

Simple Ways You Can Help Save Bees

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NC State University
A&T State University
**COOPERATIVE
EXTENSION**

Empowering People · Providing Solutions

Review Presentation

<http://pender.ces.ncsu.edu/pollinators/>


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4-H Youth Development

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Farm Health & Safety

Field Crops

Food Safety & Processing

Local Foods

Pest Management

Specialty Crops

Community

Forest Resources

Health & Nutrition

Home & Family

Lawn & Garden

Soil, Water & Air

Pollinator Resources

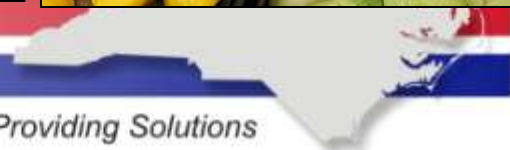
Print Content Only 



A honey bee gathers nectar and pollen from a late blooming native aster.

Why Should We Be Concerned?

- Most fruits and vegetables require insect pollination
- Bees are the most efficient pollinators



Why Should We Be Concerned?

- Local agriculture relies on pollinators



Why Should We Be Concerned?

- Ecosystems rely on pollinators



Why Are Bees So Important?

- **Three fourths of the flowering plants** on earth rely on animal mediated pollination to reproduce
- **1/3 of the world's crop production** relies on pollination!
 - \$15 billion annually in US alone!
- **Bees are the most efficient pollinators**
 - Only animals that purposefully collect pollen



Why Do Bees Visit Flowers?

For Food!

- **Pollen** = protein
 - Fashioned into ‘bee bread’, fed to immature bees
- **Nectar** = carbohydrates
 - Consumed for energy and turned into honey

Pollination is a by-product!



Many types of bees

- **Honeybees** are the most well known
 - Native to Europe
 - Managed for pollination services

Honeybee



Native Bees

50 species of
bumble bees!



- Over 4000 species of **native bees** in the US!
 - Also valuable crop pollinators – active even when cool and wet
 - Plus pollinate wild plants; Sustain native ecosystems



