



# ***All About Those Amazing Bees***

**September 7, 2019  
Summerland Fall Fair**

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Retired Pollination Biologist, Summerland, BC**



# *Goal of this talk:*

- **To introduce you to the fascinating world of the bees**
  - Who are they?
  - What do they do?
  - Where and When can you find them?
  - Why are they important?
  - How can we help to conserve them?

***Do you see this when I say BEE?***



**Honey Bee**

*Or do you see this when I say BEE?*

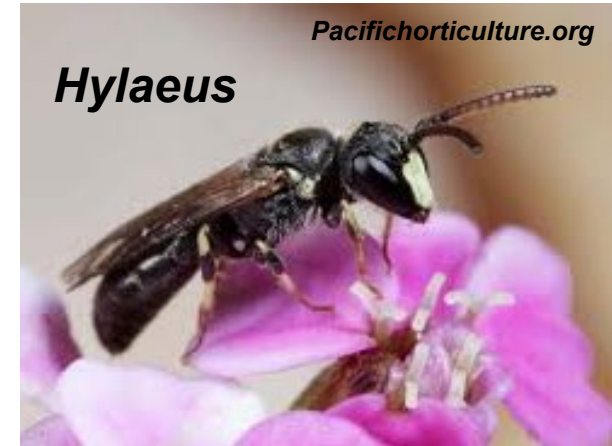


**Bumble Bee**

# What about these? Are they **BEEES**?



# What about these? Are they **BEEES**?



**Yes, these are Bees!**

# **Bee Diversity: How many species in the world?**

- ✓ **Approx. 21,500 bee species**
  - ❖ **7 honey bee species**
  - ❖ **255+ bumble bee species**
- ✓ **So, what about the other 21,000+ species?**

# How many bee species?

- ✓ **5000+ in North America**
- ✓ **800 in Canada**
- ✓ **450 in British Columbia**
- ✓ **390 in the Okanagan/Thompson**
  - ✓ **49% of the species in Canada**
  - ✓ **87% of the species in BC**
  - ✓ **1/3 not found elsewhere in Canada**



# Bee Evolution

- Order Hymenoptera, ‘membrane-winged’ insects includes Bees, Ants, Wasps
- Bees evolved from wasps
  - closest relatives are the Spicid wasps



- Wasps are carnivores – feed on animals, insects
- Bees are herbivores – feed on plants
  - Carbohydrate: Nectar
  - Protein: Pollen (grain that contains the male gamete)

# ***Life Habits and Features of Bees***

## **■ Males VS Females**

- Males look after themselves and search for a mate**
- Females build the nest, forage and rear young**

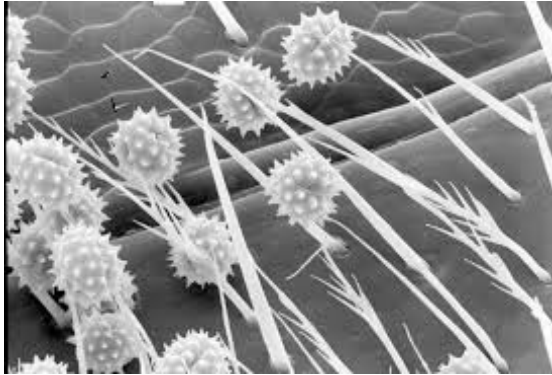
## **■ Solitary vs Social vs Parasitic**

- Solitary – live on their own**
- Social – in groups with Queen (reproductive female), Workers (sterile females) and Drones (males)**
- Parasitic on other closely related bee species**

## **■ Short (weeks) to Long (years) lives**

# *Life Habits and Features of Bees*

## ■ Plumose Hairs



## ■ Bees are 'Centre-Place' Foragers

- Are important pollinators

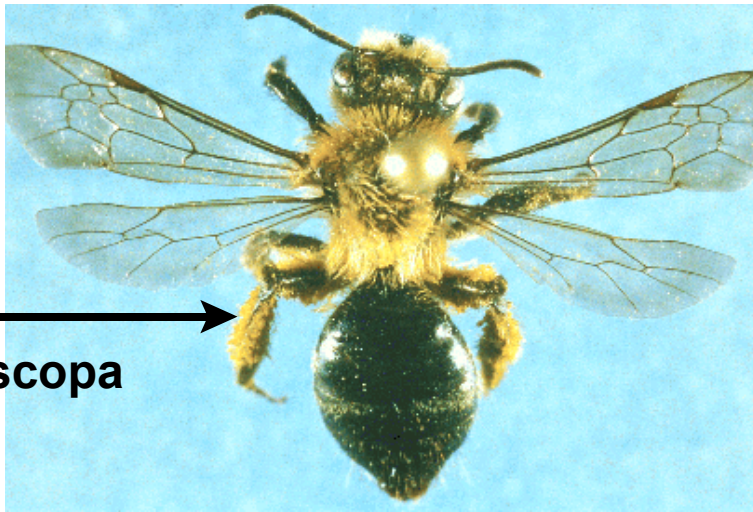
## ■ Have structures for food collection

