

Common Bees & Best Bee Plants of the East

Nancy Lee Adamson

Xerces Society &
NRCS-East National
Technology Support Center



THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION

bumble bee
on blueberry,
Vaccinium
corymbosu
m

Photo: Nancy Adamson





THE XERCES SOCIETY FOR INVERTEBRATE CONSERVATION

Celebrated 40 years in 2011 working to protect wildlife through the conservation of invertebrates and their habitat.

Major Programs:

- Endangered species
- Aquatic invertebrates
- Pollinator conservation



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



Pollinator Conservation Resource Center

Region-specific Information from Xerces, Cooperative Extension, USDA-NRCS, NGO, and other sources, including:

- Regional plant lists
- National plant lists
- Conservation guides
- Nest construction guides
- Links to identification guides
- Pesticide guidelines
- Native plant nursery directory

www.xerces.org/pollinator-resource-center

Pollinator Conservation Resource Center

Welcome to the Pollinator Conservation Resource Center, where you can find regional information about plant lists, habitat conservation guides, and more. Scroll over the map below and click on your region of the country. For questions or comments about the Resource Center, or to suggest additional content, please contact [Susie Muller](#), Xerces Assistant Pollinator Program Director.

[Click here to donate](#)

Program Features

- [main page](#)
- [pollinator resource center](#)
- [agriculture](#)
- [organic farming resources](#)
- [managing habitat for pollinators](#)
- [gardens](#)
- [native plant resources](#)
- [bumble bees in decline](#)
- [list of bees](#)
- [resources for teachers](#)
- [xerces pollinator publications](#)

Program Highlights

- [Online encyclopedia](#) on pollinator conservation basics in farm landscapes
- The Xerces Society works with congressional staff to include [pollinators in the farm bill](#)
- Xerces organizes a [briefing to U.S. legislators](#) on honeybees, colony collapse disorder and native pollinators
- The National Research Council issues a [report](#) on the Status of Pollinators in North America
- Agriculturally important [bumble bees in decline](#)

This resource center is a collaboration of the Xerces Society and [Neal Williams at the University of California, Davis](#). Significant funding was provided by a grant from NEARS. Additional funding was provided by the USDA Natural Resources Conservation Service, the Columbia Foundation, Turner Foundation, Patric Rhee Foundation, Diancy Wildlife Conservation Fund, CS Fund, Wildwood Foundation, CERES/Greater Milwaukee Foundation, Bullitt Foundation, Organic Valley, Organic Farming Research Foundation, The White Pine Fund/The Hawkspire Foundation, and Xerces Society members.

Logos: Xerces Society, UC Davis, NRCS, Natural Resources Conservation Service.

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site map • contact • give • contact the webmaster



Common Bees & Best Bee Plants of the East

- Importance of native bees, beneficial insects & managing habitat: **see past webinars by Mace Vaughan, Eric Mader, & David Orr**
- Basic bee biology, diversity & intro to common bees
- Best bee plants in the eastern U.S.
- Additional resources

bumble bee
on great blue lobelia,
Lobelia siphilitica



Bees are the most agriculturally important pollinators

- Bees actively collect and transport pollen
- Bees exhibit flower constancy
- Bees regularly forage in area around nest

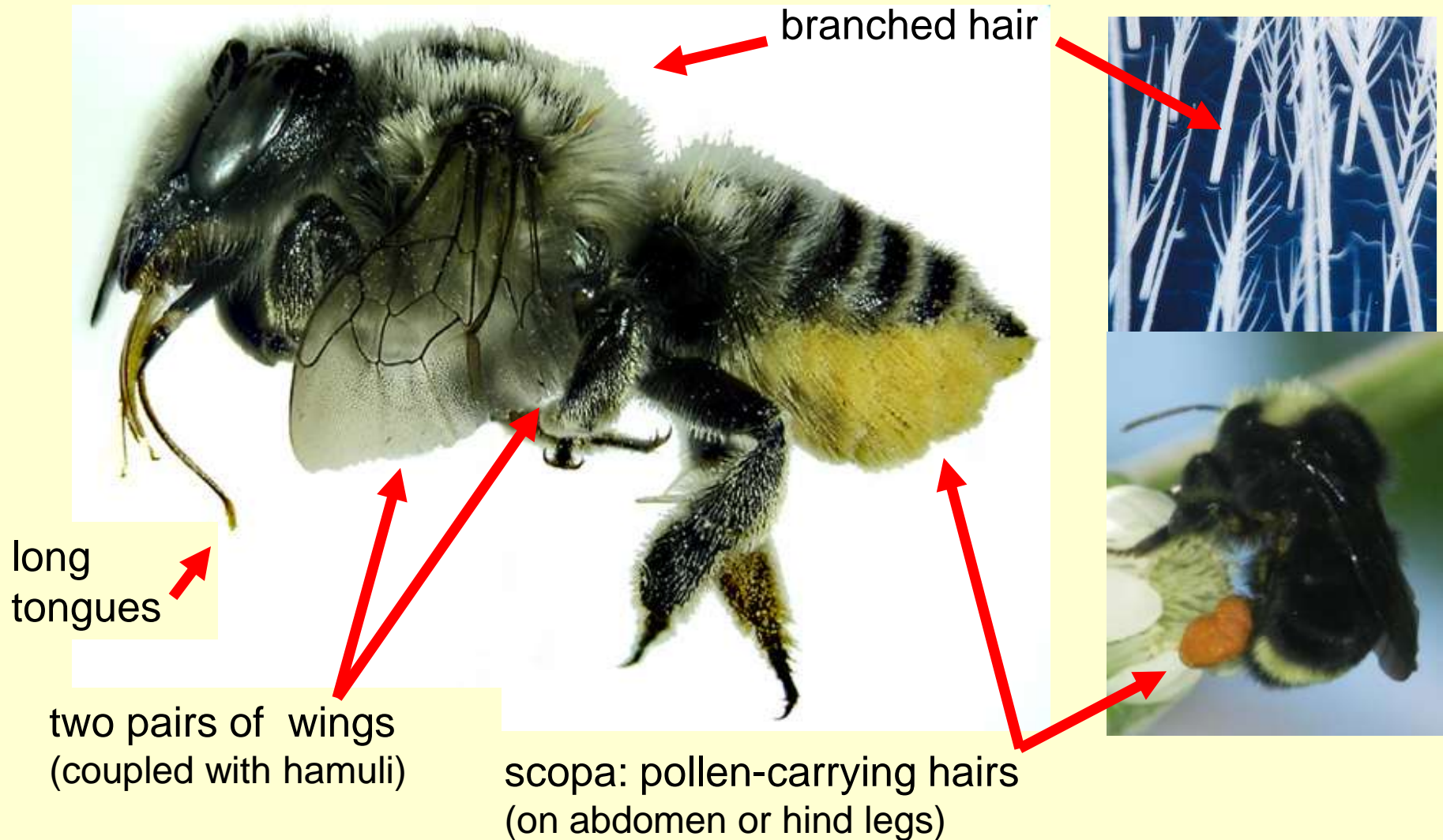
mining bee,
Andrena sp.,
on apple

Photo: Nancy Adamson



Bees: Distinguishing Characteristics

Bees evolved to collect pollen & nectar



Native Bee Diversity



bumble bee, small carpenter bee, and sweat bee on wingstem, *Verbesina* sp.

Photo: Nancy Adamson



North America is home to about
4,000 species of native bees;
~700 in the east in 66 genera.



sweat bee on blue vervain,
Verbena hastata



Three Broad Groups of Native Bees

ground-nesting bees (solitary)



polyester bee,
Colletes inaequalis



orchard mason bee,
Osmia lignaria

wood-nesting bees (solitary)



bumble bees
(social)

Bombus impatiens



Bumble Bees, *Bombus* spp.

- Apidae family
- 45 species in U.S., ~26 in East (7 in FL-19 in ME)
- Social colonies founded by single queen
- Annual colonies--last only one season
- Nest may contain 100-300 workers
- Nests in abandoned rodent burrows or under lodged grasses

