Hille Ris Lambers Lab: Project Aims (Mt. Rainier & North Cascades NP)

One of the greatest challenges ecologists face is forecasting how global climate change will impact the world around us. Climate stations unequivocally demonstrate that temperatures are rising globally, and that rainfall and snowfall events are changing in size and frequency. Ecological studies, in turn, confirm that species are already responding by shifting their distributions uphill and polewards, and by changing the timing of life events (phenology). Consequently, local communities are shifting in composition, with warm-adapted species increasing in abundance, at the expense of more cold-tolerant species. However, we lack the ability to forecast future changes, because we have an incomplete understanding of the forces (climatic and otherwise) that constrain species' performance and the time scale at which species can respond to changes in climate (through migration and shifts in phenology).

The Hille Ris Lambers lab is examining the climatic and biotic factors that constrain the distribution and performance of plants (trees and wildflowers) and will influence responses to climate change. With its large elevational range (Mt. Rainier and Mt. Baker are each >4000 meters high) and rainshadow effect, Mt. Rainier and North Cascades National Parks are ideal natural laboratories for the study of range limits and climate-plant performance relationships. As part of a long-term forest dynamics monitoring project, we assess seed production, seedling survival, tree growth and mortality of six focal tree species (*Abies amabilis, Calitropsis nootkatensis, Pseudotsuga menziesii, Thuja plicata, Tsuga heterophylla, Tsuga mertensiana*) at several stands located around Mount Rainier National Park. As of 2014, we are collaborating with Amy Angert (at University of British Columbia) to resurvey 'legacy' plant community plots in both Mt. Rainier and North Cascades- that is, resurveying the plant composition (over and understory) of ~1000 plots censused in the 70's and 80's, to determine how and whether plant communities have already responded to climate change. The HilleRisLambers and Angert labs have also established a seed addition experiment in National Forests near North Cascades NP, to assess how climate influences seed germination and seedling survival, as well as the extent to which species are dispersal limited. A citizen science program housed in the lab (MeadoWatch) at Mt. Rainier NP helps us monitor the phenology of several wildflower species in alpine and subalpine zones. Additionally, postdocs, graduate and undergraduate students study (and have studied) the relative importance of climate and competition on range limits, climatic variables associated with tree death, impacts of climate change on subalpine meadows, wildflower phenology, seedling physiology and evolutionary constraints to climatic adaptation. For most of these projects, we monitor climate variables known to affect plant performance (growing season length, snow depth, temperature, soil moisture).

Members of the field crew, whether graduate student, undergraduate intern, or volunteer, are critical to the success of these projects. We hope that involvement in these projects is interesting and satisfying both because it will allow you to spend time in one of the most beautiful and iconic places in Washington, learn about how climate change may influence plant communities, and experience ecological research.

Research Activities (as of 2019)[1]

