Public Garden

THE JOURNAL OF THE **AMERICAN PUBLIC GARDENS ASSOCIATION** VOL. 31, ISSUE 2, 2016

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SUSTAINABLE COMMUNITIES FIELD SCHOOL

ENVIRONMENTAL PSYCHOLOGY

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Public Garden

On the Cover:

Svastra obliqua, a sunflower bee, is a large, solitary, ground-nesting bee. To best meet the bee's needs plant members of the Aster family, especially sunflowers, and leave some patches of bare, undisturbed ground in which it can nest. Unlike most ground-nesters, females may nest separately, or several may share a single opening.

Photo: Betsy Betros

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EXECUTIVE DIRECTOR'S NOTE

Greetings, Public Garden Readers,

Public gardens have never been more essential. Our gardens decidedly engage the public, locally and globally, through pioneering programs and advocacy. Engaging service and powerful messaging allow us to truly connect our communities, improving quality of life for all.

Public Garden is your voice. Newly refreshed, the journal allows us to share our best—serving as a force to empower all we do. This issue is abundant with exciting, innovative programs and collaborations that show how we protect, connect, and champion through research, education, and the promotion of best practices in the world of public horticulture.

The Association's Climate & Sustainability Alliance connects public garden educators and other professionals with curricula and resources designed to address the challenges of communicating climate change and sustainability to diverse audiences. Several articles in this issue, such as the Southwest Experimental Garden Array (SEGA) (page 12), Cornell University's Climate Change Garden (page 14), and Sustainable Communities Field School (page 8), Powell Gardens' local initiatives to celebrate and protect pollinators (page 6), and the tree management program at Longwood Gardens (page 28), show how gardens of all sizes have something to contribute.

Our Association will continue to provide you with the resources needed on critical issues such as plant conservation, biodiversity, and the science of climate change. Promoting leadership-level programs and best practices strengthens our gardens and promotes community resilience. *Public Garden* connects our industry. When member institutions and partners share information through it, our readers are inspired to preserve and celebrate the world of plants, creatively and sustainably.

Our vision is *a world where public gardens are indispensable*. The refreshed *Public Garden* continues its service as ***the*** journal of public horticulture. Your Association can showcase its best by sharing your best.

Yours,

D. Casey Sclar

Executive Director
American Public Gardens Association

PROMOTING POLLINATORS AT POWELL GARDENS

Alan Branhagen
photos: Betsy Betros

Tree City USA is now being challenged by Bee City USA—an urban forest can no longer consist of lifeless zelkovas, London planes, and ginkgos; the trees must provide for the birds and the bees! A landscape of low-maintenance, pest-free, sterile, "no mess" plants, once so in vogue, has now revealed its true cost to a healthy environment. We need nature for its ecosystem services. American ecologist, forester, environmentalist, and nature writer Aldo Leopold's opening statement in his 1949 classic *A Sand County Almanac: And Sketches Here and There*— "There are those who can live without wild things and those who cannot"—has been updated by entomologist and wildlife ecologist Doug Tallamy, "If you think you can live without wild things, you should know that you cannot."

One mouthful of food out of three is provided by the work of pollinators. Pollinators support billions of dollars in agriculture production. While honeybees are good pollinators (and produce honey) and are widely utilized across the country, research shows that many of our native bees, wasps, beetles, and flies are just as good, and many are much better pollinators.

The alarming decline of the beloved (non-native) honeybee instigated a public outcry and led the conversation into the importance of pollinators in our everyday landscapes. Recent population crashes of the iconic monarch have also caught the public's attention. The plight of lesser-known, once-abundant insects such as the regal fritillary (*Speyeria idalia*) and American bumblebee (*Bombus pensylvanicus*) still goes largely unreported by the mainstream press.

In response, gardening, landscape design, landscape management, and natural area protection and conservation have been reinvigorated by a new call to action. The gardening-with-a-purpose Millennials are inspired by this evolution of environmentally responsible gardening style. The implications of this can be felt at Powell Gardens, Kansas City, and across our Lower Midwest region.

Our Heartland Harvest Garden was designed with integrated "insectaries," gardens that attract pollinators and beneficial insects and act as traps for pests. Overall, Powell Gardens has adopted a more natural style, integrating native plants throughout, and providing a reservoir of pollinators and other beneficial insects. We must keep managing all the plants in our care wisely, whether in the

The Million Pollinator Garden Challenge was launched by The National Pollinator Garden Network (NPGN), a collaboration of horticulture business, garden, pollinator, and conservation community stakeholders working together to support the health of pollinating animals. Eight founding, private, nonprofit members convened in fall 2014 to propose public/private sector efforts to help restore critical pollinator populations in support of the President's National Strategy to "Promote the Health of Honey Bees and Other Pollinators." Everyone can answer this call to action to preserve and create gardens and landscapes that help revive the health of bees, butterflies, birds, bats, and other pollinators across the country. We will move millions of individuals, kids, and families outdoors and make a connection between pollinators and the healthy food people eat.

far left: Macrosiagon limbata *male on a mint – the larvae of this species of wedge-shaped beetles attaches itself to a wasp and is carried back to the wasp's nest, where it will then parasitize a wasp larva. The males sport feathery antennae.*

left: Trichopoda *spp.– tachinid flies are not only good pollinators, but their larvae are parasites of true bugs, including squash bugs.*

right: All Aetole moths hold their hindlegs aloft while perched. The unrelated moth caterpillars are inchworms, Eupithecia *spp.*

greenhouse or in the garden and surrounding landscape, so that our populations of pollinators remain healthy and diverse. As we do, our pest control budget will continue to decline.

To bring the public's attention to these important insects, Powell Gardens has celebrated pollinator week annually for five years. Our Festival of Butterflies—the highest attended such festival in the country—celebrates our great diversity of on-site insects and butterflies. It owes its success to our collaboration with locally based Monarch Watch, Johnson County; Kansas Extension Master Gardeners; Missouri Master Naturalists; and the Idalia Society.

Powell Gardens is partnering with Kansas City Wildlands (**www.bridgingthegap.org/kansas-city-wildlands**), an umbrella group of organizations (both government and non-government) whose mission is to help restore and manage the region's finest natural areas, the requisite reservoirs of pollinator diversity. Kansas City Wildlands has conducted a bioblitz at Powell Gardens' 970-acre parcel, most of which is wild, and helped with prescribed fires on our twenty acres of remnant prairies. Each fall they bring us seed collected from native habitat, and we grow it to seedling plugs for restoration work the following season. We must not forget that many native plants, such as spring beauty, pale purple coneflower, wild geranium, and Pitcher sage, have additional unique, host-specific pollinators, so pollinator conservation is required beyond gardens.

Powell Gardens is a founding member of Grow Native! (**www.grownative.org**), a program started by the Missouri Department of Conservation to promote native Missouri plants. It now falls under the non-profit Missouri Prairie Foundation (www.moprairie.org). The Grow Native! program promotes native plants across the Lower Midwest, from eastern Kansas to southern Illinois. Debuting this year is Grow Native!'s *Pollinator Buffet* program which promotes a dozen of the best native plants for attracting native bees. Grow Native! member-retailers can buy the beautifully designed and information-rich *Pollinator Buffet* plant tags to highlight these plants. This program adds to the popular *Monarch Cafe* plant tags which promote the sale of garden-worthy milkweeds. It's a model way to get consumers to purchase pollinator-friendly plants and integrate them into any landscape.

Last, a new organization, the Kansas City Native Plant Initiative, is joining forces with us to promote the use of native plants and environmentally conscious landscapes, a sure sign that the honeybee and monarch are leading us to a more pollinator-friendly, healthier community.

Alan Branhagen has been Director of Horticulture at Powell Gardens since 1996. He holds BS and MLA degrees but considers himself an all-around plantsman and naturalist. His book Native Plants of the Midwest *by Timber Press is due out this fall.*

*Betsy Boutros, our local Idalia Society "Bug Lady," regularly volunteers at Powell Gardens and has been documenting the pollinators on our site. She has contributed 1,840 images to BugGuide (**www.bugguide.net**)—a valuable citizen science resource. She is also the author of* A Photographic Field Guide to the Butterflies of the Kansas City Region.

Climate & Sustainability Alliance

AMERICAN PUBLIC GARDENS ASSOCIATION

Valuable Resources for Public Garden Professionals

At the intersection of nature, culture, and community, public gardens are uniquely positioned to lead the transition to a sustainable future. Gardens can develop strategies and adopt practices that integrate sustainability components to increase sustainability within their gardens, and beyond—through example, education, and outreach. As we recognize that people and culture are part of, not separate from the environment, we see that true sustainability is a dynamic system of three equally critical components: (1) environmental, (2) social (people), and (3) economic. Developing and adopting a comprehensive sustainability strategy that integrates all three is the most effective way to introduce or advance sustainability. Recently updated and in peer review, the *Public Garden Sustainability Index* establishes sector-wide sustainability standards and offers unique tools to help public gardens reduce climate impacts.

Public gardens have a unique credibility in the eyes of the public. As important centers of conservation and formal and informal science education, public gardens serve as a major source of climate change and sustainability information for visitors and students of all ages and skill levels. The Climate & Sustainability Alliance connects public garden educators and other professionals with curriculum designed to address the challenges of communicating climate change to diverse audiences. The American Public Gardens Association continues to seek funding through collaborations with member gardens to address climate impacts by increasing the public's ecological literacy. A National Oceanic and Atmospheric Administration (NOAA) partnership provides public garden professionals with opportunities to exchange information on the impacts of climate variability and change, while utilizing the most current climate data.

Climate change poses an existential threat to the flora and ecosystems public gardens showcase and conserve. The American Public Gardens Association is committed to providing its members with the resources and platform needed to pursue sound public policy on critical issues such as plant conservation, biodiversity, and the science of climate change.