Conserve brush piles, un-mowed areas



Bombus impatiens
on scarlet runner bean



Bombus vagans on clover



Life Cycle of a Bumble Bee Colony

Fall: Mated queens seek overwintering sites

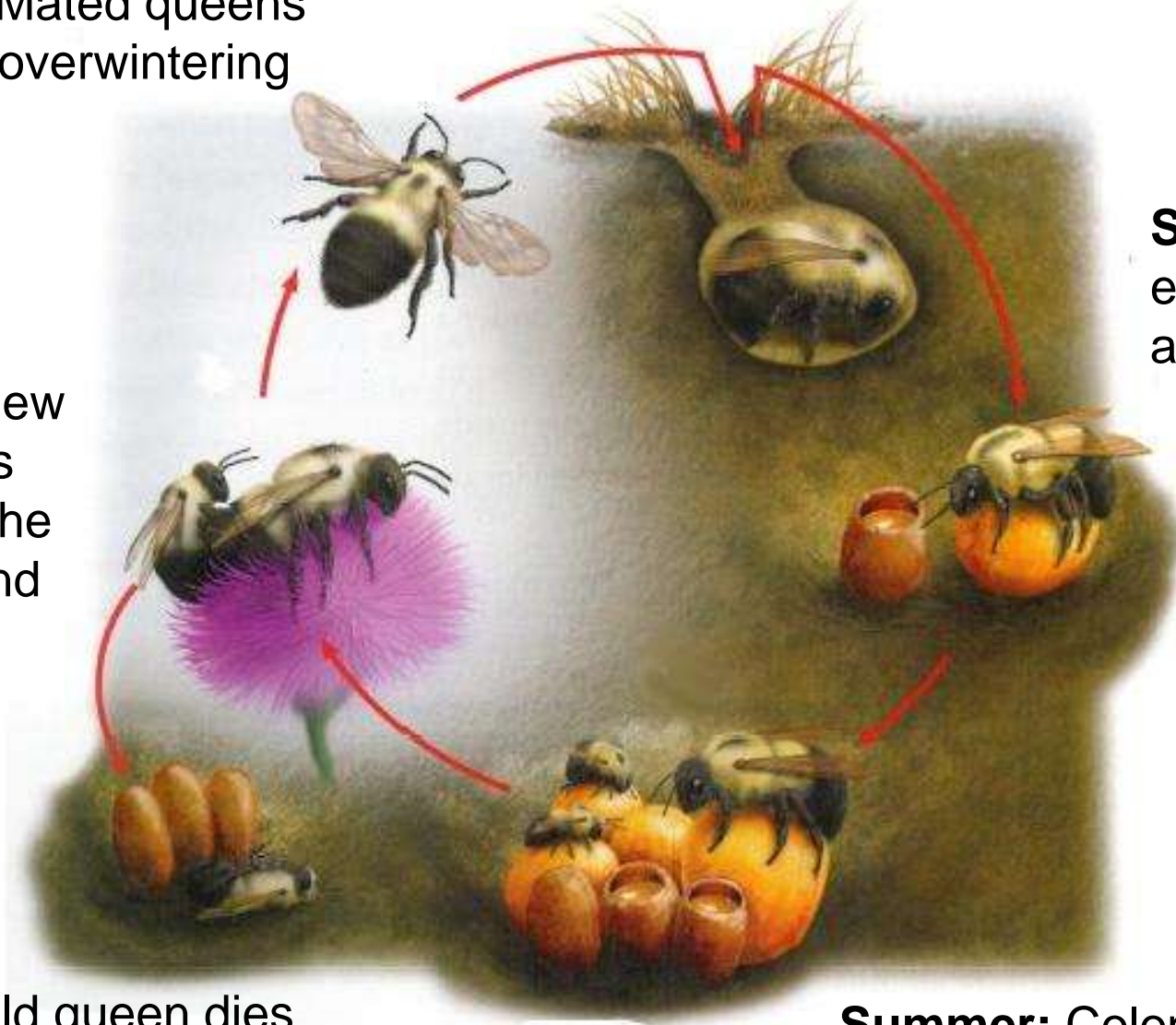
Winter: Hibernating queen

Spring: Nest establishment and egg laying

Fall: New queens leave the nest and mate

Fall: Old queen dies

Summer: Colony peak





Bumble Bees: Excellent Crop Pollinators

- Pollinators of red clover, tomato, cucurbits
- More efficient than honey bees for blueberry, cranberry, cucurbits (squash, melon) etc.
- Active in cool and wet weather & “buzz” pollinate



Bombus impatiens
& *B. griseocollis*
on squash



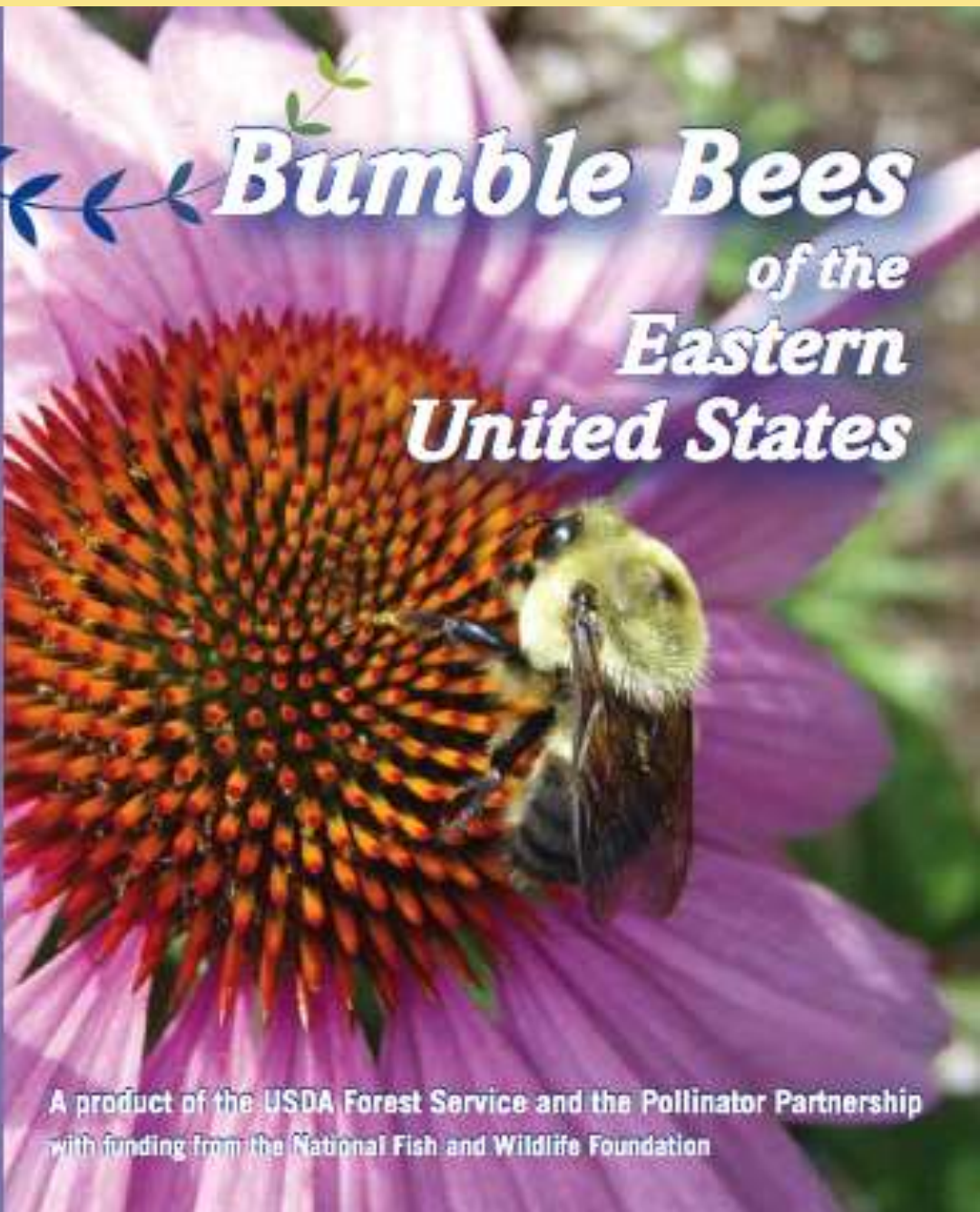
Bombus ternarius
on blueberry,
Vaccinium sp.



THE XERCES SOCIETY
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Bumble Bee Identification

Bumble Bees of the *Eastern* *United States*



By

Sheila Colla

Leif Richardson

Paul Williams



A product of the USDA Forest Service and the Pollinator Partnership
with funding from the National Fish and Wildlife Foundation



Bumble Bee Citizen Monitoring Project

WANTED

FOR POLLINATION OF CROPS AND WILDFLOWERS



Once common throughout Eastern North America, *Bombus affinis* numbers have steeply declined in recent years. To conserve *B. affinis*, the Xerces Society is documenting the former and current ranges of this bumble bee with a rusty colored patch on her back, and they need your help. Any information leading to the conservation of this species will be duly rewarded with increased food security.

RUSTY PATCHED BUMBLE BEE A.K.A. BOMBUS AFFINIS

NOT TO BE CONFUSED WITH BOMBUS VAGANS OR BOMBUS GRISEOCOLLIS

Bombus affinis workers have all black hair on their heads, distinguishing them from *Bombus vagans*. *B. affinis* workers also have a rounder face and a rusty brown spot on their second abdominal segment.

Bombus affinis workers have yellow hair on the rear half of their second abdominal segment which distinguishes them from *Bombus griseocollis*.



