Calgary Insect Pollinator Diversity and Native Plant Associations

Sarah Vermaak*, Michaela Seal**, Taylor Ford-Sahibzada*, & Mindi Summers
* undergraduate student researchers, ** research assistant
contact: mindi.summers@ucalgary.ca

Defining Pollinators

What are Pollinators?

- Anything that moves pollen from the male part of one flower to the female part of another flower[6]. Wind, humans, mammals, birds, or insects[6] can be pollinators.

Insects are Important Pollinators

- Insects pollinate ~75% of the world's flowering plants[6].
- Some are flower generalists while others are specialists[6]. Insects may also be purposeful or incidental pollinators.
- Flies, bumble bees, solitary bees, butterflies, beetles, true bugs, ants, wasps, or honeybees can all be pollinators.

Insect Pollinators in Calgary

Calgary is a Bee City[3] and:

- Hosts many insect pollinators, and likely is home to the greatest number of bee species among North American cities.
- Is committed to protecting its insect pollinators by creating, maintaining, and improving pollinator habitat[2].
- Encourages increased pollinator-friendly plant diversity and decreased pesticide use[3].
- **Partners with scientists to learn and apply knowledge about pollinators**

The Project

Research Questions & Goals:

1) **What insect pollinators are present in Calgary?**

Goal: Catalog the insect pollinator diversity and create guides for casual identification.

1) **What native plants are hosts to insect pollinators in Calgary?**

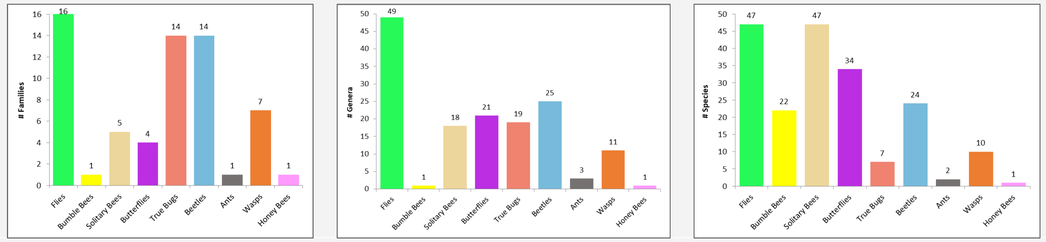
Goal: Use these associations to provide a list of planting recommendations to city planners, managers, and community members.

Plant-Pollinator Surveys

We observed and combined observations of plant-pollinator relationships collected through iNaturalist (3168 observations) from 2008-2021, physical collections and observations from specific target plants in 2020 (1840 observations), and observations of insects visiting flowers during transect (294 observations) and quadrat (225 observations) surveys in 2021. Plant-pollinator relationships were uncovered for 59 native plant species.

Insects were identified to the following major group during surveys:

Observed Pollinator Diversity in Calgary



The total number of insect families, genera, and species found associated with flowering plants within the City of Calgary, including both native and non-native plants (5527 total observations). We used available keys to identify insects during 2021 surveys and and 2020 physical collecting to major group and family. Physical specimens were further identified to family, genus, and species by Lincoln Best (bees) and Michaela Seal (flies). iNaturalist community identifications were used for identifications of pollinators available on the iNaturalist platform[5].

