CHICAGO BOTANIC GARDEN

Science Yearbook 2013

Pitcher's thistle, Door County, Wisc.

Compiled by Kayri Havens-Young

2014

EXECUTIVE SUMMARY


Evening primrose with hawkmoth

The Chicago Botanic Garden's Plant Science and Conservation department had a remarkable year in 2013. On the research front, a new project began with funding from the National Science Foundation to explore the role of floral scent in attracting both pollinators and seed predators in a rare evening primrose. Another new project will look at the effects of climate change on seed germination and seedling establishment in several native species. From monitoring our region's rarest plants to determining best restoration practices locally and in the western United States—and from documenting diversity in breadfruit, an underused crop to developing tools to manage invasive species—Garden scientists and students are positively impacting plants and plant communities around the world.


CLM interns identifying plants

Training the next generation of plant scientists and conservation biologists continues to be an important activity in the department. The joint graduate program with Northwestern University is growing and thriving. Many of our students received prestigious fellowships and awards in 2013. Over 120 interns contributed to important stewardship activities on public lands as part of our Conservation and Land Management (CLM) Intern Program. Students from middle school through to post-doctoral researchers worked alongside Garden scientists as part of the Science Career Continuum.

On our own campus, the Garden's lakes and woodlands received several regional and national recognitions for our ongoing restoration and management programs. In 2013, we added 291 accessions of 215 species to our seed bank. Our holdings now include 2,757 accessions of 1,315 species helping to safeguard our native plant species for future generations.


Garden lake shoreline

CONTENTS

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RESEARCH PROJECTS AND CONSERVATION PROGRAMS

The Chicago Botanic Garden is a leader in the international effort to conserve and promote global biodiversity. The Garden's plant biology and conservation science program is providing national and international leadership in conservation and training, engaging critical natural resource management research, and offering a world-class science facility for researchers and students. The program aims to help mitigate the loss of plant diversity and to foster an improved relationship between humans and nature. Said another way, the Garden's goal is no less than to help save the planet by helping to save its plants.

To accomplish this goal, 40 staff, 39 graduate students, 172 interns, and over 65 volunteers in the Garden's plant biology and conservation science program focus their efforts on the five interrelated research and action areas represented by the columns in the following figure.

Documenting and Understanding BioDiversity	Understanding threats to plants, fungi, and native habitats	Mitigation against threats	Using plants and fungi for human benefit	Building scientific capacity and understanding
• Genetic and species diversity • Plant/animal and plant/ fungal interactions	• Invasive species • Habitat fragmentation and destruction • Climate change • Loss of pollinators • Declines in population size	• Seed banking • Plant monitoring program • Soil restoration • Assisted migration • Restoration ecology • Urban ecology (e.g., green roofs)	• Crop genetics • Ornamental plant breeding and evaluation	• NU Graduate Program – MS and PhD • Conservation Land Management Program (BLM) • Undergraduate interns • Science First and College First

The following project summaries are organized under these areas.

RESEARCH PROJECTS AND CONSERVATION PROGRAMS

Understanding Threats to Plants, Fungi, and Natural Areas

Phenology Projects – In partnership with the National Ecological Observatory Network (NEON) and the Garden's Education Department staff, we continued work on the Project BudBurst and Floral Report Card projects. Project BudBurst is a national citizen science campaign that engages the public to collect important ecological data about the timing of leafing, flowering, and fruiting of plants (*plant phenophases*)—all of which are related to climate. The program has observers in all 50 states. The Floral Report Card project consists of a network of identical climate change

monitoring gardens. In 2011 and 2012, gardens were installed in 12 locations (four in Chicago, four in Seattle, and one each in Boston, Washington DC, North Carolina, and Iowa). Data collection began at all of the gardens in 2013. A special section of the Project BudBurst website was created to provide information about the project and house the data (Havens-Young, Schwarz-Ballard, and NEON collaborators).

Seed Germination and Climate Change – In 2013, we began a project to understand the temperature and moisture tolerance ranges for germination of numerous native species. Seed recruitment is predicted to be one of the most at-risk stages for plant regeneration in a changing climate. This project will focus on multi-species, multi-generational lab and common garden trials to characterize tolerance ranges for germination, while field trials will test how these results impact seedling establishment under future climatic scenarios (using elevational and latitudinal gradients as surrogates for projected change). These data will be employed as biophysical constraints in niche climate change models to visualize their importance in predicting species responses to climate change. In using multiple populations of common widespread congeners, representing a gradient of neighborhood sizes, the results will be applicable to a wide range of species and settings (Havens-Young, Kramer, Finch, Vitt, and outside collaborators).

Gravel Hill Biodiversity – Much like wetlands, gravel hill prairies represent a microcosm within the tallgrass prairie. The drier conditions (due to soil make-up and topography) support a unique plant community, including a number of important endemic and rare species. With the fragmentation of the landscape, these habitats are becoming increasingly isolated and many populations of these rare species are declining and we are seeing reproductive failure in a number of species. In a comprehensive study of community structure, demography, and genetics, we are investigating the decline of species within these communities in the Chicago Region and Wisconsin Driftless area, focusing on *Cirsium hillii*, *Asclepias lanuginosa, A. viridiflora,* and *Castilleja sessiliflora.* This work will allow us to identify critical threats to populations (e.g., invasive species, management, pollinator loss), identify areas suitable for restoring these critical species, and improving reproductive fertility in current populations. In addition, in 2013 we began a GIS-based Spatial Analysis of Rare Plant Populations on Gravel Hill Prairies to characterize the habitat of known populations and identify potential suitable habitat. Information collected by the Plants of Concern monitoring program was used to create Multi Criteria Evaluation models. By extracting data relating to soil attributes, land cover, hydrology, and distance metrics, gravel hill prairie habitat was classified and models were generated to identify suitable habitat based on variable weighting structures. The modeling resulted in comparable suitability scores for each natural area regardless of the model chosen. A number of restoration projects have been initiated with the help of this research and which will be monitored. Future analyses can include metrics of population health and spatial extent in order to better understand the relationship between site suitability and population dynamics (Goad, Fant, Still, Yates, Masi, and REU student Wright).

Roof Top Ecosystems – City green spaces are being recognized as important components of the urban ecosystem providing usable habitat for many organisms, including migrating species.

Green roofs are just one example of an urban green space, but they are both novel and rapidly increasing in area within North America. Graduate students Rebecca Tonietto and Kelly Ksiazek have been documenting the ecological services that green roofs provide as well as describing the ecological services found on the green roofs. Their work has resulted in three publications to date. Kelly is continuing to work on green roofs for her PhD dissertation, and she spent 10 months in Germany on a Fulbright fellowship—investigating the effects of weather variability on green roof plant diversity over multiple generations, and discerning how abiotic properties influence plant and arthropod communities on green roofs (Ksaizek, Skogen, Fant, and Larkin).

Restoration Ecology of Native Bee Communities – We are investigating the influence of grassland restoration on native bee communities in the Chicago region, using a chronosequence of restorations, unmanaged old fields, and remnant prairies. All field work has been completed and bee species identifications are underway. We are also performing gene sequencing of selected bee species to enable community phylogenetic analyses. We conducted bee and vegetation sampling in 18 sites, analyzed surround land cover, and are now integrating phylogenetic and community-level data to address these issues (Tonietto and Larkin).

Wetland Plant Communities and Secretive Marsh Birds – Earlier, we had completed a study in southern Wisconsin testing how vegetation and habitat characteristics of wetlands influence their suitability for secretive marsh birds (rails, bitterns, grebes, coots, and moorhens). As wetlands are degraded by watershed disturbances and invasive-plant species, does their ability to support this under-studied group of birds of high conservation concern decline? We are now shifting our focus to test the degree to which prevalent wetland restoration efforts in the Upper Midwest provide functional habitat for marsh birds (Larkin, Glisson, and outside collaborators).

PhragNet: A Cooperative Learning Network for *Phragmites* Management – We continue to manage a collaborative network for adaptive management of the invasive wetland plant *Phragmites australis* (common reed). Participants from throughout the United States and parts of Canada have implemented a standardized monitoring protocol in *Phragmites*-impacted areas slated for control and restoration. Hundreds of soil and leaf-tissue samples have been sent to the Garden for ongoing nutrient and genetic analyses (respectively). The goal of this cooperative effort is to "learn while doing," harnessing the collective efforts of wetland managers distributed over a broad geographic area to identify best practices for controlling *Phragmites* and reestablishing diverse native vegetation (Larkin, Lonsdorf, Fant, Jacobi, Hunt, and outside collaborators).

Controls on Wetland Denitrification – Denitrification is a valuable ecosystem service performed by wetlands that removes excess nitrate from waterways—a pollutant that causes eutrophication, algal blooms, and hypoxia. It is hypothesized that traits of wetland vegetation influence rates of denitrification. However, denitrification is difficult to study, and methodological limitations have produced a literature filled with null, conflicting, and unclear results. We are testing the hypothesis of vegetation effects on denitrification using promising biogeochemical approaches that are under-utilized in wetland ecosystems. We are comparing

wetland systems dominated by a native ecosystem engineer, *Carex stricta* (tussock sedge), which imparts fine-scale topographic heterogeneity, with those dominated by the invasive grass *Phalaris arundinacea* (reed canarygrass), which leads to topographically and biotically homogenous sites. We have completed two years of field data collection and are using controlled microcosm experiments to investigate the efficacy of natural-abundance stable isotope methods for measuring denitrification in wetlands (Hartzog, Larkin, and outside collaborators).

Community Phylogenetics of Remnant and Restored Tallgrass Prairies – We are using emerging analytical tools to incorporate understanding of plant evolutionary history into studies of prairie community change, management, and restoration. We have found that phylogenetic diversity of remnant prairies—how broadly from across the 'Tree of Life' their constituent species are drawn—varies with edaphic conditions and fire history. In addition, restored prairies have significantly lower phylogenetic diversity than remnant prairies that serve as reference communities. This means that typical management efforts are not adequately targeting the full complement of evolutionary history we wish to conserve. In addition, phylogenetic diversity strongly predicted diversity of plant functional traits. Lack of phylogenetic diversity in restorations could thus lead to reduced ecosystem functioning and resilience (Larkin, Jacobi, Lonsdorf, Williams, Barak, and outside collaborators).

Long Distance Gene Flow and Hawkmoth Pollination – Long-distance pollination has widespread implications ranging from limiting population divergence, accelerating the spread of adaptive traits, disrupting gene complexes, and maintaining species cohesion. This is particularly the case for floral traits where long distance pollinators act as agents of selection while also constraining divergence. Since 2008, we have focused on *Oenothera harringtonii*, an endemic to southeastern Colorado, and in 2011, we initiated similar studies on *Castilleja sessiliflora* in Colorado and Illinois. We use a combination of field, greenhouse, and molecular tools to assess long-distance pollination events via hawkmoths, the primary pollinator of both species. Analyses to date show little genetic differentiation range wide in *O. harringtonii,* implying high rates of gene flow among populations. However, data on floral scent shows a geographic pattern whereby populations in the south exhibit different scent compounds than those in the north part of the range. In addition, these results indicate that habitat fragmentation has not had a detectible effect on *O. harringtonii*, likely due to the fact that hawkmoth visitation still occurs in these populations. We plan to pursue similar questions with *C. sessiliflora* and additional species to determine the extent to which these patterns are generalizable for species primarily pollinated by long-distance pollinators such as hawkmoths. In addition, with funding from the grant "NSF Dimensions of Biodiversity: Landscapes of Linalool: Scent-Mediated Diversification of Flowers and Moths Across Western North America," we are working with collaborators from nine institutions to assess patterns of floral diversification in numerous species in the evening primrose family, Onagraceae, [see below under Documenting and Describing Diversity] (Skogen, Fant, and outside collaborators).

Species Distribution Modeling – In 2011, we started research in modeling the species distribution of rare plants in the western United States. The project, funded by BLM, is examining

the current and potential distribution of over 500 rare plants, including many cacti species. In 2013, additional distribution models were created for most of the species being studied and staff again spent time validating the distribution models for a small portion of our rare species. Throughout the ground-validation process, we have verified approximately 140 rare plants occurrences, of which nearly 60 are new. As a side benefit to the research project, we have added hundreds of voucher specimens to the herbarium. These will be useful for other researchers studying the flora of the West (Still, Vitt, and Havens-Young).

Plants of Concern – In 2013, the Plants of Concern program completed its thirteenth year. Since its inception through 2012, POC has trained and engaged 732 citizen scientists who have contributed 19,000 hours in the field and office. The program has monitored 261 endangered, threatened, and rare species at 329 sites in 1,094 populations (element occurrences) throughout the Chicago Wilderness region of Illinois, Wisconsin and Indiana. As a strongly collaborative regional effort, POC has worked with 116 cooperating public and private landowners. In 2013, as a result of grant funds, the program placed special focus on monitoring at Midewin National Tallgrass Prairie(for the eleventh year), and at Openlands Lakeshore Preserve, Ft. Sheridan ravines, and Waukegan area dunes and ravines. Analyses of POC's 13-year dataset are yielding critical information on rare species' population trends in relation to management activities on a region-wide basis. Susanne Masi, the program manager, retired at the end of 2013 and Rachel Goad, former program assistant was hired to replace her. POC was recognized with two conservation awards and has become a recognized model citizen science program (Masi, Vitt, Goad, Steffen, Rosenbaum, Yates, NU graduate student Vander Steldt, and interns).

Using Spatial Analysis and GIS to Investigate Patterns in Rare Plants Monitored by the Plants of Concern Program – The Plants of Concern (POC) Program monitors over 225 species of the Chicago region's endangered, threatened, and rare plants; assesses long-term trends in rare plant species; and provides data on plant response to management activities and environmental threats to over 70 partner landowners and managers for conservation decision-making. Utilizing the Conservation GIS Lab at the Garden, rare plant population data from 2001-2010 from within the Chicago region were analyzed and investigated. Exploratory spatial data analysis and GIS-based spatial analysis produced various hypotheses associated with spatial and temporal patterns of monitored rare plants, effects of management history, threats to rare plant populations, presence of invasive species, etc. Spatial analysis of POC's monitored rare plant data facilitates visualization of patterns and adds a new dimension to already valuable data. Maps, visuals, and data produced from this type of analysis create a medium of communication that can enhance the message of conservation programs such as POC for scientists, collaborating regional land managers, and the general public (Yates, Masi, Goad, Rosenbaum, and REU student Wright).

A Spatial Assessment of Rare Plant Locations across Chicago Wilderness: Putting Citizen Science Data to Work – Although the Chicago region is highly urbanized, it contains a number of high quality natural areas that support rare species. Land managers use rare species data in management planning, but they are often unable to collect this data on a scale at which it is

needed. Regional assessments and local analyses that can provide feedback about the status of rare species are critically needed. Further, although our region has been widely botanized, new locations of rare species are regularly reported, and ongoing land use changes necessitate a thorough understanding of species occurrences. Plants of Concern is a citizen science-based, regional rare plant monitoring project in the Chicago Wilderness area that is now collecting its thirteenth year of data. We performed a spatial analysis of Plants of Concern data for 40 Illinois threatened species and 81 Illinois endangered species monitored in the Chicago Wilderness region over the last 12 years, and explored the effects of soil type and surrounding land use on occurrences of state listed species. These occurrences span a broad range of habitat types, including those that were once widespread and those that have historically been fragmented or restricted. Historically fragmented habitats, such as gravel hill prairies, host numerous rare species of conservation concern. By analyzing the occurrences of rare species in fragmented habitats, we attempt to model where else in the region these rare species may occur (Goad, Fant, Still, REU student Wright, Yates, and Masi).

Understanding and Managing Invasive Aquatic Species – Invasive plants and animals pose significant ecological and environmental threats to our aquatic systems. In cooperation with the Northeast Illinois Invasive Plant Partnership, public education and identification protocols were created in 2013 to elicit the public's support in detecting hydrilla (*Hydrilla verticillata*) in Illinois at the earliest possible opportunity (this extremely aggressive invasive submerged aquatic plant has already been found in states surrounding Illinois). Garden staff also cooperated with researchers at Northwestern University and Wetlands Research Inc. to identify phernomes that might be used to attract (and then trap) the invasive common carp (*Cyprinus carpio*). In cooperation with the Park District of Highland Park, the Garden installed and maintained a water garden feature at Jens Jensen Park that showcases and interprets 14 species of native water garden plants. Finally, the Garden coordinated a multi-agency effort to document alarmingly dense populations of water hyacinth (*Eichhornia crassipes*) and water lettuce (*Pistia stratiotes*) that were found in the Skokie Lagoons in fall 2013 (Kirschner, McGlynn, and Nagle).

Redistribution of Deep Soil Water by Tree Roots and Soil Fungi in Dry Seasonal Tropical Forests – Studies of plant water uptake have largely focused on the role of roots. However, mycorrhizal fungi can play key roles in moving water to plants and enhancing nutrient uptake under dry conditions. Our study is in the Yucatan Peninsula, where extreme seasonality limits growth in the dry season (January to June), and soil water levels drop 9 meters below the surface to create an extremely dry surface soil and adverse conditions. Most trees lose their leaves, but evergreen trees appear to utilize deep water in subterranean caves. We are using this system as a proxy for climate change, particularly drought. We have found that the roots of 26 species of trees can reach deeper water sources, suggesting that redistribution may be more widespread than originally expected. Our next goal is to determine how much water is re-distributed within the dry upper soils and by which species of fungi (Egerton-Warburton, Morgan, and Amses).

Genetic Diversity in Rare Species – The maintenance of biodiversity is an important objective of many conservation plans. We are working with a number of institutions to assess the levels of

genetic diversity that currently exists in a number of rare species. This includes working with Mike Howard (New Mexico BLM) on the critically imperiled *Lepidospartum burgessi* which is only found in a few locations in southern New Mexico and north Texas, Dr. Tiffany Knight (Washington University) on the federally endangered *Cirsium fonitinale*, Christal Niederer (Creekside Center for Earth Observation) on the federally endangered *Castilleja affinis* subsp. *neglecta,* Dr Tom Kaye (Institute of Applied Ecology) on the federally threatened *Castilleja levisecta,* and Dr. Ori Fragman-Sapir (Jerulsalem Botanic Garden) on the globally rare *Iris vartanii.* These types of studies allow us to assess populations of critical concern and assist with management decisions (Fant, Kramer, Skogen, Basey, intern Shaffer, and collaborators).

Cirsium pitcheri **(Pitcher's thistle)** – In 2011 we completed work on a five-year grant to study the demography and genetics of *Cirsium pitcheri*, a threatened species that occurs around Lake Michigan. We found that the species is in decline, and that all monitored populations are below replacement rate due to numerous threats including invasive species, predation by goldfinches, and predation by a biocontrol weevil (*Larinus planus*) that had been introduced to control weedy thistles. In 2011, we began demographic monitoring of the weevil-infested population in Wisconsin to track weevil effects (which continued in 2012 and 2013). A second biocontrol weevil, *Rhinocyllus conicus*, was found as a predator on plants in Indiana in 2012, and a third weevil, *Cleonus piger*, was discovered in 2013. We also began pollination studies in 2013 in an effort to find ways to control weevils without disrupting pollination (Havens-Young, Warneke, Vitt, and outside collaborators).