Bombus affinis



Bombus vagans



Bombus griseocollis



If you have seen *Bombus affinis* please contact info@xerces.org

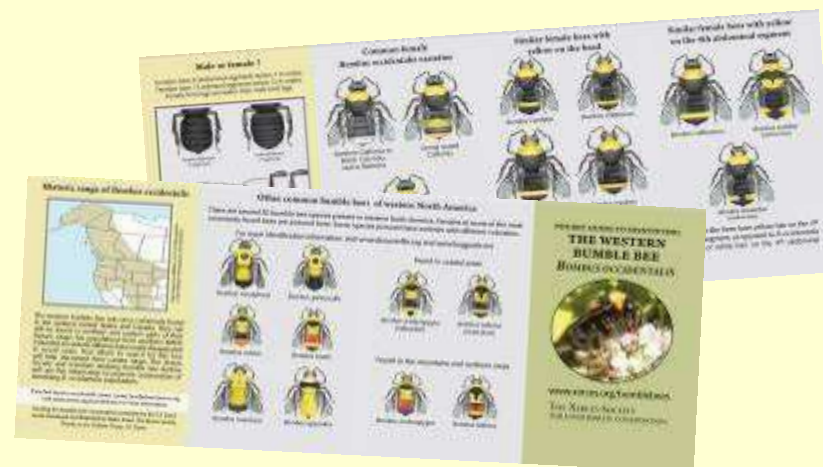
For more information on bumble bees in decline please visit www.xerces.org/bumblebees

Beginning in 2008, this project targets three formerly widespread but declining species

Goals were twofold:

1. Document the current range of declining species
2. Educate the public about status and importance of bumble bees

Results: Over 900 responses with 42 confirmed observations of target species





Bombus impatiens, common eastern bumble bee

- Most common BB in the eastern U.S.
- Escaped W of Rockies from greenhouses
- Variable in size (8.5-21 mm)—late summer small foragers may signal scarce resources



squash





Throughout East

- *Bombus bimaculatus*, two-spotted
- *Bombus griseocollis*, brown belted
- *Bombus pensylvanicus*, American

More northerly plus mountains south

- *Bombus auricomus*, black and gold
- *Bombus citrinus*, lemon cuckoo
- *Bombus perplexus*, confusing
- *Bombus vagans*, half-black

North

- *Bombus rufocinctus*, red-belted
- *Bombus ternarius*, tri-colored



B. griseocollis
to blueberry



B. pensylvanicus
on blackberry



B. perplexus
on raspberry



Ground-Nesting Solitary Bees

**Roughly 70% of bee spp.
nest underground**

- Resemble ant & ground beetle nests from above
- May aggregate nests (a few nest communally, but forage alone)
- Nest chambers lined with waxy glandular secretions that resist flooding

***Scout for nests,
conserve sandy soil
& bare ground***



Andrena barbara

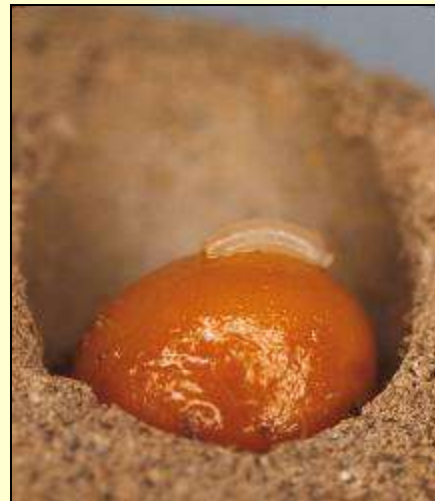




Lifecycle of Solitary Bees



Mining bee (*Andrena* sp.); a year in its underground nest as egg, larva, and pupa before emerging to spend a few weeks as an adult.

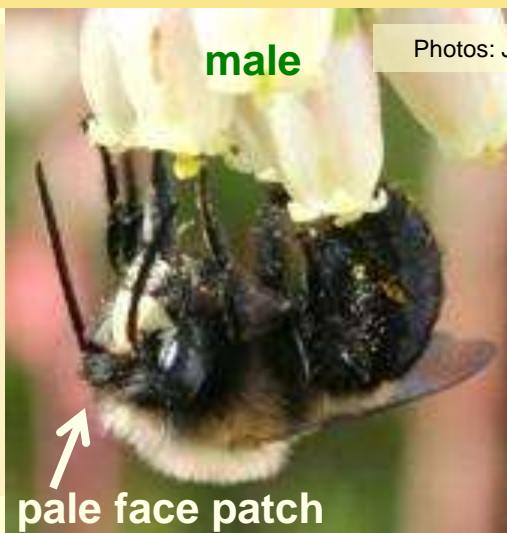




Ground Nesting: Southeastern Blueberry Bee

Habropoda laboriosa

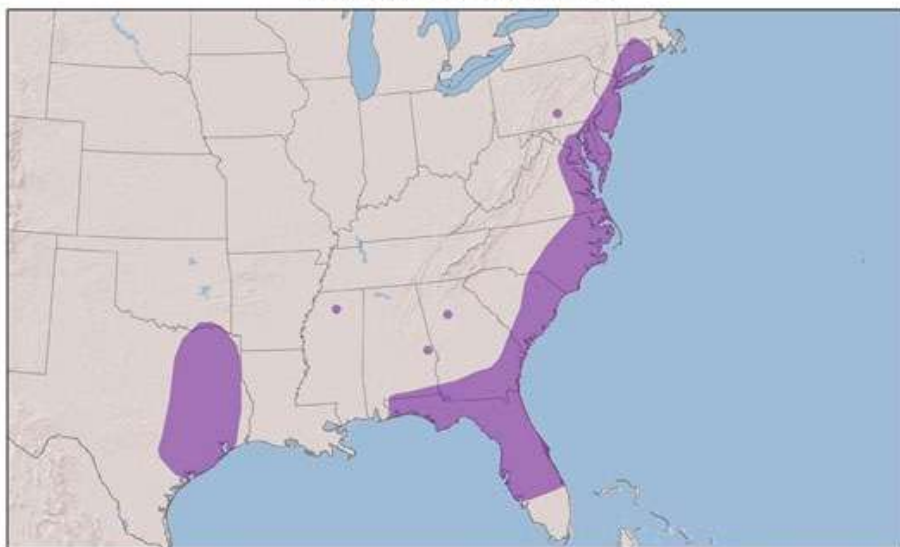
- Apidae family
- Blueberry specialist, active early spring
- Looks like small bumble bee
- Coastal plain distribution
- Gregarious nesting



Photos: Jolie Dollar



Southeastern Blueberry Bee *Habropoda laboriosa*



Legend
• Permanent Resident

0 300 600 1,200 Kilometers

Map Created July 2009



Photo: Nancy Adamson



Ground Nesting: Mining or Digger Bees

***Andrena* spp.**, ~120 in East (27 in FL-108 in PA)

- Andrenidae family
- Early spring (generally)
- Nest in well-drained soils, aggregate
- Important for apple, blueberry

effective behaviors for apple pollination



silverbell,
Halesia



male bees are
often smaller
than females



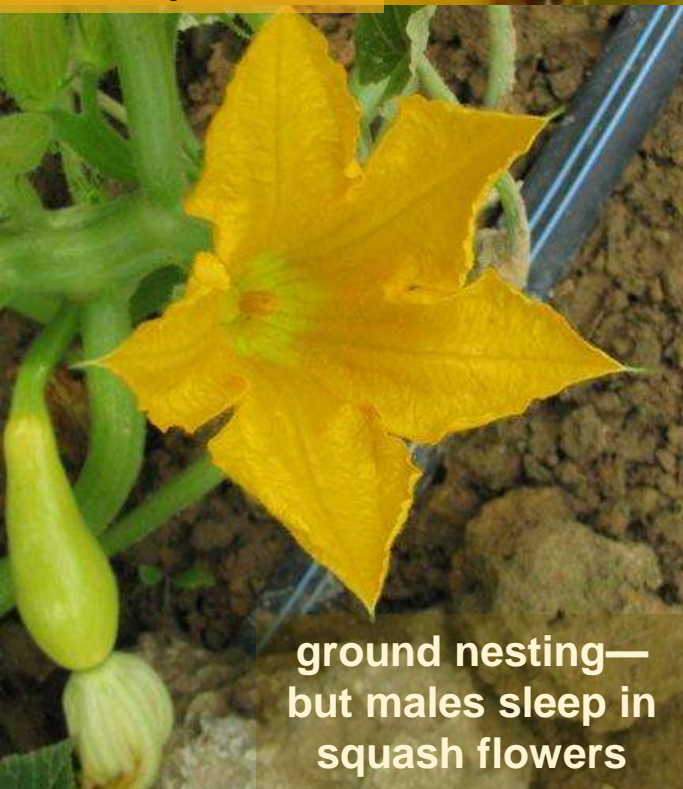
blueberry



Ground Nesting: Squash Bees

***Peponapis pruinosa*,
Xenoglossa strenua &
*X. kansensis***

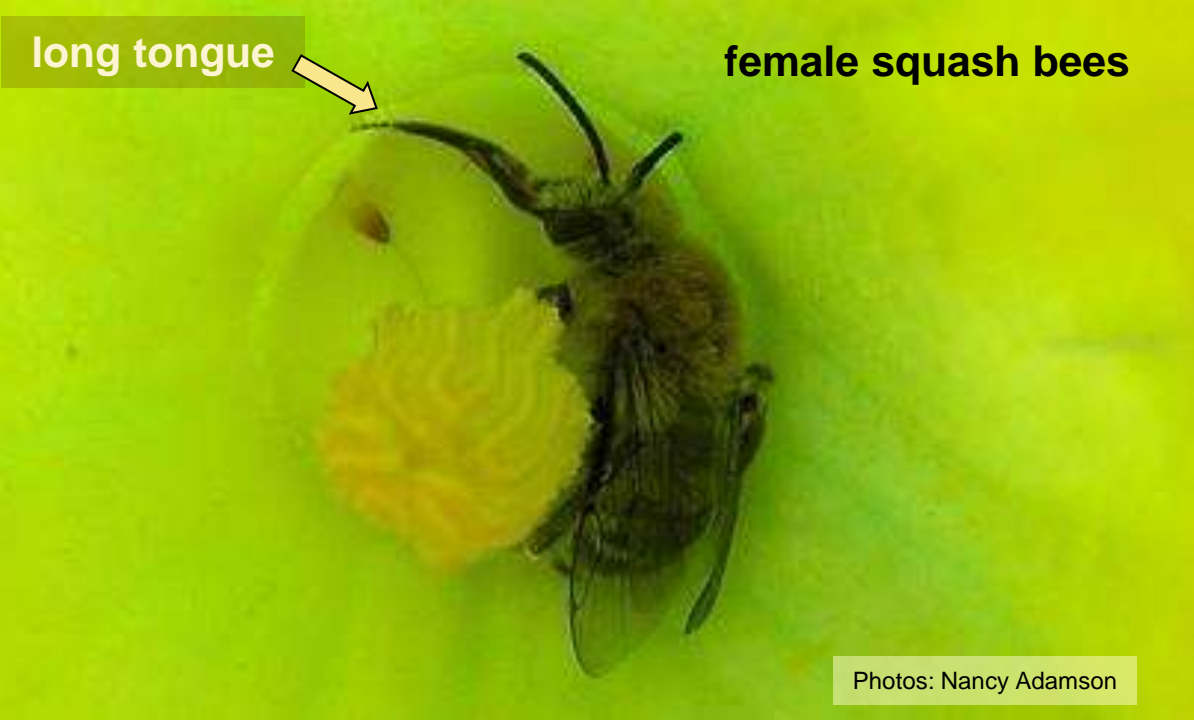
- Apidae family
- Specialize on cucurbit pollen: summer & winter squash, melon, cucumber
- Nest in or near crop
- Active early a.m., summer