- Enlarged foregut for nectar (honey stomach)
- Pollen collection areas (scopa, pollen baskets)

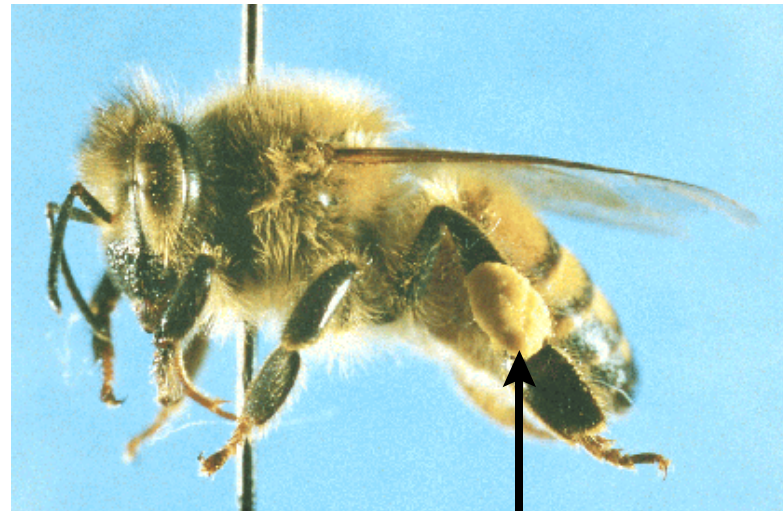
# Ú Characteristics of Bees

**Plumose hairs**

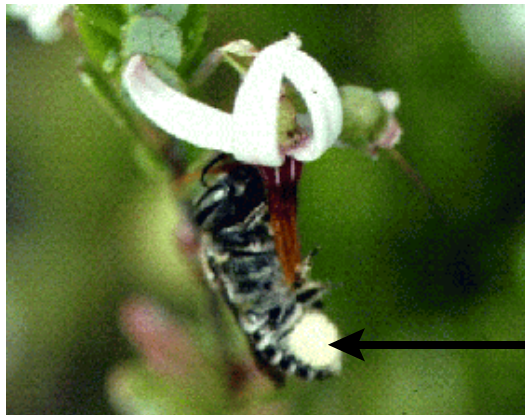
**Specialized structures of pollen collection**



scopa



pollen pellet on pollen basket



scopa

# *Bees are the most important biotic pollinating agents.*

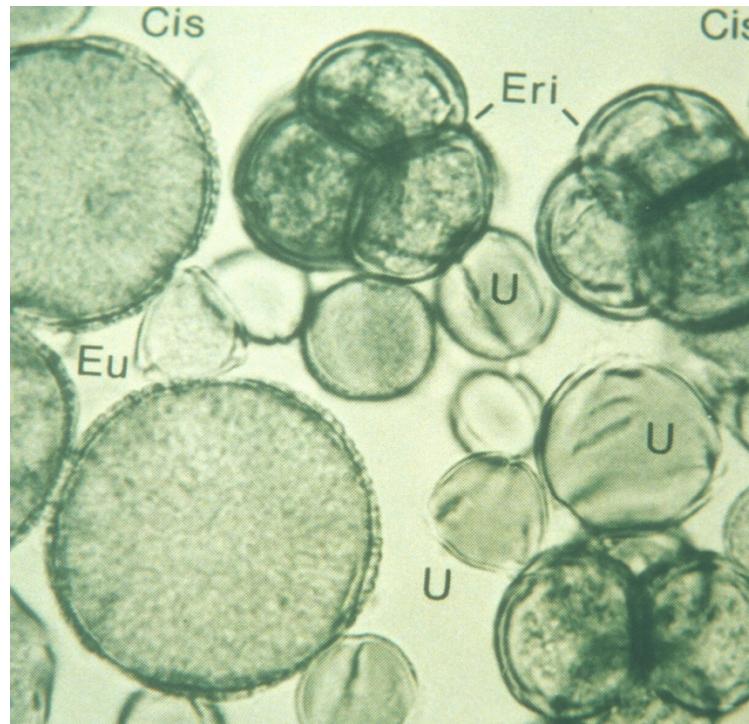
- Ú Plants provide protein (pollen) and nectar (carbohydrates).
- Ú Bees move pollen for plants.