Native Plant-Pollinator Associations

Native Plant	Solitary Bees	Flies	Bumble Bees	Butterflies	True Bugs	Beetles	Wasps	Ants	Honey Bees	# Insect Associations per Plant	# Insects Observed per Plant
Dasiphora fruticosa (Shrubby Cinquefoil)	29	35	50	2	3	3	1	1	3	9	127
Rosa sp. (Roses)	49	40	71	2	1	70	1	1	18	9	253
Gaillardia aristata (Common Gaillardia)	14	13	11	5	8	4		8	1	8	64
Geranium viscosissimum (Sticky Geranium)	3	7	10	1	11		1		5	7	38
Solidago sp. (Goldenrod)	49	39	165		7	16	16		7	7	299
Apocynum androsaemifolium (Spreading Dogbane)	13	3	20	6		1	7		4	7	54
Chamaenerion angustifolium (Fireweed)	84	11	122	2		4			12	6	235
Symphoricarpos sp. (Snowberry)	1	1	3	3		1	6			6	15
Cirsium sp. (Thistle)	4	1	13	12		7			4	6	41
Helianthus sp. (Sunflowers)	1	4	3	6	2				3	6	19
Linum lewisii (Lewis Flax)	13	18	9	2					5	5	47
Monarda fistulosa (Wild Bergamot)	22	3	54	2			1			5	82
Symphyotrichum laeve (Smooth Blue Aster)	7	8	75	4					3	5	97
Salix sp. (Willows)	78	21	16	5					6	5	126
Anemonastrum canadense (Meadow Anemone)	1	6		1	1	2				5	11
Elaeagnus commutata (Silverberry / Wolfwillow)	1	1	1	1					1	5	5
Thermopsis rhombifolia (Buffalo Bean)	1	1	13	2	1					5	18
Vicia sp. (Vetch)	3		17	23			1		2	5	46
Potentilla (Cinquefoils)	3	2		1		1	1			5	8
Cornus sericea (Red Osier Dogwood)	2	1				3		1	1	5	8
Astragalus canadensis (Canadian Milkvetch)	1		15		1			8		4	25
Ratibida columnifera (Upright Prairie Coneflower)	42	5	2				4			4	53
Campanula rotundifolia (Harebell)	1	2	6	1						4	10
Rudbeckia (Coneflowers & Black-eyed Susans)	1	4	14				1			4	20
Fragaria virginiana (Virginia Strawberry)	1	1		1	1					4	4
Dalea purpurea (Purple Prairie Clover)	5	6	17							3	28
Hedysarum boreale (Boreal Sweet-Vetch)	1		2						1	3	4
Helianthus petiolaris (Prairie Sunflower)	2	2	3							3	7
Heterotheca villosa (Hairy Goldenaster)	15	16	9							3	40
Oenothera suffrutescens (Scarlet Beeblossom)	1	2	1							3	4
Asclepias speciosa (Showy Milkweed)			2					13	23	3	38
Potentilla gracilis (Slender Cinquefoil)	5	5			2					3	12
Allium schoenoprasum (Chives)	2			1					3	3	6
Helianthus annuus (Common Sunflower)		1	3		1					3	5
Symphoricarpos occidentalis (Western Stoneseed)			1		1	1				3	3
Pulsatilla nuttalliana (Prairie Pasqueflower)		3			1				10	3	14
# Plant Associations per Insect Group	**33**	**31**	**30**	**21**	**14**	**13**	**11**	**6**	**21**		
# Insects Observed per Major Group	455	262	728	83	41	113	40	32	112		

Presence/Absence table of the plant-insect pollinator relationships found for native plants within the City of Calgary (1866 observations). Coloured boxes indicate presence, while white boxes indicate that the group was not observed. The number of observations is provided within each coloured box. Plants observed in transect and quadrat surveys (2021) and physical collecting (2020) were identified using iNaturalist[5] and the *Vascular Flora of Alberta: An Illustrated Guide*[1].

Top Ten Native Flowers

Ten native flowers were found associated with six or more major insect groups:

Dasiphora fruticosa **(Shrubby Cinquefoil) 9 Associations**

***Rosa* sp. (Rose) 9 Associations**

Gaillardia aristata **(Common Gaillardia) 8 Associations**

Geranium viscosissimum **(Sticky Geranium) 7 Associations**

***Solidago* sp. (Goldenrod) 7 Associations**

Chamaenerion angustifolium **(Fireweed) 6 Associations**

***Symphoricarpos* sp. (Snowberry) 6 Associations**

Apocynum androsaemifolium **(Spreading Dogbane) 7 Associations**

***Cirsium* sp. (Thistle) 6 Associations**

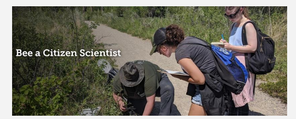
***Helianthus* sp. (Sunflower) 6 Associations**

Next Steps

- Confirm and improve insect identifications, particularly to species-level, using DNA barcoding
- Engage more citizens and experts in photographing and identifying plants and pollinators
  - Determine how best to photograph insects for identification
  - Target cultivars and common weeds for future association studies
  - Develop identification tools for future students and citizen scientists

Bee A Citizen Scientist And Get Involved!

Add photos of plants and pollinators to our **iNaturalist Pollinator Project** and/or count pollinators that visit a specific type of flower in our **Pollinator Quadrat Count.**



References

(1) Allen, L., & Kershaw L. (2021). *Vascular Flora of Alberta: An Illustrated Guide*. Self-published. Kindle Direct Publishing.
(2) Bee City Canada. Our Mission & Programs. (2021). https://beecitycanada.org/about-us/mission/ Accessed 16 September 2021.
(3) CTV News. City of Calgary declared Bee City, promotes pollinators. (2020). https://calgary.ctvnews.ca/city-of-calgary-declared-bee-city-promotes-pollinators-1.4782405 / Accessed 16 September 2021.
(4) Edmonton & Area Land Trust. Protecting Pollinators. (2021) https://www.ealt.ca/protecting-pollinators/ Accessed 1 August 2021.
(5) iNaturalist. (2021). https://www.inaturalist.org/ Accessed 10 May 2021.
(6) Partnership. Pollinators need you. You need pollinators. (2021). https://www.pollinator.org/pollinators/what-is Accessed 1 August 2021.

Funding: TFDL Program for Undergraduate Research Experience (PURE), Urban Alliance Contract -*The Native Bee Fauna and its Floral Relations in the City of Calgary, Alberta*