Rutgers Center for Resilient Landscapes
2016 Fall Symposium
October 6th, 9 am to 12 pm
Cook Student Center, Room 202C

Schedule

9 am Welcome

Session 1: Modeling Social-Ecological Disturbances
9:15 am Nazia Arbab, CRL Postdoctoral Fellow
Application of a Spatially Explicit Probabilistic Emerald Ash Borer (EAB) Dispersal Model to Assess Economic Impacts in New Jersey

9:30 am Matthew Drews, CRL Graduate Fellow
Assisting in Analyzing and Improving the Accuracy of a Mid-Atlantic Hurricane Tree Damage Model

9:45 am Joseph Rua, CRL Graduate Fellow
Exploration of FARO Freestyle 3D Laser Scanners as a Method for Estimating Understory Fuel Loading for Wildland Fire Management

10:00 am Discussion

10:30 am BREAK

Session 2: Urban Natural Resources Management
10:45 am Natalie Howe, CRL Graduate Fellow
Before the Fall: Monitoring the Ash Groves of the Philadelphia Urban Forest before the Emerald Ash Borer Kills the Canopy

11:00 am Max Piana, CRL Graduate Fellow
Forest Creation in the City: Testing an Anthropogenic Forest Succession Strategy

11:15 am Amanda Sorensen, CRL Graduate Fellow
Ecological Restoration as a Catalyst for New Forms of Civic Engagement

11:30 am Kari Williams, CRL Graduate Fellow
Land Use Histories of Forest Fragments in an Urbanized Region

11:45 am Discussion and Closing Remarks

The Center for Resilient Landscapes (CRL) is a new center located on Rutgers’ George H. Cook Campus. It is a collaborative research effort of Rutgers University, the USDA Forest Service Northern Research Station, and the New Jersey Agricultural Experiment Station. The objective of the Center is to focus on the development of social-ecological system resilience, from short-term recovery, to longer-term restoration, to fundamental system re-organization or resistance.
**Presentation Abstracts**

**Nazia Arbab - Application of a Spatially Explicit Probabilistic Emerald Ash Borer (EAB) Dispersal Model to Assess Economic Impacts in New Jersey**

Emerald Ash Borer (*Agrilus planipennis*) is an exotic invasive beetle that affects all species of true ash trees (*Fraxinus* sp.) in New Jersey. EAB was first detected in New Jersey in the summer of 2014. The full extent of EAB infestation in New Jersey is not yet known. The present research built a spatially explicit probabilistic EAB dispersal (SPEABD) model to predict high risk EAB infested zones across New Jersey. Specifically, SPEABD estimated the EAB spread using biological flight dispersal and human induced dispersal using vector grid landscape in Geographic Information System (GIS) environment. Potential dispersal and urban ash health trajectories from SPEABD model were linked to calculate estimated loss value of urban ash trees in New Jersey. The cost-benefit analysis is used to evaluate economic impact of EAB for three management scenarios. These management plans include no action, replace all ash trees and treatment of ash trees. This analytical approach will serve as a policy tool to guide forest management in New Jersey.

**Matthew Drews - Assisting in Analyzing and Improving the Accuracy of a Mid-Atlantic Hurricane Tree Damage Model**

One of the major causes of prolonged power outages, ecological damage, and personal property loss from Middle-Atlantic Hurricanes is from tree fall due to high winds, and Hurricane Sandy in 2012 was no exception in New Jersey. This prompted the US Forest Service to attempt to develop a model aimed at predicting tree damage severity ahead of time before a hurricane makes landfall. Based off of NHC’s HURDAT2 model, the Hurricane Forestry model utilized ‘best track’ forecasts and other National Hurricane Center data to develop a wind map of NJ detailing where the strongest winds may lie, including New Jersey’s unique topographical influences on the wind field. The next step of the project was then to analyze the results of the model output using Hurricane Sandy as a test case and then to compare it to meteorological surface data gathered from the New Jersey Mesonet during Sandy. The resulting model output when compared to the Mesonet data was not unreasonable. After that, additional factors that may significantly contribute to the model’s accuracy were debated and explored for future incorporation into the model, such as forest type, soil type, soil moisture, tree density, topographical exposure, time since last major weather event, etc. (Credit to Jason Cole of the US Forest Service for the development of the model).

**Natalie Howe - Before the Fall: Monitoring the Ash Groves of the Philadelphia Urban Forest Before the Emerald Ash Borer Kills the Canopy**

I will describe the beginning of a long term research project on how the Philadelphia urban forests respond to the outbreaks of the invasive insect, the emerald ash borer (EAB). EAB was documented in Philadelphia in the spring of 2016, and is expected to cause 99% mortality of ash trees in forests it invades. The effects of the EAB on the urban forest are expected to be important since ash constitutes 25% of the urban forest canopy in Philadelphia.

This long term study will document vegetation composition and structure before, during, and after EAB attack, allowing us to investigate how multiple factors (soil moisture, distance from infrastructure, and forest management) interact to influence the forest community recovery after the loss of ash trees. Philadelphia Parks and Recreation has been treating some trees across the city with insecticide to preserve them in the face of the EAB invasion. This study, which represents the first year of this long term study, measured vegetation in the canopy, understory, and in the herbaceous layer near treated trees that will survive the invasion and near untreated ash trees that will die. The study therefore documents effects that the death of ash trees is having on the urban forest vegetation.