**Central Place Foragers**  
- have a home

# But, what is pollination?

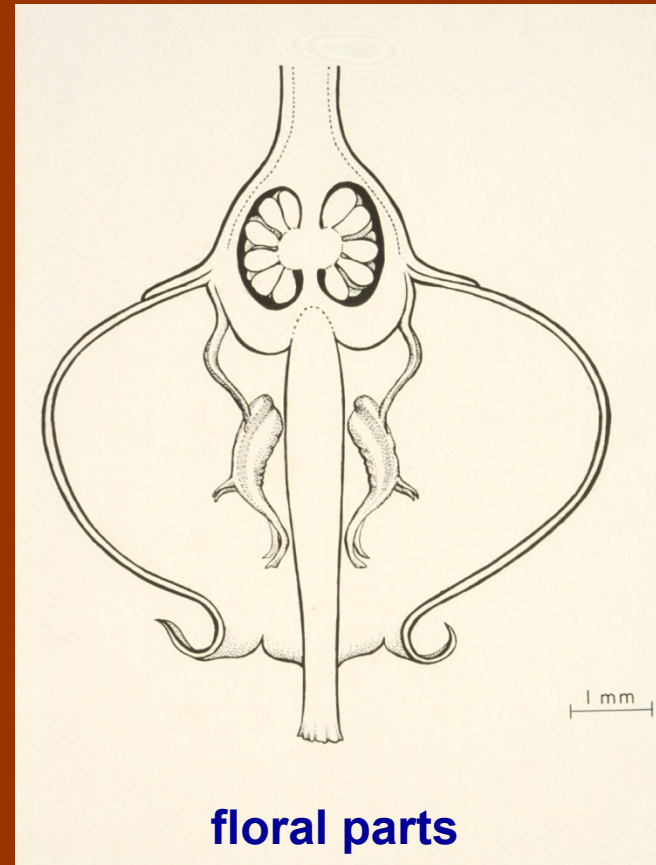
- Simple process
- Movement of pollen from male part to tip of female part of a flower



