bees.

*Better quality pollination relates to cross-pollination, the ability to buzz pollinate, and other ways bees interact with flowers.*



honey bee



digger bees





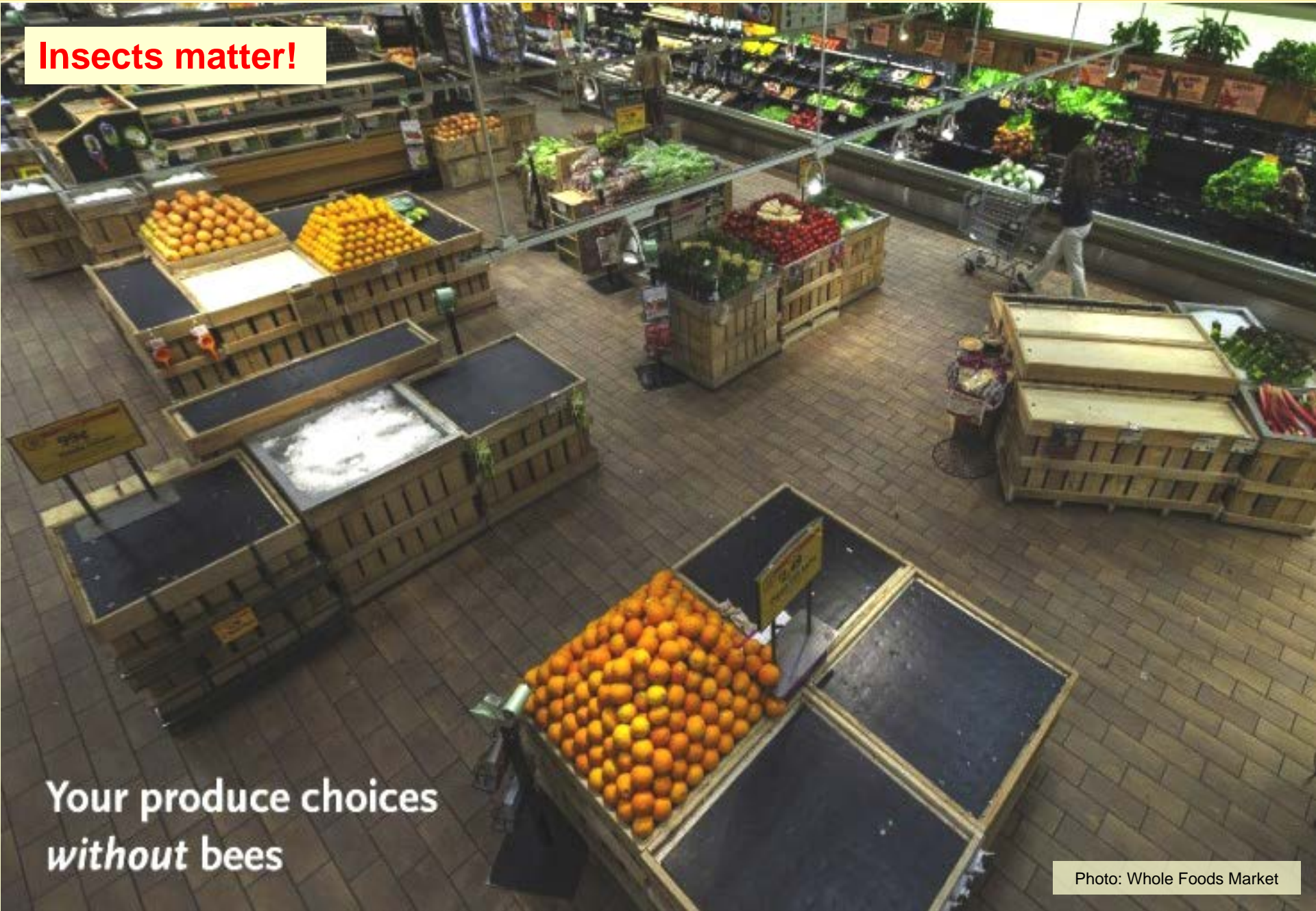
**A third of our crops depend on insect pollinators—*primarily bees***