1. **Tree demography project[2] (AKA: Forest Demography)**: How will forests on Mt. Rainier respond to climate change? We are answering this question by monitoring tree growth, reproduction and survival in 18 permanent 1 hectare stands located on all sides of Mount Rainier National Park. We monitor microclimate (snow, soil moisture, temperature, precipitation) at these sites. Project Lead: Janneke Hille Ris Lambers
2. **Plant community reassembly project[2] (AKA Cascade Legacy)**: How have overstory and understory plant communities changed in the last 35 years? Are cold-tolerant species declining at the expense of species with warmer temperature tolerances? We are revisiting ~1000 plots first surveyed in the late 70's (in Mt. Rainier National Park - MORA) and mid 80's (in North Cascades National Park - NOCA) to address this question. We are also censusing germination in a seed addition experiment (in Mt. Baker / Snoqualmie and Okanagan / Wenatchee National Forests). Project Leads: Janneke Hille Ris Lambers (UW), Amy Angert (UBC), Haley Branch (UBC – field crew lead), Kavya Pradhan (UW – field crew lead).
3. **How do the variation in plant traits (both intra- and interspecific) change across climatic gradients[2]?** What can studying these traits tell us about the productivity of forests in the PNW? Because plants interact with their environment via traits, we expect there to be a strong relationship between growth and stress related plant traits, climate, and ecosystem processes. To assess this expectation, we are collecting tree trait data in conjunction with the Cascade Legacy plot resurveys in Mt. Rainier and North Cascades National Parks. Project lead: Kavya Pradhan.
4. Wildflower phenology & Climate change (AKA MeadoWatch)? This is a citizen science program out of University of Washington, where citizen scientists monitor phenology at Mt. Rainier National Park. Project lead: Janneke Hille Ris Lambers, Meera Sethi.
5. How does seed predation vary by elevation? Classically, species interactions are thought to be stronger in the tropics (where climates are benign) than at higher latitudes, but does this pattern hold across elevation? We are participating in a distributed experiment to test the relationship between elevation and latitude and the strength of seed predation. Project leads: Janneke HilleRisLambers & Meera Sethi (Mt. Rainier), Amy Angert (Mt. Baker / Wenatchee NF).
6. How do multi-trophic interactions shape complex responses to climate change? Plants interact with many species, which can shape direct and indirect effects of climate. However, how this complex set of interactions influences climate change responses as a whole is poorly understood. We are exploring this topic using surveys of herbivore abundance and herbivory at Mt. Rainier National Park. Project lead: Meera Sethi.
7. How will interactions with mycorrhizal fungi influence conifer range shits? Conifer trees depend on mutualistic interactions with mycorrhizal fungi to obtain sufficient nutrients from the soil. Although conifers are expected to shift their ranges to higher elevations and begin growing in subalpine meadows in response to climate warming, it is not currently known whether their fungal mutualists will be able to accompany them. We are exploring this potential barrier to conifer range expansion by describing the communities of mycorrhizal fungi living in soils in different areas of the subalpine environment at Mt. Rainier National Park. Project lead: Stuart Graham.

1. Present (and past) graduate students in the lab are involved in a variety of other projects, both at Mt. Rainier and elsewhere. Please see http://faculty.washington.edu/jhrl/Index.html and http://www.meadowatch.org/ for more details.

2. The three bolded projects are projects paid interns will primarily be assisting with; note that we will try to ensure that all interns get the opportunity to work on different projects throughout the summer.

Job Description

- Field sites are in Mt. Rainier National Park, North Cascades National Park, Okanagan-Wenatchee National Forest, and Mt. Baker Snoqualmie National Forest; with lab and greenhouse work at the UW Seattle campus. Full-time interns will spend about 80-90% of the time in the field, and 10-20% of time in the lab. During field weeks, we leave the Seattle campus Monday morning and return Friday (for 5 day field weeks); or leave Wednesday and return the following Wednesday / Thursday (for 8-9 day field weeks). Lab weeks will not be evenly distributed – most of early to mid-June and late July to late September will be spent in the field.
- Field tasks include (but are not limited to) sample collection (seeds, increment cores, rhizomes); microclimate sensor management (downloading, reprogramming); data collection (species id, phenology, seedling censuses, adult tree densities, pollinator observations) and censusing of experimental plots (seed additions, phenology plots).
- Lab tasks for research based projects include processing samples (e.g. seed sorting, trait measurement), possibly greenhouse work (setting up pots, harvesting plants), plant identification (from vouchers) and entering data.
- Field based work on all projects will occur under any and all weather conditions (wet, cold, hot), and will occasionally involve some unpleasant conditions (e.g. biting insects).

Time/hours

- We have an in-lab orientation day on June 17th at University of Washington. In-field trainings will occur between June 18 and June 28, focusing on logistics and methods. Please make sure you are available during this time frame.
- Field hours are variable (due to weather and travel time), but will average out to 40 hours a week (*excluding* travel time from the field base). You will get July 4th and Labor Day off (unpaid).
- Interns can take time off, if desired, but we ask all interns to work at least 10 weeks. Time off will generally be given in one week increments (not individual days) due to group travel to field sites. Given busy field weeks and scheduling, you must request time off at least 1 month in advance (ideally by the start of the summer), and we may not be able to grant your request for time off if it occurs during particularly busy field times (or if many other interns have already requested time off). Our busiest field times are mid-June to late July and September; we may not be able to give time off to more than one intern in those times (which means if you request time off after someone else has, we may not be able to accommodate you).