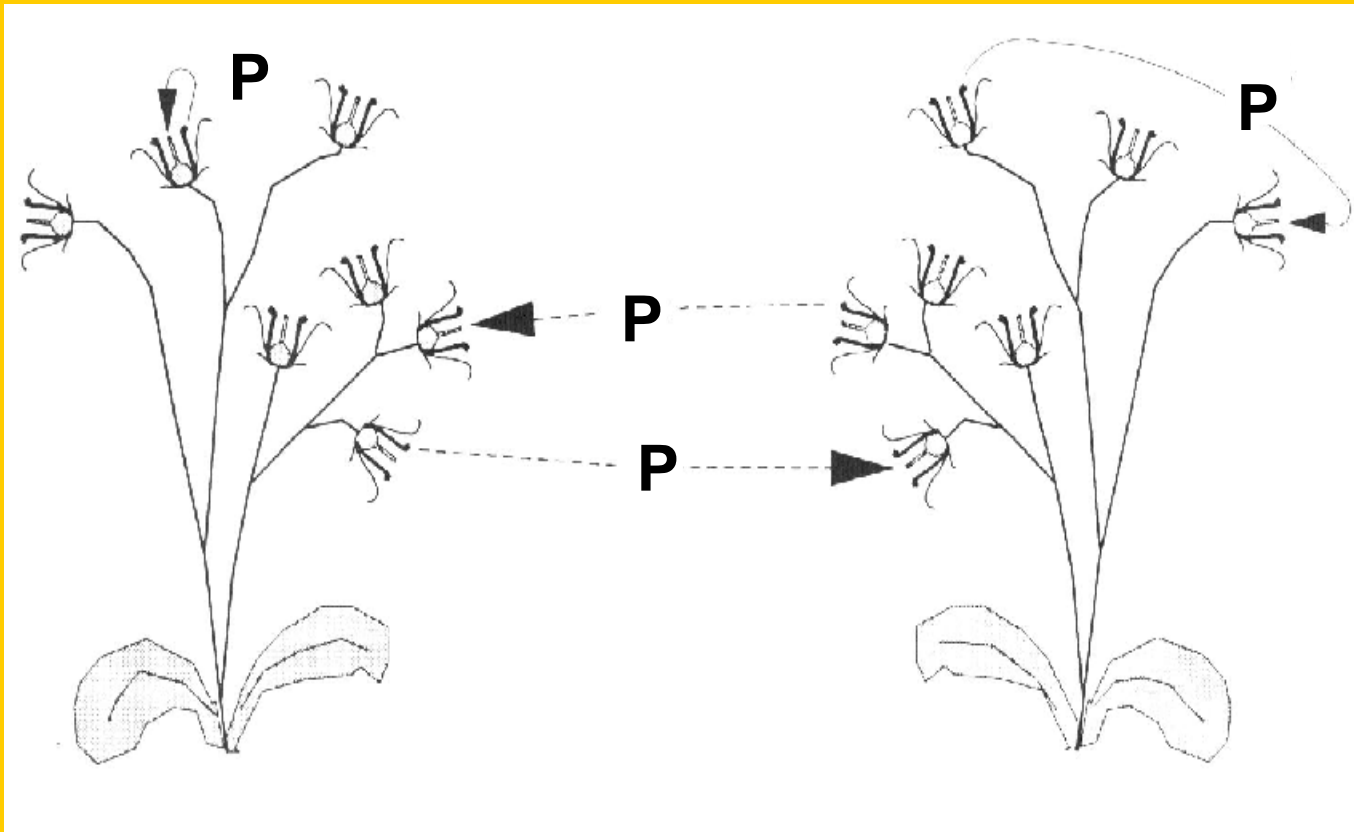
**Pollen Grains**

# *Pollination - simple, but important step in process*

- flower bud initiation and development
- flower maturation
- pollen production and release
- pollen movement from male to female parts
- pollen germination and tube growth
- fusion of egg and sperm nuclei
- fruit growth and development
- seed growth and maturation
- ripe fruit and seed
- seed release



# ***Pollination of flowers***







# Why is pollination important?

- **Value to us**
  - **1/3 of our diet depends on pollination**
    - **Many high-value crops (fruits & vegetables)**
    - **Seed production**
- **Value to natural systems**
  - **Food for wildlife**
  - **Plant reproduction**
  - **Rare plant survival**
  - **Ground cover**

# Social Species

## - Drones, Queens & Workers

- Cooperation among related individuals
  - Sweat Bees
    - Contact among adults and immatures
- Obligatory Eusocial
  - Bumble Bees
    - Annual colonies - solitary (wintered females) become social with first brood
- Highly Social
  - Honey Bees
    - Perennial Colonies



# *Solitary Species*

- **Most Bees are Solitary**
- **Each female acts alone to locate a site and build a nest, collect provisions, lay eggs and rear young**
- **No contact between individuals of separate generations**



# Parasitic Species

- Called 'Cuckoo Bees'
- Trick other bees to rear their young
- No pollen-collecting structures
- In different groups
  - Bumble Bee parasites – kill queen and take
  - Solitary species parasitic on related solitary bees – sneak into nest, kill offspring and lay egg in cell

*Bombus (Psithyrus)*  
on Bumble Bees



bugguide.net



*Nomada on Andrena*

*Sphecodes on Halictus*



bugguide.net



*Stelis on Osmia*

bugguide.net

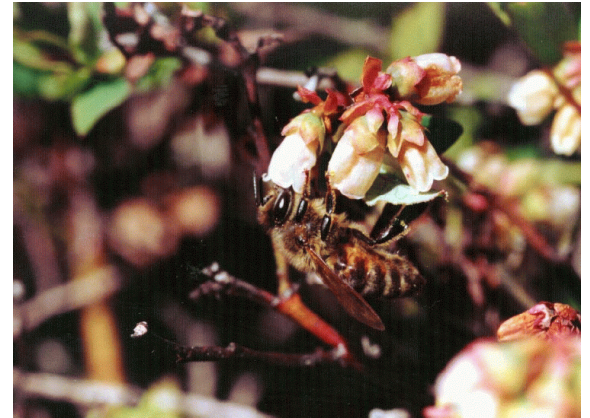


*Coelioxys on Megachile*

# *Bee Foraging Types*

## ❖ Generalists = Polylectic

- Feed on a wide range of plant species
- Often with longer life span
- Very Common
- Honey Bees, Bumble Bees, Sweat Bees, etc.



# Bee Foraging Types

## ❖ Specialists = Oligolectic

- Resource specialists on one group of plants for pollen
- Short active season
  - *Andrena carolina* on *Vaccinium*
  - *Macropis nuda* on *Lysimachia*
  - *Melissodes desponsa* on *Cirsium*

*A. carolina*



yorku.ca

Ont.