Your produce choices  
*with bees*

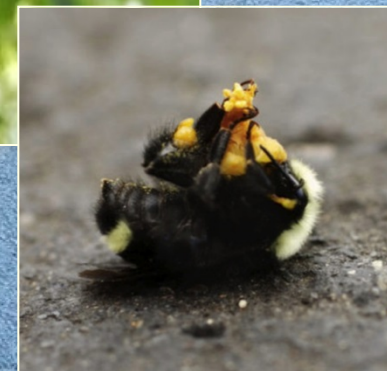
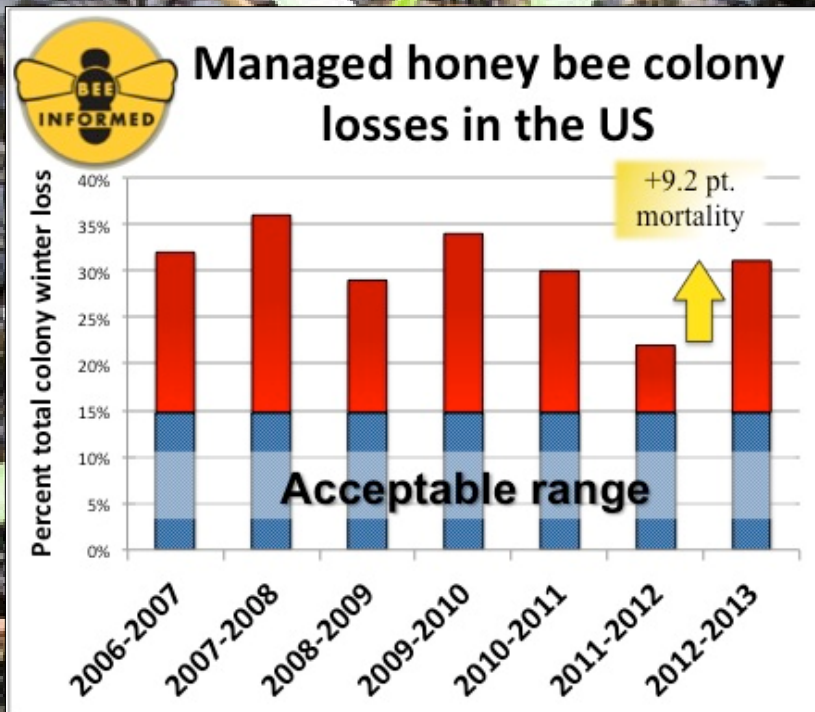


**Insects matter!**

Your produce choices  
*without* bees



Despite increased awareness since 2006, some of the highest losses ever in 2013



Graph: vanEngelsdorp et al 2013.  
<http://beeinformed.org/>

Mass bumble bee kill in Oregon, June 2013



**Strengthen habitat and pesticide protection for all bees—*this also supports other beneficial insects***





### 3 Groups of Native Bees Based on Nesting Habits

ground-nesting bees (solitary)



polyester bee,  
*Colletes inaequalis*

bumble bees (social)



*Bombus impatiens*



orchard mason bee,  
*Osmia lignaria*

cavity/tunnel-nesting bees (solitary)



## Bumble Bees, *Bombus* spp.

Annual colonies, ~25-400 workers, in abandoned rodent burrows or under lodged grasses—***Provide forage, conserve brush piles & unmown areas***



