USDA Forest Service, Northern Research Station and Rutgers, The State University of New Jersey - Center for Resilient Landscapes Fellowship Application 2017

The Center for Resilient Landscapes, a joint venture of the USDA Forest Service and Rutgers NJ Agricultural Experiment Station is pleased to announce this opportunity for summer funding for graduate research. Fellowships will be offered to currently enrolled students interested in exploring research in collaboration with Forest Service scientists and local organizations within the following seven program studies.

Fellows will be part of a developing team of faculty and USDA-FS scientists whose main objective is to study urban natural resources stewardship and the development of social-ecological system resilience, from short-term recovery, to longer-term restoration, to fundamental system re-organization. The fellows may be based in New Brunswick, NJ on the Rutgers Cook Campus, in Philadelphia, or in New York City depending on the project. The research and collaborative team is expected to have a regional focus and will develop programmatic linkages throughout (but not limited to) the Silas Little Experimental Forest; the USDA-FS Urban Field Station network; the Rutgers campuses in New Brunswick, Newark and Camden; and other regional university programs, as opportunity allows. Centrally located between the USDA-FS Urban Field Stations of Philadelphia and New York City, there will be opportunities to form collaborative relationships across and between locations. For this reason, fellows may be required to travel throughout the region. The specifics of different projects will be addressed during the interview process.

Applicants with a broad range of disciplinary backgrounds will be considered, including geography, computational sciences, entomology, ecology, plant pathology, forestry, horticulture, environmental sociology, planning, and natural resource management. The fellowship is a one year program but most of the work is expected to happen during the summer. Fellows are expected to work at the Field Stations for 12 weeks, though there is flexibility based on the awardees' schedule and project. During the remainder of the year, students will continue any remaining data analysis or writing required to meet their goals (e.g. publication or poster presentation). Transportation requirements will be dependent on the location of the project, but fellows will need to have a valid driver's license and be able to drive safely.

The fellowships are open to currently enrolled Rutgers graduate students.

Expectations for Fellows

- *Exploring* – Each fellow should expect to conduct and provide a literature review related to their project.
- *Researching* – Each fellow will develop their own research questions and project within the framework of an existing project. Fellows are expected to spend time at the preferred locations and to attend occasional field station team meetings.
- *Contributing* – Each fellow is expected to spend some time working with their mentors on data collection. This may vary considerably for each project, but students should expect to commit up to 100 hours over the course of one year working with Forest Service scientists and partners. These interactions will serve as an opportunity for fellows to develop relationships with researchers and practitioners in their area of interest. A project statement, short progress report at end of summer, and continued communication with the CRL team is required to maintain the program web site, in addition to any possible graduate committee or USDA FS team reporting requirements.
- *Sharing* – Develop a poster or oral presentation for use at conferences and Field Station programs. In addition, we expect each fellow to share the work that they have done either through a regularly maintained blog, twitter feed, webinar, PowerPoint presentation, or paper. We encourage students to try to publish their results and we will help support that if your results lend themselves to publication.

What you can expect from USDA Forest Service and our partners

- *Funding* - $5,000 Fellowship award
- *Mentoring* - Mentorship from Forest Service scientists and help with project visibility and career development. Mentors will also help with developing research questions and communicating your experience and work to others.
- *Linking* - Access to local organizations, community groups, and practitioners

Application Requirements

Applicants must be currently enrolled at Rutgers. Graduate students are welcome and encouraged to apply. Applicants need to submit:

1. A CV or resume,
2. Two letters of recommendation (one of which should be from a faculty member),
3. A statement of interest describing which project you would like to apply for, what you hope to learn from this fellowship, why you are interested in this topic, and how this fellowship fits into your professional or academic goals.
4. A brief description of how you will communicate your work to others (e.g., blog, twitter, presentation, poster, publication) and what kinds of outreach efforts could be applied

to the project (e.g., work with high school teachers and students, present at a conference, present at public forum, create a web tool).