To get involved with these initiatives, contact Sarah Beck, Program Manager, Current and Future Initiatives, at **sbeck@publicgardens.org**.

SUSTAINABLE COMMUNITIES FIELD SCHOOL: A GREEN BUSINESS PROGRAM FOR GARDENS

David Geselbracht and Patrick Lewis
photos: University of British Columbia

BEES DANCE IN THE AIR ABOVE A GROUP OF HIVES AT THE EDGE OF UBC BOTANICAL GARDEN'S CAROLINIAN FOREST GARDEN. THE BEES PERFORM AN INTRICATE CHOREOGRAPHY, SEARCHING FOR FOOD AND PERFORMING THEIR TASKS, ALL PART OF A STORY ABOUT SUSTAINABILITY, COMMUNITIES, AND BIODIVERSITY. AROUND THE HIVES ARE EMPLOYEES FROM VISITING VANCOUVER BUSINESSES WHO ARE BEING GUIDED BY DR. TARA MOREAU, ASSOCIATE DIRECTOR, SUSTAINABILITY AND COMMUNITY PROGRAMS. HER AUDIENCE ARE PARTICIPANTS IN THE PILOT PHASE OF THE UBC SUSTAINABLE COMMUNITIES FIELD SCHOOL.

CONDUCTED BY THE GARDEN IN COLLABORATION WITH VANCOUVER'S SOCIETY PROMOTING ENVIRONMENTAL CONSERVATION (SPEC), AND THE UNIVERSITY'S DEPARTMENT OF PSYCHOLOGY, THE FIELD SCHOOL WAS LAUNCHED IN SUMMER 2015. ITS CURRICULUM IS DESIGNED TO INCREASE UNDERSTANDING OF BIODIVERSITY, CLIMATE CHANGE, AND THE ROLE INDIVIDUALS CAN PLAY WITHIN THE SUSTAINABILITY MOVEMENT. THE FIELD SCHOOL USES TEAM-BUILDING EXERCISES AND EMPLOYEE-ENGAGEMENT ACTIVITIES TO BUILD SUPPORT FOR ACTION WITHIN THE CORPORATE ENVIRONMENT. TARGETING EMPLOYEES FROM TECH STARTUPS, ACCOUNTING FIRMS, AND LOCAL BANKS, MOREAU HOPES TO SPARK A CONVERSATION THAT WILL REVERBERATE THROUGHOUT THE COMMUNITY.

GREENING BUSINESS

Moreau has worked as a consultant for the United Nations Food and Agricultural Organization (FAO) and as a post-doctoral research fellow with the Pacific Institute for Climate Solutions. She is well aware of the discussions that take place within universities and the offices of non-governmental organizations, and of the sometimes insular nature of those discussions. As a scientist and activist, Moreau wants to engage the business community, believing businesses must be on board to help facilitate the changes we need in the face of rising CO_2 emissions, ocean acidification, and the loss of forests, clean water, and species.

"We need to create a green economy," says Moreau. "But to do that we need to work with business, meet them where they are, and engage them in a supportive sustainability dialogue."

At the global level, UN agencies and member governments are working to explore and develop an inclusive green economy. According to the United Nations Environment Programme:

> "[A] GREEN ECONOMY IS ONE THAT RESULTS IN IMPROVED HUMAN WELL-BEING AND SOCIAL EQUITY, WHILE SIGNIFICANTLY REDUCING ENVIRONMENTAL RISKS AND ECOLOGICAL SCARCITIES."

But if the goal in Vancouver is to think globally and act locally, then it is important to get Vancouver businesses thinking about the key issues of our time such as water conservation, energy efficiency, and food security. One such business, Vancity Credit Union, visited the Field School in July 2015 with newly hired employees. The Credit Union, which already implements carbon neutral programs and supports local environmental initiatives, wanted its new employees exposed to further sustainability education.

far left: Dr, Tara Moreau welcomes participants to the Sustainable Communities Field School.

this page: While field school participants traverse the Greenheart TreeWalk, they learn about the various layers within a forest and the role trees play in water conservation.

Central to the Field School's teaching is the Greenheart TreeWalk, a nine-hundred-foot-long cable bridge designed to allow visitors to experience a temperate rainforest canopy with minimal impact on trees and surrounding ecosystems. The design and engineering of the TreeWalk uses "kissing bar" stabilizers that gently hug the trees and ride on the bark without penetrating or damaging the trees. As the Vancity staff explored the shaded canopies of grand firs, Douglas firs, and thick cedars, Oliver Lane, Executive Director of SPEC, used simple props (an umbrella, sponge, and a coffee filter) to explain issues facing local watersheds. Lane described how forests like the one they were in help to filter water and regulate water cycles. He also explained how urbanization and climate change drastically alter these natural processes. The severe water restrictions in Vancouver during the summer of 2015 which led to critical water shortages and regional bans on non-essential water use brought the topic into sharp focus.

Following the walk and hands-on activities, Hormus Karat, a senior branch manager at Vancity, explained the importance of the experience to the company and its employees. "Businesses will have success in the long term when they understand, assist, and support a viable co-existence between people, businesses, precious natural resources, and our ecosystem," he said.

left: VanCity Credit Union staff participate in a water sharing activity.

center: Participants learn about Zero Waste and how recycling and composting play a part in achieving that goal.

right: During a team-building exercise participants reflect on what they have learned.

WHY A FIELD SCHOOL?

Field schools are schools without walls where learners use all of their senses to engage with the surrounding environment. The idea for the UBC Botanical Garden Sustainable Communities Field School was borrowed, in part, from work in South East Asia in the 1990s, where UN-FAO Farmer Field Schools helped small-scale farmers reduce pesticide use. Moreau, as part of her postdoctoral research, took the UN-FAO concept and worked with SPEC to adapt it to create Vancouver's Urban Farmer Field School (UFFS) in 2012.

> "The learning was woven throughout the whole day, without you realizing you had learned new things," she said. "And it wasn't a classroom setting; people got to move their bodies and smell the trees. It fed the soul as much as the brain."
>
> – Diane Collis, Food and Education Director at the Greater Vancouver Food Bank

UFFS gave Moreau an opportunity to see how people respond to the different stimuli provided by an urban field school. Calm and relaxed interaction away from daily concerns could move discussions about plants and soils to deeper inquiries about food systems and climate change. Focusing on a fun and interactive atmosphere seemed to provide safe and supportive conditions for public engagement with larger, global issues. The workshops were often framed within the context of hands-on activities about growing food plants and underlying gardening issues, like composting and water use.

"People don't want to hear a gloomy talk about climate change. But if they can prune fruit trees, grow food, and tend a garden, then it's easier to talk about and consider these things."

In the winter of 2013-14, UBC Botanical Garden put its education programs temporarily on hold as it reassessed its programming in light of the Garden's evolving vision. When Moreau joined the Garden in the spring of 2014 she was given the opportunity to shape a new educational program: her previous experience and the ambitions of a clear-sighted donor made the Field School a center-piece of the new initiatives.

UNDERSTANDING THE IMPACT OF EDUCATION PROGRAMS

The goals of the Convention on Biological Diversity (CBD) include the objective of improving the public's "education and awareness about plant diversity, its role in sustainable livelihoods, and importance to all life on Earth" (CBD Secretariat, 2015). Gardens are beautiful environments with a strong community presence that uniquely positions them to engage visitors in learning about biodiversity, climate change solutions, and the international policies that affect those issues. They can provide a range of initiatives within controlled and well-maintained environments that, when properly planned, allow for a variety of approaches to complex social and environmental questions.

> "It was interesting to learn about the red alders and how they are sometimes the first trees to come out after a fire, to reestablish the ecosystem"
>
> – Tarrynea Biallecki, bakery worker at Whole Foods in Vancouver.

In 2016, UBC Botanical Garden is exploring its past, present, and future as it celebrates its 100th year of operation. The Garden's first director, John Davidson, was a man before his time. As the first provincial botanist, he established the UBC Herbarium, UBC Botanical Garden, and Nature Vancouver. He promoted what would now be called "citizen science" in the early part of the last century, and was a key advocate of raising awareness of the impacts of logging on local watersheds.

The challenge to the Field School model is the challenge faced by all programs that seek to educate and activate: does it make a difference? Some recent research has presented that indeed, informal education at botanic gardens can positively affect the environmental attitudes of visitors, but quantitative evidence demonstrating or describing these outcomes is rare. So Moreau and her team have reached out to University partners to measure the effects of the Field School on participant behavior. Psychologist Dr. Jiaying Zhao, a Canada Research Chair in behavioral sustainability, and her interdisciplinary team from UBC Psychology and the Institute for Resources, Environment and Sustainability, collect data from the Field School, feeding the information back to the program with the goal of improving outcomes.

Moreau's hope is that, when properly tested and verified, "the model could be used and replicated in other communities to engage audiences on their own local sustainability issues."

David Geselbracht is a Vancouver based freelance journalist. He received a Master of Journalism from the University of British Columbia and a BA Honours from the University of Victoria.

Patrick Lewis has been director of UBC Botanical Garden since the fall of 2009. An administrator, his previous appointments have included Managing Director of the UBC Centre for Applied Ethics as well as numerous non-partisan government inquiries. He has published both short fiction and non-fiction.

