0.1 The Great Sunflower Project

Background

The great sunflower project was first established in 2007 by Stanford University Professor Gretchen LeBuhn as a way to involve citizens in the monitoring of pollinators in their backyards. Since that time, that project has grown to more than 100,000 volunteers across North America and has generated invaluable data about the distribution of bees and other pollinators across the continent, and the effects of pesticides on pollinators.

The basic premise of the initial project was to provide seeds to all volunteers of a single sunflower variety, Lemon Queen, to be planted in the gardens of participants. Once the sunflowers begin to flower, participants conduct a 15-minute observation period on a weekly basis to identify and record the pollinators visiting the sunflowers. Because the variety and species of plant used is held constant, the data generated can then be compared across habitats, geographic regions, and correlated with other factors such as land use type and insecticide use.

Figure 1 — *The lemmon queen sunflower*

Protocol/Monitoring

Participating in the great sunflower challenge allows us to compare the species diversity and density of plant pollinators to that of other geographic regions, as well as to be able to compare across our locations within southern Ontario. This will provide invaluable data with regard to areas of particular conservation interest, as well as identifying whether particular locations may benefit by employing strategies to boost pollinator nesting and foraging habitat.

Sunflower project protocol

- ?emon queen?sunflower seedlings will be provided to project participants.
- Plants will be planted and then tended as necessary.
  - Plants require full sun
  - Plant spacing: 15 inches apart
  - Plant height: 5-8 feet
  - Bloom curation: 6 weeks

Sunflower observation

1. Once flowers begin to bloom, plants are monitored once weekly for 15 minutes.
2. Environmental data to record:
   (a) Date
   (b) Time of day monitored
   (c) Temperature
   (d) Weather (Sunny, cloudy, precipitation, wind)
   (e) Number of flowers observed

3. Pollinator observation

   (a) Pollinator identification ?to the level of comfort of the observer. This ranges from major classification (Bee, wasp, fly, beetle, butterfly, moth) to more specific identification (species or pollinator ?ype? e.g., sphinx moth, sweat bee, etc).

   (b) Quantification- the number of individuals of each pollinator observed should be documented.

0.2 Pollinator Observation and walking transects

Background

Plants are pollinated by an incredibly diverse and beautiful suite of insects: Species of ants, bees, beetles, butterflies, moths and wasps all contribute pollinator services to a variety of flowering plants, shrubs and trees. However, not all species provide the same degree of pollinator services to plants, and different pollinators exhibit preferences for pollinating particular types of plants. Furthermore, pollinators may also vary in the time of day and temperature range within which they will fly, as well as the distances they will fly, and the resources they are gathering from plants. Therefore a large degree of variation in the pollinator community may be observed depending on where and when one observes pollinators.

Observing pollinators is the only way to identify the major pollinators present and active in a given location without the use of traps. This allows the pollinators to remain ?n the wing?while still gathering information about how many species of pollinators are present, their identity, abundance, and the plants being visited. These observations will allow us to compare pollinator diversity and abundance across different habitat types, microclimates, and geographic areas.

Protocol/Monitoring

There are a number of approaches that can be taken to conducting pollinator observations, which fall into two broad categories: Stationary observation is conducted by observing and documenting all of the pollinators visiting a particular plant or area for a standardized unit of time, often a 15 minute observation period is chosen. Traveling observation is accomplished by observing pollinators while moving ?this can be hiking in a new location or by repeated surveying pollinators during a walk around one? farm or property.

Observational strategies can also focus on examining how pollinator communities vary as temporal or seasonal factors also change in a single location, for

- Temporal Observation
- Seasonal Observation

Pollinator observation protocol (weekly)

1. Choose observation type that you are interested in completing: (Stationary observation, traveling observation).

2. Choose observation study type:

   (a) *Taxon specific*: Focusing on a particular group of pollinators (ants, bees, beetles, butterflies, moths, wasps.

   (b) *Temporal observation*: observing pollinators at multiple 15-minute intervals throughout the day. This includes evening observations if interested! This is the time to observe our moth pollinators!

   (c) Plant specific monitoring: this includes the sunflower project, but in addition to sunflowers, a particular native flowering plant or crop plant species of interest can be chosen for observing pollinators for this species.

   (d) Transect monitoring: Observing pollinators as you move from one environment to another by making 15 minute observations at measured distances as you transition from one habitat to another (e.g., meadow to cultivated field).

