1F

It Isn't Easy Being Green

Session Moderator: Anahit Galstyan, Biology
Mary Gates Hall 248
1:00 PM to 2:30 PM

* Note: Titles in order of presentation.

Optimal Biochar Level for *Capsicum annuum*

Ashura Aby (Aby) Takanohara, Senior, Environmental Science & Resource Management
Mentor: Soo-Hyung Kim, Environmental and Forest Sciences

Biochar is the product of biomass that undergoes pyrolysis, the process of thermal degradation in the absence of oxygen and is a type of charcoal. Research has shown biochar to be an effective soil amendment but the optimal levels of incorporation are unknown. This study examines if an optimal level for plant growth exists and to determine if introducing a stress factor will alter the optimal point. Five levels of biochar amendments at 0%, 1%, 3%, 5%, 10%, and 15% by volume have been made into root media with high or low nutrient availability as a stress factor. Sweet peppers plants were grown from seed in flats for one month and seedlings were transferred to larger pots with appropriate biochar level. They will be grown for two months and destructively harvested for dry biomass data. We hypothesize the pepper plants will have an optimal biochar level for growth and this level will change with plant stress.

Invasive Holly in a Pacific Northwest Forest: Effects on Native Vegetation

Elliott Daniel (Elliott) Church, Senior, Environmental Studies (Bothell), Global Studies (Bothell)
Mentor: David Stokes, Interdisciplinary Arts and Sciences, University of Washington Bothell

English holly (*Ilex aquifolium*) is an increasingly prominent invader of western Washington forests, yet little data exists on its effects on western Washington native flora. A population study of holly in a 15.9 acre study area in St. Edward State Park suggests that holly reduces the abundance and diversity of native vegetation. We hypothesized that these negative effects are caused by shading and/or litter fall from holly canopy. We studied native vegetation cover in four treatments (holly shade, holly litter, holly shade + litter, neither) to determine the importance of these two factors. We also contrasted photosynthetic photon flux densities (PPFD) under holly canopy with PPFD under native tree canopy and in full sun, and compared PPFD under holly canopy with existing data on compensation points for native plant species occurring in the park. If holly reduces native vegetation through shading, we expect to see reduced native vegetation abundance in our shade treatments and to find that PPFD levels underneath holly canopy are lower than required for some or all native plant species. If holly leaf litter is suppressing growth, we expect to see reduced native vegetation abundance in our litter treatments and to find that holly leaf litter is deep enough to negatively affect seed germination. Preliminary results suggest a significantly lower total vegetation cover underneath holly canopies compared with total cover outside of holly canopies, and we have recorded leaf litter depth as much as 17 cm underneath holly canopies. This study will provide quantitative data which can aid forest managers in assessing the threat holly poses to western Washington forest biodiversity. Results and implications will be discussed.

The Success Rate of Prairie Plants in Low, Moderate, and High Density

Michelle Elizabeth (Michelle) Fischer, Senior, Interdisciplinary Arts & Sciences (Environmental Studies), UW Tacoma
Mentor: John Banks, Interdisciplinary Arts & Sciences

I conducted a five month field experiment, from October 17th, 2011 to February 17th 2012, with the purpose of exploring the effects of prairie plant density on survival rates. I performed the experiment at the Pierce Oakwood prairie location utilizing the Mima Mounds preserve as a reference. My hypothesis was plants in moderate density will have a better success rate than those in low and high density. The methods for this design were established by plotting three polygons of 2m x 2m each. I divided each polygon divided into three sections, each containing low, moderate, and high density and plants randomly planted. Plot spatial arrangements were random at each polygon. Each plot contained the same species with an increasing number from low to high density. Prairie plants consisted of plants commonly found throughout Washington State. Each polygon contained *Mahonia aquifolium* (Oregon grape), *Achillea milefolium* (White Yarrow), *Holodiscus discolor* (Ocean Spray), *Castilleja miniata* (Scarlet Paintbrush), and *Aruncus dioicus* (Giant Goats Beard). The following variables were measured and recorded biweekly: height, width, temperature delta, human foot traffic, and faunal foraging patterns. *Mahonia aquifolium, Castilleja miniata*, and *Achillea milefolium* had high survival rates in low, moderate, and high densities. *Aruncus dioicus* had high survival rates in high density, and *Holodiscus discolor* was most successful in low density. My results highlight the need to better understand optimal planting densities of individual species in prairie restoration planning.

Population Dynamics of *Pseudotsuga menziesii* on Islands

Cesar Godinez, Sophomore, Biology, Sccc Inactive Code
Mentor: Joshua Whorley, Science Technology Engineering Math, Seattle Central College

Populations of *P. menziesii* on islands should exhibit reduced genetic diversity and canopy coverage, lower population age, increased reproductive succession and reduced understory species richness with respect to Mainland populations. Populations sampling within the same region and elevation should exhibit similar patterns. Seedling density as well as distribution of trees in multiple size classes and their diameter to height ratios were presented for each site. Species richness represented plant community structure and constituted of understory plants and percent coverage for each species within the plots. Genetic analysis consisted of laboratory analysis for selected individuals within the sites. Despite the vulnerability of small trees in establishment due to predation and greater sensitivity to environmental factors, high energetic costs to maintain large support structures of older trees create an additional unexpected source of vulnerability within the population. As genetic variation is component of successful reproductive succession and establishment, reduced variation in populations could result in greater sensitivity to more extreme environmental conditions as might be expected with climate change.

Fungal Endophytes of the Invasive Wetland Reed, *Phragmites australis*

Monika Fischer, Senior, Biology (Ecology, Evolution & Conservation)
Mary Gates Scholar
Mentor: Rusty Rodriguez, Biology, Adaptive Symbiotic Technologies

Fungal endophytes live cooperatively within the tissue of nearly all land-plants. Symbiotic fungi can provide great benefits to their plant host, often observed as increased growth or stress tolerance. I hypothesize that fungal endophytes increase the invasive ability of agressively invasive plant species. *Phragmites australis* is a common wetland reed with a global distribution. Roughly 200 years ago an agressive European genotype was introduced to North America. This non-native genotype out competes native genotypes and forms dense monocultures along the edge of both salt and fresh water. These monocultures not only reduce plant diversity but manipulate the ecosystem by altering soil chemistry and changing the physical structure of the land-water interface. *P. australis* is a considerable problem along the Great Lakes in Michigan and in Grey's Harbor, WA. I have isolated and identified the most abudnant filamentous fungal endophytes from both WA and MI populations of invasive *P. australis*. The endophyte communities at each location show almost no similarity, suggesting that *P. australis* aqcuires endophytes from the environment rather than carrying endophytes with it. By innoculating rice and turf grass with *P. australis* fungal endophytes and growing them under various conditions, I aim to discover the symbiotic funciton of these fungi. Additional experiments investigate the effectiveness of various field tested fungicides on individual *P. australis* fungal endophytes grown in culture. The long term goal of this project is to develope a novel method for erradicating invasive plants by targeting vital mutualistic fungal endophytes. *P. australis* fungal endophytes in culture are sensitive to field tested fungicides and the next phase of this projet will investigate the effect of fungicides on symbiotic plant.