long tongue



female squash bees

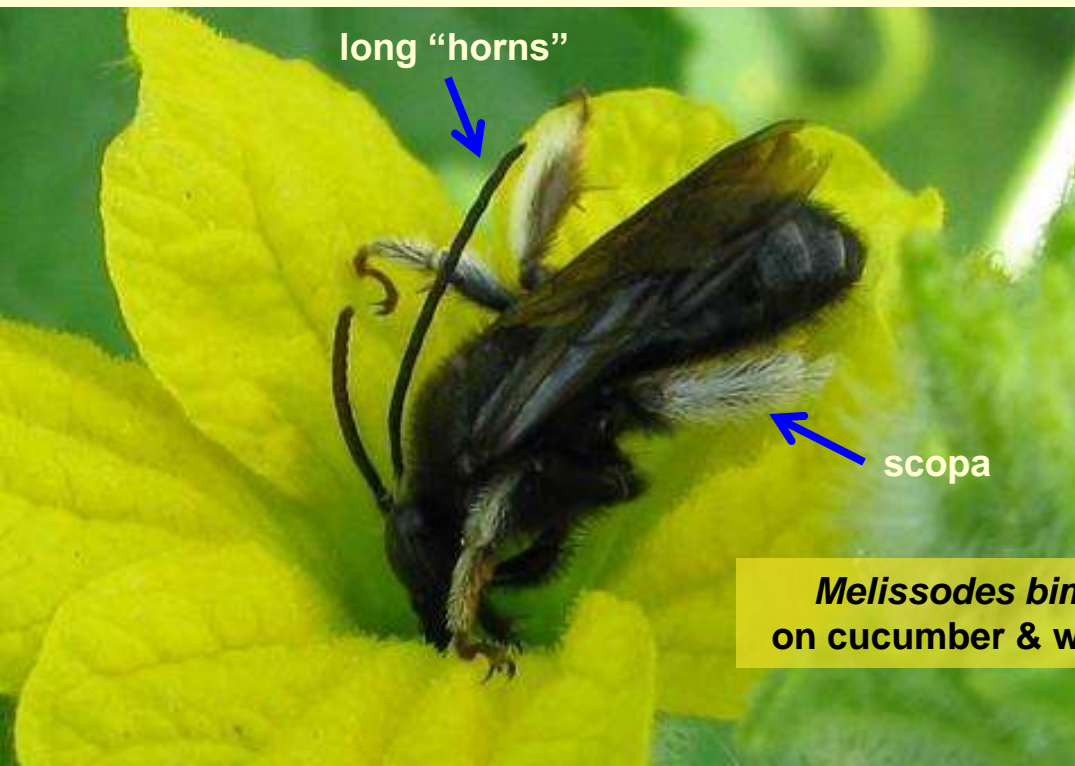




Ground Nesting: Long-Horned Bees

***Melissodes* spp.**, ~27 (9 in ME-24 in KY)

- Apidae family
- Long antennae (males)
- Hairy, with conspicuous hairy legs (scopa)
- Small to medium, robust
- Many are Asteraceae (aster family) pollen specialists, incl. sunflowers



Melissodes bimaculata
on cucumber & watermelon



***Melissodes* sp.**
on cosmos





Ground Nesting: Long-Horned Bees

***Eucera* (6) & *Svastra* (5) spp.**

- Apidae family
- Long antennae (males)
- Hairy, with conspicuous hairy legs (scopa)
- Medium to large, robust
- Many with pale hair bands

Svastra obliqua female
on sunflower, *Helianthus* sp.



Eucera hamata
female



Photos: T'ai Roulston (Univ. of
Virginia, Blandy Experimental Farm)



scopa

Eucera atriventris male
on glory-of-the-snow,
Chionodoxa luciliae



long "horns"
on males



Photo: Bob Hammond (CO
State Univ. Coop Ext.)

Svastra sp. female on prairie coneflower, *Ratibida* sp.



Ground Nesting: Green Sweat Bees

***Augochlora pura**, *Augochlorella* spp.
(3), *Augochloropsis* spp. (3)**

- Halictidae family
- Generalist, short-tongued, buzz
- Some nest communally, but each female builds and provisions her brood cells

**Augochlora* also nests in rotting wood

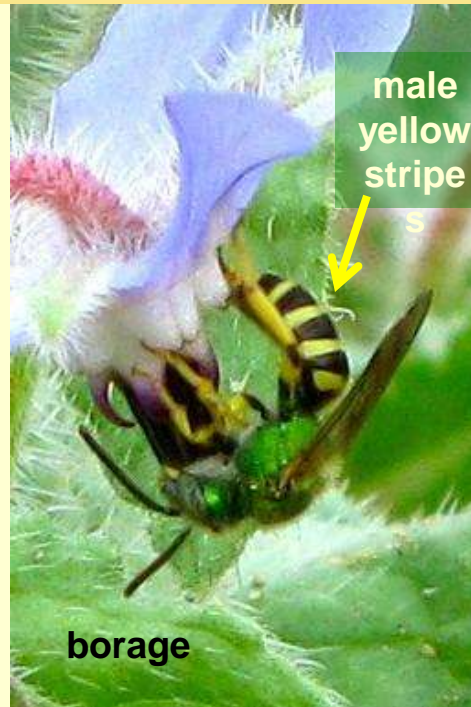




Ground Nesting: Green Sweat Bees

***Agapostemon* spp. (5)**

- Halictidae family
- Some nest communally (*solitary female builds & provisions her own brood cells*)
- Medium-sized, short-tongued generalists
- Green thorax, black or green striped abdomen (males with yellow stripes)





Ground Nesting: Sweat Bees

***Halictus* (6) & *Lasioglossum/Dialictus* (118)**

- Halictidae family
- Small, black, dark green, dark blue, with bands of white on abdomen
- Often most common bees, but easily missed due to small size
- Solitary, communal (aggregate nests) to semi-social (daughters help care for young)
- Many generalists, active all season



swamp rose,
Rosa palustris

Halictus ligatus on yarrow,
Achellia millefolium



melon



serviceberry,
Amelanchier sp.





Ground Nesting: Polyester, Plasterer, Cellophane Bees

***Colletes* spp.**, ~35 (14 in VT-26 in MD)

- Colletidae family
- Line brood cells with waterproof cellophane-like secretion
- Heart-shaped face, short tongue
- Small to medium, pale banded
- Many are pollen specialists

C. latitarsis, specialist on groundcherry, *Physalis*



T'ai Roulston at UVA's Blandy Experimental Farm marks and recaptures study bees



C. inaequalis

Photo: Steve Javorek, Agriculture Canada

heart-shaped face

C. inaequalis



short tongue

Photos: Nancy Adamson



Cavity or Tunnel Nesting Bees

Roughly 30% of native species nest in hollow plant stems, or old beetle borer holes

- Nest tunnel partitions constructed of mud, leaf pieces, or sawdust
- Artificially managed for some crops

**Conserve snags,
brush piles & pithy-
stemmed plants**



© Edward Ross



Photo: Nancy Adamson



Photo: Matthew Shepherd



Cavity or Tunnel Nesting Bees

Hollow stem example:

Cross-section of silk cocoons



Larva

Pupa

Adult

Pollen mass

Egg

Mud wall



Silk cocoons with dormant bees inside

Mud cap closure





Managed Cavity-Nesting Bees



Osmia lignaria,
blue orchard bee

Photos: Nancy Adamson



Osmia taurus or *O. cornuta*, mason bee

introduced



Photos: Eric Mader



Megachile rotundata,
alfalfa leafcutter bee

introduced

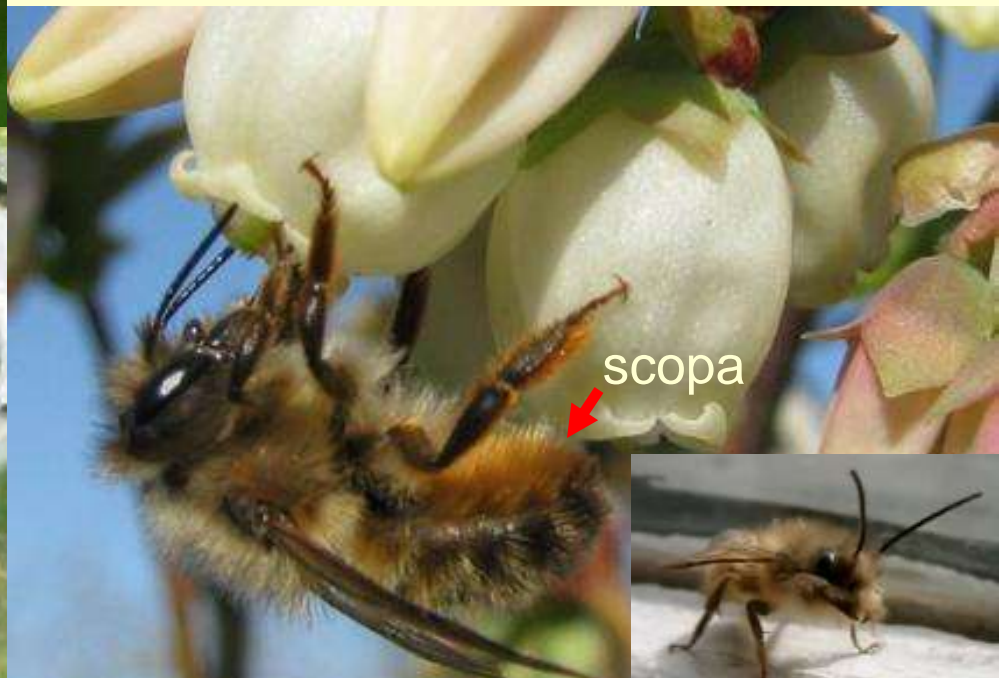
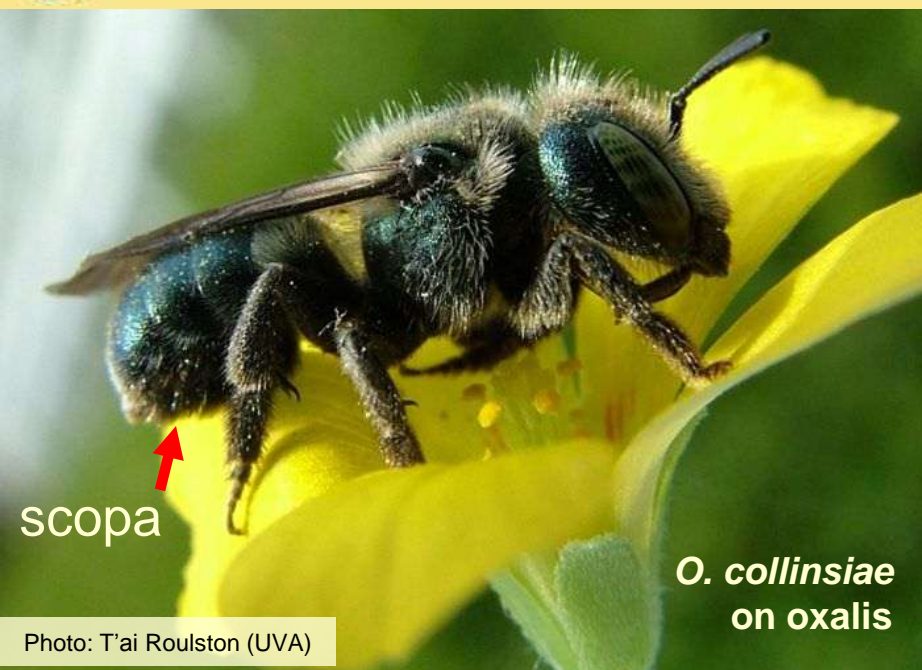




Cavity Nesting: Mason or Orchard Bees

***Osmia* spp.**, ~31 (14 MS-27 in NY)

- Megachilidae family
- Small to medium size, robust build
- Usually metallic blue or green
- Wide bodies and heads
- Scopa on underside of abdomen
- Active in spring and early summer





Cavity Nesting: Leafcutter Bees

***Megachile* spp.** ~44 (16 VT-37 NC)

- Megachilidae family
- Small to large size
- Wide bodies and heads
- Dark, typically with pale stripes
- Scopa on underside of abdomen
- *M. rotundata* introduced for alfalfa seed production



M. mendica on
blackberry



blanket flower,
Gaillardia

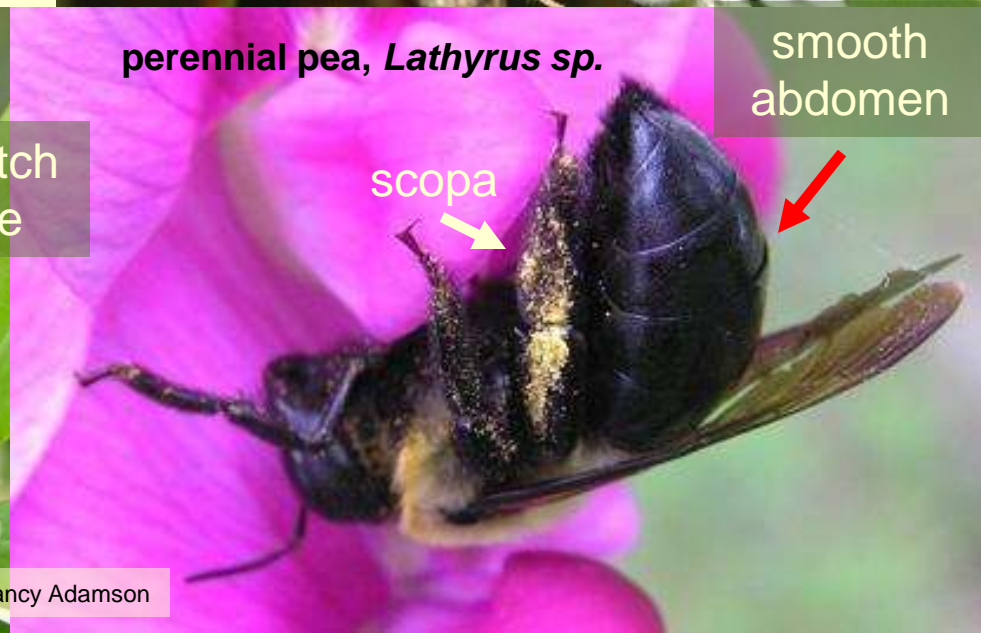
scopa



Cavity Nesting: Large Carpenter Bees

Xylocopa virginica & *X. micans*

- Family Apidae
- Large size (largest of all insect eggs, 1/2 mom's body size!)
- Usually excavate nest
- Long lived, overlapping generations for short times
- Shiny abdomen, scopa on legs
- Males with white patch, territorial





Cavity Nesting: Small Carpenter Bees

***Ceratina* spp. (4)**

- Family Apidae
- Small size, shiny body, dark metallic blue or green
- Usually excavate nest in pithy stems (box elder, elderberry, sumac, sunflower, blackberry...)
- Abdomen somewhat squared off
- Active all season



cucumber



raspberry



bumble bees on
common milkweed, *Asclepias syriaca*
common milkweed, *Asclepias syriaca*



Cuckoo Bees: Nest Parasites (Cleptoparasites)

Coelioxys



Sphecodes



Epeolus



Adults feed on pollen & nectar, lay eggs in host nest

- Slender, wasp-like
- Small to medium size
- Bodies not hairy, no scopa
- Coloration highly variable
- May have spiky projections
- Use scent to locate and evade host

Nomada



Best Bee Plants



bumble bees on
common milkweed, *Asclepias syriaca*

Photo: Nancy Adamson



More than 70 percent of flowering plants (~240,000 sp.) require an insect to move pollen.

Plant Selection

- Use plants with documented pollinator value
- Avoid species with weed-potential
- No alternate pest/disease host plants



southeastern blueberry bee, *Habropoda laboriosa*,
on redbud, *Cercis canadensis*



Pollen and Nectar

maple,
Acer



false indigo,
Baptisia



goldenrod,
Solidago, Euthamia



Pollinators need a succession of bloom: spring, summer, and fall

mountain mint,
Pycnanthemum



blazing star,
Liatris



aster
(various
genera)



willow,
Salix





Search



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Technical Resources

- Sort by Discipline
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You are here: [Home](#) / [Technical Resources](#) / Field Office Technical Guide (FOTG)

Field Office Technical Guide (FOTG)

What is FOTG?

Technical guides are the primary scientific references for NRCS. They contain technical information about the conservation of soil, water, air, and related plant and animal resources.

Technical guides used in each field office are localized so that they apply specifically to the geographic area for which they are prepared. These documents are referred to as Field Office Technical Guides (FOTGs).

Appropriate parts of the Field Office Technical Guides are automated as data bases, computer programs, and other electronic-based materials such as those included in these web based pages.