Squash Bees



Mason Bees



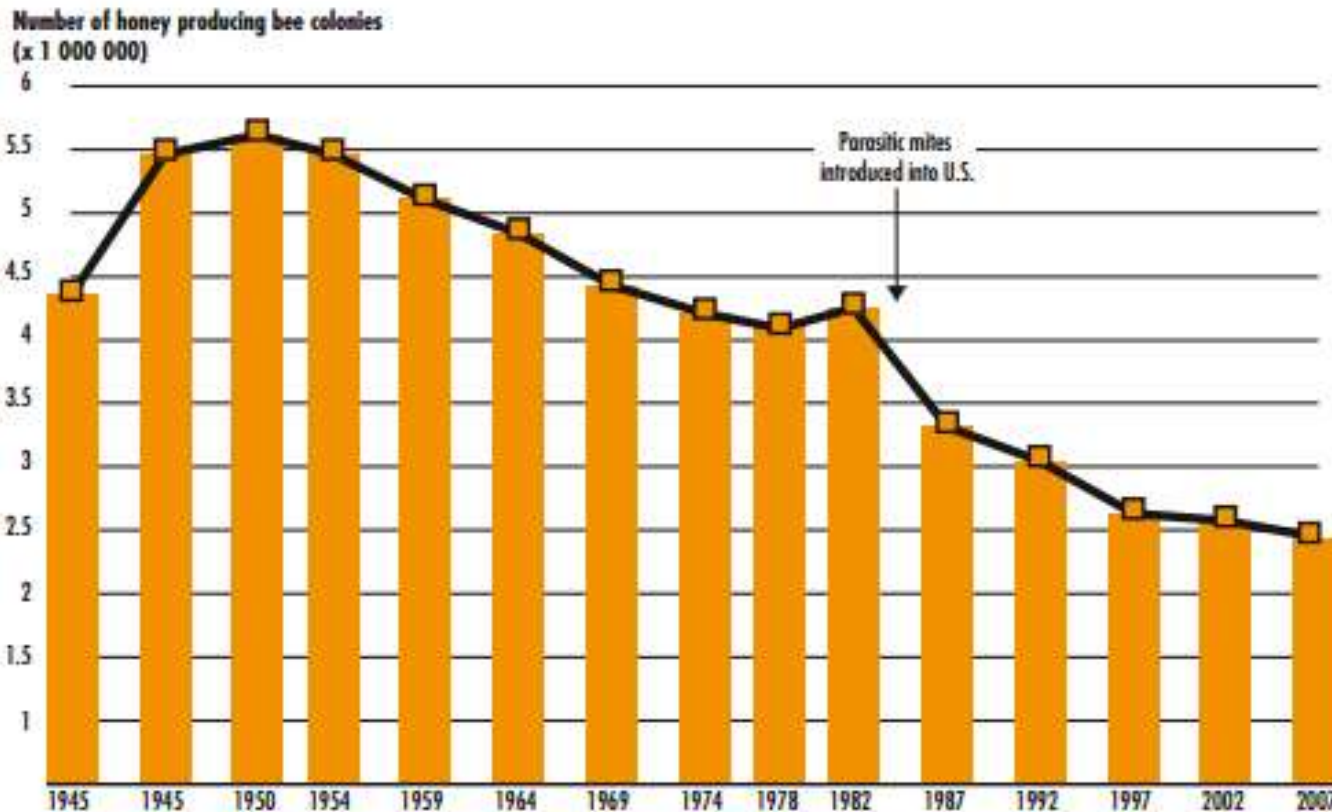
Sweat Bees

- **Most are solitary**
 - NOT aggressive!!!
 - Bumble bees live in small annual colonies
- **Most nest in the ground**
 - Some nest in wood or hollow stems