Also in 2013, we completed a paper, "Influence of contemporary and historic landscape features on the genetic structure of the sand dune endemic, *Cirsium pitcheri.*" Narrow endemic plants are at risk from climate change because of their restricted habitat preferences, lower colonization ability, and dispersal distances. Landscape genetics combines new tools and analyses that allow us to test how both past and present landscape features have facilitated or hindered previous range expansion and local migration patterns, and thereby allow us to identify potential limitations to future range shifts. We compared current and historic habitat corridors in *Cirsium pitcheri* and found a north–south pattern to the distribution of genetic diversity and inbreeding. A strong association between genetic distances and lake-level changes suggests that historic lake fluctuations best explain the broad geographic patterns, and sandy habitat best explains local patterns of movement (Fant, Havens, Radosavljevic, and Yates).

Echinacea angustifolia **(purple coneflower)** – Since 1995, Wagenius has investigated consequences of habitat fragmentation in tallgrass prairie, focusing *Echinacea angustifolia* and its associated herbivores, pollinators, and competitors. In spring 2013, Wagenius planted over 500 seedlings in an experiment designed to quantify fitness differences between native, non-native, and hybrid *Echinacea* plants. During summer 2013, Wagenius supervised a field crew of 10 and collaborated with a professor from Gustavus Adolphus College in rural western Minnesota. We established a new experimental prairie restoration plot, burned it in October, and planted over 1,000 *Echinacea* seed accessions. We also continued measuring over 10,000 *Echinacea angustifolia* plants in long-term experimental plots. We harvested 2,413 seed heads from experimental plots that are being analyzed by a dozen volunteers who will count and weigh the

fruits. Results of this work will elucidate the interplay of evolutionary and ecological processes in fragmented populations. NSF will continue to fund this project until 2016 (Wagenius and Ruth Shaw at University of Minnesota).

***Isoëtes butleri* (Butler's quillwort)** – *Isoëtes butleri* is a rare lycopod found in cedar glades and dolomite prairies. This species occurs in only four known locations in Illinois, where it is classified as state-endangered. We used long-term monitoring data from POC, genetic analyses, and ecological observations and experiments to assess threats to this species and develop recommendations for managers. We found that populations had fairly high genetic diversity, but they appeared to be displaced by taller-statured, more productive prairie species that leave behind large amounts of litter following senescence. We recommend increased use of prescribed burning as a means to open up suitable habitat for *I. butleri* (Vander Stelt, Larkin, Fant, and Masi).

***Lepidospartum burgessii* (burgess broomscale)** – *Lepidospartum burgessii* is an endemic plant of the Salt Basin of west Texas and southern New Mexico. The species occurs on various land ownerships including private lands (in Texas), state of New Mexico lands, public land managed by the Bureau of Land Management, and on National Park Service lands within the Guadalupe Mountains National Park. BLM has observed and monitored a population of approximately 5,600 plants in New Mexico since the mid-1980s. Censuses have shown a prevalence of mature and decadent plants and few juvenile plants in the population. Further investigation has shown this species rarely produces seed, and that it appears to be sustained by asexual reproduction (cloning via root shoots). The Garden has helped BLM-New Mexico determine that populations are not genetically monocultures. We are working on comparing this genetic variability with the congener (*Lepidospartum squamatum*), determining degree of asexual growth in these populations (number of clones and distance between clones), and determining relatedness within these population. In 2013, we began a study to conduct hand-pollinations between populations in hopes of increasing seed set for this extremely rare species (Williams, Fant, and Havens-Young).

***Lespedeza leptostachya* (prairie bush clover)** – Since 2000, we have been monitoring populations of this federally threatened gravel hill prairie species at Nachusa Grasslands in Franklin Grove, Illinois and at Harlem Hills Nature Preserve (part of Rock Cut State Park in Rockford, Illinois) to determine best management practices. In 2014, the stewards at Nachusa Grasslands will begin to introduce bison to the site and we will be studying the response. Bison increase the spatial heterogeneity of the landscape by grazing and other activities, opening up potential habitat for prairie bush clover. We will be using remote sensing techniques to capture this landscape-scale phenomenon and integrate the findings with our ongoing population studies (Vitt, Havens-Young, and outside collaborators).

Mitigating Threats

Seed Banking – The Garden's Dixon National Tallgrass Prairie Seed Bank continues to collect and preserve germplasm of native plant species from the Upper Midwest. In 2013, we added 291

accessions of 215 species to the bank. Our total holdings include 2,757 accessions of 1,315 species. We also collected seeds on contract from the U.S.Forest Service. We continue to be an active partner in the national "Seeds of Success" (SOS) program. Megan Haidet, hosted by the Bureau of Land Management, coordinates all Seeds of Success activities. The Seeds of Success National Collection contains more than 15,500 seed collections which are stored at the USDA Agricultural Research Service facilities. In addition to long-term conservation storage, SOS collections are available for research, restoration, and rehabilitation (Havens-Young, Haidet, Vitt, Yates, and Sollenberger).

Native Seed Farming – With an IMLS grant, the Garden is piloting a native seed augmentation project utilizing vacant city lots as urban native seed farms. In 2012, raised beds were constructed at the Cook County Vocational Rehabilitation Impact Center composting site and plants of local ecotype were planted. Seed harvesting techniques were taught to students enrolled in the native seed farming program as seeds were harvested from the Pershing Road seed farm demonstration site. With the end of grant funding for this project in 2013, we developed a plan for long-term sustainability of the project. In 2014, plants will be moved to the Forest Preserves of Cook County's seed farm that is currently in development (Havens-Young, Vitt, Sollenberger, Kirschner, Yates, and Windy City Harvest staff).

Conservation and Restoration in Changing Environments (CARICE) – Garden scientists and graduate students have been working on conservation- and restoration-related research in the arid regions of the western United States since 2002. Much of the native habitat in the western United States is degraded as a result of changes imposed by invasive species, altered fire regimes and land use patterns, and a shifting climate. These changes will only become more prevalent in the future. To ensure the region's unique plant and animal diversity—and that the ecosystem services it provides is resilient in the face of these changes—restoration on a large scale is needed. To help make restoration efforts as efficient and effective as possible, we conduct research using the tools of ecology and evolution to inform native plant materials development and restoration. Most of our work currently occurs on the Colorado Plateau. In 2013, we collected seed and utilized available Seeds of Success collections to establish research trials in the greenhouses and growth chambers at the Garden, as well as long-term study plots in Utah and Colorado in order to: 1) identify and help develop appropriate native plant material for restoration that is focused on potential 'native winner' species that may improve restoration outcomes in degraded sites, and 2) quantify how species and seed source selection impacts ecosystem function in restored habitats. We use a range of ecological and evolutionary tools and approaches to carry out this research, and we work with the Colorado Plateau Native Plant Program and other partners across the country to ensure our research helps address high-priority restoration needs (Kramer, Fant, Skogen, Larkin, Barak, Foxx, Talkington, Eshleman, Havens-Young, and outside collaborators).

Determining Genetic Limitations to Native Plant Restoration – An important goal of any reintroduction is to provide sufficient genetic variability to buffer against changing selection pressures and to ensure the long-term survival and continued evolution of a species. Genetic

erosion during the creation of a reintroduced population can have a large impact on long-term success. Reintroduction of a new species involves collecting wild seeds, bulking in seed-increase beds, propagation in tubes and direct sowing into reintroduction sites. All of these steps have the potential to create bottlenecks which diminish genetic representation. Working with two long term restorations, *Cirsium pitcheri* in Illinois Beach and *Castilleja levisecta* in western Oregon and Washington, we hope to determine if there are any potential bottlenecks in the nursery propagation process where: 1) genetic diversity is being lost, or 2) certain seed sources are favored which then predominate in reintroduction sites (Basey, Fant, and Kramer).

Ravine Seed Trial – The ravines found along the western shore of Lake Michigan are a unique natural habitat found in the Chicago region. The steep topography and cool, moist lake breezes that flow into them from Lake Michigan support a variety of rare plant communities. These natural areas are under threat from intensive urbanization, invasive species, and lack of management. Severe erosion, increasing shade levels, and loss of vegetative ground cover are some of the serious threats impacting these environments. In cooperation with the Park District of Highland Park, Garden staff are involved with designing and implementing management strategies and seed trials to determine which methods are most effective in re-establishing native species to these highly degraded systems. During 2013, baseline data was collected on existing vegetation and test plots utilizing three different seed mixes were installed. Over the next three years, data will be collected to determine the success of these seed trials and a handbook will be prepared and be made available to landowners living adjacent to ravine natural areas (Steffen and Park District of Highland Park staff).

Grassland Bird Population and Habitat Management in the East Gulf Coastal Plain – With a grant from the American Bird Conservancy, we are continuing to collaborate with U.S. Fish and Wildlife Service's East Gulf Coastal Plain Joint Venture (EGCPJV) to develop predictive models that relate focal species population dynamics to habitat dynamics and habitat management actions. A key component of this work includes communicating with partners of the EGCPJV to understand the kinds of decisions they make regarding grassland habitat management to ensure the utility of the project outputs to these decision makers. The model will ultimately link habitat management actions to grassland bird population dynamics and allow managers to evaluate habitat management strategies in terms of focal species population targets (Lonsdorf).

Developing Sustainable Pollination Strategies for U.S. Specialty Crops – Specialty crop pollination (apples, cherries, blueberries, etc.) is dependent on honey bees for pollination, yet their future ability to meet crop pollination demands is uncertain and honey bee populations are facing significant challenges. Besides honey bees, there are many other strategies that growers may employ to diversify the sources of crop pollination. Funded by a grant from the U.S. Department of Agriculture, we are collaborating with researchers from universities, industry, NGOs, and government to develop decision-support tools for growers of specialty crops. Our long-term goal is to develop and deliver context-specific Integrated Crop Pollination (ICP) recommendations on how to most effectively and economically deliver diversified sources of pollination to specialty crops. We define ICP as the combined use of different pollinator

species, habitat augmentation, and crop management practices to provide reliable and economical pollination of crops. Through this project, we aim to improve sustainability of U.S. specialty crops and thereby help ensure continued ability of growers to reap profitable returns from their investments in land, plants, and other production inputs (Lonsdorf).

Designing Decision Support Tools for Invasive Species Management – With a grant from the U.S. Fish and Wildlife Service, we continue to developed internet-based decision support tools for land managers dealing with invasive species that integrate monitoring, management objectives, and actions with predicted outcomes determined through the monitoring efforts—ultimately uniting scientific research with conservation practice. Developed after years of collaborative work, the tools promote cooperative learning and facilitate more rapid, adaptive management among land managers who would otherwise be dealing with a common problem on their own and learning more slowly. The tools are currently being used by National Wildlife Refuge managers throughout the Great Plains to more effectively control Kentucky blue grass and smooth brome grass that have invaded prairies. The tools are also being used by land managers at the Minnesota Department of Natural Resources and The Nature Conservancy. We are adapting the tool for application in the Midwest and Northeast to help managers remove reed canary grass and *Phragmites* from wetlands (Lonsdorf, Jacobi, and Larkin).

The Contribution of Fungal Macromolecules to Soil Carbon Sequestration – Fungi constitute a major portion of belowground biomass in many soils and thus, are considered to be a major contributor to carbon sequestration. While there has been substantial research directed toward defining the roles that fungi play in the soil carbon cycling, and especially toward measuring biomass and activity, there is very little information on how long fungal tissues persist in the soil and in what chemical form. We have completed a chemical analytical survey to document the abundance of key chemical groups during tissue decomposition and the microbial consortia responsible for the decomposition of tissues using next-generation sequencing. Information from this survey will be used to determine the extent to which carbon fluxes from fungi contribute to soil carbon sequestration. This study is supported by funding from the American Chemical Society (Egerton-Warburton, Buiser, Blair, and Schreiner).

Restoration of Soil Systems as Integral Components of Management Practice – Prairie and woodland restorations are typically assessed solely by their above ground visible characteristics, such as plant diversity and productivity. However, in neglecting to assess belowground ecosystem health, we may be missing half of the picture. The importance of soil ecology has often been overlooked in restoration efforts, and often disregarded as a mere “black box.” This project addresses belowground ecosystem health by examining the effects of restoration management on woodland and prairie soil quality (fertility, carbon storage, aggregation, and fungal and microbial community composition). These results will better inform restoration practitioners about the outcomes of current management practices particularly with respect to carbon sequestration (Palmer, Hevey, Egerton-Warburton, and Yost).

100 Sites for 100 Years – This project investigates the aboveground and belowground impacts of restoration practice on a regional scale and is conducted in collaboration with land managers in six counties in Illinois and Indiana (Umek, Heneghan, and outside collaborators).

Using Remote Sensing to Quantify European buckthorn Invasion on a Landscape Scale – In this project, measures of vegetation structure collected from satellites will be compared with on-the-ground measures of vegetation to refine a model that detects and quantifies the distribution of the invasive shrub European buckthorn throughout the Chicago metropolitan region (Umek and outside collaborators).

Assemblage and Diversity of Litter-Decomposing Fungi and Consequences for Nutrient Cycling in Restored Urban Ecosystems – This project investigates differences in decomposition of native plant material in remnant prairies and restored prairies along a restoration chronosequence. The functional diversity of the fungal community driving decomposition will also be compared between high quality prairies and abandoned old fields (Umek and Egerton-Warburton).

The Use of Soil Manipulation and Seeding in Restoring Exotic Shrub Invaded Woodlands – This project investigates multiple methods of soil manipulation and seed rates in a European buckthorn-invaded woodland to determine the impact of restoration practices on belowground processes and explore more effective restoration techniques for ecological restoration. This research was conducted in part with the involvement of an NSF-funded REU student during the summer of 2013 (Umek, Egerton-Warburton, Allen, Girgenti, Ross, Shah, Zorn, and outside collaborators).

Natural Areas Conservation and Management – The Garden's 225 acres of natural areas, including McDonald Woods, Dixon Prairie, Brown Nature Reserve, Skokie River Corridor, and the Garden Lakes, are managed to enhance habitat quality and increase native floral and faunal diversity. Invasive plants, in particular, pose significant threats to these ecosystems. During 2013, prescribed burns were conducted in the Dixon Prairie in the spring and the fall, as well as along the Skokie River. The invasive plants reed canary grass (*Phalaris arundinaceae*) and common reed (*Phragmites australis*) pose increased management challenges within the Garden's shoreline and wetland areas, though new/refined management approaches used during 2013 appear to effective. Despite 2013's spring flood and summer drought, aggressive maintenance and adaptive management allowed the 120,000 native plants added to the North Lake's shoreline during 2012 to survive and even thrive. Under the Landscape Architecture Foundation's Landscape Performance Series, researchers from the University of Illinois, Living Habitats, and the Garden prepared and published a Case Study Brief on the Chicago Botanic Garden's Lake Shoreline Enhancement Projects and its landscape performance benefits. The case study's analyses determined that most people consider carefully designed native plantings along the water's edge to be more visually attractive than conventional manicured-turf edges (Kirschner, Nagel, O'Shaughnessy, and Steffen).

Enhancement of the Prairie and in the Skokie River Corridor – 2013 witnessed a significant increase in herbaceous species planting in the Dixon Prairie and Skokie River Corridor. Several new species were trialed in a variety of locations including shoreline planting in areas where

invasive species had been removed. Ten bur oaks (*Quercus macrocarpa*) were planted on the west side of the Skokie to advance the savanna development. Three bur oaks were planted on the southern section of the Dixon Prairie's Marsh Island (O'Shaughnessy).

Documenting and Understanding Diversity

Revision of the Genus *Artocarpus* (Moraceae) - With a NSF grant, the Garden is working with international collaborators in Southeast Asia to study the distribution and evolution of an economically important group of plants. With approximately 60 species, *Artocarpus* is the third largest genus in the plant family that contains figs and mulberries (Moraceae). *Artocarpus* contains numerous economically important species (grown for timber and fruit) native to Southeast Asia. Two species, jackfruit and breadfruit, are cultivated throughout the tropics. By collecting location data, herbarium samples, and DNA from plants, the goal of this project is to produce a comprehensive taxonomic revision of *Artocarpus* with discussion of character evolution and ecology, distribution maps, identification keys, and online access to an image database. Information on breadfruit and jackfruit origins and cultivar diversity also will be included in the revision. In 2013, work on the project focused on fieldwork in Malaysia and India and analysis of DNA fingerprinting and sequencing data (Zerega, Williams, and outside collaborators).

Fossil Plants in Mongolia – A team of paleobotanists from Garden, Yale University, and Niigata University (Japan) joined colleagues in Mongolia for field work to search for early fossil flowers and remains of other fossil plants. The fossil record is the best source of evidence to document the origin and early evolution of a group of plants such as the angiosperms. Mongolia has an abundance of fossil deposits that date to the early Cretaceous (approximately. 100 to 130 million years ago), when flowering plants first appear in the fossil record and then rapidly diversity. Although much work has been done in Mongolia searching for dinosaurs, very little paleobotanical field work and research has been undertaken in there. This project seeks to document fossil plants from several localities that have exceptional preservation of plant material. A grant proposal submitted to National Science Foundation was selected for funding (beginning 2014), which will allow a postdoctoral research associate to be hired to assist with this project (Herendeen).

Evolutionary Relationships and Diversity in the Legume Family – The legume family, which includes important crop plants (e.g., beans, peas, and soybean) and many other economically important species is the third largest plant family with approximately 730 genera and 19,400 species found in all parts of the world. In addition to being the source for economically important plants, the family is also important because legumes dominate many tropical ecosystems. An international team of botanists is working to develop a better understanding of the diversity and evolutionary relationships in this important family. During 2013, this team presented a new proposed classification system for the family at the International Legume Conference in South Africa, and then published a paper describing the process of developing the new classification system in the conference proceedings volume (Herendeen and Radosavljevic).

Biodiversity of Symbiotic and Lignin-Degrading Fungi in Seasonal Dry Tropical Forests – Seasonally dry tropical forest systems are globally and regionally threatened by urbanization, land use change, and climate change, yet they are of high conservation value. As in many systems, there is little knowledge of fungal diversity. Our objectives are to document seasonal baseline data of community composition and diversity of ectomycorrhizal communities in younger (about 10 years old) and older (about 26 years old) stands of oak (*Quercus oleoides*) in Costa Rica. We are also investigating the diversity of arbuscular mycorrhizal and lignin-degrading fungi in the Yucatan, Mexico. These studies are using a combination of morphological, molecular, and metagenomics approaches to documenting diversity. This research was conducted with a grant from Northwestern University's Initiative for Sustainability and Energy program, and the involvement of an NSF-funded REU student during summer 2013 (Egerton-Warburton, Desai, Morgan, Keever, and Amses).

Biodiversity, Biogeography and Conservation of Cantharellacae – Cantharellace includes choice edible fungi such as chanterelles and trumpet fungi. They also are important beneficial symbionts of forest trees. Many species in the group are listed as threatened and endangered in countries that list fungi. Activities in 2013 focused on completing work on the species found in a unique forest in Guyana (second paper published) and working to identify *Cantharellus* species of the Chicago region (at least one species appears to be new to science). An invited full proposal to study the global diversity and ecology of the group was submitted to NSF following a successful NSF pre-proposal. The full proposal was not funded, but the team will resubmit in 2014 (Mueller, Wilson, and collaborators).