THE SOUTHWEST EXPERIMENTAL GARDEN ARRAY:

A TOOL FOR EXAMINING PLANT RESPONSES TO CLIMATE CHANGE

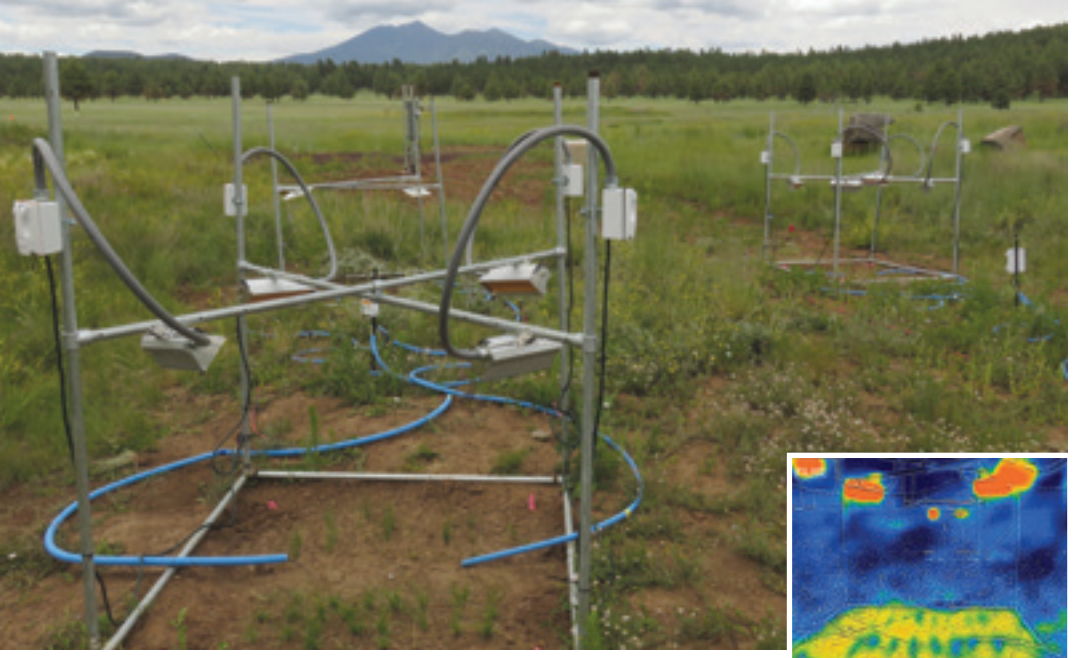
Kristin E. Haskins

In 2011, the National Science Foundation granted a group of Northern Arizona University researchers from several disciplines a multi-million dollar award to develop the Southwest Experimental Garden Array (SEGA). Simply put, SEGA is an instrument that can be used to examine the genetic effects of climate change on plant populations and plant-dependent communities that may include mycorrhizal fungi, herbivores, pollinators, and others. SEGA currently consists of ten garden sites, two of which are hosted by The Arboretum at Flagstaff, located along an elevation gradient that is distributed across northern Arizona. Based on the knowledge that higher elevations are cooler and wetter than lower elevations, movement along the gradient can be used to simulate climate change. To learn how a warmer, drier climate (the current prediction for most of the American Southwest per the Intergovernmental Panel on Climate Change 2007) will presumably affect seed production of a native bunchgrass, the targeted species is grown at a SEGA garden located lower on the elevation gradient where the existing climate mimicked the predicted change.

SEGA was founded on the "common garden" experimental design, which has been used for over a century as an elegant way to identify genetic effects on plant characteristics by removing the environmental effects. That is achieved simply by growing the plants in a common environment. In addition to providing the "common" space and streamlined permitting to conduct climate-change-related studies, the SEGA network also offers fencing to ward off large herbivores, water for irrigation, a state-of-the-art weather station, and environmental sensing for variables like soil temperature and moisture. This combination of assets has attracted a diverse pool of research projects that are breaking new ground in their respective fields.

Interest in the use of the SEGA network is spanning multiple disciplines, including conservation, chemical, and pollination ecology; plant physiology; genetics; and science education. Researchers Maggie Eshleman and Andrea Kramer (Northwestern University and Chicago Botanic Garden, respectively) are investigating whether revegetation with seeds or plants is more effective for various species of forbs. These species are important for the restoration of disturbed lands in the Colorado Plateau region. Another SEGA network project is examining the genetic basis of ecologically important traits, like drought tolerance of the wild tobacco plant (*Nicotiana attenuata*). And, if a plant is better able to cope with unpredictable environments (Ian Baldwin et al., Max Planck Institute for Chemical Ecology, Jena, Germany), SEGA offers researchers protected space, permitted use, and irrigation.

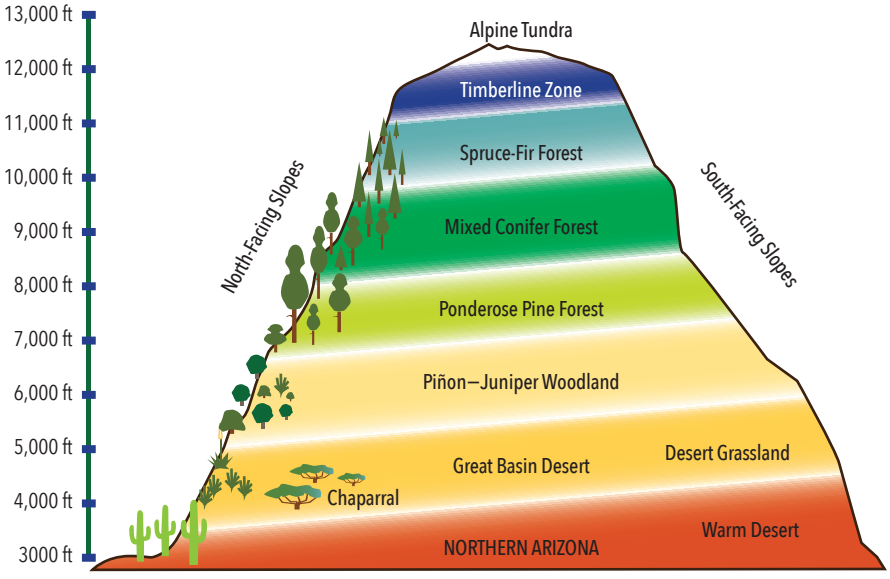
A graduate student from Northern Arizona University, Rachel Rubin, recently conducted a "heat wave" experiment at The Arboretum at Flagstaff SEGA garden in an effort to better understand how soil microbes mediate the effects of intense heat on native bunch grasses like Arizona fescue (*Festuca arizonica*) and blue grama (*Bouteloua gracilis*). Grasses were grown in a greenhouse under three soil treatments: soil that had been subjected to a heat wave, soil that was not subjected to a heat wave, and sterilized soil. After three months, the grasses were out-planted to the SEGA site at The Arboretum, where half of the plants were then subjected to a simulated heat wave. (Heat waves were supplied using SEGA-supplied, very expensive 1000W ceramic infrared heat lamps.) In addition to survival, Rubin is looking at plant aboveground and below-



*far left: Wild tobacco (*Nicotiana attenuata*) plants growing at the Walnut Creek SEGA site*
photo: Royce and Nita Carlson

right: Heat wave experiment at The Arboretum at Flagstaff SEGA site
photo: Rachel Rubin

right, inset: This image, taken with an infrared camera, shows the relative heat distribution within a heat-wave plot. The blue spots within the plot are the grasses, which stay considerably cooler even when air temperatures exceed 115°F.
photo: Rachel Rubin



SEGA garden sites are located in different life zones to allow researchers to mimic predicted climate changes by moving plants up or down the elevation gradient.

ground growth responses. It is expected that plants grown in soil whose microbial community had the chance to adapt to a heat wave would perform better than the other plants. The ubiquitous nature of soil borne microbes and their critical relationship with plants makes this study important for better comprehending restoration efforts with soil microbes and informing land managers on restoration best practices during this period of changing climate.

The research coming out of the SEGA sites is exciting and highly anticipated to provide much needed insights into mitigating environmental issues that arise from global warming. As we move into the next phase of SEGA development and expansion, we are seeking additional researchers from diverse disciplines who have new questions to investigate. Answers found will allow us to expand our toolbox for alleviating the effects of climate change. For more information on the research projects mentioned here or how to use SEGA, please visit **www.sega.nau.edu** or contact the author at **Kristin.Haskins@thearb.org**.

Watson, Robert T. and the Core Writing Team, eds. 2007. Intergovernmental Panel on Climate Change. Climate Change 2007: Working Group II (WGII): Impacts, Adaptation and Vulnerability. *New York: Cambridge University Press.*

Kristin E. Haskins, PhD, is Director of Research at The Arboretum at Flagstaff.