bugguide.net

*M. nuda*



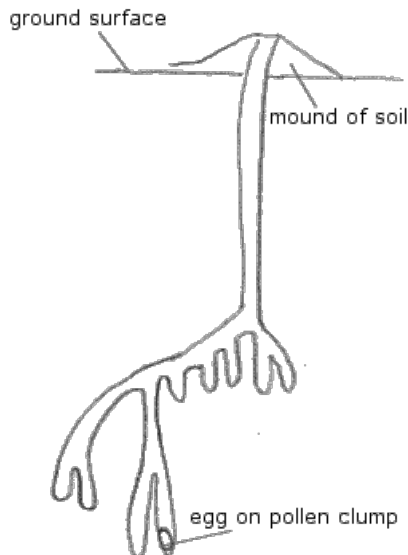
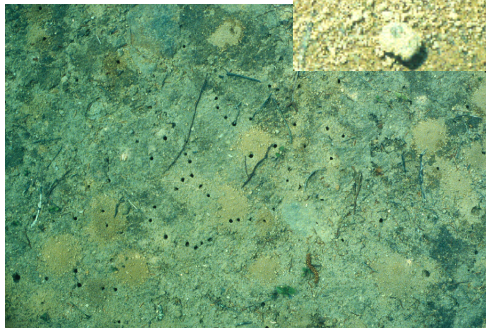
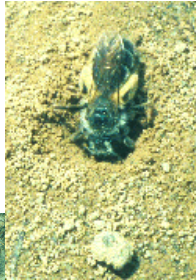
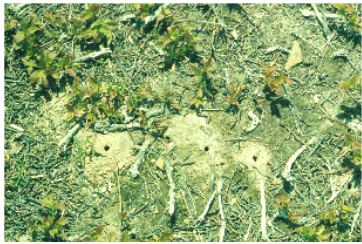
*M. desponsa*



bugguide.net

# *Most are Ground Nesters*

- **Bumble Bees**
- **Many solitary groups including halictids, andrenids, colletids**
  - **May have specific soil requirements**
  - **Short, simple or long, complex tunnels**



# Some Above Ground Nesters

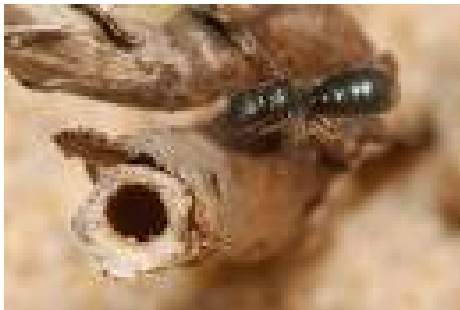
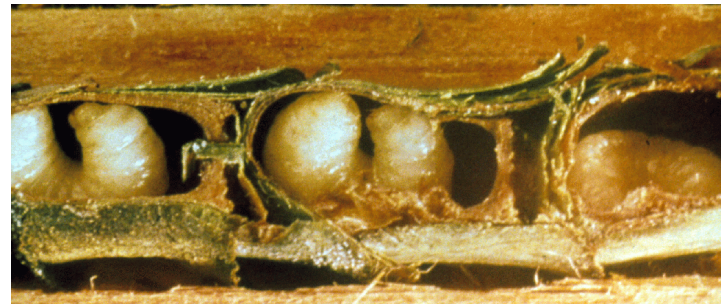
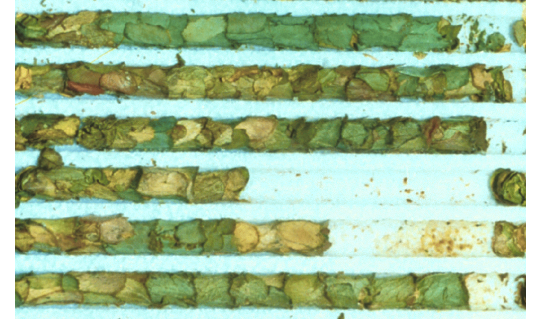
## ■ Two Groups:

### □ Pre-existing cavities

- Leafcutter and mason bees
- Some bumble bees

### □ Excavate nests

- eg use pithy stems, *small carpenter bee*



**\*Can build artificial nests for these bees to aid in population increase \***



# ***Bee Classification***

- **Superfamily Apoidea – 2 groups**
  - **Spheciformes – Sphecid Wasps**
  - **Apiformes – Bees, 7 Families**
    - **Andrenidae\*** – Mining Bees,
    - **Apidae\*** – Honey Bees, Bumble Bees, Carpenter Bees, Orchid Bees, Digger Bees
    - **Colletidae\*** – Plasterer or Polyester Bees
    - **Halictidae\*** – Sweat Bees
    - **Megachilidae\*** – Mason Bees, Leafcutter Bees
    - **Melittidae\*** – often floral specialists
    - **Stenotritidae** – only in Australia

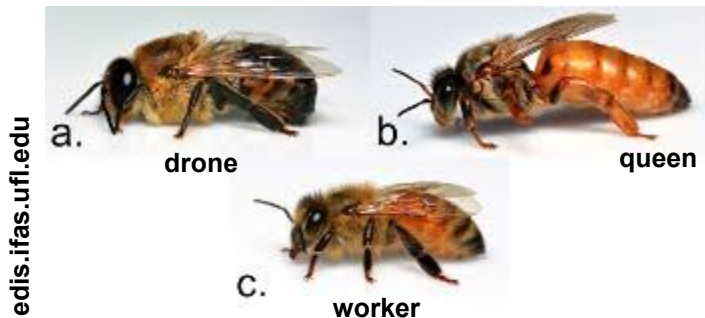
**\*found in the Okanagan/Thompson**

# Bees in the Okanagan Thompson region



## ➤ Apidae – honey bees

- 7 species native to Asia, Africa and Europe
- perennial colonies, highly social
- food stores in colony (honey, pollen) to survive adverse conditions
  - drought, winter
- one species, European honey bees (*Apis mellifera*)