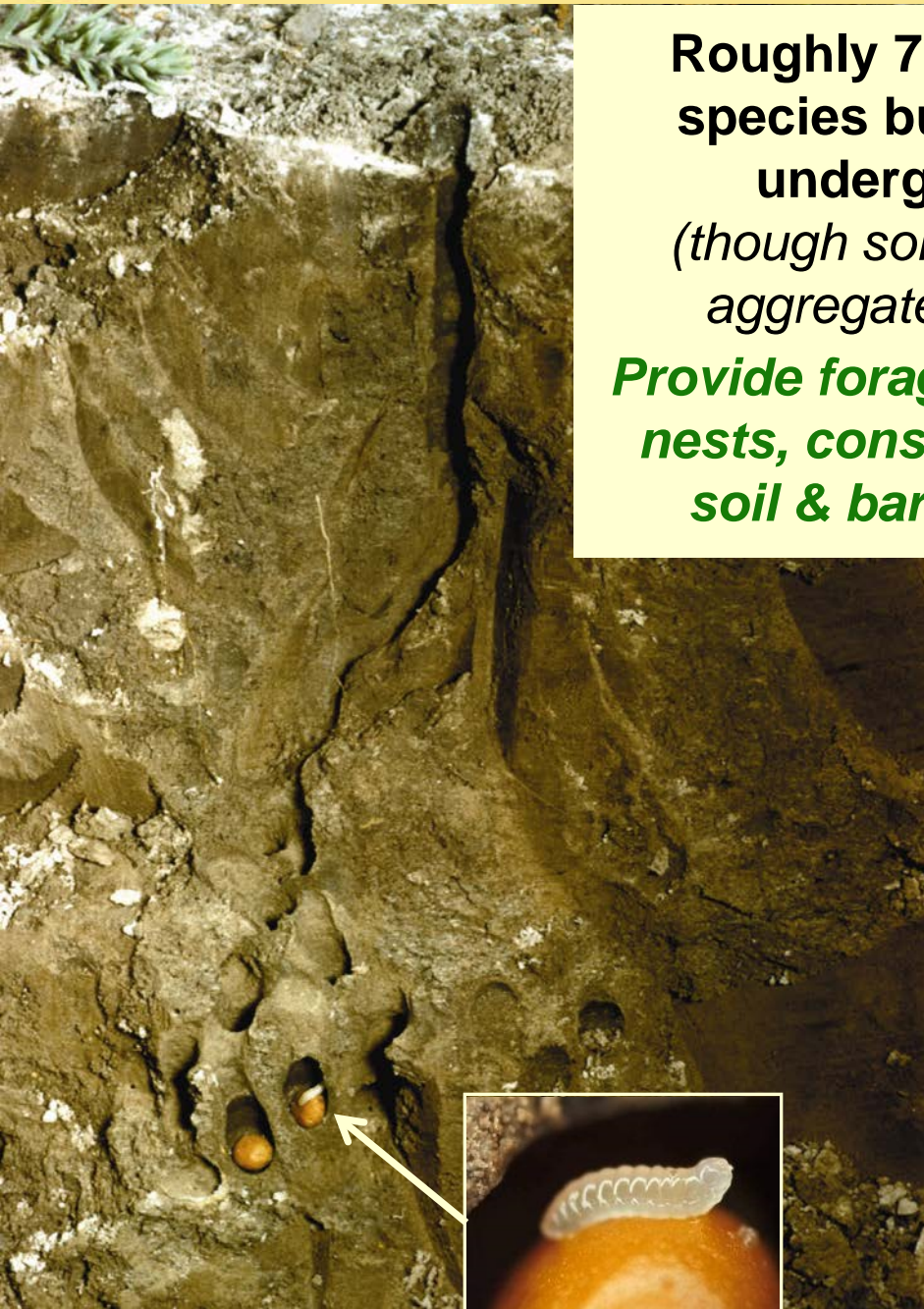
*Bombus griseocolis*  
covered in squash pollen



# Ground-Nesting Solitary Bees

**Roughly 70% of bee species build nests underground**  
*(though solitary, often aggregate nests)--*

***Provide forage, scout for nests, conserve sandy soil & bare ground***



**mining bee**  
*Andrena barbara*



## Cavity or Tunnel Nesting Solitary Bees



© Edward Ross

**Roughly 30% nest in hollow plant stems, or old beetle borer holes—**

***Provide forage, conserve snags, brush piles & pithy-stemmed plants. Leave dead plant material over winter.***



Photo: Nancy Adamson

Photo: Matthew Shepherd



## How much habitat is needed?

**Beneficial insect diversity and abundance in crops depends on natural habitat on or close to the farm**





## How much habitat is needed?

**In PA apple pollination study, trees adjacent to natural habitat were fully pollinated by native bees.**

Recommend honey bee hives placed in center areas, farthest from edge habitat.

mining bee,  
*Andrena* sp.



## Natural enemy activity and crop pollination by wild bees is greater in landscapes with diverse habitats



great golden digger wasp  
on dogbane

Bianchi, F. J. J. A., C. J. H. Booij, and T. Tscharntke. 2011. Sustainable pest regulation in agricultural landscapes: a review on landscape composition, biodiversity and natural pest control. *Proc. R. Soc. B* 273: 1715-1727.

Orr, D. and A. Fox. 2012. Augmentation and conservation of natural enemies, in *Integrated Pest Management: Principles and Practice*, edited by D. P. Abrol and U. Shankar. CAB International, Cambridge, MA.

Winfree, R., N. M. Williams, H. Gaines, J. S. Ascher, C. Kremen. 2008. Wild bee pollinators provide the majority of crop visitation across land-use gradients in New Jersey and Pennsylvania, USA. *J. Applied Ecology* 45(3): 793-802.



