**Goal**: To examine how a major abiotic force (wind) interacts with the genotype of a foundation tree species (dune willow) to influence insect food webs and willow fitness.

**Overaching Question:** How does wind exposure alter the effects of willow genotype on arthropod food webs?

**Sub-questions:**

1. How does willow genotype interact with wind exposure to influence willow phenotypes?
2. How does willow genotype interact with wind exposure to influence food web modules?

**Materials & Methods**

*Study Site*

We conducted this research at Lanphere Dunes (GPS COORDINATES), a pristine coastal dune ecosystem managed by US Fish and Wildlife service in Humboldt County, California.

*Natural History*

*Experimental Design*

We planted willow cuttings in a completely randomized block experimental design.

We established two sites at each of 10 different willow patches (10 blocks). Sites were either exposed or unexposed to the wind (fixed effects) and we planted one replicate of each of 10 genotypes (random effects) in each site (20 treatments \* 10 blocks = 200 total cuttings). We planted exposed and unexposed sites within each block the same distance from the willow patch to control for insect accessability; however, exposed sites faced prevailing winds during the growing season. These wind exposed sites were (GIVE DETAILS ON WIND EXPOSURE).

We chose these 10 genotypes because they vary significantly in carbon-nitrogen ratios, LIST OTHER TRAITS

Prior to bud burst in February 2012, we took cuttings from one replicate of each of the 10 genotypes used in this experiment that were taken from another common garden where we have replicates of 26 genetically distinct willow clones.

*Plant Traits*

We measured 6 different plant traits at the time herbivores were collected, including: specific leaf area (SLA), leaf size (LS), browned portion of leaf (likely in response to desiccation), plant height, total shoot length, and number of leaves.

*Soil Measurements*

At the end of the growing season (September 17 – 28) in 2012, we measured X aspects of the soil, including: X nutrients, total organic matter content, moisture, temperature, and electrical conductivity.

To measure nutrient availability in the soil, we used Plant Root Simulator (PRS) Probes (Western Ag Innovations, Saskatchewan, Canada). We installed PRS probes at 3 randomly selected locations within each site for 11 days.

To measure total organic matter content (TOM), we used a trowel to collect soil at a depth up to 15 cm adjacent to the randomly positioned PRS probes on Sep 18, 2012. Soils were transported back to the lab in plastic bags, sieved into fragments less than 2 mm, randomly subsampled using a soil splitter, and dried at an average temperature of 105 degrees Celsius for X days. We then weighed a subsample of the oven dried soil into an oven dried crucible and placed the crucible and soil into a furnace to be combusted at XX degrees Celsius for X days. We then weighed the combusted samples, placed them in a desiccator for 20 minutes, reweighed them. To calculate total organic matter we used the equation: TOM = (Oven Dry Weight -Combusted Weight)/Oven Dry Weight.

We used an EM50 Digital/Analog Data Logger (Decagon Devices, Washington, USA) to measure soil moisture, temperature, and electrical conductivity at a soil depth of about 5 cm. We measured soil moisture at 3 random locations within each site on three different days while PRS probes were in the ground. All readings occurred between GIVE HOURS.

**Results**

**Experiment 1: Genotype-Wind Effects on Insect Community**

Completely Randomized Block Experimental Design

* 2 treatments
  + Exposed (adjacent to willow patch)
  + Unexposed (behind willow patch relative to prevailing winds)
* 10 genotypes
  + Genotypes vary significantly in how they allocate carbon and nitrogen to their leaves.
  + I will also measure more plant traits that likely exhibit heritable genetic variation.
* 10 blocks
  + 10 different willow patches.
* Experimental unit: 1 willow cutting planted directly into the ground per treatment per genotype per block.
* Summary of material
  + 200 cuttings (10 blocks \* 2 treatments \* 10 genotypes)
* After 2-3 months:
  + Survey insects for their abundance and diversity.
  + Survey sedentary insects (galls, leaf miners, leaf folders, etc.) and rear them for their parasitoids.

**Observational Study:**

* At end of experiments, survey sedentary insect densities within and among willow patches that vary in their degree of wind exposure
* Rear galls and leaf miners to assess parasitism.