**Goal:** To understand the factors influencing the structure and dynamics of host-parasitoid networks.

**Overarching question:** How does willow genotype interact with herbivore characteristics (feeding guild and phylogeny) to influence the structure and dynamics of host-parasitoid networks?

**Sub-questions:**

1. How does willow genotype influence the dynamics of host-parasitoid networks? Does this interact with herbivore feeding guild?
   1. Preference-performance relationships of all herbivores
   2. Herbivore body size
   3. Interaction strengths for all nodes in the network
2. How does herbivore feeding guild influence the structure of host-parasitoid networks? Does herbivore phylogeny modify this relationship?
3. How does herbivory influence host-parasitoid networks?
   1. Herbivory level on galling insects

How does willow genotype influence leaf beetle preference?

* Count the number of “former egg clusters” by identifying skeletonized leaf patches (adult preference)
* Count the number of skeletonized leaves from beetle pupa (abundance)

How does willow genotype influence leaf beetle performance?

* Measure pupal length from field collected beetles (performance)
  + Maybe weighing pupa would be easier…
* Use handlens to look for parasitoid eggs (possible fly, lays them on beetle or right next to them).
  + May want to leave some of the surrounding leaf tissue if there are parasitoid eggs…
* Weigh beetles after emergence (correlation between pupal length and adult weight)
* Preserve beetles for possible dissection to determine whether male or female (may be a sexual size dimorphism)
* Note date of parasitoid emergence and date of death (duration may be an indicator of fitness)
* Measure parasitoid size

**Methods:**

* Conduct surveys throughout June, July, and August for pupating insects.
* Maybe focus on a few species for each survey?
* Pupating insect species to collect include:
  + Multiple beetle species
  + Bagworm moths
  + Tent Caterpillars
  + Tent miners
  + Path miners
  + Leaf gallers
  + Blotch miners
  + Leaf edge rollers
  + Silk leaf edge sandwich rollers
  + Stem gallers
* Use degree of date overlap as an explanatory covariate for looking for shared parasitoids and network structure and dynamics.
* Survey all replicate trees within a few days to collect herbivores for parasitoid rearings.
* All pupa will be reared separately in scint vials with loose caps. Each pupa will have a unique ID that will be matched to the corresponding tree it was collected from as well as any other relevant data. At the time of collection, pupal length will be measured using calipers and placed in vials.
  + I can try and correlate gall size to pupal length (at least for Pontania) to try and maintain consistency across measures.
* Need to try and have a consistent measure for comparison across insect species (e.g. pupal size)

**Materials:**

* Maybe…. aquapics from local florist shop to maintain fresh leaves from cuttings (hundreds)
* scint vials (maybe 1,000)

**Measurements:**

* Abundance of all herbivore species for each replicate of each genotype (as well as herbivores that were not collected during the survey…)
* Pupal size of each individual Size of all herbivore species for each replicate of each genotype (may be difficult for gallers and for insects collected at younger life stages…, unless I feed them all from a common tree and maintain them under the same conditions…but eggs may have been laid at different times…maybe just use body size as a covariate).
  + May need to determine larva stage for insects collected at different times?
  + Need to try and get a measure of this that is consistent across all insects… pupal length?
    - I guess I’m interested in this across the various insect species so I need a consistent measure (may not be able to get this for galling insects though…)
      * I can correlate gall size to emerged pupa for a consistent measure.
* Interaction strengths for all nodes in the network
  + Collect herbivores and rear them for their parasitoids (may have to feed them while they grow)
  + Frequency of consumption for various parasitoid species that is linked to herbivore species (as well as their body size and life history).

Think about the network of multiple aphid species and ant-tending and interactions with their parasitoid communities.

**Thoughts for next year…**

How does the presence of ants and wind exposure interact to influence the effects of plant genotype on insect communities?

How does the timing of aphid species colonization influence the assembly of the ecological network on willows?

* control, giant aphid, green aphid, both
* add one adult giant aphid or green aphid to each treatment.
* Exclude or allow ants