Biodiversity, Biogeography, and Conservation of *Laccaria* – *Laccaria* has been used as a model group to study fungi that form ectomycorrhizas (beneficial symbionts of forest trees). Activities in 2013 focused on analyzing the DNA data and information from long-term fieldwork to complete the most comprehensive study of diversity, evolutionary relationships, and biogeographic patterns of any genus of ectomycorrhizal fungi. A manuscript on Tibetan species of *Laccaria*, including several new species was published. A new project with Australian collaborators to investigate the role of climate in shaping diversity and distribution patterns of macrofungi was initiated (Mueller, Wilson, and collaborators).

Developing Tools to Analyze the Population Biology of Mushrooms and Related Fungi – Lack of information on the population biology of fungi has greatly hindered efforts to understand their biology and to include them in conservation discussions and action plans. Studies have been severely limited by difficulties in obtaining genetic markers to differentiate among individuals and populations needed to examine issues such as fragmentation, the effect of pollution, and potential over-harvesting for food. A pilot project to use newly developed high-throughput DNA sequencing tools to obtain informative markers was completed in 2013. A manuscript resulting from this work has been accepted pending revision (Mueller, Wilson, Wickett, and Fant).

Early Land Plant Origin and Diversification – Approximately 470 million years ago, the first plants to inhabit land arose from green algae. Subsequently, these plants diversified to form the

foundation of all terrestrial ecosystems. As part of a collaboration with the 1KP project (a multidisciplinary consortium of plant biologists and bioinformaticians led by researchers at the University of Alberta and Beijing Genomics Institute-Shenzhen), we developed methods to process large amounts of DNA sequence data to better understand the origin and evolution of early land plants. In 2013, we used these data and these methods to shift our view of how early land plants are related to each other and to groups of plants that have a more recent origin. We are now expanding this research to understand the role in plant diversification played by genes transferred directly from fungi to early land plant genomes (Wickett, Johnson, and outside collaborators).

The Moss Tree of Life – Pleurocarpous mosses are traditionally defined as having short, lateral reproductive branches. Pleurocarps (Hypnanae) comprise the most speciose lineage of mosses, a result of an explosive radiation during the Jurassic, at a time when flowering plants began to dominate many terrestrial environments. Repeated, multi-directional habitat transitions occurred as this group evolved, leading to the loss of morphological characters that may be used to describe groups. Furthermore, phylogenetic analyses based on targeted gene sequencing have been unable to resolve many relationships, including those along the backbone, within the pleurocarps. In 2013, we began work on an NSF-funded project, Assembling the Pleurocarpous Moss Tree of Life. We are currently using cutting-edge techniques in DNA sequencing to better understand the evolution of this diverse group of plants. We have recently discovered that there may be genes restricted to these mosses that are not found in any other plant group, and we will be validating and following up on these results in 2014 (Wickett, Johnson, and outside collaborators).

Diversification of Diatoms, a Hyperdiverse Group of Photosynthetic Marine Algae (brown algae, Heterokontophyta) – Diatoms account for roughly 20% of global primary production, while making up less than 0.2% of primary producer biomass. Additionally, they are the key drivers of biogeochemical silica cycling and have acquired a diverse set of metabolic pathways including a complete urea cycle (previously only known from animals), iron-concentrating mechanisms, and polyamine biosynthesis. Surprisingly, these diverse functional traits were all enabled by the acquisition of genes transferred horizontally from bacteria. We are currently using transcriptome sequencing to reconstruct the diversification of diatoms, both in species numbers and in functional diversity, and to characterize the relative importance of endogenous (novel genes acquired though duplications, e.g., polyploidy) and exogenous (transferred from bacteria) sources of genetic variation in the speciation and functional diversification of diatoms (Wickett and outside collaborators).

Diversification in Floral Color of *Castilleja spp.* – Understanding the factors that contribute to the maintenance of polymorphisms and divergence in traits is key to informing our understanding of speciation. This is particularly true of floral traits as they ultimately promote reproductive isolation in closely related individuals. Anthocyanins are the most broadly distributed of the floral pigments; in the absence of anthocyanins, floral tissues are generally yellow if carotenoids are present or white if pigments are completely lacking. Changes in floral color have the potential to attract novel pollinators that subsequently exert selective pressures

on other floral traits, even if the initial color shift reflects a response to other factors. Yellow floral pigmentation is considered to be a component of bee pollination syndromes, whereas red flowers are associated with bird attraction and bee exclusion. Although floral trait divergence has frequently been associated with pollinator-mediated selection, a growing body of evidence suggests that other non-pollinator agents can also exert selection on floral traits through pleiotropic associations of floral color. Flavonoid compounds, which are intermediates in the anthocyanin biosynthetic pathway, are also associated with stress-related functions. The hemiparasitic genus *Castilleja* has over 200 species in North America, which has multiple shifts in floral color and form. A Midwest native, *Castilleja coccinea*, has bracts which range from yellow, orange and orange-red, with different color morphs being found within close proximity to each other and even within the same population. Meanwhile, *Castilleja affinis* which grows in Coastal California, a floristic hotspot, has three subspecies growing within a small geographic area. Both these examples represent cases of sympatric divergence and isolation, associated with floral trait polymorphisms. A consideration of the complete ecological context in which floral traits modification can occur is therefore essential to an understanding of adaptive variation and the potential for floral evolution (Braum, Fant, Skogen, Widener).

Developing Genomic Resources in an Underutilized Crop – Although nearly 7,000 plant species have been cultivated at some point in human history for food consumption, approximately 95% of human food needs worldwide are met by about 30 crops. Shockingly, 40% of human food needs are met by only three of those crops: corn, wheat, and rice. Plant genetic resources are the basis for food security, and the diversity they encompass will be the fodder for adaption to climate change and the stresses that may come with it. Realizing the potential of locally grown underutilized perennial crops (which require less energy input than annuals) can reduce energy use in the agriculture sector and increase food security in vulnerable areas, many of which lie in the tropics. Genomic resources are a vital part of the toolkit for improving and broadening our agricultural base worldwide, yet very few genomic resources exist for underutilized crops. Breadfruit, *Artocarpus altilis,* is a staple starch crop that is a major component of many traditional agroforestry systems in the tropical South Pacific Islands, and it compares favorably to major staples in both yields and nutritional content. Work in 2013 began on assembling transcriptome data from breadfruit and its wild relatives (Zerega, Wickett, Laricchia, Gardner, and Williams).

Diversity of Underutilized Tree Crops and their Wild Relatives – The genus *Artocarpus* contains numerous economically important species (grown for timber and fruit) native to Southeast Asia. Two species, jackfruit and breadfruit, are cultivated throughout the tropics, but several others are important on more regional scales. Work in 2013 included fieldwork in Malaysia and India and focused on the collection of three species. Graduate student Theresa Melhem collected jackfruit (*Artocarpus heterophyllus*) diversity throughout the Western Ghats of India, its reported area of origin. Graduate student Maria Wang collected the closely related cempedak (*A. integer*) and its putative wild ancestor bangkong (*A. integer* var. *sillvestris*) throughout peninsular Malasyia. Zerega and graduate student Elliot Gardner collected terap (*A. odoratissimus*) and its putative wild ancestor *A. odoratissimus* ssp. *barbatus* in Boreno. All of the collections are now

being analyzed using DNA sequence and fingerprinting data in order to characterize genetic diversity to inform germplasm management and to test hypotheses about their origins (Zerega, Melhem, Gardner, and Wang).

Dimensions of Biodiversity - Landscapes of Linalool: Scent-Mediated Diversification of Flowers and Moths Across Western North America – We commonly think of floral scent for its role in attracting pollinators, but it can also be a cue for floral and seed predators. This project integrates chemical ecology and comparative genomics to explore the impact of past selective pressures on current patterns of diversity in non-model organisms: evening primroses, hawkmoths, bees, and micromoths. This project focuses on how chemically-mediated interactions between flowering plants, pollinators, and enemies affect diversification at the population, species, and higher taxonomic levels. Onagraceae (evening primrose family) is one of the most species-rich families of night-blooming plants in North America. Many Onagraceae, particularly species in tribe Onagreae, produce floral scent that likely dictates the primary biotic drivers impacting plant fitness, including legitimate pollinators (hawkmoths, bees) and floral and seed predators (*Mompha* moths). The same floral characteristics (color, shape, scent) that attract pollinators are also suspected to attract floral antagonists to host plants. *Mompha* is one such moth genus that specializes on Onagraceae. A thorough survey of these micromoths associated with Onagreae in western North America will result in a more accurate assessment of diversity in this group. Three dimensions of biodiversity will be integrated through studies of: 1) floral trait variation, 2) its genetic basis, and 3) their roles in driving patterns of diversity in Onagreae and *Mompha*. The identification of "hot" and "cold" spots of selection will provide a test of the role of scent in the creation and maintenance of biodiversity across landscapes and time (Skogen, Fant, Wickett, Lewis, Rhodes, Glisson, and outside collaborators).

Research Collections – The Biological Research Collections launched its website in 2013, allowing public access to information on all samples held at Chicago Botanic Garden. Currently we have accessioned over 4,950 genetic samples, which come from a broad variety of sources including living collections (Tankersely), Seed Bank (Vitt, Yates, and Sollenberger), DNA collections (Fant), and herbarium (Zerega and Masi). Plans are also underway to begin to add important rare species and research samples which will increase the value of this collection (Fant and Rosenbaum). In 2013, the herbarium increased its collections by 823 specimens, bringing the total collections to nearly 17,500. In addition, the herbarium continues to work toward digitizing its entire collection. Currently, 70% of the collections are digitized. The herbarium serves as a resource for scientists, students, and conservation practitioners and hosts visitors throughout the year. The seed bank continues to create high-resolution microscope images of all incoming seed collections (Sollenberger, Yates, and volunteers) and x-ray images for assessment of seed viability (Sollenberger and volunteers) to be displayed in the public Research Collections database.

Building Capacity and Understanding

Conservation and Land Management Internship Program – In 2013**,** 725 applications were received for 95 internships. Twenty-seven interns that had been hired in 2012 were extended

into 2013, bringing the total number of interns working in 2013 to 122. The majority of internships were with the Bureau of Land Management (BLM) (80), with 18 of these interns funded by the Washington DC office. Three interns were hired by the National Park Service (NPS), four by U.S. Fish and Wildlife Service (USFWS), four by U.S. Geologic Survey, and one by the Greenbelt Native Plant Center in New York, New York. CLM interns worked a total of 101,008 hours or 12,626 days or about 574 months.

When asked about the benefits of the CLM Internship Program, 99% of interns who responded said they were able to experience new landscapes, habitats, and species diversity; 99% said they were able to explore their career goals and expand their resume; 95% said their internship helped them learn what it's like to work at a federal agency; and 88% said they were able to apply their education to important conservation questions and better define their career goals. When asked if they would request another CLM Program intern in the future, 96% of the program's mentors said they would (Skogen, Glisson, and Johnson).

Research Experiences for Undergraduates (REU) – A total of 241 applications were received and ten interns were hired for NSF-funded REU positions at the Garden during 2013. In addition, three College-First alumni, three Northwestern University-funded undergraduates, two undergraduates from Associated Colleges of Illinois, and five interns funded from other sources also participated in the REU experience. Interns conducted research under the mentorship of 18 Garden and Northwestern University scientists and graduate students on topics spanning genetic to ecosystem levels of plant biology and conservation (Braum, Fant, and Larkin).

Graduate Programs – The joint graduate program with Northwestern University continues to attract top students to conduct plant conservation research. In 2013, the program welcomed six new MS and two new PhD students. The program currently has 11 PhD and 19 MS students. Nine MS students graduated in 2013; two of the recent graduates are already attending doctoral programs, and four are working in careers in ecology and conservation. Research topics of recent graduates included understanding the role of genetic diversity and ecological requirements of a rare species, genetic diversity and structure of urban tree species across a landscape gradient, pollination and genetic structure of a rare species, and plant animal interactions. Students continue to be successful at procuring grants for their field and lab research. Recent student fieldwork has taken place in the Chicago region, Minnesota, Wisconsin, the Colorado Plateau, California, Mexico, Malaysia, China, and India.

Building Capacity for the Conservation of Mushrooms and Related Fungi – Fungi are rarely included in discussions or action plans for conservation. This is due to insufficient communication about the critical role that fungi play and the threats that they face, as well as an insufficient focus on research to obtain the needed data to better understand how fungi are responding to anthropogenic and other threats. Significant progress was made to address this problem in 2013. Activities focused on the Global Red List Initiative. A new website was developed to facilitate submission of nominations of species to be assessed, a workshop was organized at the International Fungal Conservation Congress to kick off the project, and several publications were produced to encourage participation in the Initiative. Funding from the

Mohamed bin Zayed Species Conservation Foundation supported these activities. The Initiative also was discussed at several events of the International Union for the Conservation of Nature. Mueller chairs the IUCN Specialist Group on "Mushrooms, Brackets, and Puffballs," was elected to the IUCN SCC Steering Committee, participated in national and international conferences and workshops on fungal conservation, and coordinated the Global Fungal Red List Initiative. These efforts will continue in 2014 (Mueller and international collaborators).

Botanic Gardens Conservation International (BGCI) – BGCI coordinates worldwide plant conservation efforts and is designated to lead the United Nation's Global Strategy for Plant Conservation. It works as a global consortium of 700+ botanic gardens sharing expertise and best practices among large and small gardens in the developed and emerging world to understand, conserve, and sustainably utilize plant life everywhere on the planet. The Garden is a Patron Member of BGCI, and hosts the office of BGCI US (Kramer served as Executive Director through December 2013; Havens-Young is a board member). In 2013, BGCI US partnered with gardens across North America to expand an interpretation resource (Care for the Rare) that gardens everywhere can use to clearly communicate conservation stories of threatened plants in their collections, and the important role botanic gardens play in plant conservation. A Garden intern (Milborn) worked on this project, and conducted a gap analysis of living and seed banked collections of threatened plants in Australia and New Zealand. BGCI US also organized a workshop at the 5th Global Botanic Gardens Congress to develop a strategy for the global conservation of threatened exceptional species. BGCI US is also driving the evolution of BGCI's GardenSearch and PlantSearch databases, the only online resource of the expertise, resources, and plant collections maintained by botanic gardens around the world. In 2013, these databases provided data to researchers around the world, and collaboration with Kew Gardens and the Royal Horticultural Society led to expanded functionality for the PlantSearch database.

Plant Conservation Alliance – The Garden continues its leadership of the NGO committee of the Plant Conservation Alliance, a public/private partnership dedicated to the conservation of our native flora. In 2013, the Garden organized a lobbying effort to advocate for maintaining plant conservation funding for important government programs (Siskel and Havens-Young).

Using Plants and Fungi for Human Benefit

Plant Breeding – The program continues to develop and evaluate new perennial plants for introduction to the horticulture industry and gardeners. The program ended the year with 1,974 plants in the ground representing 278 accessions. The Garden's Production Department is holding another 971 plants for the program that will be planted in 2014. Most of these plants are advanced–generation hybrids developed at the Garden and are under evaluation as potential further breeding stock or as introductions. Of the 34 crosses attempted this year, 15 were successful producing a total of 921 seeds. Much of this seed was turned over to the Production Department for germination and subsequent planting in 2014. Backup seed were transferred to the Seed Vault for longer-term storage. Seven hybrid plants were selected for propagation for initial evaluation in-house at the Garden as potential future introductions (Ault).

Plant Evaluation – The program evaluates herbaceous and woody plants in comparative trials, ultimately recommending the top performers to gardeners and the horticulture industry. Over 1,200 taxa (representing approximately 55,000 plants) were evaluated last year in the Lavin Plant Evaluation Garden, Pullman Plant Evaluation Garden, and the Green Roof Gardens. In 2013, several new projects were started including a trials of ornamental grasses (*Molinia* spp.), shrubby bush clovers (*Lespedeza* spp.), and Russian sages (*Perovskia* spp.). The project with *Fine Gardening* magazine continued in 2013 with the publication of three articles on our plant trials, including ligularias (*Ligularia*), catmints (*Nepeta*), and assorted ornamental grasses. *Fine Gardening* is committed to publishing three stories a year through 2014 (Hawke).

Chicagoland Grows® Plant Introduction – The program markets itself and its plants to the horticulture industry with the goal of introducing new plants to the trade and to gardeners while providing income to the Garden. Three new plants were introduced this year: Phlox 'Forever Pink' (developed at the Garden), and Crescendo™ sugar maple and Beijing Gold™ tree lilac, both from The Morton Arboretum. The program was promoted through trade booth exhibitions at three trade shows, webpage updates, and numerous printed and electronic media promotions. Nearly 3,000 stock plants and cuttings were shipped to over 30 nurseries. Two plant introduction companies were licensed in Europe to trial and then patent and promote the program's perennial introductions (CNB in the Netherlands) and its woody plant introductions (SAPHO in France). Stock plants representing over 20 of our introductions were shipped to these two companies. One of the world's top unrooted cutting producers, Florexpo in Costa Rica, was licensed to begin selling in 2014 two of the program's perennial plants, Phlox 'Forever Pink' (shown on right) and Veronica 'Tidal Pool'. To protect the legal properties of the program, three plant patents were received and five plant patent applications were filed. Royalty income for the year was $153,000, an increase over the previous year's income of 12.5 percent (Ault).

Economic Botany – With a grant from NSF, the Garden is working with international collaborators in Southeast Asia to study and conserve the genetic diversity of under-utilized crops. The two focal species, jackfruit (*Artocarpus heterophyllus*) and breadfruit (*A. altilis*), are cultivated throughout the tropics and may be under threat of genetic erosion. Plantings with low genetic diversity can be more susceptible to environmental stresses such as disease or droughts. This project aims to use field data and genetic evidence from jackfruit and breadfruit to identify their wild relatives, assess genetic diversity throughout their range, determine possible threats of genetic erosion, and working closely with international collaborators make recommendations for germplasm conservation. In 2013, work on the project focused on analyzing DNA fingerprinting and sequence data from plant samples collected in India and Malaysia (Zerega, Witherup, Melhem, and outside collaborators).

Screening for Medicinal Compounds – Through a cooperative agreement with Professor Djaja Djendoel Soejarto at University of Illinois at Chicago, we provide plant material left over from cleaning seeds for our seed bank, which is then screened for various medicinal compounds at UIC. In 2013, we provided dried plant material from 290 collections to be screened (Yates, Sollenberger, Vitt, and Havens-Young).