What information is located in FOTG

Section I — General References

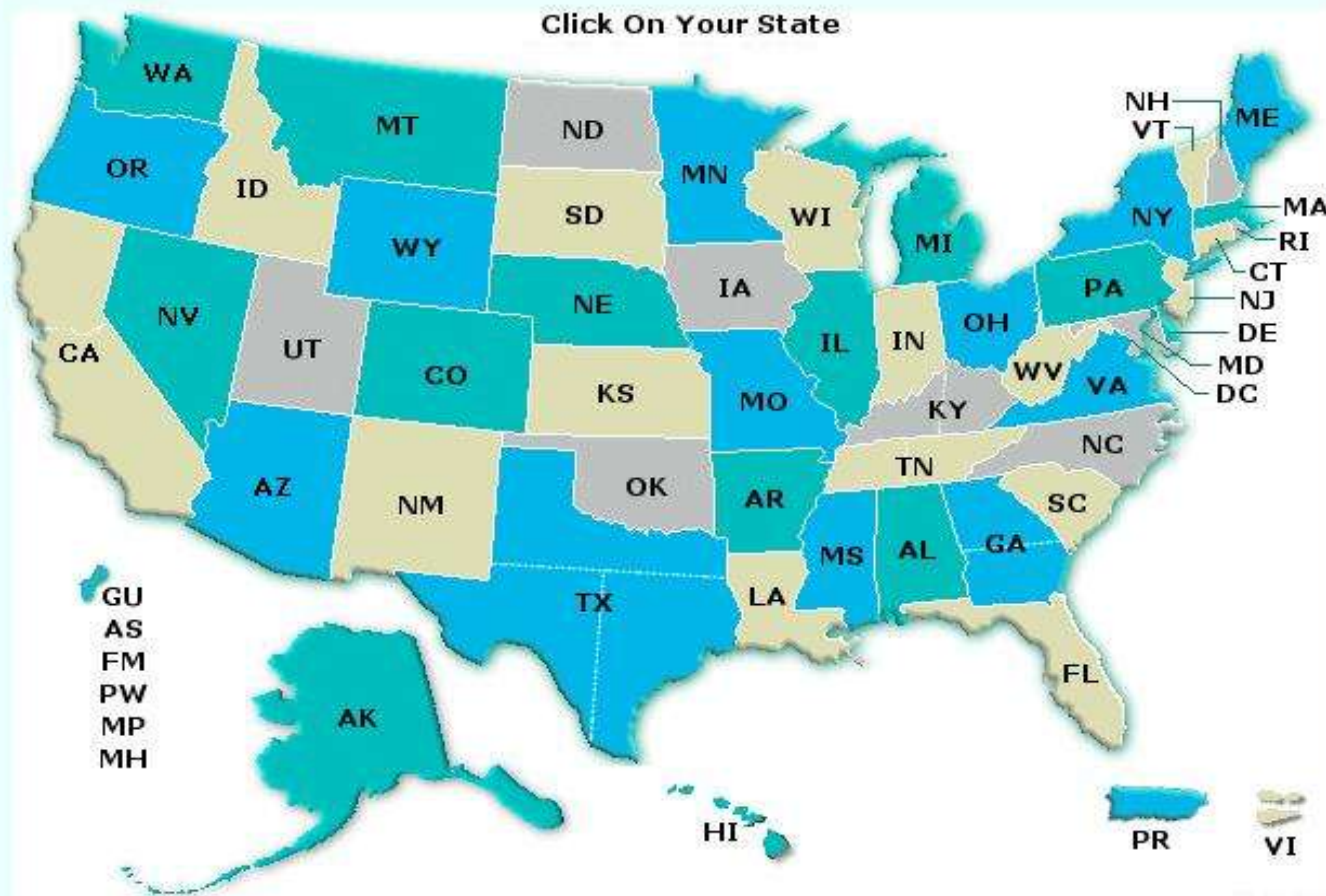
To this section you will find general state page descriptions of Major Land Resources

I Want To...

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Click On Your State



FOTG County Locator

Select your
State of
interest by
clicking the
map to the
left.



http://efotg.sc.egov.usda.gov/references/public/PA/CP42JobSheetMarch2011.pdf

http://efotg.sc.egov.usda.gov/references/public/PA/CP42JobSheetMarch2011.pdf

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Pollinator Habitat

Conservation Reserve Program Job Sheet

CP42



Definition

Pollinator habitats are areas of permanent vegetation located in an agricultural landscape: field edges, field middles, odd corners, or virtually any location that is suited for pollinator habitat. Vegetation consists of acceptable herbaceous and/or woody plants.



Purpose

Pollinator habitat will provide wildlife food and cover, reduce soil erosion from water, and protect soil and water quality. Specifically, pollinator habitat will provide nectar and pollen sources for pollinators, and offer low-disturbance areas for nesting and egg-laying.



Studied 20 plants known for bee value, availability, & ease of establishment (Dr. Rachael Winfree, Rutgers U.; Chris Miller & Jolie Dollar, CMPMC)

Agastache nepetoides, yellow giant hyssop
Asclepias incarnata, swamp milkweed
Asclepias tuberosa, butterfly milkweed
Eupatoriadelphus maculatus, spotted Joe-pye weed
Euthamia graminifolia, flat-top goldentop
Hypericum perforatum, common St. Johnswort
Lobelia siphilitica, great blue lobelia
Oligoneuron rigidus, stiff goldenrod
Penstemon hirsutus, hairy beardtongue
Pycnanthemum tenuifolium, narrowleaf mountainmint
Rudbeckia hirta, blackeyed Susan
Rudbeckia laciniata, cutleaf coneflower
Solidago rugosa, wrinkleleaf goldenrod
Symphyotrichum novae-angliae, New England aster
Symphyotrichum novi-belgii, New York aster
Symphyotrichum pilosum, hairy white oldfield aster
Verbena hastata, swamp verbena
Vernonia noveboracensis, New York ironweed
Veronicastrum virginicum, Culver's root
Zizia aurea, golden zizia





CIG Summer 2010 Results

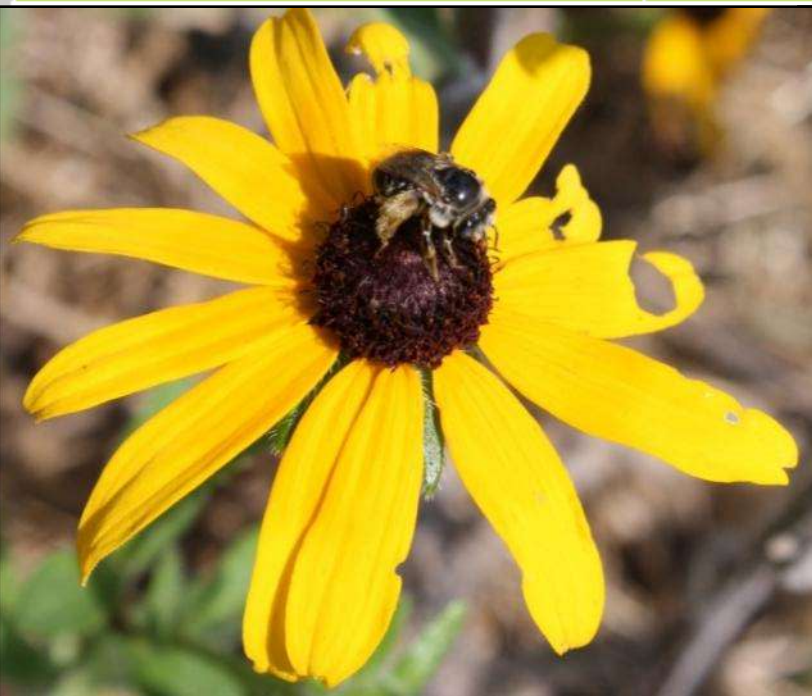
Bees

Butterflies

Early

Asclepias tuberosa
Rudbeckia hirta

Asclepias tuberosa





CIG Summer 2010 Results

Bees

Butterflies

Mid

Lobelia siphilitica
Agastache schrophulariifolia
Pycnanthemum tenuifolium

No differences





CIG Summer 2010 Results

Bees

Butterflies

Late

Eupatorium maculatum
Oligoneuron rigidum

Eupatorium maculatum
Euthamia graminifolia
Oligoneuron rigidum





Agastache nepetoides,
yellow giant hyssop

Asclepias incarnata,
swamp milkweed

Asclepias tuberosa,
butterfly milkweed

Eupatoriadelphus maculatus,
spotted Joe-pye weed

Euthamia graminifolia,
flat-top goldentop

Lobelia siphilitica,
great blue lobelia

Oligoneuron rigidus,
stiff goldenrod

Pycnanthemum tenuifolium,
narrowleaf mountainmint

Rudbeckia hirta,
blackeyed Susan

**bumble bee on
butterfly milkweed,
*Asclepias tuberosa***





Lady Bird Johnson Wildflower Center:

<http://www.wildflower.org/plants/>

WHAT STARTS HERE CHANGES THE WORLD
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EN ESPAÑOL

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Search go

ABOUT VISIT EXPLORE PLANTS EVENTS CONSERVATION EDUCATION SUPPORT

NATIVE PLANT DATABASE

SHARE   

Welcome to the latest edition of the Native Plants Database. From this page you can explore the wealth of native plants in North America. Use the options below to search for 7,219 native plants by scientific or common name or choose a particular family of plants. If you are not sure what you are looking for, try the combination search or our [Recommended Species](#) lists. If you are looking for non-native or introduced species, we suggest you visit the [USDA Plants Database](#).

Search native plant database:

Name:

Family:

[See a list of all Plants](#)


EXPLORE PLANTS

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BIBLIOGRAPHY
RECOMMENDED SPECIES

Use the options below to search for plants based on a combination of characteristics. If there are too many results, try narrowing your search by selecting more characteristics. If the results are too few, broaden your search by selecting fewer characters.

RECOMMENDED SPECIES LISTS

Find native plant species by state. Each list contains commercially available species suitable for gardens and planned landscapes. Once you have selected a collection, you can browse the collection or search within it using the combination search.