SMALL GARDEN **BIG IMPACT**

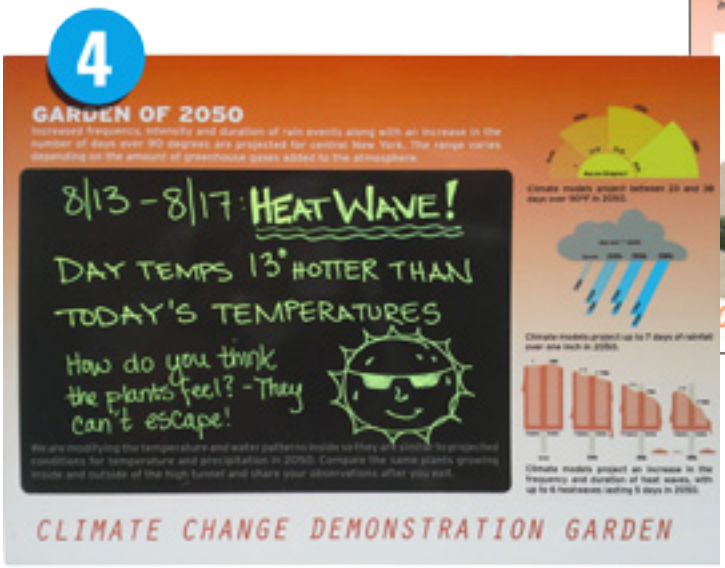
CORNELL PLANTATIONS' CLIMATE CHANGE GARDEN

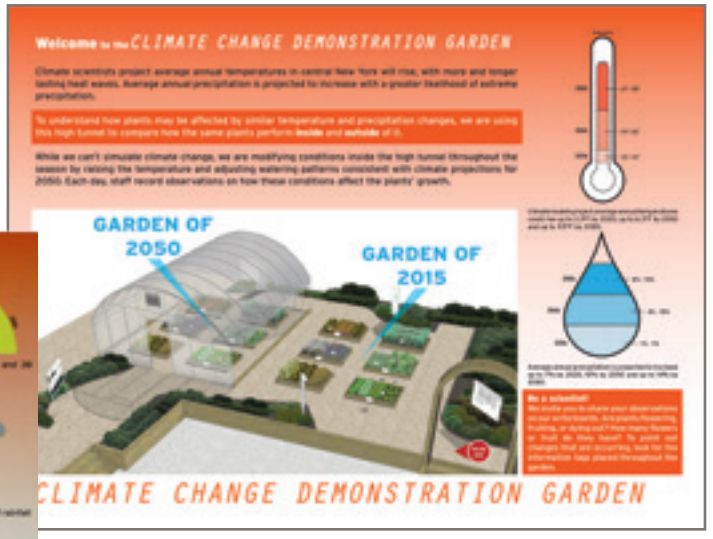
Sonja M. Skelly and Joshua F. Cerra

CLIMATE CHANGE IS A COMPLEX PHENOMENON THAT HAS BOTH GLOBAL AND LOCAL IMPLICATIONS. WHILE VISITORS TO A PUBLIC GARDEN MAY HAVE A CONCEPTUAL GRASP OF CLIMATE CHANGE, MANY OF THEM MAY NOT BE ABLE TO VISUALIZE HOW CLIMATE CHANGE WILL IMPACT THEIR COMMUNITY AND HOME ENVIRONMENTS. JUST AS PUBLIC GARDENS HAVE LONG BEEN SOURCES OF KNOWLEDGE AND INSPIRATION FOR VISITORS WITH RESPECT TO WHAT GROWS WELL IN THEIR REGION, THEY CAN ALSO SHARE INFORMATION ABOUT WHAT MAY BE EXPECTED FROM PLANTS WITH THE ONSET OF CLIMATE CHANGE.

As part of its strong educational mission, Cornell Plantations has partnered with Cornell University's faculty to develop one of the first climate change demonstration gardens of its kind. The goal of this garden is to provide visitors the opportunity to see and experience potential impacts of changing temperature conditions associated with climate change on plants. To do this, we constructed a high tunnel (a steel frame with clear plastic film stretched over it) and then placed six planting beds each inside and outside of it. We planted identical plants in the beds inside and outside the tunnel. Plants in beds inside the tunnel experience conditions similar to those projected for the 2050s in our region of New York State (increased average temperatures, increased number of days over 90°F, and increased frequency and duration of heat waves), while the exterior beds experience ambient temperature conditions for the current year. To achieve these projected conditions, we manipulated the high tunnel temperatures: we manually ventilated the tunnel by raising/lowering the tunnel sides and opening/closing the vents depending on the outside ambient temperature.

While we are careful to state that the project cannot simulate climate change and all of its many projected climate impacts, the goal of the garden is to enable visitors to compare differences in plant response within the "Garden of Today" and the "Garden of 2050" based on changing temperature conditions. Species planted within the garden have been selected based on how they express their relative susceptibility or resilience to changing temperature conditions for two general categories of plants: food plants and nectar resource plants. A sequenced set of interpretive stations choreograph the visit with an unfolding interpretive message. This includes an introduction to the garden and the science behind climate change; a description of the two main groups of plants and why they were chosen; highlights of particular plants





of interest and encouragement of visitors to record their observations; a description of the Garden of the Future, climate change projections for 2050, and identification of current conditions inside the high tunnel; and a concluding space for visitors to record their observations. Also available is a brochure listing resources for learning more and steps visitors can take to mitigate and adapt to climate change.

Our aim with the garden is to use the plants as messengers. We are looking to find plants that visually demonstrate changes due to altering conditions as a way to communicate the impacts of climate change. For example we might see plants respond by blooming at different times, varying growth patterns, fruit or seed productivity, and different disease and pest susceptibility. In order to evaluate our goals and visitors' understanding of potential climate change impacts, we administered a pilot test of a visitor survey at the end of the 2015 season. A larger sample of visitor surveys will be collected over the 2016 season.

Key linkages between environmental controls, plant response, and visitor experience make this project something of a "designed experiment" where the design and installation itself are an experimental research exercise, one that will be observed, measured, and evaluated to determine how to better refine it moving forward. We see potential for this project to inform how other botanical gardens and organizations might develop their own climate change gardens in the future. Climate change is coming to every city, town, and street corner. An installation like the Cornell Climate Change Garden can act as a portal for visitors to experience and understand potential climate change impacts on plants in their region.

Cerra, J., C. Wien, and S. Skelly. 2015. Making Change: Designing a new model for climate change interpretation and experimentation. In Incite Change/Change Insight, *ed. T. Keane. Manhattan, KS: NPP eBooks.* **http://newprairiepress.org/ebooks/4**.

To learn more about the Climate Change Garden, visit: **http://cornellplantations.org/climatechangegarden**.

Sonja M. Skelly is Director of Education at Cornell Plantations and Adjunct Associate Professor in the School of Integrated Plant Sciences at Cornell University in Ithaca, New York. She may be reached at **sms92@cornell.edu**.

Joshua F. Cerra is Assistant Professor of Landscape Architecture and Director of Undergraduate Studies at Cornell University in Ithaca, New York. He may be reached at **jfc299@cornell.edu**.

PHOTO SYNTHESIS

1] JANUARY 16, 2015

2] APRIL 4, 2015

3] JUNE 16, 2015

TULSA BOTANIC GARDEN IS DEVELOPING ON 170 ACRES OF BEAUTIFUL LAND IN THE ROLLING OSAGE HILLS, EIGHT MILES NORTHWEST OF DOWNTOWN. IN DECEMBER 2012, WE RELEASED OUR MASTER PLAN FOR DEVELOPING SEVENTY OF THOSE ACRES INTO HORTICULTURALLY THEMED GARDENS.

WHILE NECESSARY UTILITIES, SUCH AS WATER AND ELECTRICITY, WERE BEING BROUGHT TO THE GARDEN SITE, WE GOT STARTED PLANNING AND DESIGNING OUR FIRST SECTION OF THE MASTER PLAN—A THREE-ACRE ORNAMENTAL GARDEN, SET ON A HILLSIDE, WITH WATER RUNNELS AND AN ART DECO INFLUENCE REFLECTING THE RICH ARCHITECTURAL HISTORY OF OUR COMMUNITY.

WE WERE FORTUNATE THAT CLAY WOODRUM, ONE OF OUR DEDICATED MEMBERS AND VOLUNTEERS, DOCUMENTED THE CONSTRUCTION WITH HIS DRONE. CLAY'S PHOTOS DEMONSTRATED THE SCALE OF THIS GARDEN AS NOTHING ELSE COULD AND OFFERED AN "INSIDER'S VIEW" OF THE PROGRESS UNDERWAY. THROUGH HIS GENEROSITY, WE WERE ABLE TO USE THE PROGRESS PHOTOS TO KEEP DONORS AND MEMBERS INFORMED AND GARNER PUBLIC EXCITEMENT AND ENTHUSIASM.

LAST NOVEMBER, AMERICAN PUBLIC GARDENS ASSOCIATION EXECUTIVE DIRECTOR CASEY SCLAR JOINED US FOR THE GRAND OPENING OF THIS GARDEN—THE A.R. AND MARYLOUISE TANDY FLORAL TERRACES.

4] JULY 29, 2015

5] SEPTEMBER 30, 2015

CURRENTLY, WE ARE DOCUMENTING THE CONSTRUCTION OF OUR CHILDREN'S DISCOVERY GARDEN, WHICH WILL OPEN ON MAY 15, 2016. FOR MORE INFORMATION, VISIT **TULSABOTANIC.ORG**.

SUBMITTED BY LORI HUTSON, COMMUNICATIONS AND PROGRAMS DIRECTOR, TULSA BOTANIC GARDEN

ALL PHOTOS BY CLAY WOODRUM

NATURE: LIFE'S BEST MEDICINE

Kathleen L. Wolf

A STROLL THROUGH A GARDEN OFFERS RESPITE FROM TODAY'S BUSY LIFESTYLES. ONE CAN USE THE TIME AWAY, HOWEVER BRIEF, FOR CONTEMPLATION, AND TO REFRESH AND RESTORE ONESELF. A GARDEN EXPERIENCE IS NOT A CASUAL PLEASANTRY. PEOPLE HAVE LONG RECOGNIZED THE HEALTH-IMPROVING ASPECTS OF GARDENS. SUCH INTUITIONS ARE NOW SUPPORTED BY NEARLY FORTY YEARS OF RESEARCH EVIDENCE[1], SUMMARIZED IN THE **GREEN CITIES: GOOD HEALTH** WEBSITE.

DECLINING MENTAL HEALTH IS A MAJOR PUBLIC HEALTH CONCERN. IT IS ESTIMATED THAT ONE IN FIVE PEOPLE IS AFFLICTED BY A MENTAL HEALTH DISORDER. PEOPLE OF ALL AGES ARE FEELING EFFECTS OF GENERAL STRESS AND ANXIETY, AND DIAGNOSED CONDITIONS, SUCH AS DEPRESSION, ARE ON THE RISE. EXPERIENCES OF NEARBY NATURE CAN HELP.