GRANTS AND CONTRACTS ACTIVE IN 2013

Grantor/*Title*	Awardee	Amount
American Bird Conservancy *Grassland bird population and habitat management in the East Gulf Coastal Plain*	Lonsdorf	$60,000
American Chemical Society *Contribution of fungal macromolecules to soil organic carbon storage*	Egerton-Warburton	$100,000
Bureau of Land Management *CLM Conservation and Land Management Internship Program*	Havens-Young, Skogen	$2,550,000
Bureau of Land Management *Rare Plant Climate Envelope Modeling and Restoration on the Colorado Plateau*	Havens-Young, Vitt, Still, Yates Fant, Skogen, Larkin, Kramer	$2,522,000
ESRI (Environmental Systems Research Institute) Conservation Program Grant *GIS Lab, ESRI Int'l User Conference*	Yates	$1,300
Sally Mead Hands Foundation *Plants of Concern*	Masi	$10,000
Illinois Environmental Protection Agency *Illinois Clean Lakes Program Phase 2 Final Report – Chicago Botanic Garden Lakes*	Kirschner	$15,000
Illinois-Indiana Sea Grant *PhragNet: A cooperative learning network for adaptive management of Phragmites-invaded coastal habitats*	Larkin, Fant, Lonsdorf	$21,000
Illinois Natural History Survey *Early Detection/Rapid Response Plan for Hydrilla verticillata in Illinois*	McGlynn, Kirschner	$119,476

Illinois Wildlife Preservation Fund *Plants of Concern*	Masi	$28,000
Institute for Sustainability and Energy at Northwestern University	Zerega	$40,090
Institute for Museum and Library Services *Native Seed Farms*	Havens-Young	$150,000
Institute for Museum and Library Services *Conservation project with Montgomery Botanical Center*	Kramer	$12,376
Mohamed bin Zayed Species Cons. Fund *Support of Fungal Red Listing Workshop at the 2013 International Fungal Conservation Society Congress*	Mueller	$23,000
National Aeronautics and Space Admin. *Climate Change Education*	Schwarz, Havens-Young	$150,000
National Ecological Observatory Network *Project BudBurst*	Havens-Young, Schwarz-Ballard	$20,000
National Fish and Wildlife Foundation *Seeds of Success National Coordination*	Haidet, Havens-Young	$63,000
National Fish and Wildlife Foundation *Optimal Rare Plant Monitoring Manual*	Havens-Young, Vitt, Skogen	$32,000
National Fish and Wildlife Foundation *Population rescue of rare endemic Lepidospartum burgessii*	Havens-Young, Fant, Williams	$40,000
National Fish and Wildlife Foundation Sustain our Great Lakes Program *Contract with Alliance for the Great Lakes, Plants of Concern*	Masi	$11,000
Foundation Franklinia *Conserving threatened exceptional species*	Kramer	$33,000
National Park Service *CLM Conservation and Land Management Internship Program*	Havens-Young, Skogen	$45,700
National Science Foundation – DEB *Collaborative Research: AToL: Assembling the Pleurocarp Tree of Life: Resolving the*	Wickett	$428,278

rapid radiation using genomics and transcriptomics		
National Science Foundation – DEB *Dimensions of Biodiversity: Collaborative Research: Landscapes of linalool: scent-mediated diversification of flowers and moths across western North America*	Skogen, Fant, Wickett and outside collaborators	$1,555,383
National Science Foundation *Reassembling Pollinator Communities to Promote Pollination Function at the Landscape Scale*	Lonsdorf	$31,845
National Science Foundation – LTREB *Echinacea angustifolia research*	Wagenius	$225,000
National Science Foundation – MRI *GIS Lab Equipment*	Vitt, Havens-Young, Fant, Larkin Skogen, Yates	$305,000
National Science Foundation – MRI *Seed X-Ray Equipment*	Havens-Young, Vitt Skogen, Yates, Sollenberger	$135,000
National Science Foundation – REU *Research Experiences for Undergraduates*	Larkin, Fant	$301,307
National Science Foundation – REU *Summer field research experience for an undergraduate student*	Wagenius	$6,250
National Science Foundation – REVSYS *Phylogeny and revision of* Artocarpus	Zerega	$319,361
The Nature Conservancy *Plants of Concern*	Masi	$500
Northwestern University Institute for Sustainable Energy *Metagenomic discovery of novel lignin-degrading fungi*	Egerton-Warburton	$45,000
Openlands *Plants of Concern*	Masi	$14, 700
Royalty Income From Plant Introduction Program	Ault	$153,000
Stanley Smith Horticultural Trust *PlantSearch database*	Kramer	$20,000

U.S. Army Corps of Engineers *North Lake Shoreline Restoration*	Kirschner	$3,769,900
United States Botanic Garden *Conservation projects partnership*	Kramer	$84,000
U.S. Department of Education. *GAANN: Graduate Training in Evolutionary Environmental Biology* (at Univ. of Chicago)	Kidwell, Jablonski, LaBarbera, Herendeen, Johnson	$1,594,010
U.S. Environmental Protection Agency Great Lakes Restoration Initiative *Contract with Waukegan Harbor Citizens Advisory Group, Plants of Concern*	Masi	$16,200
U.S. Fish and Wildlife Service *Implementing adaptive control of Phragmites australis on stations in the Northeast Region of the U.S. National Wildlife Refuge System*	Lonsdorf, Jacobi	$368,331
USDA Farm Bill *PlantSearch and Int'l Sentinel Plant Network*	Kramer	$90,000
US Department of Agriculture *Developing Sustainable Pollination Strategies for U.S. Specialty Crops*	Lonsdorf	$21,980
USDA Forest Service *Conservation and Land Management Internship Program*	Havens-Young, Skogen	$26,900
USDA Forest Service *Seed Banking*	Havens-Young, Vitt, Yates, Sollenberger	$80,000
USDA Forest Service/Midewin Plants of Concern	Masi	$17,500
US Geologic Survey *Conservation and Land Management Internship Program*	Havens-Young, Skogen	$58,500
US Fish and Wildlife Service *Developing centralized databases and decision support tools for the National Wildlife Refuge system*	Lonsdorf and Jacobi	$50,184

US Fish and Wildlife Service *Conservation and Land Management Internship Program*	Havens-Young, Skogen	$92,480
US Fish and Wildlife Service *Seeds of Success*	Jacobi, Hunt	$86,629
US Fish and Wildlife Service *Native Prairie Adaptive Mgmt Decision support tool*	Jacobi, Hunt	$31,243
US Fish and Wildlife Service *Adaptive Science*	Jacobi, Hunt	$41,630
Total Grants Active in 2013		**$16,017,103**

Year	Total Grants	Number of Grants	Average Grant
2004	$5,410,452	29	$186,567
2005	$6,498,018	38	$171,000
2006	$9,415,030	31	$303,710
2007	$7,196,973	35	$205,628
2008	$10,415,756	31	$335,992
2009	$11,630,528	38	$314,339
2010	$13,290,572	43	$309,083
2011	$14,797,310	41	$360,910
2012	$15,894,511	49	$324,378
2013	$16,017,103	51	$314,061

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Papers, Book Chapters and Books

J. Ault

Ault, J. "2013 New Plant Pavilion" (all three 2013 plant introductions). NMPro (magazine). July 2013. Pgs. 31, 46, and 47.

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L. Egerton-Warburton

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J. Fant

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Graduate Student Publications

Radosavljevic, A. and R.P. Anderson. 2013. Making better MAXENT models of species distributions: complexity, overfitting and evaluation. Journal of Biogeography. doi: 10.1111/jbi.12227.

Soley-Guardia, M., **A. Radosavljevic**, J.L. Rivera and R.P. Anderson. In Press. The effect of spatially marginal localities in modeling of species niches and distributions. Journal of Biogeography.

Heneghan, L., C. Mulvaney, K. Ross, S. Stewart, **L. Umek,** C. Watkins, A. Wali, L.M. Westphal, and D.H. Wise. 2013. Local assessment: from wild Chicago to Chicago Wilderness - Chicago's ecological setting and recent efforts to protect and restore nature in the region. In *Urbanization, biodiversity and ecosystem services: challenges and opportunities: a global assessment.* Edited by T. Elmqvist, M. Fragkias, J. Goodness, B. Guneralp, P. McDonald, S. Parnell, M. Schewenius, M. Sendstad, K. Seto, C. Wilkinson. Open Access: Springer. Pgs. 337-354.

Iannone III,B.V., **L.G. Umek**, L. Heneghan, and D.H. Wise. 2013. Amending soil with mulched European buckthorn (*Rhamnus cathartica*) does not reduce reinvasion. Ecol. Rest. 31: 264-273.

Bulletins

Aaron, J. 2013. Plants of Concern: Gender, Conservation and Tobacco Root. *Prairie Telegraph* (Midewin). September-October: 7.

Aaron, J. 2013. What Does the Fox(glove) Say? *Prairie Telegraph* (Midewin) In press. Published January-February: 7.

Goad, R., K. Keiger, S. Masi, and D. Fink. 2013. Ravine and Bluff Vegetation of the Chicago Region. A Rapid Color Guide produced for the Ravine Rapid Assessment Toolkit for the Alliance for the Great Lakes. 2013.

Goad, R. Plants of Concern Monitors Keep an Eye on Bloom Dates. *The Habitat Herald*. September: 6-7.

Hawke, R. 2013. A Summary of the Performance of Proven Winners Plant Introductions, Proven Winners, St. Thomas, Missouri.

Hawke, R. 2013. Hardiness and Performance Report of English Roses: A report to David Austin Roses, England.

Hawke, R. 2013. Performance Report of Perennial Introductions: A report to Blooms of Bressingham, England.

Hawke, R.2013. A Summary of the Performance of North Creek Nurseries Plant Introductions, North Creek Nurseries, Landenberg, Pennsylvania.

Hawke, R. 2013. A Summary of the Performance of Intrinsic Perennial Gardens Introductions, Hebron, Illinois.

Hawke, R. 2013. A Summary of the Performance of Perennial Introductions: A report to Monrovia Growers, Azusa, California.

Hawke, R. 2013. A Summary of the Performance of Perennial Introductions: A report to Terra Nova Nurseries, Portland, Oregon.

Hawke, R. 2013. A Performance Summary Report to Darwin Perennials/BallHort, West Chicago, Illinois.

Hawke, R. 2013. A Summary of the Performance of Perennial Introductions: A report to Great Garden Plants, Holland, Michigan.

Hawke, R. 2013. A Summary of the Performance of Perennial Introductions: A report to Walters Gardens, Zeeland, Michigan.

Masi, S. 2013. Notes from the Field: Plants of Concern. *The Habitat Herald*. In press, published January 2014: 10-11.

Masi, S. and R. Goad. 2013. *Plants of Concern Volunteer Manual*.

Reports

Havens, K. 2013. NSF-MRI report.

Havens, K. 2013. USFWS report on *Cirsium pitcheri* research.

Havens, K. 2013. Report on conservation activities to Center for Plant Conservation.

Havens, K. 2013. Report to NEON on Project BudBurst.

Kirschner, R. 2013. Chicago Botanic Garden Lakes – Illinois Clean Lakes Program Phase 2 Final Report. Final Report to the Illinois Environmental Protection Agency.

Larkin, D.J., R.S. Brady, B.M. Kahler, K.E. Koch, D.G. Krementz, M.J. Monfils, G.J. Soulliere, and E.B. Webb. 2013. Collaborative research on secretive marsh birds in the Midwest region: Linking monitoring and wetland management. Upper Mississippi River and Great Lakes Region Joint Venture Technical Report No. 2013-1, Bloomington, MN, USA.

Masi, S. 2013. Permit reports to Illinois DNR and Illinois Nature Preserves Commission, Forest Preserve and Conservation Districts, for monitoring and research work at their sites.

Masi, S. and E. Bialecki. 2013. Plants of Concern in Cook County, 2004-2012. Final report to the Forest Preserve District of Cook County.

Masi, S., R. Goad, J. Steffen, and A. Collins. 2013. Openlands Lakeshore Preserve Monitoring Project, 2012. Final report to Openlands.

Masi, S. and R. Goad. 2013. Final Report to Waukegan Harbor Citizens Advisory Group. Plants of Concern contract for USEPA Great Lakes Restoration Initiative grant.

Masi, S. and R. Goad. 2013. Final Report to Alliance for the Great Lakes. Plants of Concern contract for NFWF Sustain our Great Lakes Grant.

Masi, S. and J. Aaron. 2013. Monitoring rare plants at Midewin National Tallgrass Prairie: 2001-2012. Focus on the 2012 Monitoring Season. Final report to United States Forest Service at Midewin National Tallgrass Prairie.

Masi, S. and J. Aaron. 2013. Monitoring rare plants at Midewin National Tallgrass Prairie: 2001-2013. Focus on the 2013 Monitoring Season. Final report to United States Forest Service at Midewin National Tallgrass Prairie.

Mueller, G. 2013. Mushroom, Bracket, and Puffball Specialist Group Report, Submitted for Species Annual Report published by IUCN Species Survival Commission.

Still, S., P. Vitt, and K. Havens-Young. Species Distribution Modeling of rare plants in the west: Annual Program Performance Report to the Bureau of Land Management. September 30, 2013.

Yates, E. 2013. Dixon National Tallgrass Prairie Seed Bank. Annual Report to the National Seeds of Success Program, December 2013.

Media and General Outreach

Al Jazeera America – television piece on seed banking and post-wildfire restoration featuring K. Havens and A. Kramer. October 2013.

US News and World Report Article on Botanical Capacity Crisis.

Beck, J. Undercover Science: Weevil Warriors. Chicago Botanic Garden blog. http://my.chicagobotanic.org/science_conservation/undercover-science-8/

Beck, J. Undercover Science: The Home Stretch. Chicago Botanic Garden blog. http://my.chicagobotanic.org/science_conservation/undercover-science-6/

Beck, J. Undercover Science: Painting with Numbers. CBG Blog covering E. Yates' work in the GIS Lab & Seed Bank, September 3, 2013: http://my.chicagobotanic.org/science_conservation/undercover-science-9/

"Emerald Ash Borer Virtual Fieldtrip" Google Hangouts. Various CBG Staff including Education and Research departments broadcast live to 3 classrooms across the US, December 9, 2013, resulting in the following virtual classroom program: http://youtu.be/1rjGSpLCPiA

Garden Scientist Maps Future of Rare Southwestern Cactus. 2013. Keep Growing. Glencoe, IL. 4(3) 32-35. http://issuu.com/chicagobotanicgarden/docs/keep_growing_fall2013/35?e=2596631/4694886

Kavens, K. Is spring as late as we think? Chicago Botanic Garden blog. http://my.chicagobotanic.org/science_conservation/is-spring-as-late-as-we-think/

Havens, K. It's not easy being green. Chicago Botanic Garden blog. http://my.chicagobotanic.org/science_conservation/its-not-easy-being-green/

Herendeen, P. Fossil Hunting in Mongolia. Chicago Botanic Garden blog. http://my.chicagobotanic.org/science_conservation/fossil-hunting-in-mongolia/

Kirschner, R. Coming of Age for the Garden's Cygnets. Chicago Botanic Garden blog http://my.chicagobotanic.org/nature-in-view/ecology/coming-of-age-for-the-gardens-cygnets/

Kirschner, R. Is your landscape ready for April showers? Chicago Botanic Garden blog http://my.chicagobotanic.org/science_conservation/eco_tips/is-your-landscape-ready-for-april-showers/

Kramer, A. Sowing seeds of rebirth. Chicago Tribune. October 31, 2013.

Kramer, A. Simulating Summer in the Plant Science Center. Chicago Botanic Garden blog. http://my.chicagobotanic.org/science_conservation/simulating-summer/

Still, S. and N. Jensen. A Rare Plant Portrait: The Dwarf Bear-Poppy (*Arctomecon humilis*). Chicago Botanic Garden blog. http://my.chicagobotanic.org/science_conservation/arctomecon-humilis/

Still, S. and N. Jensen. A Rare Plant Portrait: The Silverleaf Sunray (*Enceliopsis argophylla*).

Chicago Botanic Garden blog. http://my.chicagobotanic.org/science_conservation/enceliopsis-argophylla/

Skogen, K. The evolution of a research idea. Chicago Botanic Garden blog. http://my.chicagobotanic.org/science_conservation/the-evolution-of-a-research-idea/

Skogen, K. Plants Are Cool, Too! Episode 4: Desert Blooms and Marathon Moths. https://www.youtube.com/watch?v=8IPQTs0cfqw

Skogen, K. Behind the scenes: Filming Plants Are Cool, Too! Chicago Botanic Garden blog. http://my.chicagobotanic.org/science_conservation/filming-plants-are-cool-too/

Skogen, K. UCONN Today (alumni paper and website for University of Connecticut). Takin' 'adventure botany' on the road. http://today.uconn.edu/blog/2013/10/taking-adventure-botany-on-the-road/

Skogen, K., J. Fant, and N. Wickett. NSF Dimensions of Biodiversity Press Release. http://www.nsf.gov/news/news_summ.jsp?cntn_id=129242

Zielinski, Sarah. 2013. Botanists spread the gospel that breadfruit can be manna. *Science* 342: 303. Nyree Zerega quoted.

CLM intern Hector Elias Justiniani (Surprise, California - BLM) is featured in an article about SOS seed collections and post-fire reseeding 25 Nov 2013 http://www.blm.gov/ca/st/en/info/newsbytes/2013/602xtra-volunteersonlostfireburn.html

CLM Intern Tristan Cole (BLM - Arcata, CA 2013) and his work are featured on the BLM website! Tristan's work lead to the Arcata Field Office becoming the first BLM office in California to have its entire herbarium collection become part of the Consortium of California Herbaria. 14 Nov 2013 http://www.blm.gov/ca/st/en/info/newsbytes/2013/600_extra_-arcata.html

"Botanic Garden gets over-watered by storms and is saved by plants, Army", WBEZ blog posted on April 25, 2013; http://www.wbez.org/blogs/chris-bentley/2013-04/botanic-garden-gets-over-watered-storms-and-saved-plants-army-106850

"Midwest Rain Gardens: The Chicago Botanic Garden Way", Chicago Sun-Times video with Bob Kirschner about the Rainwater Glen, posted July 2013; http://video.suntimes.com/Midwest-Rain-Gardens-The-Chicago-Botanic-Garden-Way-24955552#.Uvqn1_ldXTp.

"North Shore Native Touts Rain Gardens" (features Bob Kirschner), Pioneer Press, August 8, 2013.

Citizen Science. Guide for Families Taking Part in Real Science. By Greg Landgraf. Huron Street Press (an imprint of the American Library Association, Chicago, IL. 2012. Includes section on Plants of Concern and Project Budburst.

"Ravine Rescues: Yes, in Your Backyard—and All Around the Great Lakes." In *Watermarks,* publication of Alliance for the Great Lakes. Fall, 2013: 1. Mentions Plants of Concern and the Chicago Botanic Garden as partners in the ravine project.

Ph.D. student Lauren Umek was a Planting Science Mentor - ESA organized program connecting professional scientists with small groups of middle and high school students working on research in a mentoring relationship.

Ph.D. student Lauren Umek participated in Weird Science: An Adult Science Fair. Oak Park Public Library, IL.

Ph.D. student Lauren Umek was in the Conservation Careers Forum as a panel member for first year biology STEM majors discussing local careers in conservation science. Elmhurst College, IL.

Phlox 'Forever Pink', Beijing Gold™ Tree Lilac, and Crescendo ™ sugar maple plant release bulletins published as inserts, Exclamation!(TM) London Planetree as the front cover images and story for the 2013 Plant Locator, Ornamental Grower's Association of Northern Illinois.

"Sweet and Low" (include *Phlox* 'Forever Pink'), The Morning Call (Allentown, PA newspaper). April 5, 2013. Page 3.

"Sweet and Low" (include *Phlox* 'Forever Pink'), Daily Press (Newport News, VA newspaper). April 7, 2013. Page 8.

No title. Column on Chicagoland Grows trees. Omaha World-Herald. April 18, 2013. Page 3.