**Nectar sources (buckwheat) in soybean supported increased (2½ times) parasitization of brown stink bugs** (Glynn Tillman, USDA ARS, Crop Protection & Management Research Lab, Tifton, GA, manuscript in progress)



*Telenomus podisi* female  
parasitizing stink bug eggs

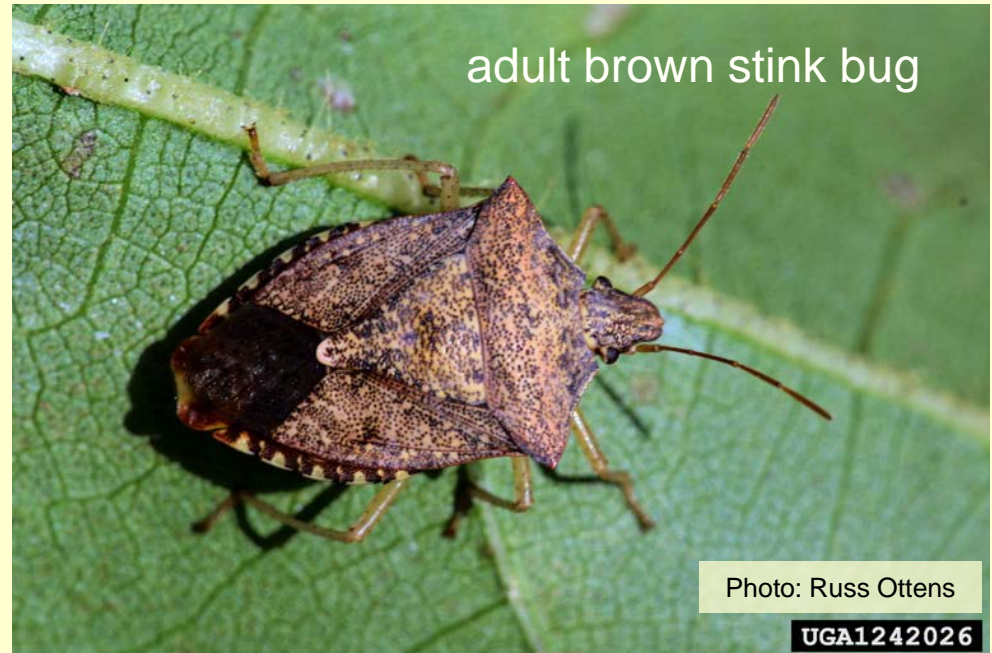


Photo: <http://zoo.bio.ufpr.br/biocontrol/entomofauna.html>  
Laboratório de Controle Integrado de Insetos (LCII)



## Means for percent parasitization per egg mass for sentinel eggs of brown stink bugs in cotton with buckwheat

Treatment	% Parasitization
Cotton w/ trap crop and buckwheat	22.38 a
Cotton w/trap crop, but no buckwheat	8.8 b
Cotton w/out trap crop or buckwheat	8.7 b

syrphid fly feeding  
on buckwheat

Research conducted by Glynn Tillman, USDA Agricultural Research Service  
[http://www.ars.usda.gov/research/projects/projects.htm?accn\\_no=420801](http://www.ars.usda.gov/research/projects/projects.htm?accn_no=420801)



**Nectar sources (milkweed) between peanut & cotton supported increased (5x!) parasitization of southern green stink bugs** (Glynn Tillman, USDAARS, Crop Protection & Management Research Lab, Tifton, GA, manuscript in progress)

*Trichopoda*  
feeding on  
milkweed  
nectar

Photo:  
Susan Day



Egg of *T. pennipes*  
on female southern  
green stink bug

Photo:  
Glynn Tillman

Photo:  
Marvin Smith  
(Wikimedia Commons)



## Impact of Milkweed Habitat on Parasitization of Southern Green Stink Bug (SGSB) Adults by *Trichopoda pennipes* in Cotton

Treatment	% Parasitization of SGSB adults by <i>T. pennipes</i>	Density of SGSB adults
Cotton w/ milkweed habitat	61.2	2.6
Cotton w/out milkweed habitat	13.3	3

(G. Tillman Study, Tifton, GA)

common  
milkweed



**Natural enemy populations are higher & pest pressure is lower in complex patchy landscapes with fallow fields, field margins, and/or wooded habitats** (Forehand et al. 2006, Bianchi et al. 2011)

Pollinator planting at Dirt Works Incubator Farm, a project of Lowcountry Local First at Rosebank Farms near Charleston, SC

Bianchi, F. J. J. A., C. J. H. Booij, and T. Tschardtke. 2011. Sustainable pest regulation in agricultural landscapes: a review on landscape composition, biodiversity and natural pest control. *Proc. R. Soc. B* 273: 1715-1727.  
Forehand, L. M., D. B. Orr, and H. M. Linker. 2006. Insect communities associated with beneficial insect habitat plants in North Carolina. *Environmental Entomology* 35 (6): 1541-1559.