IMPROVING GENERAL MOOD AND ATTITUDE

Many studies have focused on the connection between green space and physical activity because of concerns about obesity and chronic disease.[2] Better mental health is another reward. A study compared meditative and athletic walking, in both forest and indoor settings. Meditative walking generated more positive psychological effects than athletic walking did in both environments.[3]

Other investigators have found evidence of lower frustration and increased brain activity resembling meditation when moving in green space versus retail and commercial areas having no trees.[4] Also, meditative walking in the forest was the most effective at increasing happiness. Happiness is defined as the presence of a positive emotional mindset. Psychologists know that it broadens how a person thinks about and acts in the daily flow of life's efforts, creating positive intellectual and psychological resources.

Studies have compared being in natural versus built settings, and watching videos.[5] Exposure to real nature was found to increase: connectedness to nature, ability to direct attention, positive emotions, and ability to reflect on life problems.

IMPROVED WORK AND CREATIVITY

When focused on tasks that require concentration (at work or school, for instance), a person must suppress mental distractions and impulses. This can be exhausting. With greater mental fatigue we are unable to work as well, become irritable, and may feel frustrated. Short breaks in nature help to restore the mind, perhaps contributing to improved work performance and satisfaction.[6] Attention Restoration Theory (ART)[7] describes how nature provides restorative experiences.[8]

In a study of creative professionals, nature experiences enhanced creativity by evoking new ways of thinking, promoting curiosity, and encouraging more flexible thinking.[9] A recharge of directed attention may support creativity, as the restored mind is better at analyzing and developing ideas.



photos, from left to right:
1. Nature spaces offer soft fascination, drawing our attention without effort and providing restorative experiences. photo: Guy Kramer; 2. Walking around trees and in forests provides many health benefits. photo: Kathleen Wolf; 3. Children who are active outdoors show reduced attention deficit symptoms. photo: Guy Kramer; 4. Public gardens feature wonderful amenities, and can improve visitors' mental health and wellness. photo: Kathleen Wolf; 5. A bench with a view of nature is a good place to work out creative solutions. photo: Kathleen Wolf; 6. Public gardens are wonderful places for casual, meditative walks. photo: Guy Kramer

NATURE-BASED THERAPY

In one study children who were active in green outdoor spaces showed reduced Attention Deficit/Hyperactivity Disorder (ADHD) symptoms more than the kids who were involved in either built outdoor activities or indoor activities.[10] Another study found that children with ADHD concentrated better after a walk in the park than after a downtown walk or a neighborhood walk.[11]

Studies of *shinrin-yoku*, or forest bathing, in Japan have shown a remarkable array of benefits from simply walking in forested settings for an extended time. Effects include reduced stress, better mood, better immune function, and reduced diabetes symptoms.[12] Cities in some nations are now promoting forest bathing as therapy.

THE ROLE OF PUBLIC GARDENS

Synergies exist between the psychological benefits of outdoor physical activity, and the general restorative effects of contact with natural environments. Botanical gardens, arboretums, and parks could build on the research evidence to develop new partnerships and programs. For instance, corporations are promoting mindfulness workshops, and gardens could become the settings for corporate or staff retreats. In some cities physicians are doing "parks prescriptions" to promote routine, moderate activity for better patient health; public gardens, arboretums, and parks could be activity locations, hosting "walk with the doc" events. Therapy partnerships, offering facilities and expertise to address the milder mental health challenges of children and adults, could be formed. Special "forest bathing" events could also be offered. Many opportunities exist for evidence-based engagement with visitors and local communities. Public gardens, arboretums, parks, and greenspaces offer a true respite from daily stresses and can refresh and restore our mind, body, and spirit.

1. Kathleen L. Wolf and Alicia S.T. Robbins. "Metro Nature, Environmental Health, and Economic Value." Environmental Health Perspectives *123, no. 5 (2015): 390-398.*

2. Valerie F. Gladwell, Daniel K. Brown, Carly Wood, Gavin R. Sandercock, and Jo L. Barton. "The Great Outdoors: How a Green Exercise Environment Can Benefit All." Extreme Physiology & Medicine *2, no. 1 (2013): 3.*

3. Yoon-Kyung Shin, Dai Jin Kim, Kyunghee Jung-Choi, Young-Ju Son, Jung-Wan Koo, Jung-Ah Min, and Jeong-Ho Chae. "Differences of Psychological Effects between Meditative and Athletic Walking in a Forest and Gymnasium." Scandinavian Journal of Forest Research *28, no. 1 (2013): 64-72.*

4. Peter Aspinall, Panagiotis Mavros, Richard Coyne, and Jennifer Roe. "The Urban Brain: Analysing Outdoor Physical Activity with Mobile EEG." British Journal of Sports Medicine *49 (2015): 272-276.*

5. F. Stephan Mayer, Cynthia McPherson Frantz, Emma Bruehlman-Senecal, and Kyffin Dolliver. "Why Is Nature Beneficial? Environment and Behavior *41, no. 5 (2009): 607-643.*

6. Rachel Kaplan. "The Role of Nature in the Context of the Workplace." Landscape and Urban Planning *26, no. 1-4 (1993): 193-201.*

7. Stephen Kaplan. "The Restorative Benefits of Nature: Toward an Integrative Framework." Journal of Environmental Psychology *15, no. 3 (1995): 169-182.*

8. Mark G. Berman, John Jonides, and Stephen Kaplan. "The Cognitive Benefits of Interacting with Nature." Psychological Science *19 (2008): 1207-1212.*

9. Trine Plambech and Cecil C. Konijnendijk van den Bosch. "The Impact of Nature on Creativity – A Study among Danish Creative Professionals." Urban Forestry & Urban Greening *14, no. 2 (2015): 255-263.*

10. Frances E. Kuo and Andrea F. Taylor. "A Potential Natural Treatment for Attention-Deficit/Hyperactivity Disorder: Evidence from a National Study." American Journal of Public Health *94 (2004): 1580.*

11. Andrea F. Taylor and Frances E. Kuo. "Children with Attention Deficits Concentrate Better after Walk in the Park." Journal of Attention Disorders *12, no. 5 (2009): 402-409.*

12. Yuko Tsunetsugu, Bum-Jin Park, and Yoshifumi Miyazaki. "Trends in Research Related to "Shinrin-Yoku" (Taking in the Forest Atmosphere or Forest Bathing) in Japan." Environmental Health and Preventive Medicine *15, no. 1 (2010): 27-37.*

Kathleen L. Wolf, PhD, is a Research Social Scientist in the College of the Environment at the University of Washington. She may be reached at **kwolf@uw.edu**.

MAKING A PLACE OURS:

Just as we have relationships with people, we have relationships with places—the places in our lives that have meaning because they bring us joy and comfort, offer us a sense of belonging, provide us with refuge, revitalize us, and help us see new possibilities and feel connected to a larger whole. They may also offer us a sense of self-efficacy if they let us explore our abilities and see new possibilities. And, while a place may become important to us because we've shared it with other people, over time it can become meaningful in its own right, resulting in an emotional attachment. As geographer Yi-Fu Tuan noted in his book, *Space and Place: The Perspective of Experience*, "What begins as undifferentiated space, becomes place as we get to know it better and endow it with value."

Gardens, and more broadly, what is known as "nearby nature"—natural elements in the environment that are part of our everyday lives—are significant sources of meaning and attachment. This is true whether you are an avid gardener who loves to get your hands in the dirt, or simply a garden visitor who enjoys sitting on a bench to appreciate nature. There is no one pathway to place meaning and attachment; for example, it cannot be pinned down to active versus passive recreation, or whether there is the presence of other loved ones, or even a particular design feature that catalyzes place meaning. Nor is it necessary for the "nature" in question to be a presentation of the pastoral or appear untouched by humans. It can be as simple as a roadside flower whose beauty and resilience inspires us.

But one thing is sure: places to which we are attached afford us with experiences, feelings, insights, and thoughts that we value, not the least of which is an experience of restoration. In the past few decades, a body of research evidence has been amassed by environmental psychologists on the restorative effects of nature. A critical reason for this is that nature is inherently fascinating; it captures our attention effortlessly. In doing so, it relieves us of mental fatigue and takes us outside the cares of our workaday lives. In all of this, the kinesthetic and sensory experience of place is a critical part of what draws us to our special places time and again. Attachments to place also develop through behavioral processes as well. That is, when it comes to our important places, we engage in proximity-maintaining behavior to ensure continued experiences with those places, and we engage in care-taking and place protective behaviors. This is fundamentally what place stewardship is about.

CHALLENGES AND PROMISES

As with any relationships, our relationships to place are not without their challenges. This is partly because place means different things to different people. Public garden managers know this very well. As public spaces, our local gardens must appeal and respond to different tastes and concerns of a diverse audience. The reality is that places, and our attachments to them, form differently based on our socio-culturally understood identities. For example, people have different views of leisure—what it is and what it achieves—based on

NOTES FROM AN ENVIRONMENTAL PSYCHOLOGIST

Lynne C. Manzo

gender, race, ethnicity, class, and where they grew up. Sometimes these understandings clash with management practices which might appear inhospitable to some groups desiring more active recreational opportunities and, therefore, marginalize certain potential user groups. Structural constraints may also exist that impede use and participation by some because of limits of leisure time and resources.

TOWARD COLLECTIVE PLACE MEANING

To address these challenges, it is important to learn about the full range of place meanings and visitors' desires for a place. This is a critical path toward the articulation of collective place meaning. It is essential to search for commonalities among diverse user groups who can unite around what I call the "common project" of living. This involves identifying shared place values and goals to move toward a collective perspective—one that is inclusive but not necessarily homogeneous. This is the very "stuff" of community building and place responsiveness, and public gardens need to serve as the catalyst.

top: Nearby nature, like this community garden in New York City, provide a reprieve from the stresses of everyday life.
middle: We become attached to places that afford us with experiences and feelings we value.
bottom: A simple wildflower at the side of a trail or growing up through the cracks of a sidewalk can offer a moment of unexpected delight.
photos: Lynne Manzo

Lynne C. Manzo is an environmental psychologist and Associate Professor in the Department of Landscape Architecture at the University of Washington in Seattle. Her work focuses on place meanings, attachment, and the politics of belonging. Her latest book, with Patrick Devine-Wright, is Place Attachment: Advances in Theory, Methods and Applications, *published by Routledge in 2014.*

Editor's note: This article and the preceding one by Kathleen L. Wolf are based on presentations made at the February 2016 Education Symposium.