Applications will be accepted until February 28, 2017 by e-mail or by mail to:

Dr. Jason Grabosky
14 College Farm Road
New Brunswick, NJ 08901
grabosky@aesop.rutgers.edu (subject line: *name*_ CRL_ application materials)

A selection committee will be convened in March to develop interviews in March/April with applicants, the committee and the relevant research team.

Summer 2017 Potential Fellowship Project Opportunities:

1. Calculating factors leading to return visits to public parks using the Kids in Parks TRACK Trails initiative dataset

USDA Forest Service - Philadelphia Field Station

Advising: Michelle Kondo, Geoffrey Donovan, and Rebecca Jordan (Rutgers)

Kids in Parks is a nonprofit organization that formed in 2008 with the goal of improving the health of children and the health of public parks by making existing trails more attractive and fun for novice users. While there are many parks, trails and outdoor areas already accessible to both urban and rural families, hiking and other outdoor activities are often perceived to be too difficult, potentially dangerous or unexciting to newcomers. Kids in Parks seeks to get beginners outside using a network of outdoor adventures, called TRACK Trails. Each TRACK Trail features self-guided brochures and signs designed to make the experience more educational, enjoyable and fun.

TRACK Trails are established through partnerships with municipal, state, federal (including national forests), and other partners. The group's early work created a network of trails and partners in the communities on and along the Blue Ridge Parkway. Partners include the Blue Ridge Parkway Foundation, National Park Service and Blue Cross and Blue Shield of North Carolina. TRACK Trails now exist in California, District of Columbia, Maryland, North Carolina, South Carolina, South Dakota, Tennessee, Virginia, West Virginia, and Wyoming.

TRACK Trails also offers incentives, and online activities, which participants can claim by registering each of their TRACK Trails experiences. Kids in Parks now manages a database of TRACK Trails participants – participant information including home location, and TRACK Trail code, for each of their hikes. Analysis of these data could allow us to answer questions that could assist design and marketing of future TRACK Trails, and to understand the impact of this program. These questions include, for example:

- What is the frequency of return trips (to the same park, or to different parks)?
- What are the characteristics of first-visit parks compared to second-visit etc. parks?
- Which parks lead to the most second-visits (to other parks; *ie* "gateway parks")?
- What are the predictors of return and second visits? (e.g. residential demographics, family characteristics, individual characteristics (sex, age), park characteristics, distance)

Fellow Responsibilities: The fellow would be responsible for helping to build a complete database to support analyses to answer these questions. Tasks will include conducting spatial analyses to assess proximity (e.g. between participants' homes and TRACK trails, or to other parks), gathering data such as weather/climate data for each TRACK trail visit, and attributes of each park or trail such as topography.

2. Developing allometric equations for multi-stem urban trees

USDA Forest Service Philadelphia and NYC Field Stations

Advising: Lara Roman & Jason Henning (US Forest Service Philadelphia Field Station), Rich Hallett (US Forest Service NYC Urban Field Station), and Jason Grabosky (Rutgers)

Diameter at breast height (DBH) – the diameter of a tree's trunk at 4.5 ft (1.37 m) – is a fundamental piece of information for studies of forest structure and function. For example, DBH is used to describe size class distribution, estimate ecosystem services (using allometric equations and other assumptions), and repeated DBH measurements are used to report radial growth and biomass accumulation. However, in urban forests, there are many multi-stem species whose growth forms are not conducive to classic DBH measurement techniques (and indeed, in rural forest systems, DBH is not recorded for shrubby and small trees, making this problem distinct to urban forestry). Various techniques have been used to measure such trees (e.g., i-Tree Eco, Urban Forest Inventory & Analysis, and Urban Tree Monitoring Protocols), with much debate among researchers as to which techniques are best. Research is needed to evaluate the merits of various DBH measurement methods for multi-stem urban trees for applications such as descriptive size class distributions and allometric equations. Similar basic research about mangrove forests have shown the optimal ways of measuring those trees for biomass estimates. With researchers drawing attention to the need for urban-specific allometric equations (McHale et al. 2009, McPherson et al. 2016), this research will fill a vital gap in knowledge about multi-stem trees.