**Larger wildflower plantings support greater biological control without increasing herbivore density (Blaauw & Isaacs 2012)**

Blaauw, B. R. and R. Isaacs. 2012. Larger wildflower plantings increase natural enemy density, diversity, and biological control of sentinel prey, without increasing herbivore density. *Ecological Entomology*. DOI: 10.1111/j.1365-2311.2012.01376.x.

Photo: Jennifer Hopwood



**Crop diversity can reduce pest pressure and pesticide use**

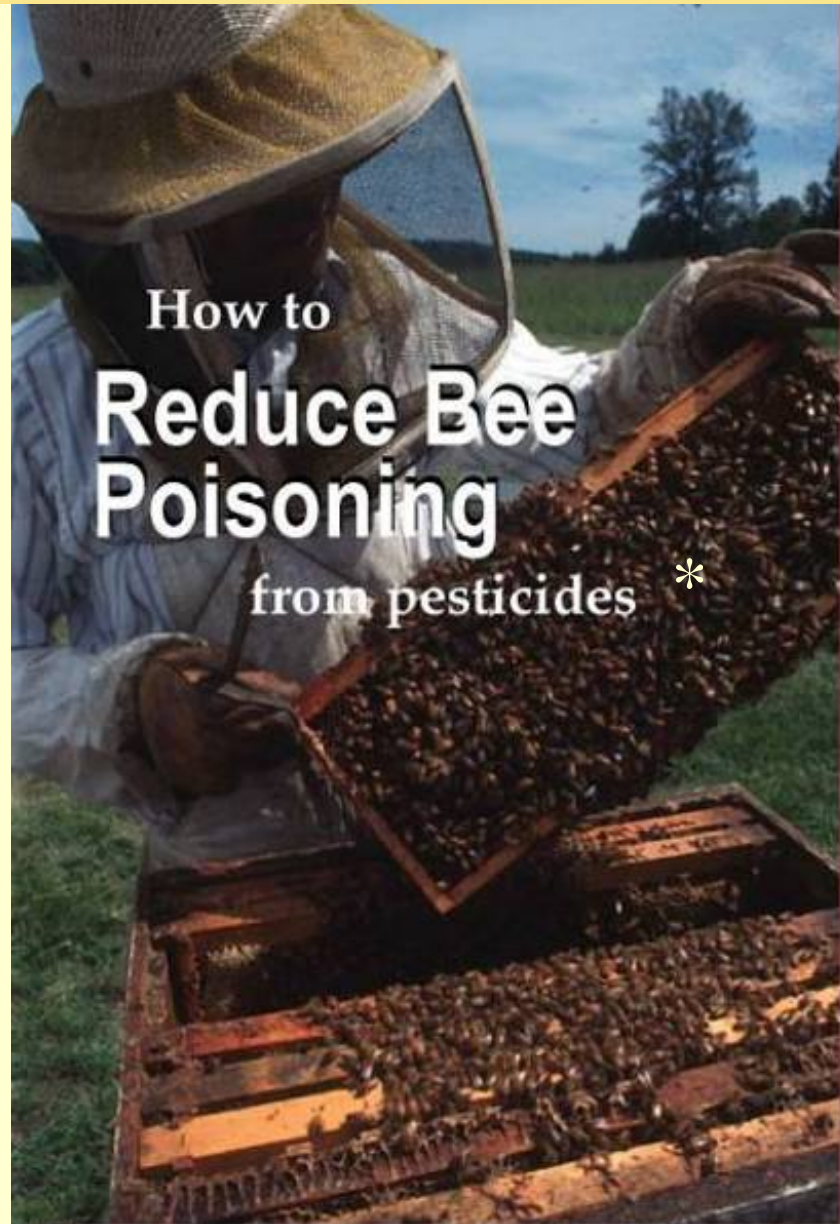




## Pesticides cause significant damage to beneficial insect populations

- Use active ingredients with least impact on bees
- Consider formulation
- Label guidelines only apply to honey bees
- Don't spray on plants in bloom
- Spray at night and when dry

\* When referring to this publication, note that product label for *Beauveria bassiana* warns it is pathogenic to honey bees and to avoid use near bees.





