The Pollination of Native Plants
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Overview

Types of Insect Pollinators

Pollination

Access to Floral Resources

Flower Features & Attractants

Flower Development & Presentation of Resources

Green Sweat Bee
Agapostemon sp.
Types of Insect Pollinators

Bees  Social Wasps  Solitary Wasps

Butterflies  Moths  Beetles  Flies
Types of Insect Pollinators

Bees

Over *4000 species* of bees in North America

*300+ species* of bees in Minnesota

Small Carpenter Bee
Ceratina sp.
Types of Insect Pollinators

Bees - Common Genera in Minnesota

Mining Bees
Andrena spp.

Long-Horned Bees
Melissodes spp.

Mason Bees
Osmia spp.

Small Carpenter Bees
Ceratina spp.

Leafcutter Bees
Megachile spp.

Small Resin Bees
Heriades spp.

Carder Bees
Anthidium spp.

Digger Bees
Anthophora spp.
Types of Insect Pollinators

Bees - Common Genera in Minnesota

Sweat Bees Halictus spp.
Green Sweat Bees Agapostemon spp.
Small Sweat Bees Lasioglossum spp.
Sweat Bees Augochlora spp.
Sweat Bees Augochlorella spp.
Cellophane Bees Colletes spp.
Yellow-Faced Bees Hylaeus spp.
Types of Insect Pollinators

Bees - Common Genera in Minnesota

Cuckoo Bees
Nomada spp.

Cuckoo Bees
Triepeolus spp.

Cuckoo Bees
Sphecodes spp.

Cuckoo Bees
Coelioxys spp.
Types of Insect Pollinators

Bumble Bees, *Bombus* spp.
18 species in Minnesota
Types of Insect Pollinators

Social Wasps - Colony (Paper Nests)

Bald-Faced Hornets
Dolichovespula spp.
Paper nests in trees

Yellowjackets
Vespula spp.
Paper nests in trees or in the ground

Paper Wasps
Polistes spp.
Open paper nests on horizontal surfaces, tree limbs, house soffits

Visit Flowers to Feed on Nectar
Types of Insect Pollinators

Yellowjacket Wasps

Ground Nesting Colonies
Aggressive

Carnivores

Most insect stings are caused by social wasps NOT BEES

Picnic Visitors
Attracted to fruit, pop, meat

Flower Visitors
Docile
Types of Insect Pollinators

**Solitary Wasps**

- Great Golden Digger Wasps: *Sphex ichneumoneus*
- Great Black Wasp: *Sphex pensylvanicus*
- Mason Wasps: *Euodynerus spp.*

Construct Solitary Nests
NOT Aggressive
Types of Insect Pollinators

**Solitary Wasps = Beneficial Insects**
Hunt crickets, grasshoppers, katydids, sawfly larvae, caterpillars, beetles and bugs

- Potter Wasps
  - Eumenes spp.
- Thread-Waisted Wasps
  - Ammophila spp.
- Grass-Carrying Wasps
  - Isodontia spp.
Types of Insect Pollinators

**Butterflies and Moths**

Visit Flowers to Feed on Nectar

Long Mouthparts = Access to Deep Tubular Flowers
Types of Insect Pollinators

**Butterflies and Moths**

Butterflies prefer flowers with a large landing platform.

Large butterflies pick up pollen on their wings.

Small butterflies and moths pick up pollen on their head and mouthparts.
Types of Insect Pollinators

Beetles

**Soldier Beetles**
Chauliognathus spp.

**Long-Horned Beetles**
Cerambycidae Family

**Beneficial Insect**
Some adults and most larvae are predators of aphids

Visit Flowers to Feed on Nectar and Pollen
Types of Insect Pollinators

Flies
Syrphid Flies (Flower Flies) Family Syrphidae

Beneficial Insect
The larvae of many syrphid flies feed on aphids

Visit Flowers to Feed on Nectar and Pollen

Bee Mimics

Bumble Bee Mimics

Wasp Mimics
Types of Insect Pollinators

Flies

Bee Flies  Family Bombyliidae

Tachinid Flies  Family Tachinidae

Many have long, modified mouthparts
Pollination

FLOWER = Food/Nesting Materials
Nectar • Pollen • Resin • Oil

INSECT = Transfers Pollen to Other Plants ~ Pollination
Access to Floral Resources

**Tongue Length**

**Long Tongued**
- Bumble Bees Bombus spp.
- Butterflies and Moths

**Short Tongued**
- Yellow-Faced Bees Hylaeus spp.
- Syrphid Flies Family Syrphidae
Access to Floral Resources

Size

**Small**
Able to crawl into corollas of different widths to feed on resources

**Medium - Large**
Restricted by tongue length & flower access
Floral Features

Flower Forms - Simple to Complex

Easy Access

Composite
‘Daisy-Like’ Flowers
Azure Aster
Symphyotrichum oolentangiense

Access More Restrictive

Bilabiata
Smooth Beard Tongue
Penstemon digitalis

Access Very Restrictive

Closed
Requires a bee strong enough to pry flower open
Bottle Gentian
Gentiana andrewsii
Access to Floral Resources

Strength

White Turtlehead, Chelone glabra
Floral Resources

Pollen Collection - Bees

Only female bees have pollen-collecting structures

Pollen Basket (Corbicula)
Bumble Bees & Honey Bees

Pollen Collection on the Hind Leg
Most other bees

Pollen Collection on the Abdomen
Bees in the Leafcutter Family (Megachilidae)
Floral Resources