ENGAGING VOLUNTEERS:
FOSTERING GARDEN OWNERSHIP THROUGH GROUPS

Jennifer Hoffman

A deficit of time, money, and labor can be the biggest limiting factor for a small botanic garden. Yet, the seven-and-a-half-acre Texas Discovery Gardens in Dallas has enjoyed substantial renovations and growth in the past few years, all with fewer than twenty staff members.

How do we do it? Our success is thanks in part to the hard work of nearly one thousand volunteers, but it's our partnerships with volunteer groups that truly make our garden shine and give our volunteers a real sense of ownership. The following are a few examples of our most significant partnerships.

The Dallas County Master Gardener Association provides more than expert volunteers. A group from the organization has worked with our Director of Horticulture to design, construct, expand, and maintain a water-wise demonstration garden. Reflecting our mission to teach people ways to sustain the natural world, the organic garden includes plant labels describing how the plants are beneficial to wildlife and a brochure that encourages guests to replicate the garden in their own yards. The Association maintains a corner of our grounds that is integral to the guest experience, and it frees Texas Discovery Gardens staff to focus on other major renovations. In 2015, Master Gardeners volunteered 3,700 hours, serving in a variety of capacities—from maintenance workers to docents.

A second group, North Texas Master Naturalists, maintains our Benny Simpson Native Plant Collection. They are also involved with the expansion of our Native Butterfly Habitat and in creating tools for teaching about the importance of native and adapted pollinator-friendly plants. With 1,389 hours logged in 2015, they have also provided a voice that reinforces our mission of getting adults and kids to learn how to sustain the natural world.

These additional gardens add thirty or more minutes of exploration to every guest's visit, and offer concrete ideas on how to reproduce what's been seen once back home. Perhaps most importantly, we now have an invested core of a few dozen volunteers who share their love for the Gardens on social media and to friends and family.

Volunteer groups offer labor, financial assistance, and the expertise needed to allow small gardens to expand much more quickly and increase their outreach. Take stock of groups in your area, and look into pairing them with specific projects or gardens that align with their expertise.

How does your garden grow? Ours grows with love and labor from wonderful volunteers.

Jennifer Hoffman is the Director of Outreach at Texas Discovery Gardens at Fair Park in Dallas, Texas. She may be reached at **JHoffman@TexasDiscoveryGardens.org**.

3 Ways Oasis Design Group Prepares Public Gardens for a More Successful Future

Botanic gardens often ask Oasis Design Group—one of the top design firms in the United States that specializes in public gardens—for advice on how they should prepare for times of transition and for the future. When it leads and guides its clients, Oasis uses the following three ways to prepare public gardens for a better future.

1. Uses a Customized, Strategic Toolkit

"Each garden is in a different place and has different needs," said Scott C. Scarfone, ASLA, PLA, founder of and principal at Oasis, which provides services tailored to each garden, project, and scale.

"Oasis' design process, planning strategies, and subsequent design responses help connect people to a garden, create a memorable place, and establish a uniquely branded experience."

Scott C. Scarfone, principal at Oasis, engages financial donors during Oasis' Vision Plan presentation for South Coast Botanic Garden in California. Photo is courtesy of South Coast Botanic Garden.

Outcomes may result in the initiation of new planning or design efforts; mid-course correction; re-energized and directed leadership; strategic Report Card audits—organizational, financial, and physical; development of a new physical master plan or strategic plan; or confirmation of an existing plan or strategy. Oasis completes work in-house and adds specialized consultants to its team as necessary. "One successful approach is to build a strategic plan and a master plan simultaneously along with a financial plan so they are all integrated," said Richard H. Daley, partner at EMD Consulting Group and an expert on financial planning for botanic gardens.

2. Empowers and Connects People Through Results-Oriented Visions

Oasis' design process, planning strategies, and subsequent design responses help connect people to a garden, create a memorable place, and establish a uniquely branded experience. "Oasis Design Group led the planning process and developed a 25-year visionary plan for South Coast Botanic Garden," said Adrienne L. Nakashima, chief executive officer at South Coast Botanic Garden Foundation in Palos Verdes, California. "Oasis facilitated multiple stakeholder groups and achieved consensus for Oasis' plan that improves the overall design of the Garden and visitor experience, increases sustainability in horticultural practices and plant collections, and addresses ongoing land reclamation issues."

3. Provides Expertise and Knowledge

Oasis shares its experience as an industry leader and has earned a seat at the table. Scarfone has worked for public gardens; taught at many of the nation's most prestigious gardens; and served actively on many committees for American Public Gardens Association, including recent Chair of the Design and Planning Professional Section, and for allied organizations and environmental groups.

To learn more about how Oasis Design Group prepares public gardens to be more successful, visit www.oasisdesigngroup.com and connect via Facebook and LinkedIn. Contact Scott Scarfone via email at sscarfone@oasisdesigngroup.com, telephone 410-732-1910, and LinkedIn.

OASIS
DESIGN GROUP

Landscape Architecture
Master Planning
Urban Design

GARDEN PROFESSIONAL SPOTLIGHT

PAUL TUKEY

CHIEF SUSTAINABILITY OFFICER, GLENSTONE MUSEUM, MARYLAND

TELL US ABOUT YOUR JOURNEY IN THE GARDEN INDUSTRY.

My interest in plants was first piqued as a child on the family farm in Maine. Almost all our food was grown there, and by spring vegetables were scarce. My grandmother loved to have me join her to scour her lawn, and the neighbors', looking for "spring tonic"—dandelion greens. Later, after obtaining a journalism degree and working as a sports writer, I returned to lawns with a landscaping business. Soon, however, I developed a severe sensitivity to the synthetic chemicals used to maintain the "perfect," weed-free lawn and sold the business.

Returning to journalism, I launched the media company *People, Places & Plants*; began the SafeLawns Foundation; and wrote *The Organic Lawn Care Manual*. The economic downturn of 2008 led me to change my business focus again, and I became a lawn-care consultant based out of Maine, where I still lived. One day I received a call from Glenstone, asking me to advise them on caring for the landscape of a museum founded by Mitchell and Emily Rales in Maryland. I replied that I didn't do house calls. But, they persisted, and soon I was a frequent traveler to Maryland.

TELL US ABOUT A RECENT PROJECT YOU WORKED ON.

The Raleses hired me in 2013 to serve as Chief Sustainability Officer at Glenstone Museum, which they are creating as a showcase for their collection of post-World War II art. Their goals are for the museum and its two-hundred-acre grounds to be 100 percent waste-free (currently, we are at 85 percent: art is shipped with lots of plastic!); for the buildings to obtain Platinum LEED-certification; for landscaping water needs to be met with cisterns holding one million gallons of water; and for all new plantings to be native to this region of the US. In addition, the Museum will boast an environmental education center where homeowners and professionals in the landscape business will be taught the best organic practices.

WHAT DO YOU FIND TO BE THE MOST REWARDING THING ABOUT WORKING IN THIS INDUSTRY?

The increasing awareness of the impact the industry has on the environment and of the need to change to sustainable practices that promote the health of all—the landscape, the environment, and the animals and people that live in it. It's no longer important just to create an aesthetically pleasing landscape without considering the consequences of how it is to be cared for.

THE ALCATRAZ FLORILEGIUM

EXHIBITION AT THE UNIVERSITY OF CALIFORNIA BOTANICAL GARDEN AT BERKELEY—JANUARY 2016

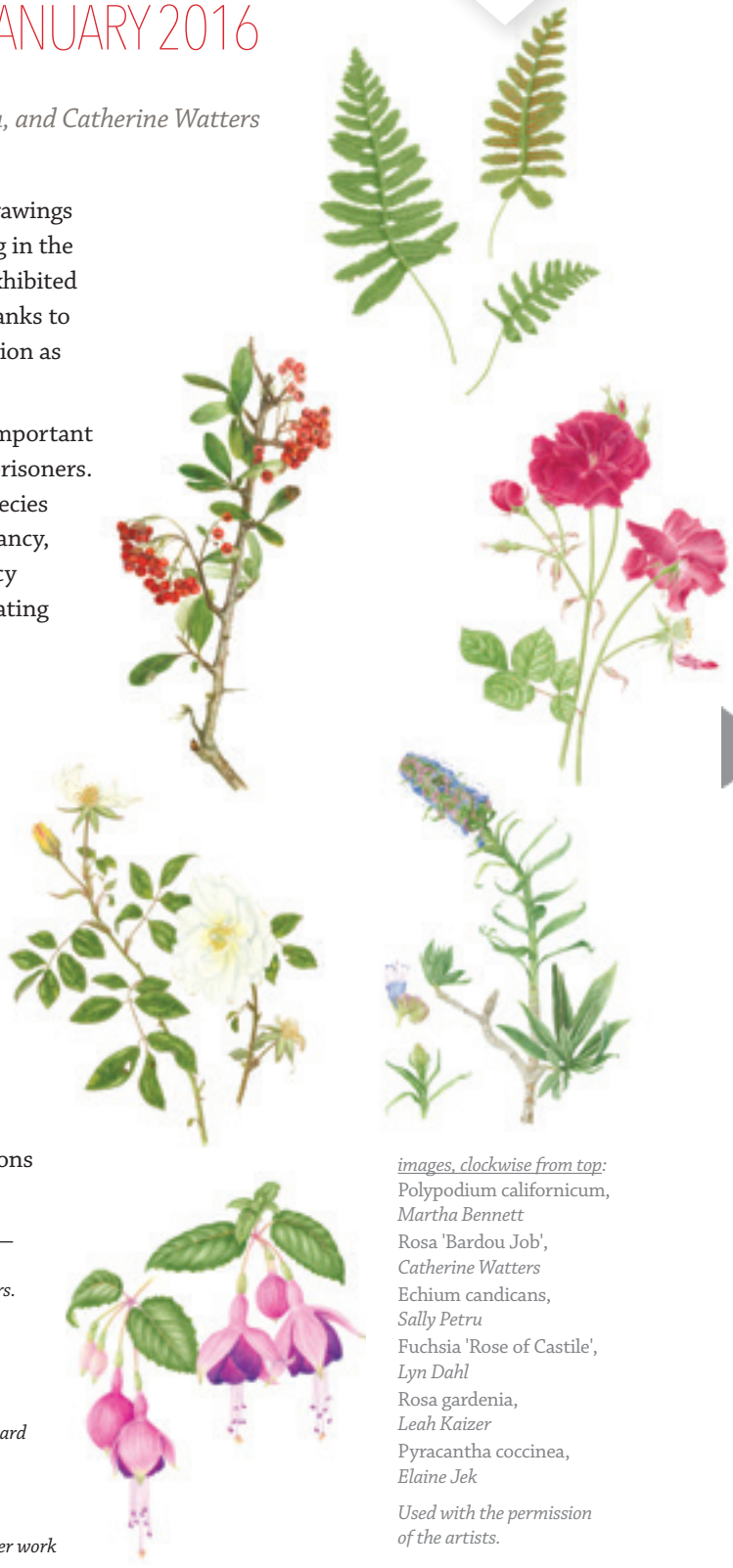
Lyn Dahl, Sally Petru, and Catherine Watters