## Neonicotinoid Systemic Insecticides

- Increasingly used on crops, ornamental plants, and lawns
- Systemic mode of action (become part of all plant tissue)
- Sprays, soil drenches, granules, seed coatings, chemigation
- Residues in pollen and nectar
- Can persist over time in plants and soil (>3 years)



<http://www.xerces.org/neonicotinoids-and-bees/>



## Neonicotinoid Toxicity to Bees

- Large doses toxic to bees
- Small doses reduce foraging ability, flight activity, & learning
- Also detrimental to bumble bees, solitary bees, and other beneficial insects
- Breakdown chemicals can be even more dangerous than original product





## Reducing Harm from Neonicotinoids

- Avoid application before or during bloom
- Avoid repeat annual use in perennial blooming species (carry over)
- NOTE: Recommended rates on household products as much 100X agricultural rates, so lethal
- Stop “cosmetic” (vs. agricultural) use (<http://www.beecityusa.org/>)





**Even organic-approved pesticides aren't always safe for bees & other beneficials.**

- Rotenone = Dangerous for Bees!
- Pyrethrins = Dangerous for Bees!
- Spinosad = Dangerous for Bees!
- *Beauveria bassiana* = Dangerous!

**Okay when not directly applied to bees (i.e. non-blooming crops or at night):**

- Insecticidal soap
- Horticultural oil
- Neem



## Safer pest management options:

- Bt
- Insect repellents (e.g. garlic or citrus oils)
- Kaolin clay barriers (Surround)
- Pheromone traps
- Mating disruptors





**Insectary plantings**

**Crop rotation and diversity**

**Trap crops**

**Floating row covers**

**Fruit bagging**

**Resistant varieties**

**Sanitation**





## Protect Ground-Nesting Insects:

- Reduce tillage
- Plastic mulch: pros and cons






## Beneficial Insect Friendly Alternatives:

- Horticultural vinegar
- Flame weeders
- Drangen weeding tractors
- Annual cover crops
- Shallow disking = ok!
- Tine weeding = ok!





**Providing  
Habitat**



**Plants with small flowers like mountain mint support wasps, flies, and many other beneficial insects**



spider wasp on  
mountain mint  
(*Pycnanthemum* sp.)

Photo: Nancy Adamson



# Habitat through the growing season

maple,  
*Acer*



false indigo,  
*Baptisia*



goldenrod,  
*Solidago*,  
*Oligoneuron*,  
*Euthamia*,

**Pollinators, predators, & parasitoids need food (nectar, pollen, or prey) and refuge when crops are harvested or pesticides used.**



willow,  
*Salix*



mountain mint,  
*Pycnanthemum*



blazing star,  
*Liatris*



aster  
*Symphyotrichum*,  
*Eurybia*



**Insect diversity increases  
with plant diversity.**

Carvell, C., W. R. Meek, R. F. Pywell, D. Goulson and M. Nowakowski. 2007. Comparing the efficacy of agri-environment schemes to enhance bumble bee abundance and diversity on arable field margins. *J of Applied Ecology* 44: 29-40.

Potts, S. G., B. Vulliamy, A. Dafni, G. Ne'eman, and P. G. Willmer. 2003. Linking bees and flowers: how do floral communities structure pollinator communities? *Ecology* 84:2628-2642.

Tscharntke, T. A., A. Gathmann, and I. Steffan-Dewenter. 1998. Bioindication using trap-nesting bees and wasps and their natural enemies and interactions. *J of Applied Ecology* 35:708-719.



## The 6 Critical Elements of Establishing New Habitat:

1. Remove **ALL** perennial weeds prior to planting
2. Do not disturb dormant weed seed
3. Make a clean seed bed/planting area
4. Use appropriate planting technology for the site
5. Plant perennial seed in the fall
6. Manage annual and biennial weeds for two years after planting





**Post Seeding:** Mow perennial seeded areas first and second year, before annual and biennial weeds produce seed

Mow when between 10–12” to 6–8” (as often as needed) to let light reach new seedlings w/o smothering





## Mowing, grazing, burning, disking are best at infrequent intervals

- Disturbance to no more than 1/3 of habitat area each year
- Time management for when most effective against target, or during dormant season
- Early successional habitat is ideal; too much disturbance favors grasses over forbs





Watch *Conserving Pollinators While Addressing Other Resource Concerns* at [ConservationWebinars.net](https://www.conservationseminars.net)



Sudie Daves Thomas (SC NRCS), Kelly Gilkerson (Clemson University),  
and Angel Sams (SC NRCS) at Rosebank Farms near Charleston, SC



## Integrated Pest Management (595):

- Protecting pollinators from pesticides
- Establishing habitat for other beneficial insects

Visit <http://www.nrcs.usda.gov> to locate your local District Conservationist.