Lady Bird Johnson Wildflower
Center Recommended Species:
<http://wildflower.org/collections/>

Special Collections

- Butterflies and Moths

Value to Beneficial Insects

- Special Value to Native Bees
- Special Value to Bumble Bees
- Special Value to Honey Bees
- Provide Nesting Materials/Structure for Native Bees

**Click on those, then narrow to
state, habit, light & soil
conditions, etc.**

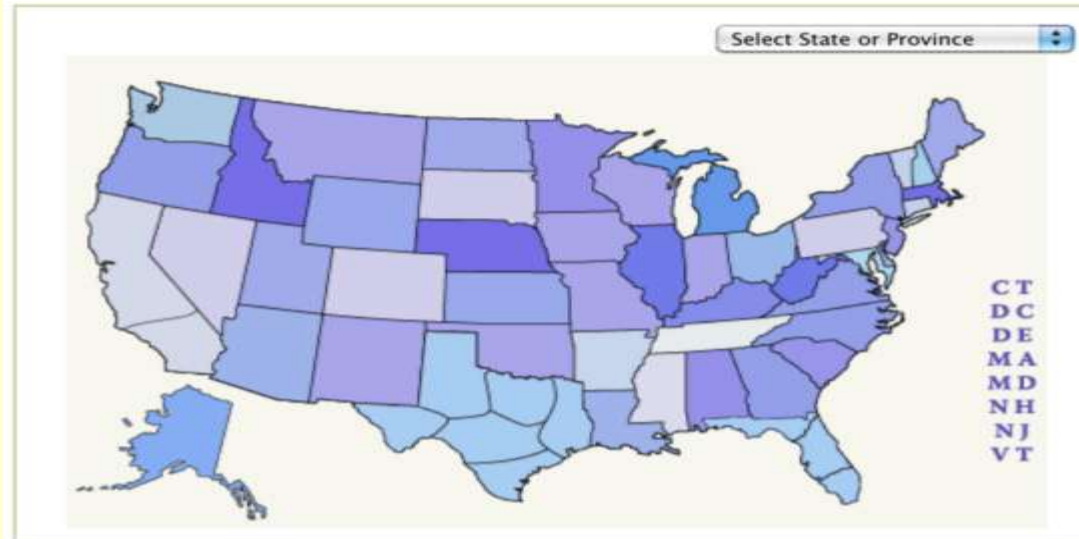


RECOMMENDED SPECIES



Welcome to the Recommended Species section of the Native Plant Information Network. Here is where we post lists of native plants recommended for various purposes. Once you have selected a collection, you can browse the collection or search within it using the combination search. Please contact the [NPIN Director](#) if you have an interest in adding a collection to this section.

Recommended Native Plants by State



[Wildflower Quiz](#) - Test your plant identification skills.

SPECIAL COLLECTIONS

[Butterflies and Moths of North America](#) - Plants that are valuable to moths and butterflies.
[Native Plant Network](#) - Propagation protocols from the Native Plant Network.
[Deer Resistant](#) - Native plants that deer tend to avoid.
[Chesapeake Bay](#) - Native Plants for wildlife and conservation landscaping in the Chesapeake Bay Watershed.

VALUE TO BENEFICIAL INSECTS

[Special Value to Native Bees](#) - Attracts large numbers of native bees.
[Special Value to Bumble Bees](#) - Attracts large numbers of bumble bees.
[Special Value to Honey Bees](#) - Important pollen or nectar sources (honey plant) for honey bees.
[Provides Nesting Materials/Structure for Native Bees](#) - Plants that native bees nest beneath, within, or harvest parts from to construct their nests.
[Supports Conservation Biological Control](#) - Plants that attracts predatory or parasitoid insects that prey upon pest insects.



Native* trees:

- *Acer*, maple
- *Amelanchier*, serviceberry
- *Crataegus*, hawthorn
- *Diospyros*, persimmon
- *Gleditsia*, honey locust
- *Ilex*, holly
- *Liriodendron*, tulip tree
- *Malus*, crab apple
- *Nyssa*, black gum
- *Prunus*, cherry, plum, peach
- *Robinia*, black locust
- *Salix*, willow
- *Sassafras*, sassafras
- *Tilia*, basswood

*Many non-native
relatives also excellent

sweat bee on
serviceberry





Spring Blooming Plants

Native shrubs/small trees:

- *Amelanchier*, serviceberry
- *Amorpha*, leadplant
- *Ceanothus*, New Jersey tea
- *Cercis*, redbud
- *Gaylussacia*, huckleberry
- *Halesia*, silverbell
- *Ilex*, holly
- *Photinia*, chokeberry
- *Physocarpus*, ninebark
- *Prunus*, cherry, plum, peach
- *Rhododendron*, azalea
- *Vaccinium*, blueberry



mining bee on blueberry



southeastern blueberry bee
on redbud



Spring Blooming Plants

Native perennials:

- *Aquilegia*, wild columbine
- *Baptisia*, wild indigo
- *Dicentra*, Dutchman's breeches
- *Geranium*, wild geranium
- *Lupinus*, wild lupine
- *Penstemon*, beardtongue
- *Polemonium*, Jacob's ladder
- *Salvia*, sage
- *Tradescantia*, spiderwort

bumble bee on
Dutchman's breeches



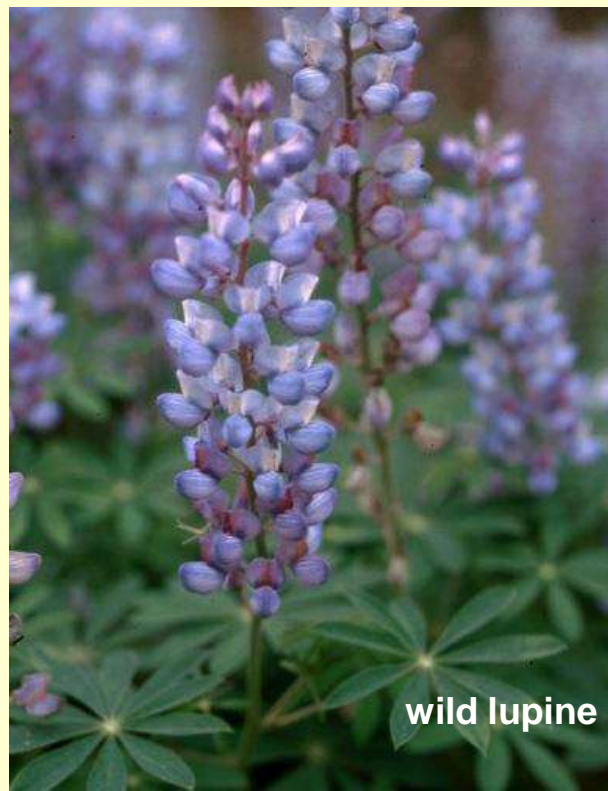
anthophorid bee on
beardtongue

sweat bee



wild columbine

lyre-leaved sage



wild lupine





Summer Blooming Plants

Native shrubs & trees:

- *Amorpha*, leadplant
- *Aralia*, devil's walkingstick
- *Baccharis*, groundsel bush
- *Cephalanthus*, buttonbush
- *Clethra*, sweet pepperbush
- *Ilex*, holly
- *Oxydendrum*, sourwood
- *Photinia*, chokeberry
- *Physocarpus*, ninebark
- *Prunus*, cherry, plum, peach
- *Rhus*, sumac
- *Rosa*, wild rose
- *Sambucus*, elderberry
- *Spiraea*, spirea

spirea



chokeberry



wild cherry



wasp on elderberry





Summer Blooming Plants

Native perennials:

- *Agastache*, hyssop
- *Asclepias*, milkweed
- *Chamaecrista*, partridge pea (annual)
- *Chelone*, turtlehead
- *Cimicifuga*, black cohosh
- *Echinacea*, coneflower
- *Eupatorium*, Joe-pye, boneset
- *Hibiscus*, rose mallow
- *Liatris*, blazing star
- *Monarda*, wild bergamot
- *Pycnanthemum*, mountain mint
- *Verbena*, vervain

sweat bee on
milkweed



sweat bee on
coneflower



bumble bee on
bergamot



bumble bee
coming out of
turtlehead



zebra swallowtail
on milkweed



blazing star



mountain mints (with a predatory wasp, right)





Fall Blooming Plants

Native perennials:

- *Cirsium*, thistle
- *Eupatorium*, Joe-pye, boneset
- *Helianthus*, sunflower
- *Helenium*, Helen's flower
- *Liatris*, blazing star
- *Lobelia*, lobelia, cardinal flower
- *Pycnanthemum*, mountain mint
- *Solidago*, goldenrod
- *Symphotrichum*, aster
- *Verbena*, vervain
- *Verbesina*, wingstem
- *Vernonia*, ironweed

bumble bee on
great blue lobelia



sweat bee
on thistle



clear wing
moth on
Joe-pye



sweat bee on
goldenrod



sweat bee
on aster





Native Milkweeds (*Asclepias* spp.)

common milkweed,
A. syriaca



- High quality nectar source for pollinators
- Obligate host plants for monarch caterpillars
- Top species for attracting beneficial insects in western US vineyards

butterfly milkweed,
A. tuberosa





Native Milkweeds (*Asclepias* spp.)

- ~80% decline in monarch butterflies since ~2000 in corn/soybean ag regions (~60% decline in milkweeds)
- Tremendous diversity in milkweeds--great potential to expand use

purple milkweed,
A. purpurascens



poke milkweed,
A. exaltata



green milkweed,
A. viridiflora



swamp milkweed,
A. incarnata



fourleaf milkweed,
A. quadrifolia





Native Thistles (*Cirsium* spp.)

