

SONORAN QUARTERLY

FOR MEMBERS AND FRIENDS OF THE DESERT BOTANICAL GARDEN

PHOENIX, ARIZONA MARCH 2012, VOLUME 66, NO. 1

Phoenix Arizona (Arizona)

TOPIA





The Arizona We Want

The Center for the Future of Arizona was created by Dr. Lattie Coor in 2002. It exists to “serve the public interest and the common good” as Arizona moves into its second century of statehood. Of all the initiatives the center has undertaken in its first decade, the one I find most significant is “The Arizona We Want” project. (I encourage Garden members to read more at www.thearizonawewant.org.)

One of the most interesting findings of the study is that, when polled state-wide, Arizonans rank “beauty or physical setting” and “availability of outdoor parks, playgrounds, and trails” as the attributes they are most satisfied within their own communities. (This is in stark contrast to how Arizonans rate the “availability of jobs” and “how much people in our community care about each other.”) We at the Garden are pleased to be a part of what Arizonans are most happy about, but we also want to help make better those things that need improving.

Arizona is a great place to call home...



It was in that spirit that the Garden entered the recent “Five Communities” competition sponsored by the Center for the Future of Arizona. Our proposal was to create a conservation alliance that would channel the energy of volunteers around the Valley into becoming stewards and advocates for the mountain preserve park systems in Phoenix and Maricopa County. The five partners in the conservation alliance are the City of Phoenix Parks and Recreation Department, Maricopa County Parks and Recreation Department, Arizona State University’s Central Arizona-Phoenix Long-Term Ecological Research program and Ecosystem Conservation and Resilience Initiative, Audubon Arizona, and Phoenix Mountains Preservation Council.

I am happy to report that the Garden’s proposal was one of the five selected for funding from a pool of nearly 100 applications! In future issues you will read more about how this \$300,000 grant, which the Center for the Future of Arizona has committed to raise for us, will be used to launch the conservation alliance. Also, you can log on and view our proposal at dbg.org/5-Communities.

Arizona is a great place to call home, and all of us here at the Garden look forward to doing our part in making it an even better place to live.

Ken Schutz,
The Dr. William Huizingh Executive Director

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Marian Barker

Print & Advertising Manager:

Renee Immel

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Beth Brand

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In Appreciation

On our Cover

Ballet Arizona dancers rehearsing for *Topia*, an original ballet by artistic director Ib Andersen choreographed for the Dance in the Desert series. For more information and performance dates see page 20. Photograph by Tim Fuller.

Back Cover

Spring Plant Sale

Sponsored by *The Arizona Republic*

Members' Preview - March 16, 2012

Open to General Public - March 17-18, 2012

Visit dbg.org/plantsale for more information.



DATABASE ACCESS GRANTED

by Dr. Kimberlie McCue, Program Director
Conservation of Threatened Species and Habitats

Have you ever wondered how many saguaros are on the property of the Desert Botanical Garden, or where in the Garden you could see your favorite kind of prickly pear in bloom, or what type of desert plant would work best in your own garden? Well, in the not too distant future anyone with an Internet connection will be able to find the answers to these questions and more by visiting the Garden's website.

In August 2011, the Institute for Museum and Library Services (IMLS) awarded the Garden a \$150,000 grant to create a completely new database to house all of our plant collections data, link that data with the geographic location of plants in the Garden, and make this information available via the Internet. The new system will serve as a powerful tool for Garden staff, particularly those involved in research, conservation, education, and exhibits, but will also allow us to offer the general public access to information on the desert plants in our collections in ways never before possible.

The new database will allow scientists anywhere in the world to quickly determine if the Garden holds plant material relevant to their research.

Work on the project began with the purchase of essential hardware, including new computers for the Curator of Living Collections and Plant Registrars, a new server to host the database, and a highly accurate GPS (Global Positioning System) unit to be used to map the Garden and all of our plants. A team of staff members, representing key departments at the Garden, was then assembled to begin identifying all the types of data considered critical for inclusion in the database. Information on our plant collections has been collected since 1939 and currently resides in numerous databases. Bringing the most important data into a single, searchable database is a crucial element of the project.

Where are the Plants?