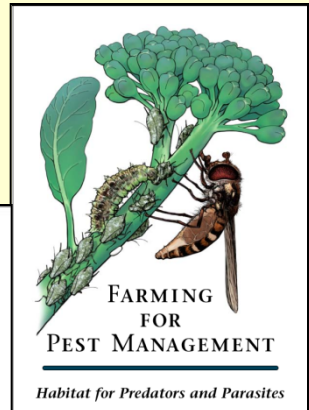


# Additional Resources





State and regional Technical Notes  
*Farming for Pollinators & Pest Management* brochures  
 Agroforestry Notes  
 PLANTS Database  
 NRCS Plant Material Centers



USDA NRCS  
 United States Department of Agriculture  
 Natural Resources Conservation Service

**Hedgerow Planting**  
*Virginia Conservation Practice Job Sheet* 422



**Definition**  
 Establishment of dense vegetation design to achieve a natural conservation purpose.

**Criteria**  
 Minimum width for Hedgerow planting. This may necessitate more than one row of plants.

Hedgerows shall be established with plants or perennial bunch grass stems attaining average height persisting over winter.

No plant listed by the state shall be established in a hedgerow from the Virginia Native Plant Guide.


The practice shall be protected from grazing and trampling to ensure that it will perform as intended.

Competing vegetation that the hedgerow becomes established shall continue beyond the hedgerow as necessary.

Job Sheet - Hedgerow Planting

USDA NRCS  
 United States Department of Agriculture  
 Natural Resources Conservation Service

**Upland Wildlife Habitat Management**  
*Virginia Conservation Practice Job Sheet* 645



**Definition**  
 Provide and manage upland habitats and connectivity within the landscape for wildlife.

**Criteria**  
**General Criteria Applicable to all Purposes**  
 A Wildlife Habitat Evaluation, approved by the NRCS State Office, shall be used to identify habitat limiting factors in the planning area. Application of this practice shall remove or reduce limiting factor(s) as indicated by results of the habitat evaluation.

Application of this practice alone, or in combination with other supporting and facilitating practices, shall result in a conservation system that will meet or exceed fifty percent (50%) of the general wildlife habitat potential for the planned project condition regardless of land use. Conservation plans developed with wildlife as the primary objective shall meet or exceed seventy-five percent (75%) of the general habitat potential for the planned project condition.

**Additional Criteria for Establishing Plants that Enable Movement or Provide Shelter or Food**  
 Plant material specifications shall require the use of native species whenever possible and include only high quality and adapted species. Natural succession may be used to establish the desired vegetative community, where soil quality is high, and a desirable seed source is nearby. Where planting is required, site preparation, planting dates, and planting methods shall optimize vegetation survival and growth. Introduced/exotic plants species are discouraged. Refer to the Plant Establishment Guide for Virginia.

**Additional Criteria for Manipulation of Vegetation to Sustain Desirable Habitat Conditions over Time**  
 Actions needed to sustain desirable wildlife habitat conditions over time include reapplication of this practice at intervals longer than 3 years. Equipment travel, grazing, haying, and other disturbance to habitat shall be minimized during April 15<sup>th</sup> - August 15<sup>th</sup> to avoid disturbing wildlife reproduction activities. Exceptions for establishing habitat-forming vegetation and controlling invasive or unwanted plants may be implemented when these activities are necessary to maintain the health of the plant community. Regulated noxious weeds and invasive plants shall be controlled.

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Job Sheet - Upland Wildlife Habitat Management (VA-645)  
 October 2011  
 Page 1 of 4

USDA National Agroforestry Center  
 AF Note - 32

**AGROFORESTRY NOTES**  
 August 2006

**Agroforestry: Sustaining Native Bee Habitat For Crop Pollination**

Introduction


Agroforestry connection

USDA NRCS  
 United States Department of Agriculture  
 Natural Resources Conservation Service  
 National Plant Data Center