Leafcutter bees cut
leaf segments to line
their nests

Honey Bee Decline

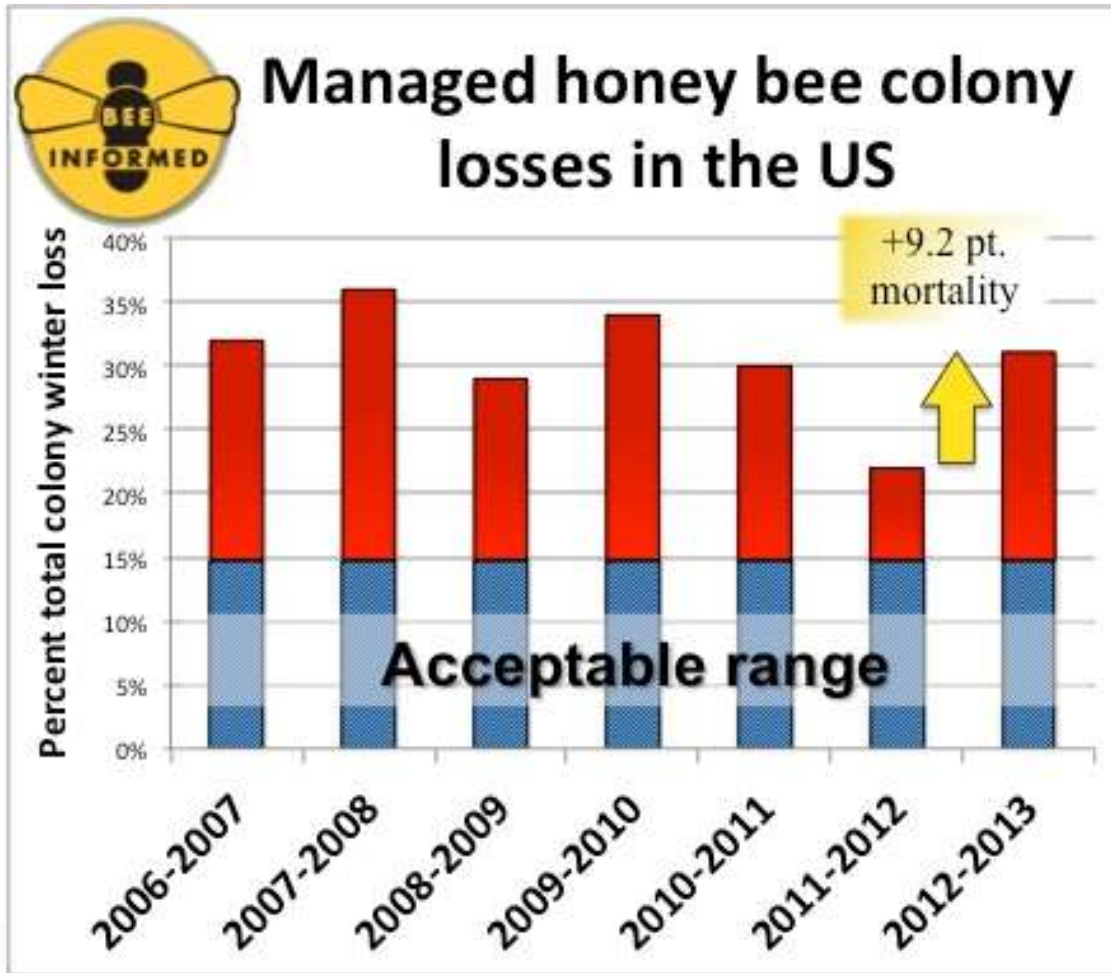


Data source: U.S. Department of Agriculture's (USDA) National Agricultural Statistics Service (NASS) NB: Data collected for producers with 5 or more colonies. Honey producing colonies are the maximum number of colonies from which honey was taken during the year. It is possible to take honey from colonies which did not survive the entire year.

The number of managed honey bee colonies in the US has declined by 50% in the past 60 years.

During this time, cropland requiring bee pollination has increased 300%

Honey Bee Decline



Since 2007 and onset of CCD, winter losses have far exceeded the 15% 'acceptable' range

Source:
<http://beeinformed.org/2013/05/winter-loss-survey-2012-2013/>



Native Bee Decline

- Though not as well documented, **native bee populations are also declining**
- **Xerces Society** lists 57 species of native bees as vulnerable or imperiled
 - <http://www.xerces.org/pollinator-redlist/>