"Elms are Back" (Chicagoland Grows trees). The Sunday Journal Sentinel (Milwaukee newspaper). Aril 21, 2013. Page 6.

"Return of the beautiful elm" (Chicagoland Grows trees). Globe Gazette (Mason City, IA newspaper). April 19, 2013. Page A5.

"Show your patriotism by planting all-American Wild Indigo" (hybrid Baptisia from Chicago Botanic Garden). News Journal (Wilmington, DE newspaper). May 27, 2013. Pages 4,7.

"Farberhulsen in ganz neuen Farben" (Baptisia breeding including our hybrids). Garten Praxis (magazine). September 2013. Pages 12, 13.

"Grow On" (Crescendo™ sugar maple). Landscape Architecture Magazine. March, 2013. 103(3), pg. 69.

Some of the Electronic Media Coverage of the Chicagoland Grows Plant Introductions:

- http://www.melindamyers.com/Embeded-Radio-Recently-Aired/creating-a-beautiful-garden-or-landscape/forever-pink-phlox.html
- http://www.991themix.com/Forever-Pink-Phlox/11789137?pid=293628
- http://gardennews.biz/?id=10668
- http://webtv.accuweather.com/en/home-garden-articles/gardening/chicagoland-grows-introduces-t/3895430
- http://winnetka.patch.com/articles/chicago-botanic-garden-unveils-new-plants
- http://northbrook.patch.com/articles/chicago-botanic-garden-unveils-new-plant-ea02ee9c
- http://www.ballpublishing.com/landscapeinsider/Newsletter.aspx?article=1114
- http://www.newplantsandflowers.com/phlox-covered-with-purplish-pink-flowers/

Other public outreach included:

Dixon Prairie/Skokie River Corridor Corporate Volunteer Days:

June 5 – ABVIE

June 25 – ABVIE

July 18 – ABVIE

July 25 – Field Museum Research Education Undergraduate Interns

Dixon National Tallgrass Prairie Seed Bank involvement with HSBC Climate Partnership through the Earthwatch Institute.

Dixon National Tallgrass Prairie Seed Bank participation in World Environment Day: provided demonstrations, slide shows of microscope seed images, a tour of the Dixon Prairie for visitors.

B. Kirschner – presentations about lake shoreline enhancement and rain gardens to corporate employees at Barilla and at the Corporate Roundtable on Sustainability (held at Underwriters Laboratories), Illinois Senator Julie Morrison's Environmental Roundtable.

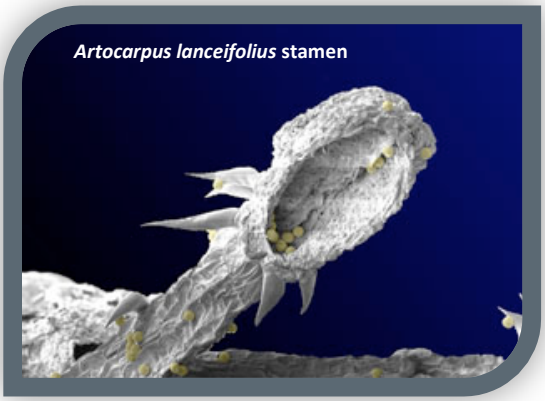
E. Yates – creation of screen displays and maps for GIS Lab, World Environment Day.

S. Wagenius – taught a lesson and supervised an experiment about plant reproductive biology to 127 seventh-grade science students at Highwood Junior High School.

AWARDS AND INVENTIONS

- The Chicago Botanic Garden received a Conservation and Native Landscaping Award from Chicago Wilderness and the U.S. Environmental Protection Agency for our North Lake Shoreline Restoration Program.
- The Chicago Botanic Garden received a Technical Merit Award from the North American Lake Management Society for our Lake and Shoreline Enhancement Program.
- The Chicago Botanic Garden received a Gold Accreditation for McDonald Woods from Chicago Wilderness' Excellence in Ecological Restoration Program.
- Patrick Herendeen was elected president-elect for the American Society of Plant Taxonomists.
- Patrick Herendeen received the "Merit Award" from the Botanical Society of America. The Botanical Society of America Merit Award is the highest honor given by the society. Awardees are chosen based on their outstanding contributions to research, education, public policy, or who have provided exceptional service to the professional botanical community, or who may have made contributions to a combination of these categories.
- Nyree Zerega served for a second year as a Center for Civic Engagement Fellow at Northwestern University.
- Susanne Masi received a North Branch Restoration Project (Forest Preserve District of Cook County Stewardship Group) Recognition Award for Plants of Concern leadership and conservation work.
- Susanne Masi. Habitat Project (Audubon-Chicago Region) Conservation Leadership Award announced. To be awarded in February 2014.
- Plants of Concern and Susanne Masi. Conservation Partnership Award announced by the Forest Preserve District of Will County. To be awarded in March 2014.
- Jim Ault received patents on Echinacea `Burgundy Fireworks, PP23,691, Veronica `Tidal Pool`, PP23,341, and Aster `Bridal Veil`, PP23,966, the rights to all of which were assigned to the Chicagoland Grows® plant introduction program.
- Emily Yates received $1,300 from the ESRI (Environmental Systems Research Institute) Conservation Program to attend the 2013 ESRI International User Conference (UC), San Diego, CA, July 8-12, 2013.

- Post-doctoral researcher Evelyn Williams received research awards from the Huron Mountains Foundation ($300) and the Clarence R. & Florence N. Hanes Fund ($1,650).
- MS student Laney Widener was awarded a grant of $700 from the California Native Plant Society for her research: Assessing reproductive isolation and genetic divergence in coastal California *Castilleja* (Orobanchaceae) species complex.
- MS student Kristen Laricchia was awarded an ISEN (Institute for Sustainability and Energy at Northwestern) grant in the amount of $5,892 for her research Transcriptome Analysis of Breadfruit across a Domestication Gradient.
- MS student Anne Nies was awarded the Mildred Hartney Scholarship from the Elmhurst Garden Club ($1,000).
- PhD student Aleks Radosavljevic was awarded the Botanical Society of America's Lawrence Memorial Award for 2013 ($2,000).
- PhD student Lauren Umek was awarded the 2013 grant from the Illinois Association of Environmental Professionals for her research Impacts of Restoration on Belowground Processes in Chicagoland Prairies ($1,000).
- MS student Theresa Melhem was awarded the 2013 Botanical Society of America Graduate Student Research Award for her work on the origins and diversity of jackfruit (Artocarpus heterophyllus) in the Western Ghats of India ($500).
- MS student Maria Wang was awarded the 2013 Botanical Society of America Graduate Student Research Award for her work on the diversity and origins of chempedak (*Artocarpus integer*) in Malaysia ($500).
- MS student Laney Widener was awarded the 2013-14 Santa Clara Valley Chapter Graduate Research Scholarship for her work focused on understanding the *Castilleja affinis* (Orobanchaceae) subspecies complex ($1,500).
- PhD student Elliot Gardner received honorable mention in the Science in Society 2013 Scientific Images Contest. He will receive a cash prize and his photo of a stunning *Artocarpus lanceifolius* stamen with pollen (shown below) will be featured in the annual Science in Society art show in October.



- PhD student Elliot Gardner was awarded the 2013 Systematics Research Fund Award (jointly administered by the Linnean Society and the Systematics Association) for his dissertation research focused on population genetics and species limits of *Artocarpus odoratissimus Blanco* (Moraceae) ($1,500).
- MS student Erin Vander Stel, was awarded the 2013 North Central Chapter Research Grant from the Society of Wetland Scientists, for her thesis research focused on factors influencing population dynamics in Isoëtes butleri, an endangered wetland species ($750).

- PhD student Elliot Gardner was awarded the 2013 American Society of Plant Taxonomists Graduate Student Research Award for his dissertation research focused on population genetics and species limits of *Artocarpus odoratissimus Blanco* (Moraceae) ($800).
- PhD student Aleks Radosavljevic has been awarded a one year Smithsonian Curatorial Graduate Fellowship. He will be assisting in collections improvement in the Botany Department at the National Museum of Natural History in Washington DC during 2013 – 14, while continuing work on his research focused on the systematics, biogeography, and taxonomic revision of the legume genus *Cynometra* ($27,000).
- PhD student Kelly Ksiazek received a 2013 Fulbright Travel Grant and Germanistic Society of America Fellowship for her research on green roofs in Germany.
- PhD student Paul Hartzog was awarded an ISEN (Initiative for Sustainability and Energy at Northwestern) Cluster Fellowship for 2013-14. Cluster Fellows are exceptional students with deep interest in energy and sustainability.
- MS student Stephanie Frischie has been selected to participate in the 2013 U.S. Borlaug Summer Institute on Global Food Security at Purdue University.
- PhD student Kelly Ksiazek was awarded the 2013 Phipps Conservatory Botany in Action Fellowship ($5,000) for her research in Germany: "Predicting the future of green roof biodiversity" and the Phipps Conservatory Botany in Action and Garden Club of Allegheny County Outreach Award ($1,000)
- PhD student Kelly Ksiazek was awarded the 2013 Illinois State Academy of Science Student Research Grant ($500) for her research in Chicago: "Can designing green roofs as Illinois prairie analogs increase urban ecosystem services?"
- PhD student Kelly Ksiazek was awarded the 2013 Prairie Biotic Research Inc. Award ($1,000) for her research: "Can designing green roofs as prairie analogs increase habitat for native species?"
- MS student Corey Palmer was the recipient of the 2013 Garden Club of America Fellowship in Ecological Restoration. Corey has been awarded $8,000 for her research which focuses on land management strategies in prairie restorations and how they affect soil quality.
- PhD student Elliot Gardne, was awarded the Torrey Botanical Society Student Training Fellowship for $1000 to attend a Tropical Botany course in Florida during summer 2013.
- MS student Anne Nies was awarded the Fred Case Grant ($1,000) by the Native Orchid Society for her work that focuses on orchids and their mycorrhizal associations as they relate to various land management approaches (2013).
- Lauren Umek (PhD student) was awarded a Presidential Fellowship from Northwestern University (2013) for her research on investigating the effects of exotic plant invasion and restoration on plant communities and soil processes. The fellowships are the most prestigious fellowship at Northwestern and are awarded to a very limited number of graduate students each year.
- Matthew Rhodes was awarded a Sigma Xi Grant-in-Aid of Research for $500 to support his Master's research focusing on how temporal variation in pollinator community structure influences reproductive dynamics and pollen movement in *Oenothera harringtonii*, an evening primrose endemic to southeastern Colorado, USA.
- PhD student Aleksandar Radosavljevic received the Lawrence Memorial Award from the Hunt Institute for Botanical Documentation, which includes $2,000 to support field work.
- Undergraduate student Maria Wang was awarded Program Honors in Biological Sciences at NU and the Emanuel Margoliash Prize for her senior thesis research on the pollination biology and conservation of the prairie grass *Dichanthelium leibergii*.

PRESENTATIONS AND WORKSHOPS

J. Ault

Chicagoland Grows plant introduction program. Staffed display booth and discussed program and plant introductions with attendees during trade show. Mid-America Horticultural Trade Show, Chicago, Illinois. January 16-18, 2013.

Developing Native Plants for Midwestern Landscape Use: Chicagoland Grows Plant Introduction Program. University of Wisconsin Winter Seminar, lecture given three times, in Bristol, WI and Waukesha, WI on January 20, 2013, and in Sheboygan, WI on March 8, 2013. Invited speaker.

Chicagoland Grows plant introduction program. Staffed display booth and discussed program and plant introductions with attendees during trade show. OFA Short Course and Trade Show, Columbus, Ohio. July 14-16. 2013.

Chicagoland Grows plant introduction program. Staffed display booth and discussed program and plant introductions with attendees during trade show. ILCA Summer Field Day, West Chicago, Illinois. August 1, 2013.

From Native Habitats to Your Landscapes: A Model for Domesticating our Natural Plant Heritage. Far West Trade Show, Portland Oregon. August 23, 2013. Invited speaker.

Back to the Basics: How We Propagate Plants for Chicago Botanic Garden's Plant Breeding Program. Annual Meeting of the IPPS Eastern Region, Naperville, Illinois. October 9, 2013. Invited speaker.

Chicagoland Grows new plant introductions during the New Plant Forum. Annual Meeting of the IPPS Eastern Region, Naperville, Illinois. October 10, 2013.

Developing New Perennials for Midwest Gardens. Lecture for Plant Propagation and Introduction to Horticulture students at College of Lake County, Grayslake, Illinois, October 14, 2013. Invited guest lecturer.

Chicagoland Grows®, Inc. Plant Introduction Program. Horticultural Inspectors Society conference, Lisle, Illinois. October 23, 2013. Invited speaker.

Developing New Perennials for Midwest Gardens. Garden Clubs of Illinois. Elmhurst, Illinois. October 28, 2013. Invited speaker.

From Native Habitats To Your Landscapes – Adapting Our Natural Plant Heritage. Rotary Botanical Gardens Fall Garden Symposium, Janesville, Illinois. November 2, 2013. Invited speaker.

L. Egerton-Warburton

The role of soil aggregates in sequestering carbon in restored temperate grasslands. Yost, J.L.*, Palmer, C.E., and Egerton-Warburton, L.M. International Union of Soil Scientists Meeting, Global Soil Carbon Symposium, Madison WI.

Contribution of fungal macromolecules to soil carbon sequestration. Levinson, W.*, Schreiner, K., Fournillier, K., Blair, N., and Egerton-Warburton, L.M. International Union of Soil Scientists Meeting, Global Soil Carbon Symposium, Madison WI.

Markers of soil quality in urban grassland restorations. Palmer, C.E , Yost, J.L.*, and Egerton-Warburton, L.M. 5th National Conference on Ecosystem Restoration, Chicago IL.

Ectomycorrhizal community recovery following exotic species invasion and restoration in an oak

woodland. Hevey, R.D., and Egerton-Warburton, L.M. Ecological Society of America Annual Meeting, Minneapolis, MN.

The role of soil aggregates in sequestering carbon in restored temperate grasslands. Yost, J.L.*, Palmer, C.E., and Egerton-Warburton, L.M. Ecological Society of America Annual Meeting, Minneapolis, MN.

Ectomycorrhizal community recovery following exotic species invasion and restoration in an oak savanna. Egerton-Warburton, L.M. and Hevey, R.D. Society for Ecological Restoration, Madison, WI.

The role of soil aggregates in sequestering carbon in restored temperate grasslands. Yost, J.L.*, Palmer, C.E., Schreiner, K.M., and Egerton-Warburton, L.M. Natural Areas Conference, Chicago, IL.

The contribution of fungal necromass to soil organic matter storage. Schreiner, K.M, Blair, N.E., Buiser, A.*, and Egerton-Warburton, L.M. American Geophysical Union, San Francisco, CA.

J. Fant

Genetic consideration for restoration of rare species: Lessons learnd from Cirsium pitcheri and Asclepias lanuginosa reintroductions. SER Symposium - Genetic Diversity and Restoration Seed Sourcing: Status of the Science, Madison, WI, October 2013.

Phenotypic and genetic variation of Bromus tectorum in native and invasive populations. A.B. Griffith, C.H. Pao, J.B. Fant, and C. Flowe. Poster Presentation, Ecological Society of America, Minneapolis, MN, Aug 2014.

Population genetics and viability of genetic rescue in the restricted endemic Lepidospartum burgessii (Asteraceae). E.W. Williams, J.B. Fant, K. Havens and M. Howard. Poster Presentation, Ecological Society of America, Minneapolis, MN, August 2014.

R. Goad

Plants of Concern, a citizen science-based monitoring program in Chicago Wilderness since 2001. Poster presented at Wild Things Stewardship Conference, University of Illinois Chicago, February 2013.

Ravine Rapid Assessment Webinar. Co-presenter. Hosted by the Alliance for the Great Lakes. April 2013

Plants of Concern. Presentation to the Illinois Native Plants Society, Southern Chapter. November 2013.

K. Havens-Young

Seed Banking at Chicago Botanic Garden. Invited presentation on seed banking at the Seeds of Success meeting, Chapel Hill, NC, 2013.

Restoration genetics and plant responses to climate change. Invited presentation to DOI agencies, Washington DC, 2013.

Demography of Cirsium pitcheri. Invited presentation at the Center for Plant Conservation annual meeting, Austin, TX, 2013

Organized and moderated a workshop on restoration genetics for the Native Seed Conference, Santa Fe, NM, 2013.

Maintaining and Restoring Resilient Plant Communities in a Changing Climate, Past-President's Symposium, Botany 2013, New Orleans, LA, 2013.

Maintaining and Restoring Resilient Plant Communities in a Changing Climate. Natural Areas Association, Chicago, IL, 2013.

Planning for the use of native plant materials in a changing climate. Society for Ecological Restoration, Madison, WI, 2013.

Assessing the risk of cultivars of invasive species. Botanic Garden Conservation International Congress, Dunedin, NZ, 2013.

Global Partnership for Plant Conservation Meeting, GSPC Update planning, Dunedin, NZ, 2013.

Exceptional species workshop. Botanic Garden Conservation International Congress, Dunedin, NZ, 2013.

R. Hawke

New Perennials for the Garden. New England Grows Tradeshow, February 6, 2013.

Three Strikes and They're Out! Tribulations of Plant Trials. Michigan State University Plants of Distinction Symposium, Grand Rapids and Novi, MI, March 18, 2013.

Smart Perennials for Michigan. Michigan State University Plants of Distinction Symposium, Grand Rapids and Novi, MI, March 18, 2013.

When Pretty Isn't Enough. Spring Thaw Symposium, Green Bay Botanical Garden, Green Bay, WI, March 23, 2013.

Proven Plants for Northern Gardens. Lake Forest Garden Club, Lake Forest, IL, April 11, 2013.

New Plant Introductions from Chicagoland Grows and Intrinsic Perennials. New Plant Forum, Perennial Plant Symposium, Vancouver, BC, Canada, July 25, 2013.

Smart Perennials for Michigan Landscapes. 2013 Smart Gardening Conference, Marquette, MI, September 14, 2013.

Four-Star Plants for your Garden. Indianapolis Museum of Art Horticultural Society, Indianapolis, IN, November 3, 2013.

P. Herendeen

Synchrotron x-ray microtomography in studies of fossil flowers. Chicago Plant Science Symposium, April 20, 2013.

Systematics and Fossil History of Leguminosae (and a little bit on Fossil Plants from the Early Cretaceous of Mongolia). P. Herendeen, University of Florida, November 2013.

Co-organizer (with Richard Ree), Chicago Plant Science Symposium. "*Old Questions, New Tools.*" The Field Museum.

Towards a new classification system for the Leguminosae: A draft proposal for discussion and improvement during 6ILC. Presented for the Legume Phylogeny Working Group by P. Herendeen, A. Bruneau, C. Hughes, R.T. Pennington and M.F. Wojciechowski. Sixth International Legume Conference, Johannesburg, South Africa, January 6-11, 2013.

Towards a new classification system for the Leguminosae: Revisit, revise, move forward. Discussion co-chaired by P. Herendeen and G.P. Lewis. Sixth International Legume Conference, Johannesburg, South Africa, January 6-11, 2013.

R. Kirschner

But What Will the Neighbors Think? Creating Native Shoreline Landscapes That Are Easy on the Eye and Great for the Environment! Keynote Address (Day 1) at Pennsylvania Lake Management Society Annual Conference, State College, PA, February 2013.

