

# POLLINATION

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Texas Master Beekeeper Program

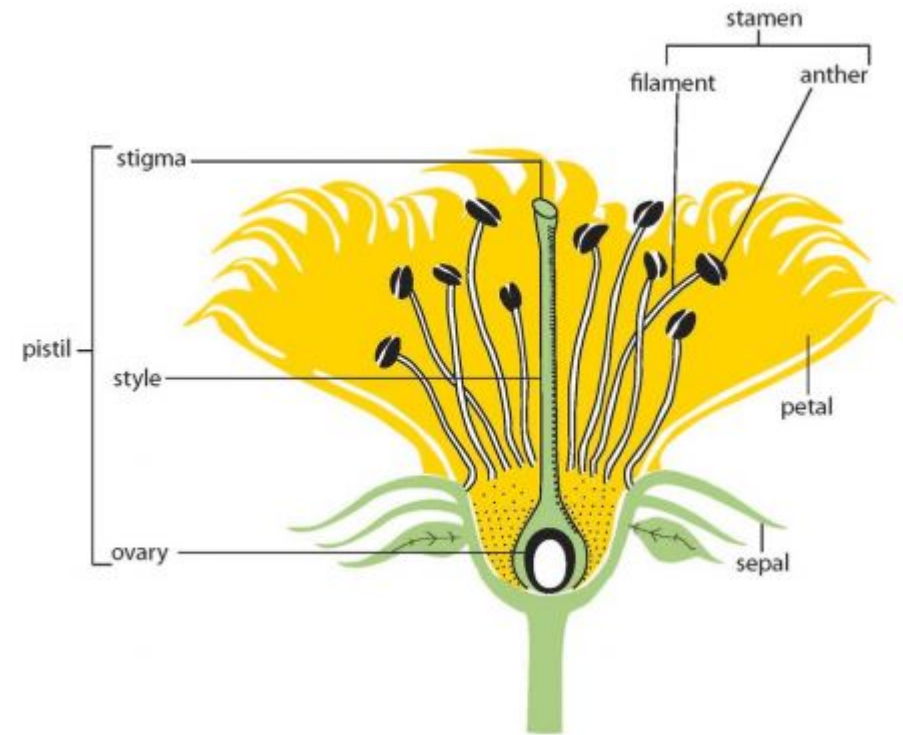
Advanced Level Module

# What is pollen?

- Main protein source for honey bees.
- Necessary for honey bee growth and development.
- Composed of many different components:
  - Water, crude protein, ether extract, carbohydrates, starch, lipids, and other unknowns.
  - The quantity of these components vary between pollen sources.

# Where does pollen come from?

- Produced by the stamen (male reproductive part of a flower).
- Pollen needs to be transferred from stamen to stigma (female reproductive part of a flower) for pollination to occur.
  - Bees play a major role in pollinating plants.



Credit: Department of Entomology and Nematology, University of Florida

# Where does pollen come from?

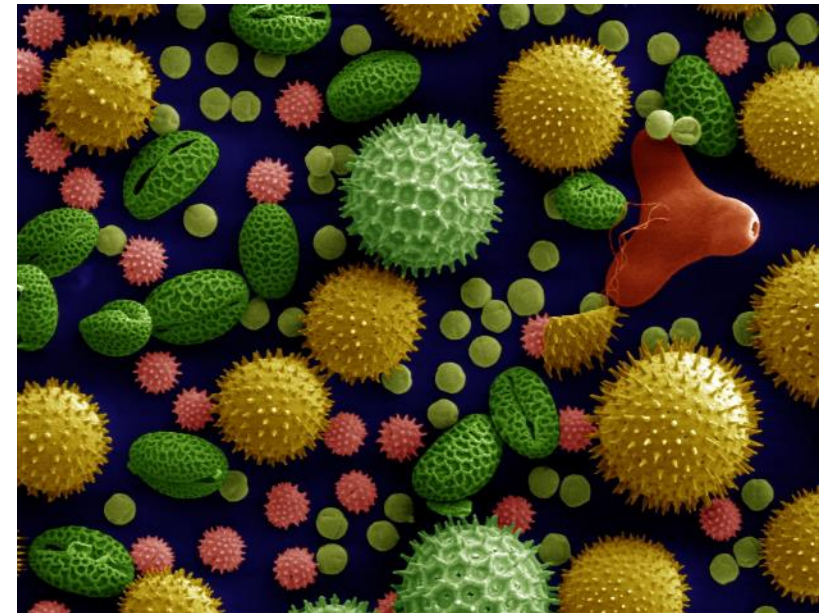
- All plants vary in the amount and quality of pollen that the flowers produce.
- Plants can either:
  - Produce lots of low quality pollen
    - Ex: raspberry, blackberry, sunflower, pine
  - Produce very little of high quality pollen
    - Ex: canola, almond

# Why do bees need pollen?

- Pollen is necessary for the growth and development of honey bees.
- Larvae are fed both brood food and bee bread.
- Soon after emergence, bees will consume bee bread to finalize their development.
- One worker larvae requires 124-145 mg of pollen.
- High protein content → longer life
- Low protein content → decrease in brood rearing
- Protein content is key for a healthy hive.