The results of the first field season demonstrate that the ash groves of the three watershed parks of Philadelphia (Cobbs Creek, the Wissahickon, and the Pennypack) have distinct initial conditions in terms of understory vegetation communities and in terms of potential canopy in a post-ash forest.
Recognizing the suite of ecosystem services from urban forest, cities around the world are embarking on efforts to increase green space within urban limits. Tree planting is one area of focus for these efforts. While increasingly common, the ecological understanding of urban afforestation sites is limited and needed to inform design and management strategies. In 2015 a long-term study of an afforestation strategy using urban adapted early successional tree species was integrated into a New York City Million Trees Planting Campaign within the Freshkills Park. The study asks: Can we use pioneer species such as willow and poplar as part of an anthropogenic forest succession program to achieve more rapid canopy closure on urban afforestation sites thereby reducing maintenance costs and allowing for a faster creation of a forest in the city? This presentation will review the design and installation of Freshkills Afforestation study and the series of experiments that have been initiated on the site that aim to describe the impact of different afforestation strategies on planting success, soil carbon, seed dispersal, and forest succession.

**Max Piana - Forest Creation in the City: Testing an Anthropogenic Forest Succession Strategy**

In recent years, wildfires in the United States have been burning with greater frequency and intensity. This trend is only expected to accelerate with changes in global climate. While wildfires play important roles as disturbance regimes and forest health, they can also threaten both structures and human life — especially in the wildland urban interface (WUI). Estimating forest fuel loading is crucial for estimating wildfire risk, ongoing fire behavior model development, and evaluating treatment effectiveness. Fuel loading is a key factor that regulates fire intensity, as well as rate of spread, during wildfires, and many simulation models of fire behavior require estimates of fuel loading. Further, it is the only factor in fire behavior that fuels managers can influence, yet has high temporal and spatial variability, especially in regions with frequent fires or other disturbances. The current destructive harvest methods used are time consuming and are not, by definition, “repeatable” (as the plot has been harvested to be dried and measured). As it is vitally important to be able to rapidly and accurately assess fuel loading in with a high spatial resolution, I have endeavored to investigate an alternative and technologically sophisticated approach.

While air-born and terrestrial LiDAR has been demonstrated as a useful means of quantifying forest canopy fuels, newer hand held scanning units have since become available, but have not yet been used on forest fuels. One such unit is the FARO Freestyle 3D laser scanner. The purpose of this study is to determine the effectiveness and utility of using a Faro Freestyle 3D hand laser scanner to measure the surface fuel loading in a pine-oak forest. I performed three different tests in order to evaluate the potential for the Faro Freestyle 3D scanner’s use in measuring the fuel loading of surface fuels, which are those fuels that are within two meters above the ground surface. Current remote sensor methods have some difficulties in detecting the structure of a forest in the shrub layer in the first two meters because of noise from the canopy, and uncertainties in determining ground elevation. My work demonstrates that handheld LiDAR units can be used to successfully estimate the biomass of the shrub layer non-destructively in a forest by using Bayesian Regression to compare the amount of pixels scanned by the laser to the biomass of the harvested plots and detect any relationships between the data points. In combination with other LiDAR technologies to estimate canopy fuel loading, this research contributes to much better estimates of forest fuels.

**Joseph Rua - Exploration of FARO Freestyle 3D Laser Scanners as a Method for Estimating Understory Fuel Loading for Wildland Fire Management**

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**Amanda Sorensen - Ecological Restoration as a Catalyst for New Forms of Civic Engagement**

Environmental and ecological restoration projects are used widely as a means in which to reverse the degradation and damage done to an ecosystem by human activity (Jackson et al. 1995). While the effects on the ecosystem have been widely evaluated (Benayas et al. 2009), there has been little work done to investigate the social impact on the communities these projects take place in, particularly in urban communities. This project investigates the role of the communities in restoration, building upon a current ecological restoration maritime planting experiment in the Jamaica Bay region of New York City. Particularly, we were interested in the role of individual identity, perceptions of restored areas, and environmental identity on community motivations to contribute to restoration projects and valuation of the environment. We developed a 36 item questionnaire with scales of questions on environmental values, identity, views of community, views on restoration, and motivation to contribute to restoration projects. From our initial analysis we see the emergence of unique community or neighborhood identities that may influence individuals’ perceptions,
support of, and desire to engage in ecological restoration programs. Additionally, the desire to preserve local biodiversity was not correlated with engagement in ecological restoration programs where as a desire to help and improve the local community was. These results suggest a potential need to reframe how scientists approach and discuss future restoration projects with community members to garner support for these types of programs. Planned follow-up interviews this fall aim to tease apart these findings and investigate the impact and role of framing in this restoration program.

Kari Williams - Land Use Histories of Forest Fragments in an Urbanized Region

Small, fragmented forest environments are common in between the dense human settlements of urban regions, including much of the Eastern United States. The FRAME (Forest Fragments in Managed Ecosystems) is a long-term research program to study urban forest fragments through 38 established sites in the Philadelphia Metropolitan Area. These sites, though all urban deciduous forests within one region, are widely heterogeneous. The diversity of each site can be documented through careful study of the existing conditions, but it can only be understood by looking to the past. In the roughly 350 years since Europeans settled in the Delaware Valley, land uses have changed with economy, technology and population growth. Working with the hypothesis that historic events leave an ecological legacy, this project assembles the historic land uses of the FRAME sites. The detailed archival research will allow for analysis to link ecological trends and anomalies to historic contexts, providing a richer insight into each forest fragment.