Getting the Most out of Your Lakeshore's Native Planting Project. Keynote Address (Day 2) at Pennsylvania Lake Management Society Annual Conference, State College, PA, February 2013.

But What Will the Neighbors Think? Creating Native Shoreline Landscapes That Are Easy on the Eye AND Great for the Environment. Presentation at North American Lake Management Society's Annual International Symposium, San Diego, CA, October 2013.

Shorelines That Work: Native Plantings Heal Erosive Water Landscapes and Provide Impressive Visual Appeal. Invited presentation at The Conservation Foundation's "Beyond the Basics: It Takes A Community to Clean Stormwater" conference, Woodridge, IL, March 2013.

Shoreline Plant Performance and Survivability at the Chicago Botanic Garden. Invited plenary presentation at the annual "Michigan Shoreline and Shallows Conference – Natural Shorelines and the Habitat Connection", East Lansing, MI, March 2013.

Alternatives for Invasive Aquatic Plants in Water Gardens and Shoreline Landscapes. Presented at the Illinois-Indiana Sea Grant's Workshop for Master Gardeners, Glencoe, IL, April 2013.

Building a Better Water Garden – Alternatives for Invasive Aquatic Plants. Presented via webinar for the NOAA Great Lakes Sea Grant Network's Aquatic Invasive Species Webinar Series, June 2013.

A. Kramer

Genetics primer to producing seed for restoration in a changing climate. Invited Presentation, Climate Change Task Force & Natural Resources Management Team joint meeting. Chicago, IL,, December 2013.

A test of potential seed transfer zones for restoration in the Great Basin: examples from Penstemon and Eriogonum. Society for Ecological Restoration World Conference, Madison, WI, October 2013.

Genetic impacts of moving and mixing seeds between ecoregions: examples from 3 Penstemon species. 12th Biennial Conference of Science and Management on the Colorado Plateau, Flagstaff, AZ, September 2013.

Getting plant conservation right: successes, challenges and opportunities for the future. Invited Presentation, Smithsonian Botanical Symposium. Washington, DC, April 2013.

A genetics primer to producing seed for restoration. National Native Seed Conference. Santa Fe, NM, April 2013.

D. Larkin

Dynamics and consequences of plant invasions in the upper Midwest. Invited talk, Associated Colleges of the Chicago Area.

Dimensions of restoration. Invited talk, Friends of the Green Bay Trail, Glencoe, IL.

Co-organizer (with Andrew Hipp), *Taking the long view: What can paleo, phylogenetic, and other long-term perspectives tell us about ecological restoration?* Symposium at the Society for Ecological Restoration International World Conference, Madison, WI.

Taking the long view: Can considering phylogenetic diversity improve restoration outcomes in tallgrass prairie? Symposium talk, Society for Ecological Restoration International World Conference, Madison, WI.

PhragNet: Crowdsourcing Phragmites *management data.* Symposium talk, Society of Wetland Scientists annual meeting, Duluth, MN.

Twenty-five years of community phylogenetic change in tallgrass-prairie remnants. Ecological Society of America annual meeting. Minneapolis, MN.

Surrounding land-use and management, but not area, predict plant species richness of remnant prairies in Illinois. Ecological Society of America annual meeting, Minneapolis, MN.

The effects of tallgrass prairie restoration on native bee communities in Northeastern Illinois. Society for Ecological Restoration International World Conference, Madison, WI.

S. Masi

Plants of Concern. Training Workshops for Citizen Science Monitors. Co-taught four training workshops held in different parts of the region during April/June. With R. Goad.

Plants of Concern: Volunteers Monitor Rare Plants in a Standardized Regional Program. Presentation to Northwestern University Graduate Students, Chicago Botanic Garden. With R. Goad, J. Aaron and D. Suarez, November 22, 2013.

Plants of Concern, Chicago Botanic Garden: a regional rare plant monitoring program, an overview. Invitational symposium on Public Participation in Scientific Research. Botany 2013. New Orleans, LA, July 27-31, 2013. Co-authored by R. Goad.

G. Mueller

Importance of Plants and the Importance of Plant Research, Keynote Address for Illinois Extension Service Annual Event, Rockford, IL, March 2, 2013.

Southern Illinois Mushrooms: Colorful, Diverse, and Important, Southern Illinois Native Plant Society Symposium, Carbondale, IL, March 16, 2013.

Macrofungi of Chicago, Chicagoland Species Forum, DePaul University April 22, 2013.

Seed banking, Creating Native Seed Sources and Plant Materials Capacity Supporting Local Restoration Efforts, APGA Conference, Phoenix, AZ, May 23, 2013.

Mitigating the Loss of Botanical Capacity Examples from Chicago Botanic Garden, Global Botanic Garden Congress, Dunedin, New Zealand, October 21-25, 2013.

Feeding the movement, how botanic gardens support local & sustainable food systems with Chicago Botanic Garden examples, Global Botanic Garden Congress, Dunedin, New Zealand, October 21-25, 2013 (with Patsy Benveniste).

Fungal conservation in the USA, International Fungal Conservation Congress, Akyaka, Turkey November 12, 2013.

IUCN Workshop on Developing Biotic Indicators for Assessing the Success of Large Scale Forest Restoration Projects, Ghana, February 16-22, 2013.

IUCN Key Biodiversity Areas, Criteria Workshop, Front Royal, VA, March 11-14, 2013.

Center For Tree Science Advisory Workshop, Morton Arboretum, June 6 -7, 2013.

Global Fungal Red List Initiative Workshop, International Fungal Conservation Congress, Akyaka, Turkey November 14, 2013 (Organized and Chaired with Michael Krikorev, Sweden)

Natural Areas Association Annual Meeting, Program Chair, Chicago, October 14, 2013.

Global Partnership for Plant Conservation Meeting, GSPC Update planning, Dunedin, New Zealand, October 23, 2013.

K. Skogen

Vagrant pollinators, fragrant plants - geographic variation in floral scent despite hawkmoth-mediated gene flow linking isolated populations. University of Wisconsin, Whitewater, WI.

Vagrant pollinators, fragrant plants - geographic variation in floral scent despite hawkmoth-mediated gene flow linking isolated populations. Bucknell University, Lewisburg, PA.

Moths vs. bees: Linking temporal variation in pollinator community structure to reproductive dynamics and pollen movement in an annual plant. Rhodes, M.K., K.A. Skogen, and J.B. Fant. Ecological Society of America, Minneapolis, MN

Green roofs provide resources for native forbs and bees in Chicago. Invited talk for special session: incorporating Ecology into Green Roof Research. K. Ksiazek, R.K. Tonietto, and K.A. Skogen. Ecological Society of America, Minneapolis, MN.

S. Still

Development of tools and technology to improve the success and planning of restoration of big sagebrush ecosystems. B. Richardson, N. Shaw, M. Gerimo, S. Carlson, H. Ortiz, S. Sanderson, and S. Still. Great Basin Landscape Conservation Cooperative Meeting "The Great Basin: A Landscape Under Fire", Reno, NV.

GIS-based spatial analysis of rare plant populations on gravel hill prairies: habitat suitability modeling. R. Goad, J. Fant, S. Still, C. Wright, E. Yates, and S. Masi. Illinois GIS Association Fall Conference, Lisle, IL.

A spatial assessment of rare plant locations across Chicago Wilderness: Putting citizen science data to good work. R. Goad, J. Fant, S. Still, C. Wright, E. Yates, and S. Masi. Natural Areas Association Conference, Chicago, IL.

Measuring the impact of climate change on the distribution rare plants: A case study using species of the western United States. S. Still. Symposium on Biogeography at the 7th Colombian Botany Congress, Ibagu, Colombia.

Perambulating through poppies: My odyssey though California opiates. S. Still. Plant Biology and Conservation Seminar at Northwestern University, Evanston, IL.

Species concepts in plants. S. Still. Guest lecturer, course in ecology at DePaul University, Chicago, IL.

Planning for the use of native plant materials in a changing climate. K. Havens, P. Vitt, A. Kramer, S. Still, and J. Fant. Society for Ecological Restoration 2013, Madison, WI.

Maintaining and restoring resilient plant communities in a changing climate. K. Havens, P. Vitt, A. Kramer, S. Still, and J. Fant. Natural Areas Association 2013, Chicago, IL.

Maintaining and restoring resilient plant communities in a changing climate. K. Havens, P. Vitt, A. Kramer, S. Still, and J. Fant. Botany 2013, New Orleans, LA.

Measuring distribution change and vulnerability of rare plants in response to climate change: a case study using species of the western United States. S. Still. Botany 2013, New Orleans, LA.

Evaluating the potential of assisted migration as an adaptive strategy in a changing climate. P. Vitt, S. Still, and E. Yates. National Native Seed Conference. Sante Fe, NM.

P. Vitt

The Importance of Plant Ecology and Conservation to the Green Building Industry. Design Futures Council, Minneapolis, MN, October 8, 2013.

Climate Change Affects the Ranges of Rare Plants, and What We Can Do About It. Spaceship Earth: The Fragility of Our Planet, World Environment Day Keynote Panel, Chicago Botanic Garden, June 1, 2013.

Evaluating the Potential of Assisted Migration as an Adaptive Strategy in a Changing Climate. P. Vitt, S. Still, and E. Yates. National Native Seed Conference, Sante Fe, NM, April 2013.

Effects of Climate Change and Fragmentation on Rare and Endangered Plants. Plenary Address - Species on the Brink: Management of Threated, Endangered and Declining Species. Vitt, P. and S. Still. The Wildlife Society, Lafayette, IN, March 2013.

Using Multiple Lines of Evidence to Prioritize Assisted Migration of Both Rare and Common Species. Assisted Migration: A primer for Reforestation and Restoration Decision Makers. Vitt, P. and S. Still. Western Forestry and Conservation Association, World Forestry Center, Portland, OR, February 2013.

S. Wagenius

Dynamic responses to habitat fragmentation in a prairie plant. Invited speaker at Legacies From Long-Term Ecological Studies: Using the (Recent) Past to Inform Future Research Session, at the Ecology Annual meeting, Minneapolis, MN, August 5, 2013.

Exploring top-down and bottom-up interactions between Echinacea angustifolia and its specialist ant-tended aphid. K. Muller and S. Wagenius. Ecology Annual meeting, Minneapolis, MN, August 6, 2013.

Prescribed prairie burns influence reproduction of the purple coneflower Echinacea angustifolia with G. Kiefer, J. Nicol, J. Ison, A. Zahler, and K. Kapsar. Natural Areas Asssociation Annual Meeting, Chicago, IL, October 4, 2013.

Assessment of the effects of the introduction of non-native echinacea species in the pollination of native Echinacea angustifolia in western Minnesota. D. Blasini*, S. Wagenius. Society for Advancement of Chicanos and Native Americans in Science Annual Meeting, San Antonio, TX, October 5, 2013.

WANTED: more and better sex between prairie plants living in fragmented prairie. Invited speaker at Lake Forest College, Lake Forest, IL, October 30, 2013.

Ants in fragmented Minnesota prairie habitat with G. Hallaman, S. Zufan, K. Muller, and J. Gall. Chicago Area Ant Lab Meeting, Chicago, IL, November 2, 2013.

N. Wickett

Shifting hypotheses at the base of land plants: evidence from high throughput transcriptome sequencing. University of Missouri, April 30, 2013.

How high throughput sequencing and bioinformatics are changing our hypotheses of early land plant evolution. University of Massachusetts, Amherst, March 14, 2013.

Reconstructing the rapid radiation of pleurocarpous mosses using genomic approaches. Wickett, N.J., Y. Liu, A.J. Shaw, and B. Goffinet. Meeting abstract in Botany 2013 Abstracts, New Orleans, LA, 2013.

Inferring relationships of early land plants using a transcriptome-based approach. Wickett, N.J., J. Leebens-Mack, G. Wong, *et al*. Meeting abstract in Plant & Animal Genome XXI, San Diego, CA, January 12-16, 2013.

E. Williams

Population genetics and viability of genetic rescue in the restricted endemic Lepidospartum burgessii (Asteraceae). Williams, E.W., J. Fant, and K. Havens. Ecological Society of America Conference, Minneapolis, MN.

A revised and expanded phylogeny of Artocarpus (Moraceae). Williams, E.W., and N. Zerega. Botanical Society of America Conference, New Orleans, LA.

E. Yates

Evaluating the Potential of Assisted Migration as an Adaptive Strategy in a Changing Climate. 2nd National Native Seed Conference, Santa Fe, NM, April 8-11, 2013. With P. Vitt and S. Still.

GIS-based Spatial Analysis of Rare Plant Populations on Gravel Hill Prairies: Habitat Suitability Modeling. Illinois GIS Association (ILGISA) Fall Conference, Lisle, IL, October 21-22, 2013. With C. Wright, R. Goad, J. Fant, and S. Still.

A Spatial Assessment of Rare Plant Locations across Chicago Wilderness: Putting Citizen Science Data to Work. Natural Areas Association Conference, Chicago, IL, October 1-2, 2013. With R. Goad, J. Fant, S. Still, C. Wright, and S. Masi.

Using spatial analysis and GIS to investigate patterns in rare plants monitored by the Chicago Botanic Garden's Plants of Concern Program. 2013 ESRI International User Conference (UC), San Diego, CA, July 8-12, 2013.

Seeds of Success workshop for CLM internship training at Chicago Botanic Garden. Led 40 interns in seed collecting techniques in the field, with M. Haidet and D. Sollenberger, June 13, 2013.

Graduate Student Presentations:

Williams, E.W., and N.J.C. Zerega. 2013. A revised and expanded phylogeny of *Artocarpus* (Moraceae) and its biogeographic implications. Botany 2013, New Orleans, LA, July 2013.

Gardner, E.M., and N.J.C. Zerega. 2013. Molecular phylogeny and biogeography of *Maclura* (Moraceae). Botany 2013, New Orleans, LA, July 2013.

Radosavljevic, A., B. Mackinker, P.S. Herendeen, and F. Forest. 2013. Phylogeny, biogeography, and morphological evolution of Cynometra and Maniltoa (Leguminosae: Caesalpinioideae). Presented at 6th International Legume Conference, Johannesburg, South Africa.

Radosavljevic, A., B. Mackinker, P.S. Herendeen, and F. Forest. 2013. Phylogeny and biogeography of Cynometra and Maniltoa (Leguminosae: Caesalpinioideae). Presented at Botany 2013, New Orleans, LA.

Moths vs. bees: Linking temporal variation in pollinator community structure to reproductive dynamics and pollen movement in an annual plant. M.A.Rhodes, K.A. Skogen, J.B.Fant, Oral Presentation, Ecological Society of America, Minneapolis, MN, August 2014.

Ksiazek, K. Begrünten Dächer und Urbanen Biodiversität (Green roofs and urban biodiversity). Hochschule Neubrandenburg, Master-Seminar in Biodiversität in der Landnutzungsplanung –Flora und Vegetation (Master's Course in Biodiversity in land use planning – Flora and vegetation), Neubrandenburg, Germany, October 2013.

Ksiazek, K. and M. Köhler. Correlations between annual weather variability and green roof plant diversity. World Green Infrastructure Network Congress, Nantes, France, September 2013.

Ksiazek, K. Vegetationskunde in den Vereinigten Staaten (Vegetation science in the United States). Hochschule Neubrandenburg, B-WPM 15: Vegatationskunde Mitteleuropas (Central European Vegetation Science), Neubrandenburg, Germany, April 2013.

Gobster, P, L. Umek, A. Wali and D.H. Wise, G. Panel presentation and discussion for book release "Our once and future planet" by Paddy Woodworth. DePaul University, Chicago, IL.

Umek, L. Chicago Land Management Research Program. Society for Ecological Restoration World Conference, Madison, WI.

Umek, L. L. Heneghan, and D.H. Wise. The Chicago Wilderness Land Management Research Program, aka 100 Sites for 100 Years: Developing an urban long-term restoration research program. Society for Ecological Restoration, Midwest Great Lakes Chapter Annual Meeting, Wooster, OH.

TEACHING AND MENTORING

L. Egerton-Warburton

Soils and the Environment: The Earth's Critical Zone (PBC418; Winter 2013), Northwestern University

High school students advised

Vanessa Duran (College First)

Manka Rifi (Main East High School)

Undergraduate students advised:

William Levinson (Lake Forest College)

Jenifer Yost (Lake Forest College)

Mariah Allen (Lake Forest College- NSF REU)

Thomas Wilson Lake Forest College)
William Levinson(ake Forest College)
Kevin Amses (Humboldt State University (NSF- REU)
Thomas Flynn (Lake Forest College)
Ben Girgenti (Brown University)
Allison Buiser (Knox College)
Christian Keeve (Northwestern University)
Jessica Ross (Northwestern University)
Cassie Shah (DePaul University)
Elina Shapiro (Lake Forest Colleg)
Erik Zorn, (Northwestern University)

Graduate students advised or committee member:

Robert Hevey (MS, NU)
Nik Desai (MS NU, graduated May 2013)
Lauren Umek (PhD NU)
Matt McCreary (PhD UIC)
Benjamin Morgan (PhD NU)
Anne Neis (MS NU)
Chen Ning (MS NU)
Corey Palmer (MS NU)

J. Fant

Co-PI, Research Experiences for Undergraduates (REU) site Program in Plant Biology and Conservation

Conservation Genetics (Spring 2013), Northwestern University

Field and Laboratory Methods in Plant Biology and Conservation (Fall 2013), Northwestern University

Postdoctoral Fellow Advised:

Evelyn Williams

Graduate students advised or committee member:

Stephanie Frischie (current MS, NU)
Alicia Foxx (current MS, NU),
Anna Braum (current MA, NU)
Kelly Ksiazek (current PhD , NU)
Eun Sun Kim (current PhD, UIC)
Theresa Melham (current MS, NU)
Matt Rhodes (MS 2013, NU)
Erin Vander Stelt (MS 2013, NU)
Maria Wang (current MS, NU)

Undergraduate students advised

Hoisin West (University of New Haven – NSF REU)
Rosalba Herrera (Loyola University – CF alum)

K. Havens-Young

Conservation and Land Management Intern Training Workshop. Chicago Botanic Garden.

Graduate students advised or committee member:

Jessamine Finch (PhD at NU)
Christopher Warneke (MS at NU)
Stephanie Frischie (MS at NU)

Undergraduate student advised:

Alex Blanchard

R. Hawke

Clematis Up Close. Enrichment course, School of the Chicago Botanic Garden, March 30, 2013.

Herbaceous Perennials. Plant Materials Certificate Course, School of the Chicago Botanic Garden, July 16-September 10, 2013.

P. Herendeen

Plant Evolution and Diversity: Northwestern University (Winter 2013).

Graduate students advised or committee member:

Aleksandar Radosavljevic (PhD at NU)
Elliot Gardner (PhD at NU)
Rui Zhang (PhD at NU)

Undergraduate student advised:

Valerie Thomas (Northwestern University)

Bob Kirschner

But What Will the Neighbors Think? Creating Native Shoreline Landscapes That Are Easy on the Eye AND Great for the Environment. Seminar for students in the Illinois Institute of Technology's Ecology and Materials Workshop I, as well as the University of Illinois' Ecological Process and Design course.