The Alcatraz Florilegium, a collection of seventy-eight botanical drawings and paintings of the surviving and re-introduced plants growing in the botanical gardens on San Francisco Bay's Alcatraz Island, was exhibited at The University of California Botanical Garden at Berkeley, thanks to Director Paul Licht and his wonderful staff. It was a fitting location as the island can be seen from the Garden.

For more than a century, the gardens on Alcatraz had been an important part of everyday life for the military, prison staff families, and prisoners. The prison was closed in 1963 and the gardens and their 145 species of plants were neglected. Forty years later, The Garden Conservancy, in partnership with the Golden Gate National Parks Conservancy and with the support of the National Park Service, began renovating the gardens. Staff and volunteers removed the overgrowth and were amazed to find many of the original plants! They were dubbed "The Survivors."

Beginning in 2012, artists of the Northern California Society of Botanical Artists began to draw and paint them and other plants re-introduced to the gardens. The first forty-five works of *The Alcatraz Florilegium* were exhibited in the cellblock at Alcatraz from September 2013 to February 2014 as part of the restoration's tenth anniversary.

The Alcatraz Florilegium continues to grow with each regular specimen collecting trip to Alcatraz. We expect to have around one hundred images by the time our book is published in fall 2016. We have all found it fascinating to learn about the inhabitants of Alcatraz, to illustrate the plants that enhanced their lives, and to share their stories through exhibitions and the book. It's been a "labor of love" for all of us.



images, clockwise from top:
Polypodium californicum, *Martha Bennett*
Rosa 'Bardou Job', *Catherine Watters*
Echium candicans, *Sally Petru*
Fuchsia 'Rose of Castile', *Lyn Dahl*
Rosa gardenia, *Leah Kaizer*
Pyracantha coccinea, *Elaine Jek*

Used with the permission of the artists.

Lyn Dahl's love of gardening inspired her to study botanical art with Catherine Watters. Her paintings have been exhibited at the University of California Botanical Gardens at Berkeley, on Alcatraz, and at the Presidio in San Francisco.

Sally Petru is a botanical artist and art instructor who has supported botanical art as founding President of the Northern California Society of Botanical Artists and as a board member of the American Society of Botanical Artists. For more information about the artist, go to **www.sallypetru.com**.

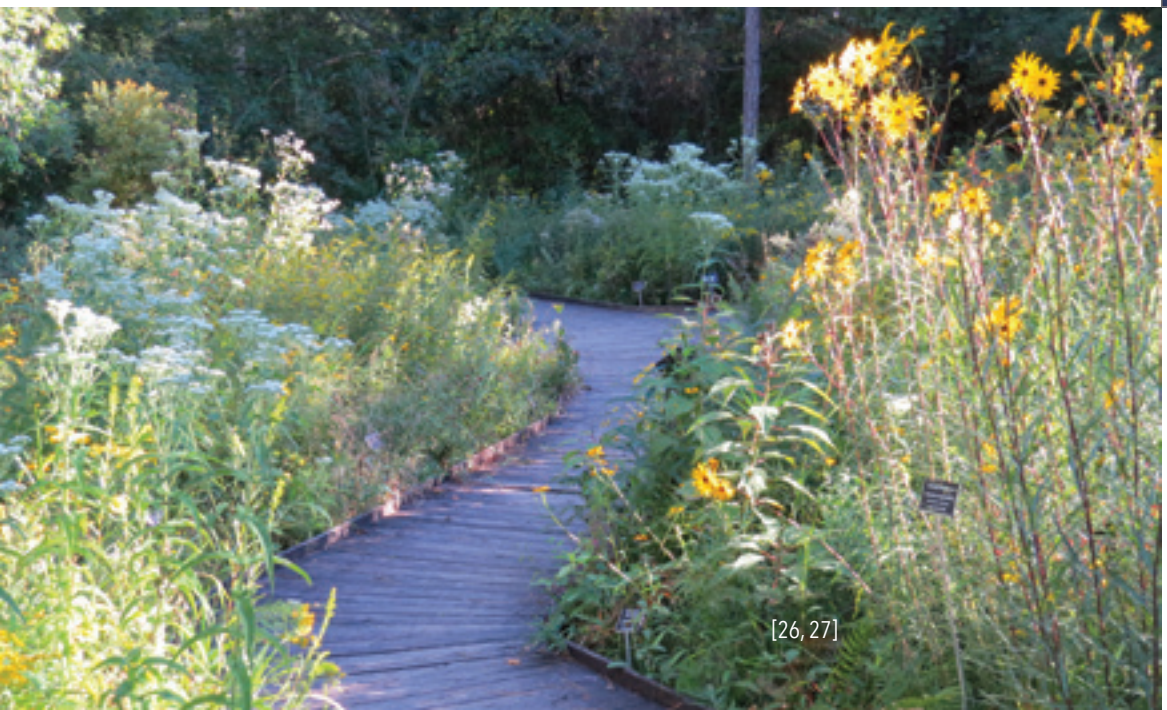
Catherine Watters exhibits her paintings and teaches botanical art internationally. Her work is featured in several florilegia, books, and magazines. For more information, please visit her website **www.catherinewatters.com**.

ADMINISTRATIVE LESSONS

Peter White

Peter White retired in December 2014 as Director of the North Carolina Botanical Garden, a position he held for twenty-eight years. He shares with us the lessons he learned during that time. Abbreviated highlights are here; the full document can be found at **www.publicgardens.org/content/currentpublicgarden**.

1. BE OPEN, THOUGHTFUL, REFLECTIVE, AND FAIR TO THOSE AROUND YOU.
2. ACT ON PRINCIPLES, NOT PERSONALITIES.
3. SELL A VISION OF A BETTER FUTURE WHILE ACKNOWLEDGING THE CHALLENGES.
4. KNOW WHEN IT'S TIME TO MAKE A LEAP OF FAITH EVEN IF ALL THE FUNDING ISN'T QUITE LINED UP.
5. REACH OUT TO POTENTIAL DONORS; BUILD CONNECTIONS.
6. REMEMBER THAT GARDENS APPEAL TO DIFFERENT PEOPLE ON MANY LEVELS–SCIENCE, NATURE, ART, AND OTHERS.
7. DON'T FOCUS ON JUST ONE AREA OR ASPECT OF YOUR GARDEN–SEE #6 ABOVE. STAY BALANCED.
8. THE GOAL IS FOR YOU TO IMPROVE THE GARDEN…AND HAND IT OFF TO THE NEXT DIRECTOR TO CONTINUE THE PROCESS.
9. CREATE OPPORTUNITIES FOR THE STAFF AND THE BOARD TO WORK TOGETHER AND LEARN FROM EACH OTHER.
10. MANAGE PERSONNEL THOUGHTFULLY TO MAINTAIN MORALE AND PREVENT DISTRACTIONS.



above:
Peter White
left:
The Coastal Plain Savannah Collection

THINGS WE **LOVE** THIS SPRING

ON-THE-GO READING ROOM

The Rose Kennedy Greenway Conservancy has loved using the Uni Project portable reading room to engage visitors in hands-on, impromptu reading and interesting conversation. This custom-designed unit inspires curiosity and wonder, and has been invaluable for helping our Greenway Ambassadors interact with park users. As an outdoor home base, the Uni is a unique solution.

For more information, visit **www.theuniproject.org/read**.

Submitted by Keelin Purcell, Volunteer and Education Manager, Committee on the Visual Arts, Rose Kennedy Greenway Conservancy, Boston, Massachusetts

THE HIMALAYAN BLUE POPPY

A spring flower show favorite at Phipps Conservatory, the Himalayan blue poppy (*Meconopsis sheldonii* 'Lingholm') is sensitive to warmer temperatures. For that reason, we purchase bare-root plants from an Alaskan nursery, pot them with good drainage, give them twelve weeks of cold dormancy, and then place them in the cooler greenhouse. The first buds emerge in seven to eight weeks. Although its flower has a short bloom life, the Himalayan blue poppy is a definite "wow" plant and one not often seen in our climate.

