Diversity and ecology of pollinators in the Pacific Northwest with emphasis on native bees

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Native pollinators include:

- Certain birds: ex. Hummingbirds
- Certain bats: Pacific Northwest??
- Insects: many flower visiting insects
  - Wasps – many visit flowers for nectar
  - Flies – flower flies, bee flies, et al.
  - Butterflies & Moths – some specialized pollinators
  - Beetles – some feed on pollen & flower parts; can be destructive
  - Many others are incidental flower visitors
  - Bees – most important, abundant, specialized

Why are bees such good pollinators?

- Require large quantities of pollen to feed their young
- Most bees are hairy
- Pollen collecting/transport structures
- Specialized pollen collecting behavior
- Flower fidelity is well developed
- Bees just plain work hard: "Busy as a bee"

Bees vs. wasps: What's the difference?

- Bees
  - Tend to be hairy and at least some hairs are branched or feathery
  - Lack reflective hairs on the face
  - Pollen is the protein source used to feed the young
- Wasps
  - Relatively non-hairy and all hairs are simple
  - Many have reflective hairs on the face (Sphecidae)
  - Protein source for the young is insects and spiders

Bee species richness

- World fauna: >17,500 named species (2007); ca. 20,000 in total
- 7 large groups (families) currently recognized: 6 occur in PNW
- North American fauna: ~3000 spp.
- Pacific Northwest: ~ 1000 spp.
- Washington: 500+? (undercollected)
- Yakima River Canyon: >100 spp.

Bee ecology I: Social vs. solitary

- Social
  - Honeybee, bumble-bees, sweat bees
  - live in colonies
  - Queen is primary egg-layer
  - Workers (females) maintain the nest and collect food
  - Males – only interested in sex
- Solitary
  - ~85% of all bees – 15,000+ species
  - Each female constructs her own nest and rears 10 or so young
  - Males – only interested in sex

Bee ecology II: solitary bee life cycles

- Most species have 1 generation/year
- Adults actively flying for only 5 or 6 weeks/year; rest of year spent in inactive state
- Period of adult activity corresponds with flowering of important host plant(s)
- As a result we see a turnover of species over the course of the season
- Reproductive output: ~1 offspring per day; 5-20 in a female's lifetime
- Larval food: a mix of pollen and nectar
- Overwintering: as an adult or mature larva in the natal cell

Bee ecology III: Solitary bee nests

- Ground nesting: construct cells in the soil, majority of species: ex. *Andrena* - 1400+ species, *Perdita* - 600+ species
- Above-ground nesting: significant minority
  - pre-existing tunnels in wood (beetle borings)
  - pithy stems of sumac, elderberry, etc.
  - rotten wood/logs – a few species
  - free standing: made of mud or plant material
  - opportunistic use of nail holes, electrical outlets, human provided trap nests

Bee ecology IV: Long-tongued vs short-tongued bees

- Based on the structure and relative length of the tongue or proboscis
- Long-tongue bees: honeybee, bumblebees, digger bees, leafcutters
- Short-tongue bees: sweat bees, sand bees, membrane bees
- Tongue length determines whether a bee can reach nectar in a flower

Bee ecology V: floral relationships

- Pollen use:
  - Polylectic bees (pollen generalists) collect pollen from plants in several (many) plant families. Many species.
  - Oligolectic bees (pollen specialists) collect pollen from a single genus or several related genera of plants. Many species.
  - Monolectic bees utilize a single species of plant for pollen. A few species?

Bee ecology VI: pollen bees and cuckoo bees

- Pollen-collecting bees: these species are typical, hard-working bees.
- Cuckoo (cleptoparasitic) bees:
  - Female lays egg in nest of suitable host bee
  - Cuckoo larva kills host egg or larva & feeds on pollen stored by the female host bee
  - Cuckoo adults and larvae are specialized for the parasitic way of life
  - Hundreds of species of cuckoo bees
  - Cuckoo & host may or may not be related