# European Honey Bee



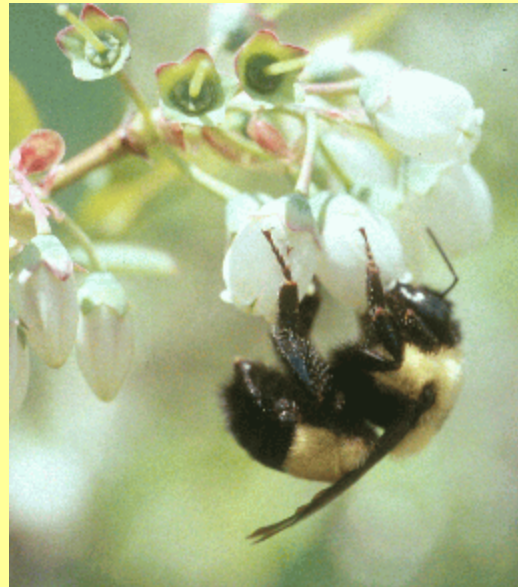
- ! management very well known**
- ! available world-wide**
- ! easily moved where needed**
- ! generalist foragers**
- ! income from other products**

# ***Bees in the Okanagan Thompson region***

## **➤ Apidae – bumble bees**

- 35 species**
- hairy, black and yellow – sometimes white and orange**
- small to large**
- annual colonies, highly social**
  - queen starts colony in spring and rears first offspring**
  - workers look after colony and foraging**
  - reproductives (queens and males) produced at end of summer**
  - new queens mate and overwinter**
- limited amount of food in colony**

# *Indigenous Bumble Bees (Bombus spp.)*

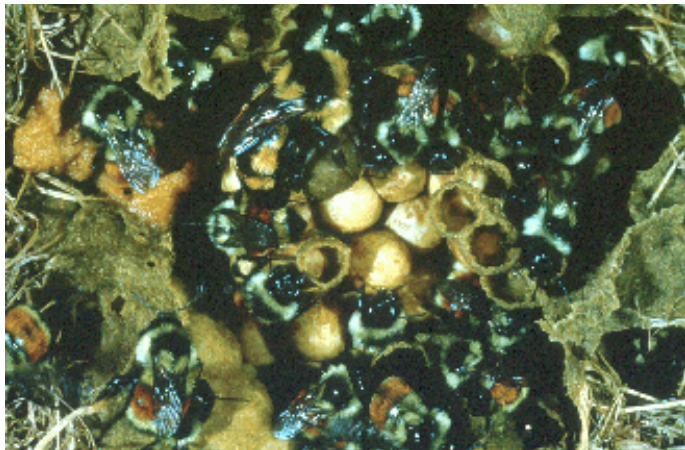


***Bombus (Psithyrus)* -  
parasitic**



# Bumble Bees

- ! effective on specific crops
- ! useful in greenhouses
- ! forage in poorer conditions
- ! small, expensive colonies
- ! useful in greenhouses



# Bees in the Okanagan Thompson region

## ➤ Apidae – solitary species

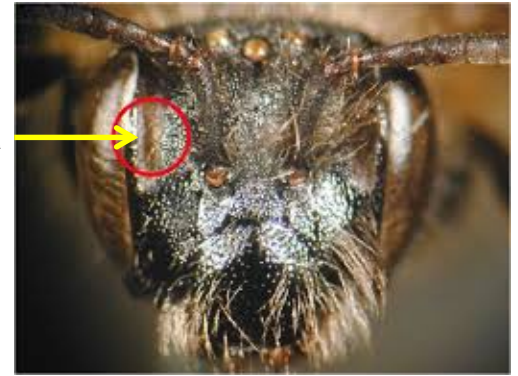
- Small carpenter bee (*Ceratina*)
- Digger bees (*Anthophora*)
- Long-horned bees (*Melissodes*, *Eucera*)



# Bees in the Okanagan Thompson region

## ➤ Andrenidae – solitary species

- Mining bees (*Andrena*)
- Large group
- Small to medium sized
- Ground nesters
- Important pollinators
- Usually short adult lives



facial fovea

konchudb.agr.agr.kyushu-u.ac.jp

*A. carolina*



yorku.ca

WATER  
Out. 7-2  
G. K.