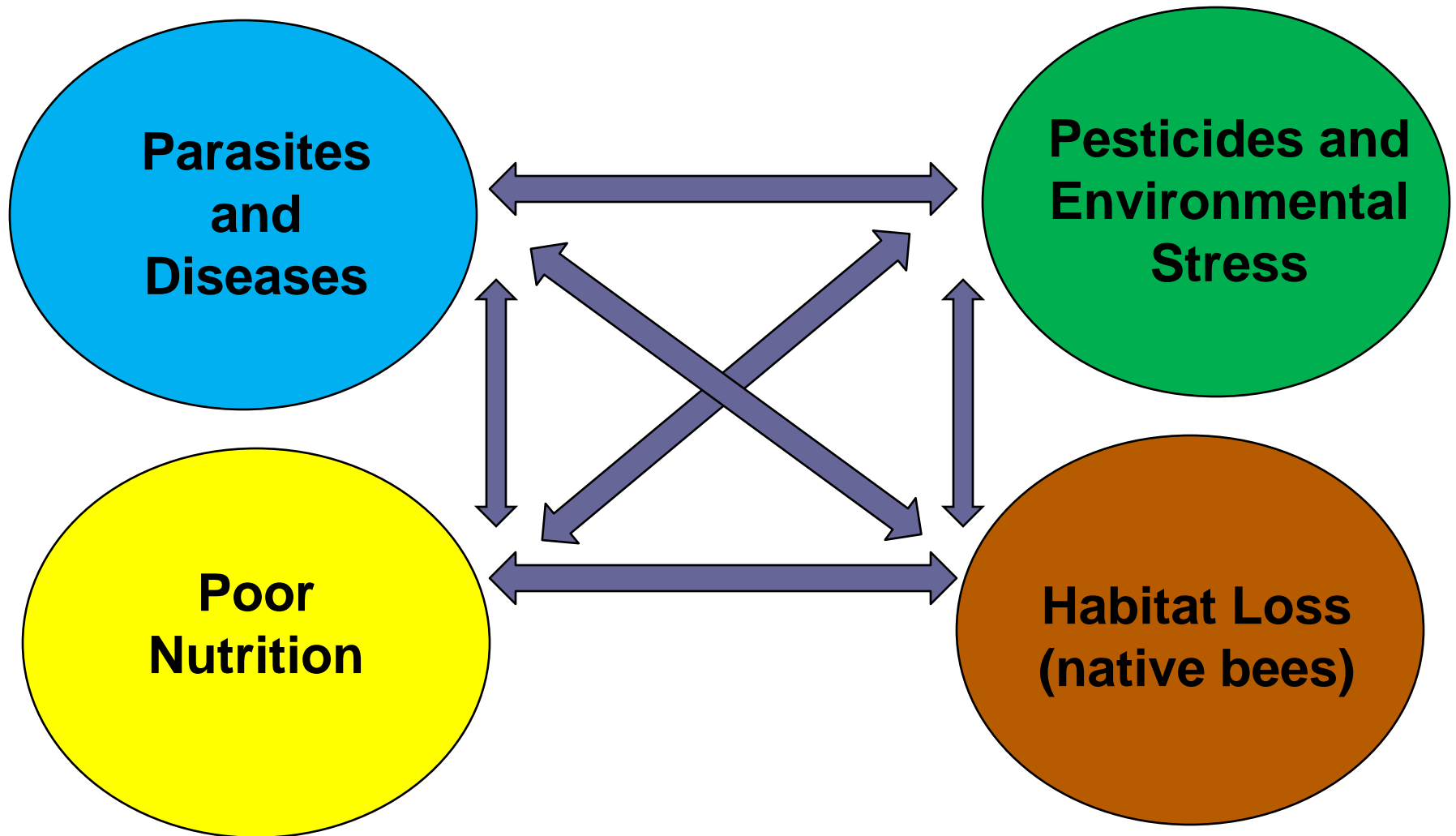


Native to the eastern US, the rusty patch bumble bee is at high risk of extinction.

Image by: Johanna James-Heinz



Causes of Bee Decline: Complex and Interacting



Causes of Decline: Parasites and Diseases

- **Parasite:**
Varroa destructor
- **Most destructive pest of bees**
- Introduced late 1980's,
native to Asia
- Feeds on hemolymph
- **Spreads debilitating virus diseases**



Causes of Decline: Pesticides

- PSU study analyzed pollen taken from bee hives across US for pesticide residues
 - 98 different residues identified
 - **Average: 7 per sample**
 - Included insecticides, fungicides, herbicides



Pesticide Exposure

- **Honey bees forage 2-4 miles from hive**
- Native bees typically forage less than 1 mile from nest
- Among pesticides, **insecticides are most acutely toxic to bees**