Our vendor: The Blue Poppy, 17800 East Feldman Court, Palmer, Alaska 99645

Submitted by Katie Werner, Greenhouse Production Foreman, Phipps Conservatory and Botanical Gardens

ANTI-COMPACTION FLOORING

We love the anti-compaction flooring we put down for events or use in small pieces when doing any heavy work on soil or delicate, outdoor surfaces: **www.eventdeck.com**.

Many other anti-compaction and protective outdoor mat options probably exist, but this one is pretty great. We rent one and have purchased some for regular use. They have replaced the plywood we used to use and are durable, easy to put down and take up, and can also work as ADA-accessible pathways. You can even drive trucks on them!

Submitted by Melanie Sifton, Vice President of Horticulture and Facilities at Brooklyn Botanic Garden

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TREE MANAGEMENT AND CLIMATE

Trees are an important part of Longwood Gardens' heritage. They are the backbone of our 1,077 acres, and vital to our horticulture displays and picturesque landscape that attract more than 1.3 million guests each year. Longwood was founded in 1906 when industrialist Pierre Samuel du Pont purchased the property to prevent the harvest of a collection of nationally recognized trees. This care for trees was ingrained by du Pont, as is evident in this quote from the Caretaker's Notebook of 1912: "No tree, dead or alive, is to be removed or trimmed, no matter whether located on the farm or in the woods, unless by special permission of the owner…The preservation and care of trees is considered of first importance, as their injury is irreparable, while time and money (or both) will rectify most other mistakes."

In 2008, we developed a detailed tree management plan that helps guide the care of Longwood's historical trees, some of which are more than 250 years old. In 2013, we started including climate change modeling in our tree management program to help determine how certain tree species would grow in our region as well as to help us make informed decisions when selecting trees for planting or replacement.

After researching climate change models for tree species, we contacted Dr. Louis Iverson, Landscape Ecologist at the United States Department of Agriculture's Forest Service. Dr. Iverson has developed a detailed *Climate Change Atlas* for 134 tree species in the eastern United States that takes into account temperature and precipitation, land use, soil characteristics, and elevation to model suitable tree species habitat for the next one hundred years. Climate change is linked to the presence of greenhouse gases in the atmosphere, and the *Climate Change Atlas* predicts possible species habitat and distribution changes associated with future atmospheric CO_2 levels. The model projects three different climate scenarios, each of which reflects the climatic response to a specific level of carbon emissions. As the climate changes, suitable habitat might also change for certain tree species, resulting in greater or decreased habitat for the modeled species.

For each tree species under each emissions scenario, the model predicts an impact on suitable habitat. Species habitat outcomes range from habitat elimination to small or large decreases or increases in habitat, or to the creation of new habitat in areas of the country currently unsuitable for the species. Tree species whose suitable habitat would be eliminated at Longwood under the harshest scenario include: *Magnolia acuminata* (cucumber tree), *Tsuga canadensis* (eastern hemlock), and *Liriodendron tulipifera* (tulip tree). Other species such as *Quercus shumardii* (Shumard oak), *Catalpa speciosa* (northern catalpa), and *Ulmus crassifolia* (cedar elm) would see large increases in suitable habitat.

CHANGE

Shawn Kister

Longwood has 105 tree species that have been modeled and a total of 3,241 trees that fall into one of the eight suitable habitat outcomes. A tree species habitat listed as increasing will not necessarily spread to new locations. Natural boundaries, urban areas, disease, and insect pressures may slow the movement of species into a geographical area that is shown to be more suitable.

Climate change models can be a useful tool in managing your tree collection. Longwood utilizes the tree model atlas as one piece of information that can help determine potential resources needed to maintain tree health. This could include increased monitoring for pests or additional watering should the model predict a decrease in tree habitat. These models can help you make prudent decisions to ensure your tree collection thrives into the future, and can serve as an informative guide when conditions indicate that habitat changes are occurring.

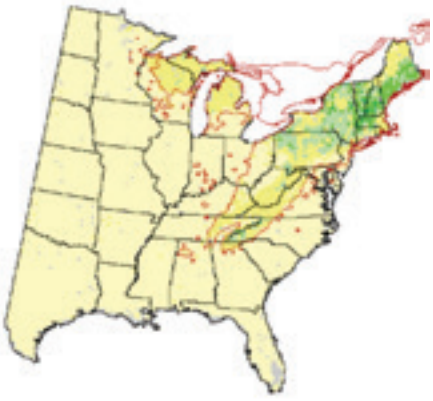
Resources for additional information:
www.nrs.fs.fed.us/people/liverson

www.fs.fed.us/nrs/atlas/combined/index.php

www.fs.fed.us/nrs/atlas/tree/multi.php?size=333&update-maps=Update+Maps&modcur=1&hadhi=2&pcmlo=5&spp=261&go=1

Shawn Kister is the Grounds Division Leader at Longwood Gardens and may be reached at **skister@longwoodgardens.org**.

CURRENT HEMLOCK DISTRIBUTION IN THE EASTERN US



(PCM) ASSUMES CLIMATE CHANGE IS CURBED BY LOWER EMISSIONS, AND HEMLOCK HABITAT IS NOT GREATLY REDUCED.

(HADLEY) – ASSUMES CLIMATE CHANGE CONTINUES ON CURRENT PROJECTION AND HEMLOCK HABITAT IS GREATLY REDUCED.

All maps from USDA Forest Service

CACTI AND SUCCULENTS OF THE MOJAVE DESERT

Brandi Eide

SOME MAY VIEW THE MOJAVE DESERT AS BARREN; HOWEVER, THE NUMBERS OF SPECIES THAT THRIVE IN THESE RELATIVELY HARSH AND EXTREME CONDITIONS REPRESENT THE INCREDIBLE DIVERSITY OF LIFE PRESENT HERE. IN ADDITION TO BEING THE SMALLEST OF THE NORTH AMERICAN DESERTS, THE MOJAVE IS ALSO THE DRIEST, WITH AN AVERAGE ANNUAL PRECIPITATION OF FIVE INCHES, AND A FEW YEARS HAVE LEFT SOME AREAS WITH NO MEASURABLE RAINFALL. TREES ARE SPARSE, BUT THE TREE-LIKE ENDEMIC JOSHUA TREE, *YUCCA BREVIFOLIA*, IS PREVALENT IN HIGHER ELEVATIONS AND IS AN INDICATOR SPECIES FOR THIS DESERT.

above:
A spring show with Cylindropuntia x multigeniculata *and* Opuntia basilaris *var.* treleasei. *photo: Renee Grayson*

bottom, from left to right:
Escobaria vivipara *var.* rosea. *photo: Brandi Eide*
Yucca brevifolia *withstands desert extremes. photo: Ray Saumure*
Mojave succulent collection. photo: Brandi Eide

The Springs Preserve Botanical Garden opened in 2007. Just minutes from the Las Vegas strip, this 180-acre Preserve seems worlds away. Although several major hotels and casinos can be seen from the site, the surrounding mountain ranges are a far more dominant presence. With our scant four inches of annual rain, the use and interpretation of native plants and water conservation are a key focus. Displaying native plants in the Mojave cactus and succulent collection is a natural fit here, allowing us to showcase the wonders of our desert, while reinforcing the message of water conservation and sustainable desert living. As a relatively young garden, we were fortunate to have many mature specimens to add to our collection, most with wild provenance data, in large part due to rapid land development in the Las Vegas area in the years preceding our opening. The majority of the land developed was previously Bureau of Land Management land, which in some ways streamlined our acquisition process, and these salvaged plants formed the core collection from which we continue to grow.

Plants and seed were collected from many populations around Nevada and Arizona; some of these plant habitats have been eliminated by development. Many plants in this collection are highly important as they likely represent the last remnants of unique genetic populations that no longer exist *in situ*. In addition to plants gathered on collecting trips, some collectors and nurseries have also provided us with wild-collected material. With the benefit of having many experts on staff, we were able to grow this collection quickly, and out of the fifty-three succulent taxa we recognize, we feature forty-nine; thirty are of documented wild origin, thirty-two are cacti, and four families are represented. The collection is dispersed throughout the property, with a concentration in a themed bed at the forefront of our cactus collection in the Botanical Garden.

Future work on the Mojave cactus and succulent collection includes acquiring a few more taxa, performing ongoing work to verify identification, and investigating methods for improving the labeling used for tracking and interpretation purposes. This is a valuable collection representative of an area where plants are still regularly discovered and where land development continues. Thankfully the many mountain ranges in this desert offer protection and function as diversity islands; plants are often isolated by great distances, and vastly different microclimates can exist within a small range. Yet, the terrain and climate can pose challenges for researchers, as does the ephemeral nature of many desert plants. As many old Western films imply, in the Desert Southwest it can be easy to remain undetected. Seeds can lie dormant in soils for decades awaiting perfect conditions, making it easy for researchers to pass plants by. Even enduring plants can remain unnoticed due to the challenges of accessing remote and harsh landscapes.

Succulents are dynamic plants that easily garner attention with their striking forms, stunning flowers, and remarkable adaptations. One goal with this collection is to help visitors appreciate the unique beauty and fragility of this rugged desert environment in a larger effort to encourage protection of species and habitat.

I am grateful to Pete Duncombe, Tracy Omar, and Dan Secinaro for their assistance compiling information for this article.

Brandi Eide is Botanical Gardens Supervisor at Springs Preserve. She may be reached at **brandi.eide@lvvwd.com**.

American Public Gardens Association
PublicGardens.org

Public Garden

351 Longwood Road
Kennett Square, PA 19348

NEXT ISSUE: DISASTER MANAGEMENT PLANNING ❁ ANNUAL CONFERENCE HIGHLIGHTS