*A. perplexa*



yorku.ca

Elanor H. Hall  
Emerg. Sp. Lab.  
P.O. Box 500  
New Brunswick, N.B.

*A. pallidifovea*



yorku.ca

1-844-777-7777  
www.yorku.ca

*Nomada* - parasitic



yorku.ca

© Anne Ziegler



# *Andrena* (Digger Bees)



# Bees in the Okanagan Thompson region

## ➤ Halictidae – solitary species

- Sweat Bees
- Large group of small bees
- Very common

*Agapostemon spenda*



entnemdept.ufl.edu

*Halictus rubicundus*



bugguide.net

yorku.ca

*Halictid* at nest entrance



entnemdept.ufl.edu

bugguide.net

*Agapostemon texana*



yorku.ca

Inaturalist.org

*Halictus*



bugguide.net



*Sphecodes* -  
parasitic

# *Halictids* (Sweat Bees)



*Field Identification of Bees Foraging at Blueberry*

# Bees in the Okanagan Thompson region

## ➤ Megachilidae – solitary species

- Mason Bees (*Osmia*)
- Leafcutting bees (*Megachile*)
- Carry pollen on the abdomen
- Nest in cavities above ground



*Coelioxys* -  
*parasitic*



*Stelis* - *parasitic*



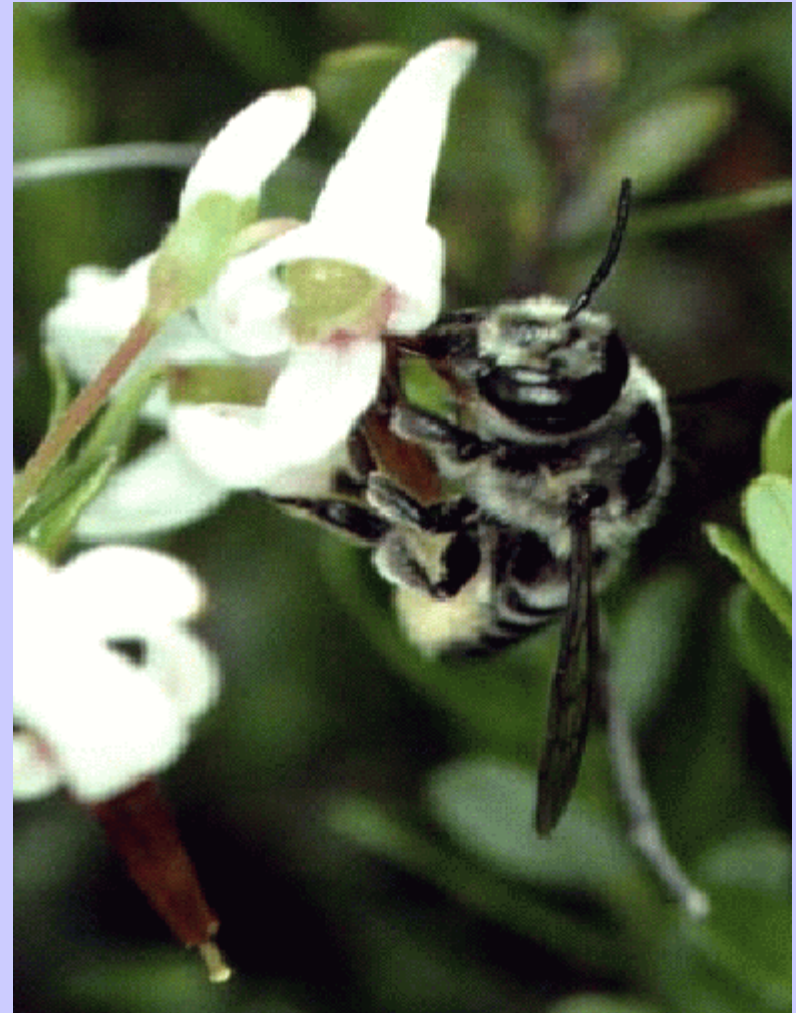
# *Megachilids*

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*Osmia* (Mason bees)

(Leafcutting bees)  
*Megachile*



# Bees in the Okanagan Thompson region

## ➤ Colletidae – solitary species

- Cellophane Bees
- Plasterer Bees (*Colletes*)
- Yellow-Faced Bees (*Hylaeus*)
  - carry pollen in gut



researchgate.net

Cellophane Bee cell

*C. compactus*



Forke et al. 2011  
37 Aug., 11  
Palau, Micronesia

yorku.ca

*C. hyalinus*



yorku.ca

pacifichorticulture.org

*Hylaeus*



*H. modestus*



yorku.ca

CANADA: NS  
MONTREAL: 7-11  
18-01-2011, NY  
Col. Cary She

*H. hyalinatus*



yorku.ca

Col. Cary She

# Bees in the Okanagan Thompson region

## ➤ Melittidae – solitary species

- Small group of bees in Africa and temperate areas
- (*Melitta*)
- Small, dark and rare
- Often specialist foragers