3. Environmental data to record:

   (a) Date

   (b) Time of day monitored

   (c) Temperature

   (d) Weather (Sunny, cloudy, precipitation, wind)

   (e) Identity and number of flowers observed

4. Pollinator observation

   (a) Pollinator identification ?to the level of comfort of the observer. This ranges from major classification (Bee, wasp, fly, beetle, butterfly, moth) to more specific identification (species or pollinator ?ype? e.g., sphinx moth, sweat bee, etc..).

   (b) Quantification- the number of individuals of each pollinator observed should be documented.

POLLINATOR MONITORING DATASHEET (Sunflower, open observation)

Instructions: 1. Fill out top of data sheet.; 2. Set timer for 15 minutes, and when ready hit start; 3. Note any floral visitors you see and identify to your confidence level; 4. Fill out remainder of top of datasheet; and 5. Make additional notes about the site.

Site Name: _____ Date: _____ Observer: _____

Observation start time: _____ Observation end time_____

Weather at start: Shade temp C) _____ Wind (m/s): _____ Sky: clear/partly cloudy/bright overcast

Weather at end: Shade temp C) _____ Wind (m/s): _____ Sky: clear/partly cloudy/bright overcast

Visitor Categories:

Type = Honey bee, Other Bee, Fly, Wasp, Moth, Butterfly (add type if you know!), Spider, Beetle, Bug, Bird, Ant, UFI (Unidentified flying insect)

*Bee Groups (in brackets: common descriptions)*_____

Honey Bee = HB
Carpenter = Carpenter
Hairy Leg Bee = HLB
Green Sweat Bee = Green Sweat Bee
Cuckoo Bee = Cuckoo (red abdomen/small/large)
Bumble bee = Bumble (black face/yellow face/orange tip/four stripe/yellow body)
Striped Sweat Bee = SSB (small/medium)
Tiny Dark Bee = TDB (dull round tip/shield tip/yellow face and wasp-like
Striped Hairy Belly Bee = SHBB (tiny/small/medium)
Metallic Hairy Belly Bee = MHBB (blue/black/green)

OBSERVATION

Important: Remember to look out for flowers, stand so that you do not cast a shadow, and only ID floral visitors to the level at which you are confident in your identification

Pollinator Type	# of times pollinator seen on bloom	Description	Plant Identification
TDB	3		Swamp aster
Butterfly	1	Orange with black patterns, white checkerboards on tip of wings	
UFI	1	Black, hairy, 2m high, growls at me	Raspberry

Pollinator Type	# of times pollinator seen on bloom	Description	Plant Identification

0.2.1 Wind Speed

Beauford Force	**Wind Speed** *Km/h*	*m/s*	**Descriptive Term**	**Effects observed on land**
0	Less than 1	< 0.3 m/s	Calm	Smoke rises vertically.
1	1.1–5.5 km/h	0.3–1.5 m/s	Light air	Direction of wind shown by smoke drift, but not wind vanes.
2	5.6–11 km/h	1.6–3.4 m/s	Light breeze	Wind felt on face. Leaves rustle. Ordinary vane moved by wind.
3	12–19 km/h	3.5–5.4 m/s	Gentle breeze	Leaves and small twigs in constant motion. Wind extends light flag.
4	20–28 km/h	5.5–7.9 m/s	Moderate breeze	Raises dust and loose paper. Small branches are moved.
5	29–38 km/h	8.0–10.7 m/s	Fresh breeze	Small trees with leaves begin to sway. Crested wavelets form on inland waters.
6	39–49 km/h	10.8–13.8 m/s	Strong breeze	Large branches in motion. Whistling heard in telephone wires. Umbrellas used with difficulty.
7	50 - 61 km/h	13.9–17.1 m/s	Near gale	Whole trees in motion. Inconvenience felt in walking against wind.
8	62 - 74 km/h	17.2–20.7 m/s	Gale	Breaks twigs off trees. Generally impedes progress. Walking into wind almost impossible.
9	75 - 88 km/h	20.8–24.4 m/s	Strong gale	Slight structural damage occurs, e.g. roofing shingles may become loose or blow off.
10	89 - 102 km/h	24.5–28.4 m/s	Storm	Trees uprooted. Considerable structural damage occurs.
11	103 - 117 km/h	28.5–32.6 m/s	Violent storm	Widespread damage.
12	118 - 133 km/h	$\geq$ 32.7 m/s	Hurricane	Rare. Severe widespread damage to vegetation and significant structural damage possible.

Source: Estimating windspeed using Beauford Scale (Environment Canada)