# Pollen collection

- A colony requires 15-55kg of pollen each year.
- A single colony can collect ~57kg of pollen per year.
- 15-30% of foragers collect pollen.
- Pollen is chosen by its odor and grain shape, not by its nutritional value.



# Pollen collection - Corbicula

- Honey bees carry pollen on the corbicula ("pollen basket")
  - Located on the last pair of legs.
  - Specialized hair structure designed for carrying pollen.
- One honey bee can carry a pollen load that weighs ~35% of its own body weight.



Hind leg of *Apis mellifera* (Honeybee)  
Camp Mabry Nat. Guard, Austin, Travis Co., Texas  
N30.321 W97.767  
June 22, 2006

Public Domain image by Christopher Johnson  
Produced as part of the "Insects Unlocked" project  
University of Texas at Austin

# Pollen collection – In the hive

- Workers add glandular secretions to the pollen.
  - Secretions contain enzymes and acids that prevent bacterial growth during long-term storage.
- “bee bread” = stored pollen
  - Only stored for a few months.
- Workers also add microbes to pollen.
  - Enzymes from microbes break down the pollen and make the nutrients and amino acids available.



# How can a beekeeper help?

- Check your surroundings!
  - Are the plants around the hives good pollen sources?
  - Not all blooming flowers are beneficial to bees.
    - Ex: ornamentals
- Honey bees need variety!
  - One type of pollen does not supply bees with all of the nutrients they need.
  - Variety of pollens = variety of nutrients
  - Pollen quality overrides quantity



# How can a beekeeper help?

- Familiarize yourself with nectar and pollen plants in your area.
  - Can vary depending on season.
- If there is a lack of pollen, or pollen quality is low in the area, substitute pollen may be applied within the hive, or made available nearby.
  - Pollen patty, dry pollen substitute.

# Texas Bee Botany

- Xerces Society (<http://www.xerces.org/>)
- Native American Seed Mix (<http://www.seedsource.com/>)
- NASA ([http://honeybeenet.gsfc.nasa.gov/Honeybees/Forage\\_info.htm](http://honeybeenet.gsfc.nasa.gov/Honeybees/Forage_info.htm))
- USDA (<http://plants.usda.gov/checklist.html>)