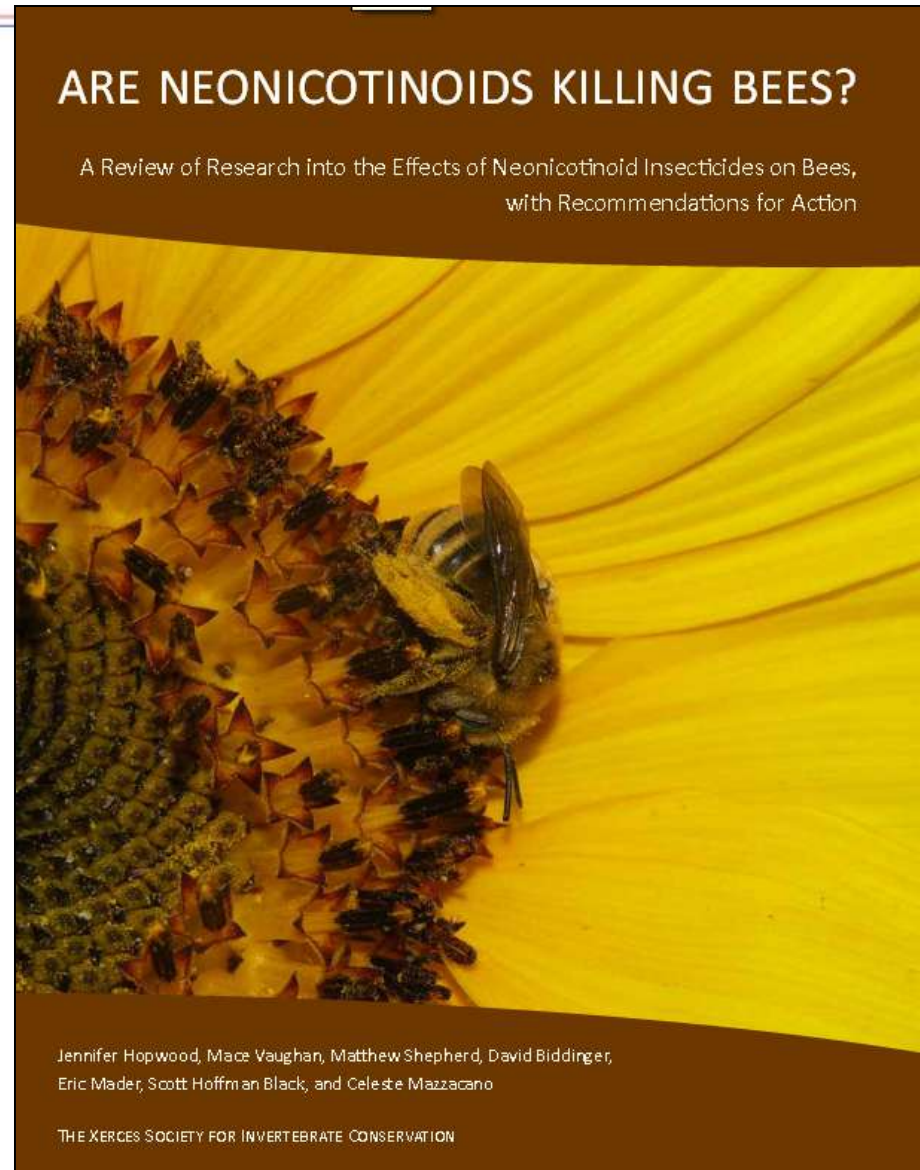


Mass bee death due to improper insecticide application



Pesticides: Neonicotinoids

- **New class of insecticides**
 - **Introduced 1990's, now most widely used insecticides on earth**
- **Systemic:** taken up by roots or leaves and moved to all parts of the plant, including nectar and pollen
- **Effects usually sublethal**
 - Disorientation
 - Increase disease susceptibility



Xerces Society report –
available online



Look for active
ingredient:
Imidacloprid



Active Ingredients:	
Imidacloprid	2.94%
Other Ingredients	97.06%
Total	<u>100.00%</u>

Neonicotinoids

- **Long residual life in soil**
- When applied as soil drench or granules, levels **persist and accumulate** in the soil
- **Chemical present in blooms months to years following treatment**
 - Rhododendron – sub-lethal levels 6 years after treatment
 - Amelanchier – acute lethal levels 18 months after treatment

Do not soil apply
neonicotinoids

Do not apply to
plants in bloom
or about to
bloom



Causes of Decline: Poor Nutrition

Dysfunctional food system

- **Lack of diversity**
 - Large fields of one species: monocultures
 - Flowerless landscapes
 - Overzealous weed control
 - Destruction of native plant communities
 - Lack of meadows and cover crops



Henbit – a valuable early nectar source and weed



Causes of Decline: Poor Nutrition

Dysfunctional food system

- Lack of year-round food source
- Pesticide contamination

Imagine having to walk to the grocery store when you have the flu only find all the food is contaminated with poison.



Honeybees are trucked in to almond orchards during bloom but have to be trucked afterwards or they would starve



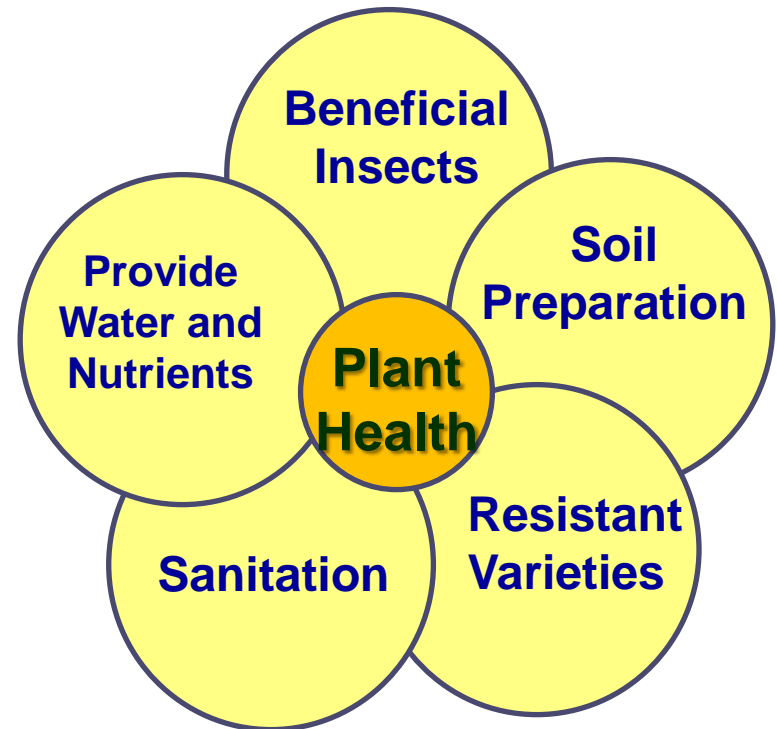
What Can You Do?