Fellow Responsibilities: The fellow would be responsible for completing field work to measure urban trees, culling select multi-stem species from existing data sets (e.g., *Lagerstroemia* sp., *Malus* sp., *Prunus* sp., *Pyrus* sp., *Zelkova serrata*). The focus would be on street trees due to data availability as well as past research suggesting that street trees require distinct allometric equations from rural trees. Available data sets include inventories for Philadelphia, the University of Pennsylvania campus, and New York City. The student would then use that data to develop alternative allometric equations using different ways of measuring DBH, and make recommendations as to optimal methods. Note that this project would require a student living and doing field work in Philadelphia (preferred) or NYC.

Research questions: For multi-stem urban tree species, what are the implications of various methods of recording DBH for allometric equations? Which DBH methods are most appropriate for estimating tree height, crown height, and crown width?

3. Forest conservation and collective management on private lands: the role of land use planning, informal institutions, and citizen management

USDA Forest Service - Baltimore Field Station

Advising: Miranda Mockrin, Nancy Sonti, and Morgan Grove

Protected areas, or parks, form the backbone of many jurisdictions' forest conservation efforts, yet substantial areas of forest are found *outside* parks, across a variety of private and community land ownerships. In the city of Baltimore, twenty percent of tree canopy is in forest patches (10,000 sq. ft. or more) outside parks, in public and private ownership. While much of Baltimore County remains rural, forests are highly fragmented into approximately 9,000 patches, with an estimated 50,000 or more owners. Across such a diverse backdrop of forest owners, we seek to understand ***how and why forest cover is maintained and managed when it lacks formal protection and management. What are the roles of formal and informal institutions, such as land-use planning, homeowners associations, and citizen management***? By examining these relationships across urban to rural settings, in Baltimore City and the County, we hope to bridge and extend past research and conservation efforts on forest patches in both jurisdictions.

Research Objectives:

A) Compile and analyze Baltimore City and County data on forest patches and ownership to identify the size, location, and ownership type of these non-protected forest patches, in the City, and inside and beyond the County's urban growth boundary.
B) Inventory existing regulatory and incentive policies, programs, and plans at the state and local level for land use conservation and land management programs, and analyze their relevance to Objective A.
C) Identify a limited number of patches for in-depth study and examine ownerships and land-use histories of these patches, using publically available records and historical land cover. Interviews with municipal decision-makers and managers (starting with local government, but including non-profit staff, homeowners associations, and citizen groups) can reveal current management strategies and histories of forest preservation.

Fellow Responsibilities: This project can be tailored to research fellow's strengths and interests, but helpful skill sets for this project include GIS, policy analyses, and experience in designing and conducting semi-structured interviews, and analyzing interview data.

Relocation to Baltimore, MD for the project duration is preferred but not required.

4. Developing a Soil Quality Index for Legacy Soils in the Urban Context

USDA Forest Service – NYC Urban Field Station

Advising: Frank Gallagher (Rutgers), Rich Hallett, Allyson Salisbury (Rutgers)

Novel assemblages often referred to as "urban wildlands" appear to function and be resilient in spite of the environmental stressors associated with legacy soils from past industrial activities. They developed unique patterns of species diversity/distribution; models of primary productivity (Gallagher et.al. 2008ab, Dahle et. al. 2014); and carbon sequestration (Renninger, et. al. 2012) that are driven by threshold tolerances, as well as develop along nontraditional guild trajectories (Gallagher. 2011). In addition, the ecological risk associated with uptake and transfer of various contaminants appears not to follow traditional biomagnification scenarios (Gallagher et al., 2008a; Qian et al., in review). Within these domains this project seeks to address current knowledge gaps through the characterization and comparison of soils within two well-known urban brown fields.