Bloom Period	Common Name	Scientific Name	Flower Color	Max. Height (Feet)	Water Needs L: low; M: medium; H: high	Notes
<b>Forbs</b>						
All species are perennials, unless otherwise noted. Max. Height is an average, individual plants may vary.						
Early	1 Antelope horns milkweed	<i>Asclepias asperula</i> ssp. <i>capricornu</i>	green	2	M	<i>Asclepias</i> spp. are host plants for monarch, queen, and soldier ( <i>Danaus</i> spp.) butterflies; highly attractive to bees and beneficial insects
	2 Cream wild indigo	<i>Baptisia bracteata</i>	pale yellow	2	L	Found in eastern half of the region; visited by queen bumble bees and other long-tongued bees; butterfly and moth host plant
	3 Prairie penstemon	<i>Penstemon cobaea</i>	purple	2	L	Grows in a variety of soils; visited by butterflies, moths, and bees; a host plant for the dotted checkerspot butterfly ( <i>Poladryas minuta</i> )
	4 Prairie spiderwort	<i>Tradescantia occidentalis</i>	blue	2	L	Drought tolerant; will grow in partial shade; deer-resistant; attracts bumble bees, honey bees, and beneficial flies
	5 Scarlet globemallow	<i>Sphaeralcea coccinea</i>	orange	1	L	<i>Sphaeralcea</i> spp. are drought tolerant; visited by bees and butterflies; a host plant for the small checkered skipper ( <i>Pyrgus scriptura</i> )
Mid	6 Blanketflower	<i>Gaillardia pulchella</i>	red/ orange	2	L	Establishes easily from seed; supports a wide range of beneficial insects; grows as an annual, biennial, or perennial
	7 Lemon beebalm	<i>Monarda citriodora</i>	purple	2	L	Hawk moths, hummingbirds, and long-tongued bees (including bumble bees) are visitors; grows as an annual, biennial, or perennial
	8 Mexican hat	<i>Ratibida columnifera</i>	yellow	2	L	Foliage repellant to deer; attracts bees and beneficial flies, beetles, and wasps during its long bloom period
	9 Narrowleaf coneflower	<i>Echinacea angustifolia</i>	pink	3	L	Key nectar source for skippers; <i>Echinacea</i> spp. attract bees in the genera <i>Bombus</i> , <i>Melissodes</i> , <i>Svastra</i> , and <i>Megachile</i>
	10 Narrowleaf mountain mint	<i>Pycnanthemum tenuifolium</i>	white	3	M	Found in eastern half of the region; attracts blue and copper butterflies, many bees (including honey bees), beetles, flies, and more
	11 Purple poppy mallow	<i>Callirhoe involucrata</i>	purple	1	L	Drought tolerant; long bloom period; attracts bees and beneficial flies; a host plant for the grey hairstreak butterfly ( <i>Strymon melinus</i> )
	12 White prairie clover	<i>Dalea candida</i>	white	2	L	This and <i>D. purpurea</i> very attractive to pollinators and beneficial insects; a host plant for the southern dogface butterfly ( <i>Zerene cesonia</i> )
Mid-Late	13 Baldwin's ironweed	<i>Vernonia baldwinii</i>	purple	5	L	Grows under a variety of conditions; spreads via rhizomes; this and other <i>Vernonia</i> spp. attract late summer butterflies and bees
	14 Dotted blazing star	<i>Liatris punctata</i>	purple	2.5	M	<i>Liatris</i> spp. are the primary nectar source for many skipper species; attracts numerous bee and butterfly species (including monarchs)
	15 Leavenworth's eryngo	<i>Eryngium leavenworthii</i>	purple	3	L	Showy annual with spiky flowers that provides brilliant summer color; attracts bees; deer-resistant; tolerates partial shade
	16 Wholeleaf rosinweed	<i>Silphium integrifolium</i>	yellow	6	L	Grows in a variety of soils; attracts bees and beneficial flies, and is a host plant for the silphium moth ( <i>Papaipema silphii</i> )
Late	17 Aromatic aster	<i>Symphotrichum oblongifolium</i>	purple	2	L	Late blooming with fragrant foliage; visited by butterflies, moths, bees, and beneficial wasps and flies; a host plant for many moths
	18 Azure blue sage	<i>Salvia azurea</i>	blue	6	L	Grows in a variety of soils; fragrant foliage; attracts long-tongued bees; a host plant for the hermit sphinx moth ( <i>Lintneria eremitus</i> )
	19 Giant goldenrod	<i>Solidago gigantea</i>	yellow	7	M	Very adaptable; spreads via rhizomes; beyond attracting pollinators, goldenrods ( <i>Solidago</i> spp.) are host plants for several moth species
	20 Maximilian sunflower	<i>Helianthus maximiliani</i>	yellow	8	L	This plant may spread easily, via rhizome and seed; very attractive to a huge diversity of bees and other pollinators
	21 Showy goldenrod	<i>Solidago speciosa</i>	yellow	5	M	Goldenrods are frequented by beneficial solitary wasps, pollen-eating soldier beetles, honey bees, monarch butterflies, and much more
<b>Shrubs and Trees</b>						
Early	22 Chickasaw plum	<i>Prunus angustifolia</i>	white	25	M	Thicket-forming shrub or tree with fragrant flowers that attract bees and butterflies; a host plant for several butterflies
Mid	23 False indigo bush	<i>Amorpha fruticosa</i>	purple	12	M	Prefers moist soil; attracts a diversity of bees and beneficial insects; a host plant for numerous butterfly and moth species
Mid-Late	24 Buttonbush	<i>Cephalanthus occidentalis</i>	white	8	H	Prefers wet or moist soil; attracts many long-tongued bees and butterflies; a host plant numerous moths and butterflies



Credit: Southern Plains Pollinator Plants, Xerces Society



# Honey Bee Forage Map

- Created by Honey Bee Net team at the Goddard Space Flight Center.
- Interactive map
  - Click on your region to show the list of honey bee forage plants.
- [http://honeybeenet.gsfc.nasa.gov/Honeybees/Forage\\_info.htm](http://honeybeenet.gsfc.nasa.gov/Honeybees/Forage_info.htm)

**HONEY BEE FORAGE MAP**  
 The 14 regions of the Ayers and Harman honey bee forage map are indicated below. These regions are based on natural patterns of land use and flora. Note that selecting the large pink area in the northern boreal region of the Canadian provinces will not provide a list of species at this time. Ayers and Harman indicated that this is not an important beekeeping region. Forage is similar to that of Alaska and is characterized by long harsh winters and a short forage season. Other sources of forage information exist for the region and we will attempt to provide that information as soon as we are able.