- **Minimize Pesticide Use**
 - Practice Integrated Pest Management
 - Use natural pesticides when possible
- **Provide Nesting Habitat**
 - Preserve natural areas
- **Plant Flowers!**



Minimize Pesticide Use: IPM

- An **integrated** approach
- **Seeks balance**, not eradication
- **ID pests** before deciding on control strategy
- **Pesticides as last resort**; use natural products when possible



Build Healthy Soils

- **Till compost into the soil**
- Soil test to determine if lime is needed to raise pH
- Add nutrients based on soil test results
- Mulch!



Right Plant, Right Place

- Plant **vegetables and fruits** in **sunny areas** with **well drained soil**
- **Choose ornamentals suited to site conditions**
 - Shade or sun
 - Sand or clay
 - High or low pH
 - Salt spray



Sanitation

- **Remove infected plant parts or pull out plants**
 - Minimize spread to related plants
- **Clear out crop debris at end of the season**
 - Prevent pests from overwintering

If only a few leaves are infected, remove them from the plant



Mummy berry survives the winter in shriveled fruit that fall to the ground

Watering

- Water stressed plants are more susceptible to pest problems
 - **Water 2-3 times a week** in sandy soil in summer if no rain
 - 1/3 inch each application
- **Avoid wetting leaves** to minimize foliage diseases

Most foliage diseases require moisture to infect



Drip irrigation delivers water directly to the soil



Beneficial Insects

- Learn to recognize all **life stages** of beneficials
- **Diverse landscapes** encourage beneficials – plant many different types of plants, including flowers
 - Bee friendly flowers are also beneficial friendly!
- Strive for a **balance** of good and bad insects.
- **Minimize pesticide use!!!**

*Adults
ladybug*



*Ladybug
larvae*

Using Pesticides: Minimizing Hazard to Bees

- **Never use dusts!**
- Apply late evening
- **Never spray open blossoms**
- Avoid drift on flowering weeds and adjacent crops

Like pollen, dusts are picked up and carried back to the colony



Always read and follow label directions!

- Check the label for bee hazard statement

ENVIRONMENTAL HAZARDS

To protect the environment, do not allow pesticide to enter or run off into storm drains, drainage ditches, gutters or surface waters. Applying this product in calm weather when rain is not predicted for the next 24 hours will help to ensure that wind or rain does not blow or wash pesticide off the treatment area.

BEE HAZARD • This product is toxic to bees exposed to direct treatment. Do not apply this product while bees are actively visiting the treatment area.

Pesticide Sources

- **Synthetic** = man-made
 - Often based on natural substances
- **Natural** = derived from naturally occurring materials
 - Minerals
 - Plants
 - Microbes
 - Soaps and Oils



Residual Activity

- How long a pesticide remains active after it is applied
- **Synthetics have much longer residual activity** than natural products
 - Greater chance of impacting non-target species (people, pests, wildlife, pollinators, beneficial insects)
- Metabolites of synthetic pesticides often have long residual life
- Synthetics often more potent – greater acute toxicity



How Do You Know if a Product is Natural?

- **Active ingredients** listed on the label
- **OMRI listed** – approved for use by certified organic farmers
- **Some products have natural active ingredients but are not OMRI approved**



Active ingredients are listed on the label



Insecticidal Soap

- **Active Ingredient:** Potassium Salts of Fatty Acids
 - kills soft body pests: aphids, whitefly, mites
 - Kills only what it contacts – not eggs
 - Repeated applications often necessary
- **No residual activity**



Horticultural Oils

Mineral oils

- kill by smothering,
- kill all life stages (eggs must be exposed)
- great for scale, spider mites, aphids, whitefly
- Can damage plants at high temperatures
- Older “dormant” oils = winter only

No residual activity

Plant oils: (sesame, clove, canola, etc) **work similarly**



Neem Oil and Azadirachtin

- Derived from Neem tree seed
- Over 70 cmpds, **Azadirachtin** believed most active
- **Controls** aphids, mites, thrips, whitefly
- May help control powdery mildew
- Primarily acts as **growth regulator** – works best on immature insects
- Slow acting
- Breaks down in sunlight