In 1995 under contract with the New Jersey Department of Environmental Protection (NJDEP), the United States Army Corps of Engineers collected and analyzed soil samples for the 125 priority pollutants (NJDEP 1995), from the abandon rail yard within Liberty State Park (LSP). One composite sample was collected by split spoon from the A and C1 horizons from 98 sampling points. Soil metals were analyzed using graphite furnace atomic absorption spectrometry (GFAA). A second soil metal data set was collected in 2005 by NJDEP in 32 of the plots from the 1995 study. Three samples were collected at each plot with a soil borer at a depth of 10 to 25 cm (C1 horizon), the depth of greatest root density (Gallagher et al. 2008a). Sixteen additional sites were used to further define areas of unusually high metal concentrations. A total metal load (TML) index was calculated for each study plot in the site (Gallagher et al. 2008b). TML is a rank-sum index based on total soil metal concentration. These data were then kriged to develop a TML map for the entire site. Seven of the sites sampled in 2005, those with established early successional hardwood forest assemblages, were again sampled in 2014/15 to assess changes over the past decade (Salisbury et al., 2017).

These data appear to indicate that the soil's total metal load exerts a threshold effect on the plant assemblages. Above a certain level productivity and diversity diminish significantly (Gallagher, et. al. 2008) Such findings raise the question, are plant assemblage responses to anthropogenic soils site specific or can common trends be identified through the use of a standard metric of soil conditions?

Freshkills Park (FP) in Staten Island, New York offers a prime opportunity to explore such questions within the same geographic region however having a different industrial history. Fifty-three soil samples were collected in Summer 2014 from randomly selected spots across the site from a sample depth of 0-10 cm. Plant available elements were estimated using a 1.25 M ammonium acetate solution and a mechanical vacuum extractor. A preliminary TML was also created for the site.

A comparison of soil metal concentration at both the single element and aggregated levels would yield insight into the commonalities and/or differences associated with metal induced abiotic stress within postindustrial landscapes. However, since samples were measured using different analytical

procedures, comparisons of the data in current forms are challenging. Research at LSP (Salisbury et. al., 2017) has demonstrated that such differences can be overcome. The objective of this project is therefor to develop a soil metric similar to the TML approach used at LSP but more generic in order facilitate comparison between multiple sites. The index could be developed as an original model or be modified from an existing index developed for other applications, such as the FIA Soil Quality Index (USDA, Forest Service, 2001).

Fellow Responsibilities: A research fellow would be expected to collect additional soil samples as needed, re-analyze soil samples so that analytical methods match between LSP and FP, then develop and apply a new soil index method using the LSP and FP soil data. This index would then be used in future research to compare the relationships between plant community structure and function at multiple sites. Understanding these relationships can help set management expectations for establishing and maintaining plant assemblages on post-industrial sites.

5. Stewardship Mapping and Assessment Project (STEW-MAP)

USDA Forest Service NYC Urban Field Station

Advising: Erika Svendsen, Lindsay Campbell, and Michelle Johnson

The Stewardship Mapping and Assessment Project (STEW-MAP) seeks to answer the question: What are the social and spatial (geographic) interactions among people and groups that conserve, manage, monitor, advocate for, and educate the public about their local environments (including water, land, air, waste, toxics, and energy issues)? Stewardship is one of the ways that both informal and more organized groups contribute to the care of their local environments. These groups work alongside or independent of public agencies and private businesses in managing urban places.

STEW-MAP was initially completed for NYC in 2007 and is being repeated in NYC this year, enabling an analysis of stewardship over time. STEW-MAP includes a survey of stewardship organizations that involves mapping organizations' areas of activity (or turfs) and their social networks with which they collaborate. This survey is then followed up by interviews of willing survey respondents.