Click on the map to see a list of honey bee forage species and their blooming periods for any region within a state.

**Bee Forage Regions**

**List of Honey Bee Forage Species within Region 12 for the State of TX**  
 Ordered by Begin Bloom Month

USDA code	Family	Latin Name	Common Name	Plant Type	Begin Bloom Month	End Bloom Month	Sig
CUSA4	Cucurbitaceae	<i>Cucumis sativus</i>	cucumber	C	1	12	N
VACCI	Ericaceae	<i>Vaccinium</i>	Blueberry, huckleberry	SDB	1	6	N
CUME	Cucurbitaceae	<i>Cucumis melo</i>	Cantaloupe, muskmelon, casaba,	C	2	8	N
ULMUS	Ulmaceae	<i>Ulmus</i>	Elm	TDB	2	4	N
QUERC	Fagaceae	<i>Quercus</i>	Oak	TDB	3	5	N
BESC	Rhamnaceae	<i>Berchemia scandens</i>	Rattan vine, supplejack	V, F	3	6	Y
GAPU	Asteraceae	<i>Gaillardia puchella</i>	Marigold, indian blanket	F	4	10	N
MELIL	Fabaceae	<i>Melilotus</i>	Sweet clover (white/yellow)	F	4	10	Y
MONAR	Lamiaceae	<i>Monarda</i>	Horsemint, wild bergamot, bee-balm	F	4	10	Y
TRIN3	Fabaceae	<i>Trifolium incarnatum</i>	Crimson / Italian clover	F	4	6	Y
TRRE3	Fabaceae	<i>Trifolium repens</i>	White, dutch clover	F	4	10	Y
TRVE	Fabaceae	<i>Trifolium vesiculosum</i>	Arrowleaf, yuchee clover	F	4	7	N
VICIA	Fabaceae	<i>Vicia</i>	Vetch, tare	F	4	9	Y
ACGR	Fabaceae	<i>Acacia greggii</i>	Catclaw, devil's claw, Texas mimosa	S	4	7	N
LIGUS2	Oleaceae	<i>Ligustrum</i>	Privet, hedge plant	S	4	7	N
PRGLG	Fabaceae	<i>Prosopis glandulosa</i>	Mesquite	S	4	6	N
ILEX	Aquifoliaceae	<i>Ilex</i>	Holly, yaupon	TEB	4	6	Y
CILAL	Cucurbitaceae	<i>Citrullus lanatus</i>	watermelon	C	5	8	N
ASTER	Asteraceae	<i>Aster</i>	Aster	F	5	11	N
SOBIA	Poaceae	<i>Sorghum bicolor</i>	Sorghum, broom-corn	F	5	10	N
TRSE6	Euphorbiaceae	<i>Triadica sebifera</i>	Chinese tallow tree, vegetable tallow	TDB	5	6	Y
GOSSY	Malvaceae	<i>Gossypium</i>	Cotton	C	6	9	N
GUTET	Asteraceae	<i>Gutierrezia texana</i>	Bromweed	F	7	10	N
SOLID	Asteraceae	<i>Solidago</i>	Goldenrod	F	7	11	N
GUSA2	Asteraceae	<i>Gutierrezia sarothrae</i>	Matchweed, snakeweed	F	8	10	N

**Plant Type codes:**  
 T - tree  
 TDB - tree, deciduous broadleaf  
 TEN - tree, evergreen needleleaf  
 TEB - tree, evergreen broadleaf  
 S - shrub  
 SEB - shrub, evergreen broadleaf  
 SDB - shrub, deciduous broadleaf  
 V - vine  
 VDB - vine, deciduous broadleaf  
 G - grass  
 F - forb (herbaceous flowering plants, non-woody)  
 C - crops/cultivated

**Sig column**  
 This column indicates whether or not the species is considered a very important nectar source species within the state and region selected. If it is a significant source, it is indicated here with a "Y" and the row is highlighted.

In this context, important is defined by Ayers and Harman as those species that "reliably produce a large percent of the harvested honey" within the selected region.

RETURN to map