Pyrethrum and Pyethrins

Tanacetum cinerariifolium,
Dalmation
Chrysanthemum

- Usually combined with other natural ingredients
- **Pyrethrum** = Made from the dried flower heads of *Tanacetum cinerariifolium*
- **Pyrethrins** = active compounds
- Quick knock down for wide range of insects
- **Breaks down rapidly in sunlight**
- Harsh on beneficials



B.t.– *Bacillus thuringiensis*

Naturally occurring bacteria effective for **caterpillar control**

- Most effective when pest are young/small
- Stop feeding within a few hours, slow death
- Spray in evening, breaks down in sunlight
- Separate strain for **Colorado potato beetle control**



Spinosad

- Developed from soil dwelling bacterium
- Causes death within a few days
- A little more persistent than B.t. and neem (3-5 days)
- **Effective for**
 - Caterpillars,
 - Colorado potato beetle,
 - Fire ants (baits)



Preserve Nesting Habitat

- **70% of native bees nest in ground**
 - Favor well drained, sunny areas with sparse vegetation
- **Preserve natural areas**
 - Do not disturb existing nesting areas



Provide Nesting Habitat

- 30% nest in wood or hollow stems
- Create bee blocks: holes $\frac{3}{32}$ " to $\frac{3}{8}$ " diameter
- Leave dead trees when safe
- Bundles of hollow stems or straws
- Place in morning sun, 4' above ground



Plant Flowers!

- **Colors:** White, yellow, blue, purple, violet
- **Fragrance:** floral or herbal
- **Shapes:** daisy/coneflower/sunflower; shallow tubular; legume (bean/clover); or lots of small flowers together
- Plant **single** instead of double varieties

Pollen and nectar are less accessible
in double flowered varieties



Planting for Bees: Maximize What You Have

- **Allow crops to bloom** – broccoli, mustard, kale
- **Leave weeds to bloom when possible** – clover, henbit, dandelion
- **Identify ‘dearth’ times (no blooms)** – plant to fill these times



Honeybee on broccoli flower

Pollinator Habitat

This area has been planted with a range of flowering native plants to provide high quality habitat for native bees and other pollinators.

To learn how you can create good habitat for pollinators, please visit www.xerces.org



A weedy lawn is a pollinator paradise!



Dandelion



Henbit



Clover

Planting for Bees

- **Sun:** at least 6 hrs/day
- **Masses** – groups of at least 3 of each variety
- **Diversity** - 10+ different species
- **Flowers** from early spring – late fall
- **Perennials** – reliable year after year and richer nectar sources



Mass plantings are easier to find and increase forage efficiency



Planting for Bees: Native Plants

- **Native bees prefer native plants**
 - Native plants 4 times more likely to attract native bees
 - Some native bees feed exclusively on certain plants; Time their emergence to these plants bloom period
- **Including native plants in your landscape will support a greater diversity of pollinators**



Southeastern Blueberry Bee



More Plant Suggestions

- **Pollinator Paradise Garden**
 - www.protectpollinators.org
 - Chatham County Cooperative Extension
- **NC Extension: Going Native**
 - Landscaping for wildlife with native plants
 - <http://www.ncsu.edu/goingnative/>
- **Regional native plant guide** from Pollinator Partnership
 - <http://www.pollinator.org/guides.htm>
 - We are the Outer Coastal region



Pollinator Paradise Garden



Many Excellent Learning Resources!

THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION



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Pollinator Conservation

Pollinators are essential to our environment. The ecological service they provide is necessary for the reproduction of nearly 70 percent of the world's flowering plants, including more than two-thirds of the world's crop species. The United States alone grows more than one hundred crops that either need or benefit from pollinators, and the economic value of these native pollinators is estimated at \$3 billion per year in the U.S. Beyond agriculture, pollinators are keystone species in most terrestrial ecosystems. Fruits and seeds derived from insect pollination are a major part of the diet of approximately 25 percent of all birds, and of mammals ranging from red-backed voles to grizzly bears. In many places, the essential service of pollination is at risk from habitat loss, pesticide use, and introduced diseases.

Learn About Your **Landscape**:

Find conservation information specific to your area of care.

Agriculture

Gardens

**Natural Areas
and Rangelands**

Organic Farms

Parks and Golf

Courses

Roadsides

Schools



Learn about pollinators!
[Find out more information here.](#)

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to protect invertebrates!