- Not to be confused with non-native thistles!!! (e.g. Canada thistle, etc.)
- Not weedy!!!
- Incredibly important pollen and nectar source for huge numbers of beneficial insects
 - (and seeds for song birds!)
- Increasingly imperiled!
 - (Efforts to control non-native thistles are eliminating native species)





Non-native bee plants

- Red clover (esp. mammoth red)
- White clover (esp. Ladino)
- Alfalfa
- Buckwheat
- Basil
- Borage
- Hairy vetch
- Catmint
- Cosmos
- Annual sunflower
- Oregano
- Russian sage
- Siberian squill





male sweat bees, *Halictus ligatus*,
on wingstem, *Verbesina*



Bees are part of the whole system

**bumble bee
collecting corn pollen**



Hedgerows & Field Borders

Hedgerows to protect pollinators from pesticide drift

- Vegetative most effective (3D porosity & 60% density ideal)
- Multiple rows small needled evergreens*
 - *Picea*, spruce
 - *Juniperus*, juniper, red cedar
 - *Abies*, fir
 - *Thuja*, arborvitae

*Farming for
Pollinators
brochure*



http://www.xerces.org/wp-content/uploads/2008/09/farming_for_pollinators_brochure.pdf

*Pines are NOT recommended—less dense growth habit and too open over time

Forb vs Grass Plantings



Photo: Nancy Adamson



Seeding Rates to Help Keep Costs Reasonable

Target seeding rate should be in seeds per square foot

- Drill seeding: 25-35 seeds/sq ft
- Broadcast: 40-60 seeds/sq ft





Forb vs Grass Plantings

Use seed calculator to determine seed mix

- Order pure live seed (PLS) whenever possible
- Avoid pre-emergent herbicides used for grassland plantings

| Species/Variety | Percent of mix (%) | Total number PLS seed/ ft ² | Target PLS seed/ft ² | ft ² / ac | number seeds/lb # |
|------------------------------|-----------------------|--|---------------------------------------|----------------------|-------------------------|
| <i>Lupinus perennis</i> | 0.25% | 40 | 0.10 | 43560 | 23,000 |
| <i>Rudbeckia hirta</i> | 2.00% | 40 | 0.80 | 43560 | 1,700,000 |
| <i>Asclepias tuberosa</i> | 0.25% | 40 | 0.10 | 43560 | 70,000 |
| <i>Monarda fistulosa</i> | 5.00% | 40 | 2.00 | 43560 | 1,250,000 |
| <i>Solidago rigida</i> | 5.00% | 40 | 2.00 | 43560 | 750,000 |
| <i>Lobelia cardinalis</i> | 8.00% | 40 | 3.20 | 43560 | 8,000,000 |
| <i>Eupatorium fistulosum</i> | 6.00% | 40 | 2.40 | 43560 | 1,600,000 |

Additional Resources



bumble bee
on silverbell,
Halesia



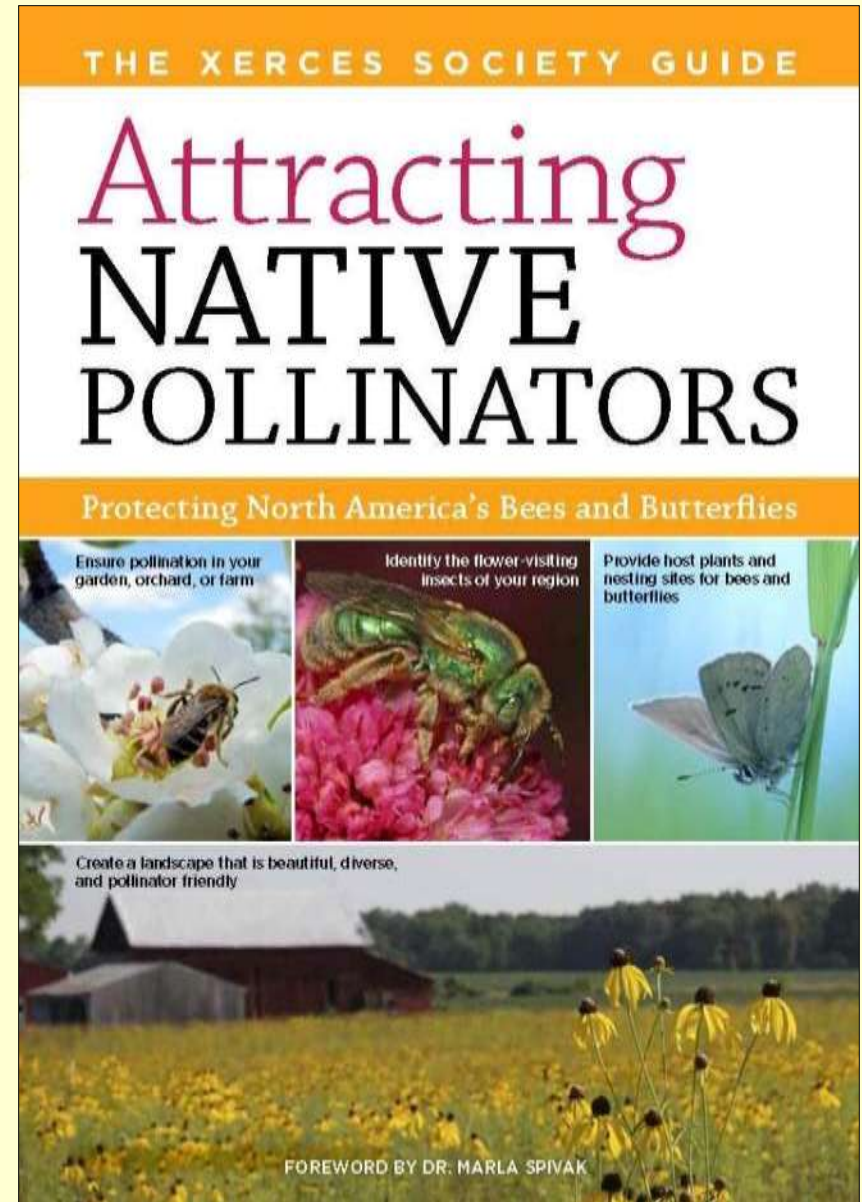
Published in February 2011

“*Attracting Native Pollinators* belongs on the bookshelf of everyone who values the future of the natural world.”

- Douglas W. Tallamy, researcher and author of *Bringing Nature Home*

“Precise, elegant and thoughtful, the recommendations offered by the Xerces Society will become essential to advancing a healthy and diverse food production system.”

- Gary Nabhan, author of *The Forgotten Pollinators* and *Renewing America's Food Traditions*





Pollinator Conservation Resource Center

Region-specific Information from Xerces, Cooperative Extension, USDA-NRCS, NGO, and other sources, including:

- Regional plant lists
- National plant lists
- Conservation guides
- Nest construction guides
- Links to identification guides
- Pesticide guidelines
- Native plant nursery directory

www.xerces.org/pollinator-resource-center

Pollinator Conservation Resource Center

Welcome to the Pollinator Conservation Resource Center, where you can find regional information about plant lists, habitat conservation guides, and more. Scroll over the map below and click on your region of the country. For questions or comments about the Resource Center, or to suggest additional content, please contact [Bob Medler](mailto:Bob.Medler@xerces.org), Xerces Assistant Pollinator Program Director.

[Click here to donate](#)

Program Features

- [main page](#)
- [pollinator resource center](#)
- [agriculture](#)
- [organic farming resources](#)
- [managing habitat for pollinators](#)
- [gardens](#)
- [native plant resources](#)
- [bumble bees in decline](#)
- [red list of bees](#)
- [resources for teachers](#)
- [xerces pollinator publications](#)

Program Highlights

- [Online encyclopedia](#) on pollinator conservation basics in farm landscapes
- The Xerces Society works with congressional staff to include [pollinators in the farm bill](#)
- Xerces organizes a [briefing to U.S. legislators](#) on honeybees, colony collapse disorder and native pollinators
- The National Research Council issues a [report](#) on the Status of Pollinators in North America
- Agriculturally important [bumble bees in decline](#)

This resource center is a collaboration of the Xerces Society and [Neal Williams at the University of California, Davis](#). Significant funding was provided by a grant from NERAC. Additional funding was provided by the USDA Natural Resources Conservation Service, the Columbia Foundation, Turner Foundation, Patric Rhee Foundation, Disney Wildlife Conservation Fund, CS Fund, Wildwood Foundation, CERES/Greater Milwaukee Foundation, Bullitt Foundation, Organic Valley, Organic Farming Research Foundation, The White Pine Fund/The Hawkspire Foundation, and Xerces Society members.

Logos: Xerces Society, UC Davis, NRCS, Natural Resources Conservation Service.

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site map • contact • give • contact the webmaster



Your Local USDA Natural Resources Conservation Service (NRCS) Office:

- Information about Farm Bill programs
- New state pollinator technology notes
- Revised EQIP/WHIP standards for pollinator plantings
- *Farming for Pollinators* brochure
- Organic conversion assistance



USDA-NRCS Virginia Plant Establishment Guide

Revised 2011



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Updated October 31, 2011



A diverse community of wild native bees can provide significant pollination for many crops.



www.xerces.org
(follow links to pollinator program)

bumble bee queen on peach

Photo: Nancy Adamson



A diverse community of wild native bees can provide significant pollination for many crops.



www.xerces.org
(follow links to pollinator program)

mining bee, *Andrena*, on apple

Photo: Nancy Adamson



Habitat supports wild & managed pollinators

- plant forage patches
- create nest sites
- minimize pesticide risk



www.xerces.org
(follow links to pollinator program)

Photo: Nancy Adamson



Thank You

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MOSES

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Thank You & Weblinks

Thank you!!
Questions?

Weblinks are available in a separate .pdf file posted with the webinar replay or from Nancy at nancy@xerces.org or nancy.adamson@gnb.usda.gov.

large carpenter bee
on narrow-leaved mountain mint,
Pycnanthemum tenuifolium)