Fellow Responsibilities: The Rutgers Fellow for this project would assist the STEW-MAP team with one or more of these aspects of STEW-MAP, depending upon their interests and/or skills in **survey analysis, interviews, spatial analysis, social networks, and/or organizational sociology**. The Fellow also could develop additional research questions building on these STEW-MAP datasets in NYC or previous 2015 water-focused stewardship surveys in the NY/NJ Harbor watershed in collaboration with the Harbor Estuary Program. Some travel would be expected to the NYC Urban Field Station in Bayside, Queens, and/or lower Manhattan over the course of the fellowship.

6. Resilient Recovery in Coastal Communities: Residential development, adaptation, and green infrastructure after Hurricane Sandy

USDA Forest Service NYC and Baltimore Field Stations

Advising: Michelle Johnson and Miranda Mockrin

Policy innovation can often occur in reaction to a natural hazard, when communities have to rebuild homes and infrastructure at a time when the risk of natural hazards has been made apparent (Mockrin et al. 2016). The increased frequency and strength of coastal storms and flooding both pose a threat to coastal communities and offer opportunities—to invest in green infrastructure, such as wetlands; to buffer storm surge; and/or to retreat, and move housing away from harm's way. We propose to examine policy and rebuilding responses in coastal cities in New York and New Jersey following Hurricane Sandy, examining changes in land use, green infrastructure, and rebuilding rates. Hurricane Sandy affected the NYC metro area, along with coastal and inland New Jersey and Long Island and Connecticut in 2012. Research objectives for this project include 1) Compile and analyze building permit and buy out data for coastal municipalities; 2) Inventory land use policies, regulations, and planning documents for policies and regulations resulting in changes in green infrastructure; and 3) if time allows, interviews with municipal decision-makers and managers.

Fellow Responsibilities: This project can be tailored to research fellow's strengths and interests, including experience with GIS, collating and organizing data, and policy analysis.

7. Using the seed bank to predict changes in plant composition after Emerald Ash Borer invasion in Philadelphia's urban forest.

Advising: Sarah C. Low, Natalie Howe, John Dighton (Rutgers), Ken Clark

Since emerald ash borer (EAB) was anticipated to establish and impact ash in Philadelphia, a study was designed in 2015 and implemented in 2016 to look at changes before and after invasion. Meanwhile, the City of Philadelphia's Department of Parks & Recreation conducted an extensive inventory and treatment program in order to save large ash trees and delay maintenance associated with hazardous dead and dying trees. In summer 2016, Emerald Ash Borer was discovered in Pennypack Park in Philadelphia, PA. As a result, there will be forest stands with thriving treated ash trees and stands with large canopy gaps and large amounts of coarse woody debris from fallen ash. We have a snapshot of the plant composition that is present now, but we do not know how that plant community will change over time as ash trees die. We are proposing to grow out the seed bank to help better understand what species are present in the soil and how that varies across sites. In addition to being important research in the field of disturbance ecology, it is also valuable in helping managers understand what is possible. It could provide information about whether or not native species are available in the soil and what invasive plants are likely to emerge. Knowing what species might be most likely to grow in a site helps managers plan restoration activities. They are better able to make decisions about what plants to plant and what plants to anticipate removing. The proposed project will address questions like: How will these

dynamic and heterogeneous forest communities change over time? Can those changes be predicted through information gathered at the site and in the seed bank? How can this knowledge be used by practitioners to shape management priorities and plans?

Fellow Responsibilities: The fellow for this project would be expected to develop a detailed protocol based off of the existing EAB forest community monitoring plan. The fellow would be responsible for going to all of the sites and collecting soil samples for the purpose of growing out the seed bank. The fellow would then be responsible for growing out the seed bank and identifying the emergent plants by species.

8. Independent Ideas

USDA Forest Service: To Be Determined

If a potential candidate has a research idea that they would like to propose as a potential CRL Fellowship Project, the idea can be submitted for consideration under this project title. The project must be appropriate to the mission of the Center for Resilient Landscapes, and must be reasonable in scope to correspond with the available funding. The project must address some aspect of landscape resilience with implications for both New Jersey and the Northeast Region or beyond in the management and stewardship of environmental resources, social connection to such resources or ecological function in changing environments, or disturbances.