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

Master Gardener Spring Plant Sale

Pender Extension Center

801 S. Walker St., Burgaw

Fri., April 11, 12:00pm – 6pm

Sat., April 12, 8:30am – Noon



Many varieties of vegetables and herbs, blueberries, and perennial flowers for pollinators, as well as “Master Gardener” grown plants

Upcoming Classes:

**Presented by Pender Extension
Master Gardener Speakers' Bureau**

April 1, 11am, Hampstead Library

“Composting” by Maureen Spataro

May 6, 11am, Hampstead Library

“Lawns” by David Hull



Gardening News by Email

Pender Gardener – Sustainable lawn and landscape care, great plants, and pest management

- **To Subscribe:** send an email to mj2@lists.ncsu.edu
 - Leave the subject line blank
 - In the body of the message put: **subscribe pendergardener**

Food Gardener - When to plant herbs, vegetables and fruits and sustainable pest management

- **To subscribe:** send an email to mj2@lists.ncsu.edu
 - Leave the subject line blank
 - In the body of the message put: **subscribe foodgardener**



Join the Year Round Gardening Challenge

Sign Up:

<http://pender.ces.ncsu.edu/>

- Get weekly email updates on when to plant, pest alerts, upcoming classes and more!
- 3, Zone 8 planner winners chosen each month!

The screenshot shows the website for the Pender County Center of NC State University's Cooperative Extension. The header includes the NC State University logo, the Cooperative Extension logo, and a search bar. The main navigation menu includes Home, About, Contact Us, Meet Our Staff, Events, NC A&T, and Our County Centers. The page features a large image of a beach with tall grasses in the foreground. Below the image, there is a section for '4-H Youth Development' and 'Agriculture & Food' with various sub-topics. A 'Featured Content' section highlights the 'Year Round Gardening Challenge' with a 'Read The Rest' button. Below that, there is a 'Featured Extension Video' section with two video thumbnails: 'Controlling Red Imported Fire Ants' and 'Aisle by Aisle: Choosing Dairy'. At the bottom, there is a 'News' section with two articles: 'Growing Flowers and Vegetables From Seed' and 'Applying Pre-Emergent Herbicides To Lawns'. To the right of the news section, there is an 'EVENTS' section with two workshop listings: 'Seed Starting Workshop' on Thursday, March 20, 2014, and another 'Seed Starting Workshop' on Saturday, March 15, 2014. A contact box for the Pender County Center is also visible, providing the address (801 South Walker St, Burgaw, NC 28425) and phone numbers (910) 259-1235 and (910) 259-1291. An 'ask an Expert' logo is located at the bottom center of the page.

Become an Extension Master Gardener!

- **Volunteer Program** – EMG's help with educational outreach
- **Next training class** begins August 20
- **Classes meet 9:30 to 1:00** at Extension office every Wednesday through end of October
- **Fee: \$75**
- **Volunteer 40 hours** within 1 year of completing training





**Extension
Master
Gardener**

NC COOPERATIVE EXTENSION

‘Ask an Extension Master Gardener’

**Ask questions, bring samples for id, soil test supplies,
pick up information**

- **Poplar Grove Farmer’s Market**, 2nd Wed of each month, April – October (9am – 1pm)
- **Hampstead Library**, 3rd Monday of each month, April - October (10:30am – 1pm)
- **Extension Office, Burgaw**, Mondays 1pm – 4pm; Thursdays 9am – Noon, April – October; 259-1238
- **Events:** Poplar Grove Herb Fair, Burgaw Springfest



North Carolina Cooperative Extension

We have an Extension center in every county!

<http://ces.ncsu.edu>



to submit questions to our **'Ask an Expert'** widget and
to find your local Extension center

Pender County Center

<http://pender.ces.ncsu.edu>

801 S. Walker St., Burgaw

259-1235 (general)

259-1238 (hotline)





Pollinator Habitat

This area has been planted with a range of flowering native plants to provide good quality habitat for native bees and other pollinators.

For information about creating habitat for pollinators, please visit:
www.xerces.org
www.nj.nrcs.usda.gov



Logos for Xerces Society, NJ Department of Environmental Protection, NJ Department of Agriculture, and others.

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POLLINATOR HABITAT

Pesticide free
Native plantings