THE XERCES SOCIETY FOR INVERTEBRATE CONSERVATION

SAN FRANCISCO STATE UNIVERSITY

**Using Farm Bill Programs for Pollinator Conservation**

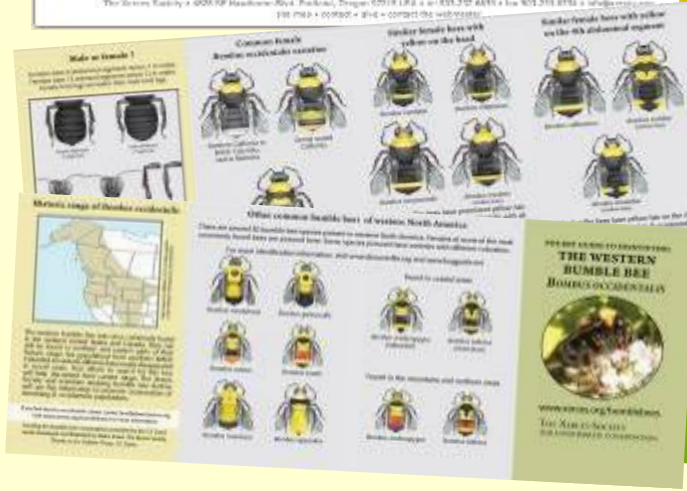
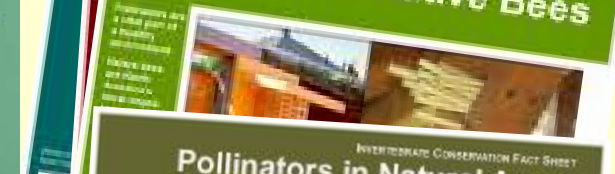
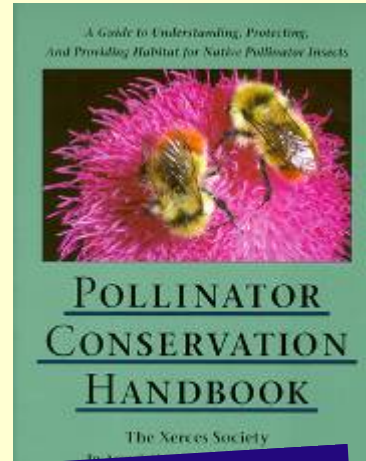


July 2008

As well as bats and birds. Providing food for animals can help reduce pest populations. Farmers can attract and parasitize resources that practices benefit as well, and are bill programs. Information and your farmland for natural insects that are pests and weeds.



- Xerces Society publications
- [www.xerces.org](http://www.xerces.org)





<http://www.xerces.org/conservationbiocontrol/>



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[our work](#)

## Conservation Biological Control Resources

With the advent of chemical pesticides, the contributions of beneficial insects (those that prey upon or parasitize crop pests) were largely forgotten. However, pesticides alone have not solved the problem of crop pests. "Conservation Biological Control," is a strategy that seeks to integrate beneficial insects back into crop systems for natural pest control. This strategy is based upon ongoing research that now demonstrates a link between the conservation of natural habitat and reduced pest problems on farms.

In collaboration with the University of California Berkeley, the USDA Natural Resources Conservation Service, and other partners, the Xerces Society is expanding efforts to demonstrate the effectiveness of conservation biological control through field research with academic partners, habitat restoration field trials, and outreach to farm communities and farm agency staff. Through this effort, we have developed [Farming For Pest Management](#), a brochure that identifies common conservation biological control opportunities for farmers. Additional resources are in development and will be available soon. For other information and suggestions on implementing conservation biological control, please visit the links below.



### Newsletter

Sign up for our newsletter to receive the latest date information about our events.



## Wildflower-rich habitats support beneficial insects & other wildlife

### Ensure

- diverse forage & nesting sites
- management for insect diversity



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

(follow links to pollinator program)

bumble bee to blazing star



## Three Steps You Can Take to Bring Back the Pollinators

1. Sign the Pollinator Protection Pledge.
2. Install a Pollinator Habitat sign.
3. Spread the word!



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



Photo: Matthew Shepherd



**Plant flowers...**  
**...as native as possible.**  
**Reduce pesticide use.**

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(follow links to  
pollinator program)

southeastern blueberry bee  
on redbud



...and many excellent scientists,  
conservationists, and farmers

Financial support from

- Xerces Society Members
- NRCS East National Tech Center
- Turner Foundation
- Disney Worldwide Conservation Fund
- C.S. Fund
- Whole Foods Market & their vendors
- Organic Valley FAFO
- Organic Farming Research Foundation
- Nat'l Institute of Food & Agric., USDA
- Cinco
- Clif Bar Family Foundation
- Alice C. Tyler Perpetual Trust
- Sarah K. de Coizart Article TENTH Perpetual Charitable Trust
- The Edward Gorey Charitable Trust
- EarthShare (CFC #18360)
- Endangered Species Chocolate
- The Metabolic Studio
- The Ceres Foundation
- & many others...



andrenid bee on apple

**Thank you, Holli Kuykendall & Sudie Daves Thomas!!**

**Questions? Contact:**


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bumble bee  
on peach

Photo: Nancy Adamson