A. Kramer

Graduate students advised or committee member

Janet Backs-Rizner (PhD, UIC)
Alicia Foxx (current MS, NU)
Ryan Disney (current MS, NU)
Lindsey Darling (MS, NU, completed fall 2013)
Matt Rhodes (MS, NU, completed fall 2013)
Nora Talkington (current MS, NU)
Maggie Eshleman (current MS, NU)
Adrienne Basey (current MS, NU)
Stephanie Frischie (current MS, NU)
Theresa Melhem (current MS, NU)
Maria Wang (current MS, NU)

REU Student Co-Mentor

Jessic Riebkes (with B. Barak)

College First Co-Mentor

Edgar Padilla (with B. Barak and J. Reibkes)

High School Students mentor

Tina Moazezi

Fabiola Yun

D. Larkin

PI, Research Experiences for Undergraduates (REU) site Program in Plant Biology and Conservation

Plant Community Ecology (Spring 2013), Northwestern University

Field and Laboratory Methods in Plant Biology and Conservation (Fall 2013), Northwestern University

Ecology and Materials Workshop I: Plants and Planting (Fall 2013), Illinois Institute of Technology

Graduate students advised or committee member:

Jennifer Alyah (NU)

Rebecca Barak (NU)

Ryan Disney (NU)

Paul Hartzog (NU)

Sam Isham (NU)

Rebecca Tonietto (NU)

Erin Vander Stelt (NU)

S. Masi

Co-taught with R. Goad four Plants of Concern Volunteer Training workshops throughout the region in April and June

Coordinated and mentored group volunteer monitoring field forays throughout the season at Illinois Beach State Park, Sand Ridge Savanna, Hickory Creek Barrens, Florsheim Nature Preserve

Students mentored

Erin Vander Stelt, Northwestern MS student, for her thesis project

REU intern Christopher Wright. With E. Yates

G. Mueller

Students mentored

Rui Zhang

Chen Ning

Lynnaun Johnson

J. O'Shaughnessy

Prairie Restoration Management Tour, Ecosystems Studies Teacher Workshop, August 22, 2013

Prairie Evening Walk, School of the Botanic Garden, August 22, 2013

Prairie Restoration Management Tour, "Conservation Field and Lab Methods in Plant Biology and Conservation" class for Northwestern-Chicago Botanic Garden Masters candidates, October 7, 2013

Prairie Restoration Management Tour, Illinois Institute of Technology Ecology Class, October 17, 2013

K. Skogen

Conservation and Land Management Internship Program – Training Workshop. Chicago Botanic Garden. June 10-14th, 2013. 50 interns and ten instructors attended this week-long workshop

PBC 451/Biol Sci 355 Fundamentals of Plant Science & Conservation, *Instructor* Northwestern University, Evanston, IL, Fall 2013

PBC 450 Field & Laboratory Methods in Plant Biology & Conservation*, Co-Instructor* Northwestern University, Evanston, IL. Fall 2013

Graduate students advised or committee member

Anna Braum (MS at NU)
Elliot Gardner (PhD at NU)
Kelly Ksiazek (PhD at NU) Major Advisor
Emily Lewis (Ms at NU) Major Advisor
Matthew Rhodes (MS at NU) Major Advisor
Ricardo Rivera (MS at NU) Major Advisor
Karen Taira (MS at NU)
Laney Widener (MS at NU)

Undergraduate mentored:

James Medina (Oberlin College)

Mentored research assistants:

Evan Hilpman
Matt Rhodes
Sadie Todd
Kathleen (KC) West

D. Sollenberger

College First student advised:

Fred Weichmann

J. Steffen

Introduction to Bird Watching. School of the Chicago Botanic Garden, May 16 and 18, 2013

Recognizing Sedges in the Field. School of the Chicago Botanic Garden, June 15, 2013

Introduction to Spiders and Their Ecology. School of the Chicago Botanic Garden, September 7, 2013

S. Still

PBC 450 Field & Laboratory Methods in Plant Biology & Conservation, Co-Instructor
Northwestern University, Evanston, IL, Fall 2011

Undergraduate students advised:
Matthew Lichty (Knox College)
Christopher Wright (University of Washington Bothell)

Graduate student committee member:
Stephanie Fritsche (MS at Northwestern University)

P. Vitt

Postdoctoral fellow advised:
Shannon Still

Graduate student advised:
Anne Nies

S. Wagenius

Quantitative Methods in Ecology and Conservation (Winter 2013), Northwestern University
Conservation Genetics (Spring 2013), Northwestern University

Major advisor for graduate students:
Joshua Drizin (MS, Northwestern University)
Karen Taira (MS, Northwestern University)
Katherine Muller (MS, Northwestern University)

Committee member for graduate students:
Rebecca Tonietto (PhD, Northwestern University)
David Lowenstein (PhD, University of Illinois—Chicago)

Undergraduate students advised:
Sarah Baker (St. Catherine University, MN)
Dayvis Blasini (Northeastern Illinois University)
Gia Hallaman (Northwestern University)
Kory Kolis (Gustavus Adolphus College, MN)
Jill Pastick (Lake Forest College, IL)
Shona Sanford-Long (Middlebury College, VT)
Grace Sassana (Carleton College, MN)
Marie Schaedel (Carleton College, MN)
Aaron Suiter (Carleton College, MN)
Maria Wang (Northwestern University)

Secondary School Science Teachers Mentored:
Greg Diersen (Great Plains High School, SD)
Sara Zufan (Chicago Public Schools, IL)

N. Wickett

Functional Genomics: Northwestern University (Winter 2013)
The Nature of Plants: Northwestern University (Spring 2013)

Understanding Evolution from Seaweed to Salad: Northwestern University (Fall 2013)

Graduate students advised:

Claire Malley (MS, Northwestern University)

Kristen Laricchia (MS, Northwestern University)

Graduate student committee member:

Aleksandar Radosavljevic (PhD, Northwestern University)

Elliot Gardner (PhD, Northwestern University)

Ben Morgan (PhD, Northwestern University)

Rui Zhang (PhD, Northwestern University)

Undergraduate students advised:

Arianna Farmer (Northwestern University)

Raudel Cabral (Northwestern University)

E. Williams

Invited lecture: Bryophytes, lycophytes, and pterophytes. Wisconsin Lutheran College, Milwaukee, WI.

Undergraduates advised:

Brittney Ellis (Lake Forest College Senior Thesis)

Robert Harris III (REU)

E. Yates

Field and Laboratory Methods in Plant Biology and Conservation, PBC 450 (Fall 2013), Northwestern University, GIS and spatial analysis instructor. *Botany 1: Botany for Beginners.* School of the Chicago Botanic Garden. March / April 2013.

Emerald Ash Borer Virtual Fieldtrip, Google Hangouts. Various CBG Staff including Education and Research departments broadcast live to 3 classrooms across the US, December 9, 2013, resulting in the following virtual classroom program: http://youtu.be/1rjGSpLCPiA

Conservation and Land Management Intern Training Workshop. Chicago Botanic Garden, June 13, 2013.

Research Experience for Undergraduates (REU) student advised:

Christopher Wright

N. Zerega

Spring Flora (PBC 415/BIO 316), Spring quarter 2013 at Northwestern University (25 students)

Field and Lab Methods in Plant Biology and Conservation (PBC 450), Fall 2013 quarter at Northwestern University (eight students)

Postdoc advisor:

Evelyn Williams

Major advisor for graduate students:

Lindsay Darling (MS, Northwestern University, graduated 2013)

Elliot Gardner (PhD, Northwestern University)

Kristen Laricchia (MS, Northwestern University)

Theresa Melhem (MS, Northwestern University)

Maria Wang (MS, Northwestern University)
Colby Witherup (MS, Northwestern University, graduated 2013)

Committee member for graduate students:

Stephanie Frischie (MS, Northwestern University)
Paul Hartzog (PhD, Northwestern University)
Aleksandar Radosavljevic (PhD, Northwestern University)
Laney Widener (MS, Northwestern University)
Rui Zhang (PhD, Northwestern University)

Undergraduate students advised:

Paya Sharaf (Northwestern University)
Tyr Wiesner-Hanks (Northwestern University, graduated 2013)

PROFESSIONAL SERVICE

J. Ault

Chicagoland Grows®, Inc. Plant Introduction Program

Director and Manager
Liaison to Ornamental Growers Association of N. Illinois (OGA) Board of Directors

L. Egerton-Warburton

National Science Foundation

Grant proposal reviewer

Soil Science Society of America

Francis and Evelyn Clark Soil Biology Scholarship. Committee member. 2013 - 2015.

Research Associate, The University of California, Riverside

Manuscript Reviewer

Annals of Botany
Fungal Biology
Fungal Ecology
International Journal of Plant Sciences
Functional Ecology
Plant and Soil
Applied Soil Ecology
Oecologia

J. Fant

Botanical Society of America

Member (2007-present)

Ecological Society of America

Member (2007-present)

DePaul Institutional Biosafety Committee

Committee Member (2009-present)

Manuscript reviewer

American Journal of Botany
Annales Botanici Fennici
Annals of Botany
Applied Vegetation Science
Aquatic Botany
Botanical Bulletin of Academia Sinica
Folia Geobotanica
International Journal of Plant Science
Molecular Ecology
Plant Systematics and Evolution
Preslia
Restoration Ecology
Telopea

Proposal reviewer

National Science Foundation

R. Goad

Illinois Native Plant Society

Secretary – State Association and Northeast Illinois Chapter

Joint celebration of Openlands (50th anniversary) and the Illinois Nature Preserves Commission.

Attended. Openlands Lakeshore Preserve, May 6

40th Annual Natural Areas Association Conference

Assistant leader, field trip, October 4

M. Haidet

Colorado Plateau Native Plant Program

Technical Committee

Mid-Atlantic Regional Seed Bank

Species Selection Committee

North American Orchid Conservation Center

Seed Banking Committee

Plant Conservation Alliance

SOS contact

K. Havens-Young

American Public Gardens Association

Member of Conservation Committee (1999-present)

Botanical Society of America

Public Policy Committee (2011-present)

Botanic Gardens Conservation International

US Board of Directors (2005-present)

Chicago Wilderness

Member, Global Climate Change Task Force (2007-present)

Center for Plant Conservation

Member of recovery criteria for endangered plants team

Member of ecotype team

Fairchild Tropical Botanical Garden

Research Associate

Illinois Endangered Species Protection Board

Member of Scientific Review Panel (1999-present)

Invasive Plant Council of Illinois

Co-founder (2002-present)

Illinois Native Plant Society

Past President

Landscape, Ecological and Anthropogenic Processes (LEAP) Program Committees at University of Illinois Chicago

Admissions Committee

Curriculum Committee

Midewin National Tallgrass Prairie

Member of Scientific Review Panel (1999-present)

Midwest Invasive Plant Network

Board member and Treasurer (2002-present)

Midwestern Rare Plant Task Force

Founder and co-coordinator (1997-present)

North American Botanic Garden Conservation Strategy

Team member.

Plant Conservation Alliance

Cooperator contact

Plant Biology and Conservation (PBC) committees at Northwestern University

PBC Oversight Committee

PBC Admissions Committee

World Conservation Union (IUCN) Species Survival Commission,

Conservation Breeding Specialist Group, Intensively Managed Populations (2010-present)

U.S. Fish and Wildlife Service Endangered Species Recovery Team member for Asclepias meadii, Cirsium pitcheri, Platanthera leucophaea

Manuscript reviewer

American Journal of Botany

Biological Conservation

Conservation Biology

Conservation Genetics

Evolution

International Journal of Plant Sciences

New Phytologist

Proposal reviewer

National Science Foundation

External dissertation reviewer

University of Western Australia

R. Hawke

American Public Gardens Association

Member of Plant Collections Section

Member of Plant Nomenclature & Registration Section

Plants in Focus: Perennial Evaluation Committee

Member

Chicagoland Grows®, Inc. Plant Introduction Program

Member, New Plant Committee

P. Herendeen

International Association for Plant Taxonomy

Secretary, Nomenclature Committee on Fossil Plants

American Society of Plant Taxonomists

Program Director

President Elect September 2013 – 2014)

Botanical Society of America

Secretary-Treasurer for Systematics Section of BSA

International Journal of Plant Sciences (University of Chicago Press)

Editor in Chief

PhytoKeys (open access journal)

Subject Editor (paleobotany, legume systematics), July 2011 – present

National Science Foundation

Grant proposal ad hoc reviewer

Manuscript Reviewer

American Journal of Botany

Annals of Botany

Annals of the Missouri Botanical Garden

Grana

International Journal of Plant Sciences

Systematic Botany

Plant Biology and Conservation (PBC) committees at Northwestern University

PBC Curriculum Committee

R. Kirschner

Chicago Regional Biodiversity Council (Chicago Wilderness)

Member of Natural Resources Management Team

Member of Aquatics Task Force

North American Lake Management Society
Hosted Mid-Term Board of Directors Meeting
Member
Illinois' Hydrilla Task Force
Co-coordinator
Lincoln Park Conservancy
Member of North Pond Master Plan Advisory Group

A. Kramer
American Public Gardens Association
Chair, Plant Conservation Professional Section (2010-2013)
Colorado Plateau Native Plant Program
Member, Technical and Research Committees (2012-present)
Manuscript reviewer
Annales Botanici Fennici
Plant Biology and Conservation, Northwestern University
MS admissions committee

D. Larkin
Manuscript reviewer
Ecological Engineering
Diversity and Distributions
Hydrobiologia
Water
Wetlands
National Science Foundation panelist
Biology REU Sites
The Nature Conservancy in Illinois
Scientific Advisory Committee
Northeastern Illinois Invasive Plant Partnership
Steering Committee
Great Lakes Phragmites *Collaborative*
Steering Committee, Research Subcommittee
Midwest Marsh Bird Monitoring Working Group
Chair of Research Subcommittee

S. Masi
Botanical Society of America
Member
Chicago Wilderness Natural Resource Management Team
Member
Endangered Species Protection Board Technical Expert Consultant (Plants)

Illinois Endangered Species Protection Board
Member
Illinois Native Plant Society
Member
Manuscript Reviewer
Erigenia
Midewin National Tallgrass Prairie Stakeholders Group
Participant
Natural Areas Association
Member
Participant in Citizen Science Networks
PPSR (Public Participation in Scientific Research – Cornell University), POC presence on website.

G. Mueller
International Union for the Conservation of Nature (IUCN) Species Survival Commission
Steering Committee
Chair, Mushrooms, Brackets, and Puffballs Specialist Group
International Society for the Conservation of Fungi, Board Member
Illinois Nature Conservancy
Member, Science Advisory Council
Illinois Mycological Association
Scientific Advisor
Chicago Wilderness
Member Executive Council
Member Executive Advisory Committee
Member Sustainability Working Group
City of Chicago
Member of Mayor's Nature and Wildlife Committee
Chicago Council for Science and Technology
Member of Board
Manuscript reviewer
Numerous journals as well as pre-reviews for colleagues
Proposal reviewer
National Science Foundation, National Geographic, others

K. Skogen
Botanical Society of America.
Karling and Graduate Student Research Awards. Committee member (2010-present)
Public Policy Committee (2013-present)
Manuscript reviewer
American Journal of Botany
Oecologia

Plant Biology and Conservation, Northwestern University

MS Admissions Committee

Curriculum committee member

J. Steffen

Openlands

Researcher inventorying spiders and micro arthropods.

S. Still

Chicago Wilderness

Member, Global Climate Change Task Force (2011-present)

California Native Plant Society

Steering committee for CNPS 2015 Conference

Manuscript Reviewer

American Journal of Botany

BioScience

Madroño

PLoS One

P. Vitt

Chicago Wilderness

Member, Global Climate Change Task Force (2009-present)

Chicago Climate Action Plan

Adaptation Advisory Committee

U.S. Fish and Wildlife Service Endangered Species Recovery Team member for Lespedeza leptostachya, Platanthera praeclara

Manuscript reviewer

American Journal of Botany

Biological Conservation

Conservation Biology

Ecology Letters

Proposal reviewer

National Science Foundation

S. Wagenius

Committee Member at Northwestern University

Curriculum Committee for Plant Biology and Conservation

Ecological Society of America

Member

Manuscript reviewer

Journal of Economic Entomology

Ecological Restoration

Evolution
Oecologia
PlosOne

N. Wickett

Plant Biology and Conservation committees
PhD Admissions Committee

Botanical Society of America
Member
Committee member – Technological Committee

American Bryological and Lichenological Society
Member

American Society of Plant Taxonomists
Member

Proposal Reviewer
National Science Foundation

E. Williams

Botanical Society of America
Master Plant Science Team

Manuscript reviewer
American Fern Journal

E. Yates

Session Moderator
5th Annual Undergraduate Research Symposium, Simpson Theatre, Field Museum of Natural History, Chicago, IL, August 16, 2013

GIS Certification Institute (GISCI)
Certified Geographic Information Systems Professional (GISP)

Association of American Geographers
Member & Annual Meeting presenter, *Topics in Biogeography* section

ESRI (Environmental Systems Research Institute)
International Users Conference Presenter, Conservation Theater

Illinois GIS Association
Member & conference presenter

Illinois Geographical Society
Member

N. Zerega

Society Service
Secretary, American Society of Plant Taxonomists

Committee Member at Northwestern University
Environmental Science, Engineering, and Policy Committee

Environmental Policy and Culture Committee
Curriculum Committee for Plant Biology and Conservation
Admissions Committee for Plant Biology and Conservation
The Graduate School Advisory Council on Academic Affairs

Manuscript Reviewer

Economic Botany
Molecular Phylogenetics and Evolution
Phytokeys
Systematic Botany

Society Membership

American Society of Plant Taxonomists
Botanical Society of America
Society for Economic Botany
Society of Herbarium Curators

Graduate Students:

L. Umek reelected to board of directors of Midwest Great Lakes Chapter of the Society for Ecological Restoration for a second term.

L. Umek Nominated as chair of the awards committee – instituted their first-ever student research grant offering up to $1,000 in research support for students researching ecological restoration.

COLLABORATIONS

J. Ault

Kris Bachtell, Kunso Kim, and Joe Rothleutner (The Morton Arboretum), Ornamental Growers Association of Northern Illinois (OGA), 100-plus nurseries evaluating/growing the breeding program and other Chicagoland Grows® plant introductions.

L. Egerton-Warburton

Edith B. Allen (University of California, Riverside), Michael F. Allen (University of California, Riverside), Hormoz BassiriRad (University of Illinois Chicago), Kingsley Dixon (Kings Park and Botanic Garden, Australia), Arturo Gomez-Pompa (University of California, Riverside), Robert C. Graham (University of California, Riverside), Andrew Jacobson (Northwestern University), Nancy C. Johnson (Northern Arizona University), Ari Jumponnen (Kansas State University), José Ignacio Querejeta (CEBAS-CSIC, Spain), Rodrigo Vargas (University of California, Berkeley), Patricia Beddows (Northwestern University), Neal Blair (Northwestern University), Yun Wang (Northwestern University).