Compensation/pay

- This internship is ideal for those wishing to gain experience in ecological research, Pacific Northwestern flora and fauna, Graduate school, and the biological impacts of climate change.
- Field Crew Interns hired through the HilleRisLambers lab get a $640 / week ($16 / hour for a 40 hour week).
- During field weeks, travel and lodging (camping or very occasionally cabins) is covered. Cooking is done communally (at the field house or campsites).

Other

- Lodging includes housing in park housing (Mt. Rainier NP) in shared rooms with shared bathrooms, occasional motel stays (SE side of MORA), car camping (NW and E side of MORA, Forest Service) and occasional backpacking trips (SUNR stand, Cascade Legacy resurveys). The HilleRisLambers lab has tents for you to use, however, you may be required to share a 2 person tent if using lab tents.
- We require all interns to have good hiking shoes, outdoor clothing, a field pack, and their own sleeping bag and mat. Tents and cooking gear are provided by the lab.

Packing List / required items

*****Note: you are required to own all items in **bold**

Clothes

□ ___ **Field shirts** (4-5 t-shirts or long-sleeved shirts). Non-cotton, wicking material dries faster.
□ ___ **Field pants** (2-3 pairs). DON'T only bring jeans. They get cold when wet and dry slowly)
□ ___ **Fleece/wool sweaters/jackets** (3 layer minimum as it definitely can get cold. Note, you can get wool sweaters at second hand stores (like Goodwill) for around $5 and these work great.)
□ **___Warm fleece or wool pants**
□ ___ **Wool or synthetic (not cotton) socks (bring lots)**
□ **___Broken in, ankle high hiking boots with good tread** (Also keep in mind they get will get wet. Gortex boots will prevent your feet from getting wet and cold.)
□ ___ **Rain gear – both jacket and pants** (goretex jacket and pants are ideal. Definitely DON'T forget rain pants & jacket)
□ ___ **Warm hat & gloves** (have I mentioned it can get cold?-you should be able to work in the gloves. It it is raining and cold, wear latex gloves under thick wool gloves to keep your hands warm or dish gloves over cotton/thin wool gloves works great too).
□ ___ **Hat for sun** (baseball cap is good, you may occasionally need this on hot days at exposed sites)
□ ___ **Sleeping bag & pillow (if at Nisqually house/T-woods) & Sleeping Pad if camping**
□ ___ hiking sock liners (helpful for preventing blisters and cheap, only need 1-2 pairs)
□ ___ gaiters (help keep your feet dry)
□ ___ flip flops / sandals (for around the campground)
□ ___ **Towel**
□ ___ other (underwear, pajamas, long-underwear, etc)

Personal Stuff

□ ___ **Day pack for lunch and field gear. This needs to be large enough to carry lunch, H_2O, raingear, fieldgear – including a clipboard (*at least* 20 liters). It should have a hipbelt for support.**
□ ___ Back packing pack for backpacking trips – if you have it, we will ask you to use it.
□ ___ **2 water bottles, 1-liter size. You must be able to carry at least 2 liters of water (in addition to field gear)**
□ ___ **Any prescription medications**
□ ___ **Sunblock**
□ **___Sunglasses (you will need these when there is still snow)**
□ ___ **EpiPen** (if you have allergies – e.g. there are yellow jackets later in the summer)
□ ___ Toiletries
□ ___ Benadryl and Neosporin, or other medications you might regularly need (the lab carries ibuprofen, aspirin, and benadryl in first aid kits)
□ ___ Bug spray (mosquitos may sometimes be bad)
□ ___ Extra contact lenses or glasses
□ ___ Headlamp

Other

□ **___ First day's lunch (first field day – each week)**
□ ___ Leatherman or pocket knife (definitely useful)
□ ___ Camera & extra battery
□ ___ Books or other entertainment
□ ___ iPod or similar mp3 player with headphones
□ ___ Food items you can't live without (good chocolate, beer, etc)
□ ___ Music for car ride (cds, mp3 player & connector University cars have a cd player & AUX outlet)
□ ___ Beer / wine / champagne / cognac (project funding does NOT cover these!)