Pollen Collection - Packaged Pollen

Swamp Milkweed
Asclepias incarnata
Floral Resources

**Pollen Feeding - Bees, Flies, Beetles**

Pollen is a source of protein

Prairie Phlox, *Phlox pilosa*

Jacob's Ladder, *Polemonium reptans*

New England Aster, *Symphyotrichum novae-angliae*
Floral Resources

Buzz Pollination

Prairie Smoke
Geum triflorum

Solomon’s Seal
Polygonatum biflorum
Floral Resources

Attractants

Nectar Guides
- Prairie Phlox
  Phlox pilosa
- Wild Petunia
  Ruellia humilis

Stripes, spots or color contrasts on the flower

Flower Color & Color Contrast
- New England Aster
  Symphyotrichum novae-angliae
- American Pasqueflower
  Anemone patens
Floral Resources

**Attractants**

Flower Color & Color Contrast

Yellow petals and stamens only visual attractant

Bees do not ‘see’ red

Wild Columbine
Aquilegia canadensis

A human’s view of black-eyed susan flowers

A bee’s view of black-eyed susan flowers

Black-Eyed Susan
Rudbeckia hirta
Sequential Development

Wild Geranium
Geranium maculatum

Offset development of reproductive flower parts limits self-pollination

Male Phase  →  Female Phase  =  Protandrous
Sequential Development - Influence of Pollinator Activity

**Wild Geranium**
Geranium maculatum

**Presentation of Resources**

Mason Bees
Osmia spp.
*Collect Pollen*

Small Carpenter Bees
Ceratina spp.
*Feed on Nectar*

Syrphid Flies
Pipiza spp.
*Feed on Pollen*
Flower Development
Presentation of Resources

Sequential Development - Self-Pollinating Flowers

Bloodroot
Sanguinaria canadensis

Self-compatible
Self-pollinates around the third day of flower opening

Flowers during fluctuating temperatures and potentially low pollinator activity
Flower Development

Presentation of Resources

American Pasqueflower
Anemone patens

Sequential Development

Low nectar reward

Flowers track sun throughout the day creating a warm place for pollinators to forage

Female Phase  →  Male Phase  =  Protogynous
Flower Development
Presentation of Resources

**Pollen Presentation**

Canada Tick Trefoil
*Desmodium canadense*

Keel Depressed
Pollen Forcibly Ejected
Flower Activated

Leafcutter Bee
*Megachile sp.*
Flower Development
Presentation of Resources

Pollen Presentation

Harebell
Campanula rotundifolia

Pollinators visit for pollen and nectar

Male Phase ➔ Female Phase = Protandrous
Flower Development
Presentation of Resources

Pollen Presentation

Harebell
Campanula rotundifolia

Pollen is shed from anthers and drops into the bottom of the flower.

As the style elongates, hairs pick up the pollen grains.

Male Phase  Female Phase = Protandrous
Flower Development

Presentation of Resources

Pollen Presentation

Harebell
Campanula rotundifolia

Leafcutter bees collect/pick up pollen on their abdomen as they forage for nectar.

Bees feed on pollen presented on the style.
Flower Development

Presentation of Resources

**Pollen Presentation**

Harebell
Campanula rotundifolia

Hairs eventually retract, pollen falls off and the stigma becomes receptive

**Female Phase**

Pollinators visit for nectar
Flower Development

Presentation of Resources

Nectar Production/Nectary Location- Influence on Foraging Behavior

Wild White Indigo
Baptisia lactea

Flowers develop from the bottom of the raceme upward

Nectar production peaks during the female (pistillate) phase

Male Phase → Female Phase = Protandrous
Flower Development

Wild White Indigo
Baptisia lactea

Presentation of Resources

Nectar Production/Nectary Location - Influence on Foraging Behavior

Flowers primarily visited by queen bumble bees in early spring

Bumble bees land on the lowest open flowers on the raceme

Lowest flowers are in the female phase producing more nectar

Male Phase  $\rightarrow$ Female Phase = Protandrous
Flower Development

Presentation of Resources

Enter Violets Upside Down to Feed on Nectar

Downy Yellow Violet
Viola pubescens

Illustration redrawn from:
Flower Development

Presentation of Resources

Nectar Production/Nectary Location - Influence on Foraging Behavior

Prairie Phlox
Phlox pilosa

Nectary at the base of the flower corolla
Anthers staggered - 2 near opening, 2 below
Anthers shed pollen first (protandrous)
Flower Development
Presentation of Resources

Nectar Production/Nectary Location- Influence on Foraging Behavior
Pollen Presentation

Prairie Phlox
Phlox pilosa

Initial visits after flowers open are by pollen-foraging pollinators
Flower Development

Presentation of Resources

**Nectar Production/Nectary Location- Influence on Foraging Behavior**

**Pollen Presentation**

Prairie Phlox  
*Phlox pilosa*

Butterflies and moths are the most effective and primary pollinators

Flowers are self-incompatible (require cross-pollination)
Top 10 Things YOU can do for Pollinators

1. Provide a Variety of Flowering **Native Plants** That Overlap Through The Season

2. Leave Areas of **Bare Soil** For Ground Nesting Bee Species

3. Place/bundle hollow plants stems in the landscape for **Cavity-Nesting Pollinators**

4. Leave Standing **Tree Snags**, Old Potter Wasp Nests, Standing Hollow Stems

5. Do not use pesticides.

6. Provide **Larval Host Plants** for Butterflies & Moths

7. Do Not Disturb **Existing Nesting Sites** in your landscape

8. Create **New Habitat** for pollinators and remove invasive plants

9. **Use Straight Native Plant Species**
   Plant breeding can cause flowers to lose fragrance, nectar, pollen & bee accessibility

10. **Talk to Your Neighbors** or friends about the importance of pollinators