# ***What do bees require to live?***

- **Food: flowers**
- **Shelter:**
  - **Nest sites**
  - **Nesting materials – e.g. leafcutter bees, mason bees**
- **Mating areas**



# Bee Phenology



*Bombus*

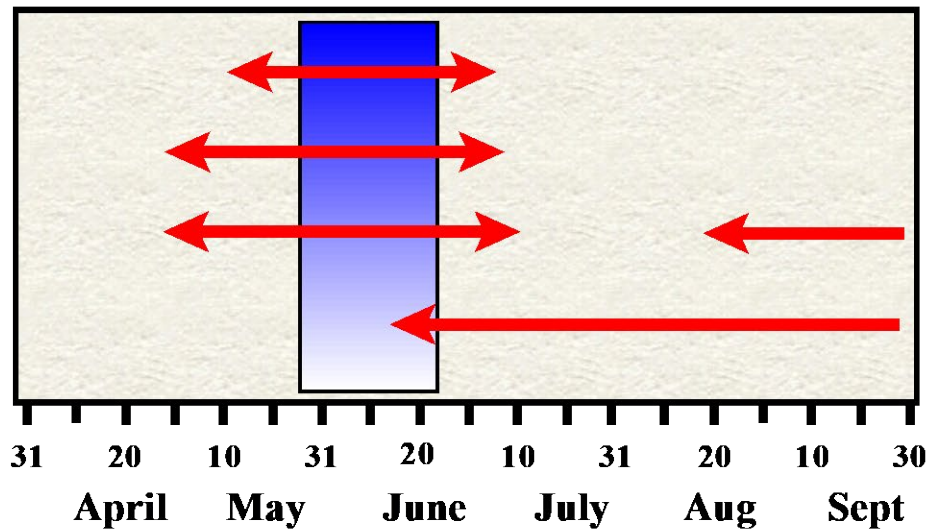


*Andrena*



*Osmia*

*Osmia*  
*Andrena*  
*Bombus (Q)*  
*Bombus (W)*



 Blueberry Flowering Period

# ***Why are bees threatened?***

## **■ Loss of Habitat**

- Lack of nesting areas, food**
- Small areas of habitat available**

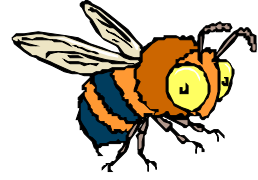
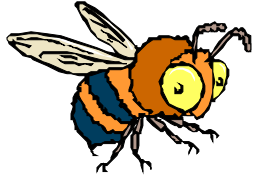
## **■ Climate Change**

- Lack of synchronization of flowering and bee emergence**

## **■ Toxic chemicals**

- Pesticides**

# How Can We help the Bees:



**A strategy for indigenous bee conservation should include Bee Forage, Nesting Sites, Mating Areas and Management Effects.**

- unproductive land is valuable bee habitat
  - edges are important
  - judicious use of herbicides and other pesticides
  - adjacent crop and sprout fields
  - early successional land should be maintained
  - needs of different bees must be considered
-

# ➤ **RESOURCES**

## ➤ **Pollinator Gardens**

- **Summerland Ornamental Gardens, Agriculture and Agri-Food Canada Research Centre, Summerland**
- **Kelowna Public Art Pollinator Pasture, City of Kelowna  
Brent's Grist Mill Heritage Site**
  - near corner of Leckie and Dilworth, Kelowna

## ➤ **Websites**

- **Border Free Bees: [borderfreebees.com](http://borderfreebees.com)**
- **Master Gardeners Association of BNC: [mgabc.org](http://mgabc.org)**
- **Dr. E. Elle, Simon Fraser university:  
[sfu.ca/people/eelle/bee\\_info.html](http://sfu.ca/people/eelle/bee_info.html)**
- **Hutchings Bee Servies:  
[sites.google.com/site/hutchingservice/home](http://sites.google.com/site/hutchingservice/home)**
- **The Xerces Society: [xerces.org](http://xerces.org)**



# ***Did I meet my Goal?***

- **To introduce you to the fascinating world of the bees**
  - **Who are they?**
  - **What do they do?**
  - **Where and When can you find them?**
  - **Why are they important?**
  - **How can we help to conserve them?**



***Thank you. Questions?***

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[sfu.ca/people/eelle/bee\\_info.html](http://sfu.ca/people/eelle/bee_info.html)**
- **Hutchings Bee Servies:  
[sites.google.com/site/hutchingservice/home](http://sites.google.com/site/hutchingservice/home)**
- **The Xerces Society: [xerces.org](http://xerces.org)**