J. Fant

Mary Ashley (University of Illinois Chicago), Alona Banai (Loyola University), Tim Bell (Chicago State University), Justin Borevitz (Australian University), Marlin Bowles (Morton Arboretum), Diane Byers (Illinois State University) Julie Etterson (University of Minnesota, Duluth), Pam Geddes (NEIU), Alden Griffith (Wellesley College), Terry Harrison (University of Illinois, Urbana-

Champaign) Chrystal Ho Pao (Trinity International Univ.), Kristina Hufford (University of Wyoming, WY), Kathleen Kay (University of California Santa Cruz), Tom Kaye (Inst of Ap. Ecology), Tiffany Knight (Washington University, St Louis), Rachel Levin (Amherst College) Joyce Maschinski (Fairchild Tropical Botanic Garden), Geoff Morris (University of Chicago), Christal Niederer (Creekside Center for Earth Observation), Peggy Olwell (BLM), Christopher Preston (Centre of Ecology and Hydrology, UK), Rob Raguso (Cornell Uni), Eric Ribbens (WIU) David Tank (U. Idaho), Jeff Walck (Middle Tennessee State University, TN).

M. Haidet

Bill Brumback (New England Wildflower Society, Framingham, MA), Mike Cashman (Agricultural Research Service, Pullman, WA), David Ellis (Agricultural Research Service, Ft. Collins, CO), Brian Endress (Zoological Society of San Diego), Minnette Marr (Lady Bird Johnson Wildflower Center, Austin, TX), Ray Mims (US Botanic Garden, Washington, DC), Peggy Olwell (Bureau of Land Management, Washington, DC), Johnny Randall (North Carolina Botanical Garden, Chapel Hill, NC), Nita Rauch & Kayla Herriman (US Forest Service, Bend, OR), Rusty Russell (Smithsonian Institution), Ed Toth (NYC Department of Parks, New York, NY).

K. Havens-Young

Mary Ashley (University of Illinois Chicago), Tim Bell (Chicago State University), Marlin Bowles (Morton Arb., Lisle, IL), Bill Brumback (New England Wildflower Society, Framingham, MA), Bob Christian (East Carolina Univ., NC), Kingsley Dixon (Kings Park & Botanic Garden, Perth, AUS), Patricia DeAngelis (U.S. Fish and Wildlife Service, Arlington, VA), Tony Endress (University of Illinois Urbana Champaign), Don Falk (University of Arizona, Tucson, AZ), Jeremie Fant (CBG), Elizabeth Farnsworth (New England Wildflower Society, Framingham, MA), Ed Guerrant (Portland State University, Portland, OR), Alyssa Hakes (Lawrence Univ., Appleton, WI), Sandra Henderson, (NEON, Boulder, CO), Kent Holsinger (University of Connecticut, Storrs, CT), Kristina Hufford (University of Wyoming, WY), Claudia Jolls (East Carolina University, NC), Lara Jefferson (CBG Research Associate), Jeff Karron (University of WI Milwaukee), Tom Kaye (Institute for Applied Ecology, OR), Bruce Kendall (University of California Santa Barbara), Kathryn Kennedy (Center for Plant Conservation, St. Louis, MO), Tiffany Knight (Washington University , St. Louis, MO), Andrea Kramer (BGCI, Chicago), Mike Maunder (Florida International Univ.), Kathryn McEachern (US Geological Survey, CA), Eric Menges (Archbold Biol. Station, Lake Wales, FL), Rachel Muir (US Geological Survey, Ft. Collins, CO), Sara Oldfield (BGCI, London, UK), Peggy Olwell (Bureau of Land Management, Washington DC), Noel Pavlovik (US Geological Survey, IN), Marcello Pennacchio (Perth AUS), Kristina Schierenbeck (California State University, Chico, CA), Larry Stritch (US Forest Service, Washington DC), Shannon Still (CBG), Marshall Sundberg (Emporia State University, KS), Pati Vitt (CBG), Jeff Walck (Middle Tennessee State University, TN).

R. Hawke

Allen Bush (Jelitto Perennial Seeds, Germany), Jack De Vroomen (De Vroomen Plants, Holland), Evan Elenbaas (Walters Gardens, Zeeland, MI), Raymond Evison (Guernsey Clematis Nursery Ltd, England), Dan Heims (Terra Nova Nurseries, Portland, OR), Chris Kelleher (Blooms of Bressingham, England), Michael Marriott (David Austin Roses, England), Jim Nau (Ball

Horticultural, North Chicago, IL), Angela Treadwell Palmer (Plants Nouveau, Charleston, SC), Mary Walters and Chris Hansen (Great Garden Plants, Michigan), Dr. Mark Widrlechner (USDA North Central Plant Introduction Station, Ames, IA), Nicholas Staddon (Monrovia Growers, Azusa, CA), Steve Castorani (North Creek Nurseries, Landenberg, PA), Kerry Meyers (Proven Winners, St. Thomas, MO).

P. Herendeen

Anne Bruneau (University of Montreal), Peter Crane (Yale University), Else Marie Friis (Swedish Museum of Natural History), Vicki Funk (Smithsonian Institution) , Bente Klitgaard (Royal Botanic Gardens, Kew), John Kress (Smithsonian Institution), Matthew Lavin (Montana State University), Gwilym Lewis (Royal Botanic Gardens, Kew), Melissa Luckow (Cornell University), Richard Lupia (University of Oklahoma), Susana Magallon (Universidad Nacional Autónoma de México*)*, Steven Manchester (University of Florida), Lucinda McDade (Rancho Santa Ana Botanic Garden), Toby Pennington (Royal Botanic Garden Edinburgh), Karen Redden (Smithsonian Institution), Michael Sanderson (Arizona State University), Doug Soltis (University of Florida), Pam Soltis (University of Florida), David Spooner (USDA, Madison, WI), Masamichi Takahashi (Niigata University, Japan), Scott Wing (Smithsonian Institution), Martin Wojciechowski (Arizona State University).

S. Jacobi

Marissa Ahlering (TNC), Daren Carlson (MN DNR), Cami Dixon (USFWS), Patricia Heglund (USFWS), Benjamin Hobbs (Johns Hopkins University),Tim Jones (USFWS), Jill Gannon (USGS), Melinda Knutson (USFWS), James Lyons (USFWS), Clint Moore (USGS), Carrie Reinhardt-Adams (University of Florida), Terry Shaffer (USGS), Wayne Thogmartin (USGS), Sara Vacek (USFWS), Peter Wilcock (Johns Hopkins University).

R. Kirschner

Mike Adam (Lake County Health Department), Patrice Charlebois (Illinois-Indiana Sea Grant Program), Kimberly Gray (Northwestern University), Patrick Goggin (Wisconsin Department of Natural Resources), Rebecca Grill (Park District of Highland Park), Donald Hey (Wetlands Research, Inc.), Kevin Irons (Illinois Department of Natural Resources), Jinki Kim (University of Illinois), Heidi Natura (Living Habitats), Joan Nassauer (University of Michigan), Lois Wolfson (Michigan State University).

A. Kramer

Mary Ashley (University of Illinois at Chicago), Eduardo Cires (Ghent Univ.), Nikki Grant-Hoffman (Bureau of Land Management), Ed Guerrant (Portland State University), Abby Hird (BGCI US at Rancho Santa Ana Botanic Garden), Kristina Hufford (University of Wyoming), Tom Kaye (Institute for Applied Ecology), Ray Mims (United States Botanic Garden), Sara Oldfield (BGCI), Peggy Olwell (Bureau of Land Management); Wayne Padgett (Bureau of Land Management), Valerie Pence (Cincinnati Zoo and Botanical Garden), Marie-Stephanie Samain (Ghent Univ.), Nancy Shaw (USFS), Jeffrey Walck (Middle Tennessee State University), Larry Stritch (US Forest Service), Troy Wood (US Geological Survey), Barbara Zorn-Arnold (Ashford University).

D. Larkin

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E. Lonsdorf

Norbert Cordeiro (Roosevelt University), Jane Goodall, Patricia Heglund (USFWS), Tim Jones (USFWS), Claire Kremen (U. California-Berkeley), Josh Lawler (U. Washington), David Lewis (U. of Puget Sound), Elizabeth Lonsdorf (Lincoln Park Zoo), Socheata Lor (USWFWS), James Lyons (USFWS), Clint Moore (USGS), Erik Nelson (Bowdoin College), Maile Neel (University of Maryland), Andrew Plantinga (Oregon State U.), Steve Polasky (U. of Minnesota), Anne Pusey (Duke University), Volker Radeloff (U. Wisconsin), Carrie Reinhardt-Adams (University of Florida), Taylor Ricketts (University of Vermont), Wayne Thogmartin (USGS), Dominic Travis (U. Minnesota), Denis White, Neal Williams (U. California-Davis).

S. Masi

Linda Masters, Openlands; Chris Mulvaney (Chicago Wilderness); Melinda Pruitt Jones (Chicago Wilderness); Karen Glennemeier (The Habitat Project, Audubon-Chicago Region); Laurel Ross and staff (The Field Museum); Susie Schreiber (Waukegan Harbor Citizens Advisory Group); Angela Larsen (Alliance for the Great Lakes); Karen Tharp (Volunteer Stewardship Network, The Nature Conservancy); Cathy McGlynn (New Invaders Watch Program); Carol Freeman (Carol Freeman Photography); John Wilker (Illinois DNR); Randy Heidorn (Illinois Nature Preserves Commission); Illinois Endangered Species Protection Board; Renee Thakali and Eric Ulaszek (Midewin National Tallgrass Prairie); 70 landowner-partners of Plants of Concern, from federal, state, and local public agencies and private landowners.

G. Mueller

Jerry Adelmann (Openlands, Chicago), Cathie Aime (LSU), Martyn Ainsworth (Royal Botanic Gardens, Kew), Eef Arnolds (Emeritis Director of the Biological Station Wijster, The Netherlands), Peter Avis (Indiana University Northwest, Gary, IN), Hormoz Bassir Rad (U. Illinois at Chicago), Justin Borevitz (Australian National University), Mayra Camino, (University of Havana, Cuba), Paul Cannon (Royal Botanic Gardens, Kew), Julieta Carranza (U. Costa Rica), Priscila Chaverri (University of Maryland), Michael Coates (University of Chicago), Anders Dahlberg (Swedish Species Information Centre, Upsala, Sweden), Cvetomir Denchev (Institute of Botany, Bulgarian Academy of Sciences, Bulgaria), Aaron Durnbach (Loyola University, Chicago), Ana Esperanza Franco (University of Antiochia, Medellin, Colombia), Roy Halling (New York Botanical Garden), Tsutomu Hattori (Forestry and Forest Products Research Institute, Japan), Terry Henkel (Humboldt State, California), Craig Hilton-Taylor (IUCN, Cambridge, UK), Kentaro Hosaka (National Museum of Nature and. Science, Japan), Reda Irsenaite (Vilnius University, Lithuania), Carolyn Johnson (University of Chicago), Matthew Keirle (State College of Florida), Heikki Kotiranta (Finnish Environment Institute, Finland), Patrick Leacock (Field Museum), Thorsten

Lumbsch (Field Museum), Milagro Mata (INBio, Costa Rica), T. W. May (Royal Botanic Gardens, Melbourne), Joe McFarland (IDNR), David Minter (CABI, UK), Randy Molina (US Forest Service, Corvallis, retired), Bob Mosely (TNC, Illinois), Sara Oldfield (BGCI, London, UK), Claudia Perini (University of Siena, Italy), Ron Petersen (U, Tennessee, Knoxville), Melinda Pruett-Jones (Chicago Wilderness), Arnold Randall (Forest Preserves of Cook County, and Chicago Wilderness), Laurel Ross (Field Museum), Christoph Scheidegger (Swiss Federal Research Institute for Forest, Snow and Landscape, Switzerland), Simon Stuart (IUCN, Bath, UK), Tatyana Svetasheva (Tula State University, Tula, Russia), Gavin van Horn (Center for Humans and Nature), Zhu-Liang Yang (Kunming Institute of Botany).

K. Skogen

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S. Still

James André (University of California Natural Reserve System), Mauricio Diazgranados (Smithsonian Institution), Jeremie Fant (CBG), Anne Frances (NatureServe), Kay Havens-Young (CBG), Nabeeh Hasan (National Jewish Health), Kristina Hufford (University of Wyoming), Nick Jensen (Rancho Santa Ana Botanic Garden), Dana Kadavy (Signature Science), Andrea Kramer (CBG), Tasha La Doux (University of California Natural Reserve System), Dan Larkin (CBG), Patrick McIntyre (California Department of Fish and Wildlife), Leah Oliver (NatureServe), Peggy Olwell (Bureau of Land Management, Washington DC), Bryce Richardson (US Forest Service), Steve Schoenig (California Department of Fish and Wildlife), Andrew Severin (Iowa State University), Aaron Sims (California Native Plant Society), Krista Ternus (Signature Science), Amanda Treher (NatureServe), Pati Vitt (CBG), Jeffrey Walck (Middle Tennessee State University).

P. Vitt

Amy Ando (University of Illinois), Tim Bell (Chicago State University), Todd Bittner (Cornell Plantations), Marlin Bowles (Morton Arboretum), Kingsley Dixon (Kings Park & Botanic Garden, AUS), Ed Guerrant (Berry Botanic Garden), Marion Harris (North Dakota State University), Kent Holsinger (University of Connecticut), Bruce Kendall (University of California Santa Barbara), Kathryn Kennedy (Center for Plant Conservation), Bill Kleiman (TNC), Tiffany Knight (Washington University), Mike Maunder (Fairchild Tropical Garden), Eric Menges (Archbold Biol. Station), Peggy Olwell (Bureau of Land Management), Nancy Sather (Minnesota DNR), Kathryn Theiss (University of Connecticut), Arthur Weis (University of Toronto).

S. Wagenius

Eric Lonsdorf (CBG), Gretel Kiefer (TNC), Kevin Kotts (Minnesota DNR), Mary Ashley (University of Illinois Chicago), Ruth Shaw (University of Minnesota), Charlie Geyer (University of Minnesota), Diedre Reitz (University of Chicago), Caroline Ridley (US EPA), Andy McCall (Denison University), Greg Diersen (University of Minnesota), Steph Lyon (University of Wisconsin – Madison), Jennifer Ison (Wabash College), Amy Dykstra (Bethel University), Lynn Westley (Lake Forest College), Pamela Kittelson (Gustavus Adolphus College, MN).

N. Wickett

Andrew Alverson (University of Arkansas), Gordon Burleigh (University of Florida), Cymon Cox (University of Algarve, Portugal), Claude dePamphilis (Penn State), Bernard Goffinet (University of Connecticut), Gane Ka-Shu Wong (University of Alberta), Matias Kirst (University of Florida), Jim Leebens-Mack (University of Georgia), Stuart McDaniel (University of Florida), Jon Shaw (Duke University), Susann Wicke (Westfälische Wilhelms-Universität, Münster, Germany).

E. Williams

Donald Farrar (Iowa State University), Donald Henson (independent contractor), Donald Waller (University of Wisconsin – Madison).

E. Yates

Mary Byrne Rager (Bioloque), Andrew Clark (US National Herbarium, Smithsonian), Thomas Croat (Missouri Botanical Garden), Carol Davit (Missouri Prairie Foundation), Diane Donovan (Shaw Nature Reserve, St. Louis, MO), Dave Ellis (National Center for Genetic Resources Preservation, CO), Megan Haidet (Seeds of Success, Bureau of Land Management), Jesse Kieft (CartoPac Field Solutions), Cheiko Maene (GIS Collaborative, University of Chicago), Jason McNees (Conservation Data Analyst, Nature Serve), Kelly Neil (IL Nature Preserves Commission), Andrew Robb (Seiler Instruments, Inc.), Susan Romano (Western Illinois University), Karen Tharp (Illinois Volunteer Stewards Network), Emma York (Herbarium, Royal Botanic Gardens, Kew), Phil Young (Advanced Geospatial Laboratory, Northern IL University).

N. Zerega

Arunrat Chavererach (University of Khon Kaen, Thailand), Richard Chung (Forest Research Institute of Malaysia), Kassandra Davis (University of Tennessee), Louise Egerton-Warburton (Chicago Botanic Garden), Elliot Gardner (Northwestern University), Salma Hossain (Gono University, Bangladesh), Brian Irish (USDA), Ruby Khan (University of Rajshahi, Bangladesh), Kristen Laricchia (Northwestern University), Theresa Melhem (Northwestern University), Tracy Misiewicz (University of California, Berkeley), Stephanie Moormann (Argonne National Laboratory), Timothy Motley (passed away in 2013, formerly at Old Dominion University), Sarah Owen (Argonne National Laboratory), Joan Pereira (Sabah Forestry Centre), Diane Ragone (National Tropical Botanical Garden), G. Ravikanth (Ashoka Trust for Research in Ecology and the Environment, ATREE, Bangalore, India), Nina Ronsted (University of Copenhagen), Paya Sarraf (Northwestern University), Brian Scheffler (USDA), Siddappa Setty (Ashoka Trust for Research in Ecology and the Environment, ATREE, Bangalore, India), Sheron Simpson (USDA), Nur Supardi

(Forest Research Institute of Malaysia), Maria Wang (Northwestern University), Norman Wickett (Chicago Botanic Garden), Tyr Wiesner-Hanks (Cornell University), Evelyn Williams (Chicago Botanic Garden), Colby Witherup (Northwestern University), Francis Zee (USDA), M.I. Zuberi (Ambo University, Ambo, Ethiopia).

APPENDIX 1: Seed Bank and Plants of Concern Partnerships

Persons/Institutions Using Seeds From the Dixon National Tallgrass Prairie Seed Bank

- Prof. Djaja Djendoel Soejarto, University of Illinois at Chicago, chaff from 290 species in 2013
- National Center for Genetic Resources Preservation, USDA, Ft. Collins, CO – 290 accessions

Plants of Concern Landowner and Agency Partners

Boone Creek Watershed Alliance
Cary Park District
CD McHenry County
Chicago Park District
Chicago Wilderness
City of Elgin
City of Lake Forest
City of Waukegan
Commonwealth Edison
Dale Shriver
Deerfield Associates
Downers Grove Park District
Dundee Township
FPD Cook County
FPD DuPage County
FPD Kane County
FPD Kendall County
FPD Lake County
FPD Will County
Glenview Park District
Heidi and Dan Natura
Highland Park/Park District of Highland Park
Illinois DNR
IL Endangered Species Protection Board
IL Natural Heritage Database
IL Nature Preserves Commission
IN Department of Natural Resources
Jerry Kolar
John Clemetsen
Joliet Park District
Keenan Family
Lakowski Family
Libertyville Township
Lockport Township Park District/FPD Will County
Lorna Gladstone
Marsh Family
Marty Papanek
Masi/D'Alessandro Family
MWRD
Natural Land Institute
Nelsons
Nicole Williams/Larry Becker
North Shore School District 112
Northeastern Illinois University
Northwestern University
Oak Lawn Park District
Oakton Community College
Openlands
Palatine Park District
Plainfield Park District
Privately Owned Properties (4)
Rendl Family
Rodney & Libby Aavang
Shaw Family
Shirley Heinze Foundation
St. Charles Park District
The Nature Conservancy
Tom Burroughs
US Forest Service (at Midewin National Tallgrass Prairie)
US Department of Energy (at Fermilab)
US Department of Interior (at Indiana Dunes National Lakeshore)
Village of Lake in the Hills
Village of Lincolnshire
Village of Long Grove
Village of Oakwood Hills
Waukegan Harbor Citizens Advisory Group
Wisconsin DNR
Wilmette Park District
Zion Park District