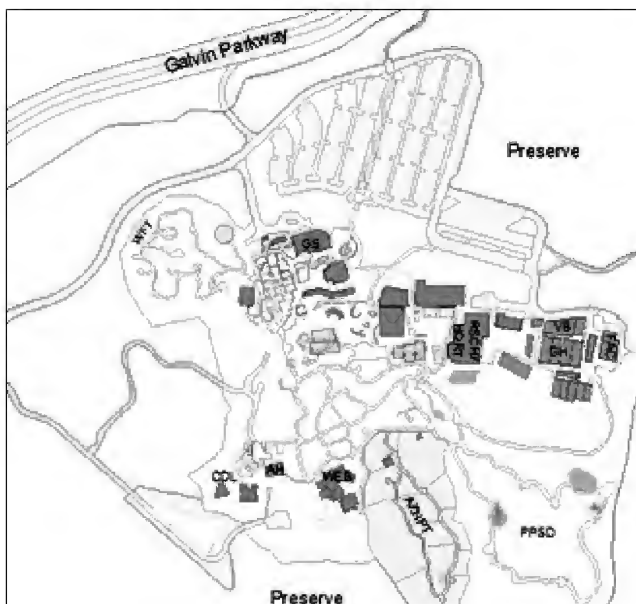
The Garden has tens of thousands of plants on display, in greenhouses, and in shade houses. A few members of the staff are intimately familiar with where specific plants are located, but no single person knows where every individual plant is. The current database contains only general location information; it might say, for example, that a particular plant is within the Cactus Gallery in a certain bed. The exact location of the plant, however, is not pinpointed.

A major component of the new database project involves constructing a GIS (Geographic Information System) in which the geographic location of each plant will be saved. ESRI, a world leader in GIS, donated critical software to the Garden in support of this project, while SRP donated an orthophotograph of the Garden. An orthophotograph is an aerial photo for which every point in the photo is geo-referenced (has assigned to it a specific geographic coordinate). The Garden's orthophotograph has four-inch resolution, meaning that each pixel in the image represents four inches on the ground.

Using the orthophoto and our new GPS unit, Curator of Living Collections Raul Puente, and Plant Registrar Elizabeth Taddiken have constructed a basemap of the Garden. This map delineates the Garden's boundaries, buildings, roads, parking lots, trails, paths, and planting areas. With the basemap complete, attention will now turn to mapping each individual cactus and agave in the Garden. Our goal is to have all specimens in the cactus and agave families mapped by the time the database goes live. Mapping will continue until all the Garden's plants are entered into the system. Preliminary work with the GPS unit has yielded accuracies of five centimeters or less, meaning the coordinates determined by the GPS for a given plant location is within that distance of its actual location on Earth.



Aerial orthophotograph of the Desert Botanical Garden (above). Basemap of the Garden created in GIS (lower image).



Using the Database

Once the database goes live in early 2013, you will be able to link to it from the Garden website. A user-friendly interface will allow searches to be done by either scientific or common name. For example, if you search for *Opuntia*, all records for that genus will be shown. You will see that the oldest collection of *Opuntia* the Garden has dates back to 1939, the year the Garden opened! Click on the link for that specific collection and you will learn it is *Opuntia engelmannii* var. *engelmannii*, the cactus apple, collected by George Lindsay, the Garden's first director. You will also see photos of the plant and, because the collection data will link to the GIS, a map will show exactly where the plant is in the Garden.

In addition to collection data, we will also include plant information useful to gardeners, such as whether it is native to Arizona, when it flowers, and its water requirements.



Opuntia engelmannii var. *engelmannii*. Photo by Max Licher.

Link to Wild Plant Information

Another useful feature in the new database is the inclusion of a link to SEINet (Southwest Environmental Information Network). From the record of our example *Opuntia*, clicking through to SEINet will give the user a detailed description of the plant, more photos, and a map showing where the plant occurs in the wild (for endangered plant species, this detailed information is hidden).

Contributing to Science

In 2010, the Garden was formally designated as the holder of the National Collections of Cactaceae and Agavaceae. As such, we have an obligation to make available the data we hold on these collections. Currently, if a researcher wants to know something as simple as whether the Garden has specimens of a particular plant, they need to contact the Research Department directly. The new database will allow scientists anywhere in the world to quickly determine if the Garden holds plant material relevant to their research. They will also be able to see when the material came into the Garden, where and by whom it was collected, and the conservation status of the species. In addition to the link to SEINet, there will also be a link to Tropicos, Missouri Botanical Garden's database of botanical nomenclature.

Visitors to the Garden will also be able to take advantage of the new database. With a smart phone, access to the database is at hand. Type in the name of the plant from its label and the same information accessible from your home computer will come up on your phone. Over time, we will update content and functionality. For example, in the future, QR codes may be incorporated into plant labels so a simple scan will be all that is required to access plant information.

This IMLS supported database project represents a major jump forward for the Garden's plant data management and outreach capabilities. When we go live, we will join a handful of other gardens that have made their collections information accessible to the public, and we will be the first to do so in the Southwest.



WORKING WITH NATURE IN OUR DESERT CITY

by Dr. Joe McAuliffe, Director of Research

The *Center for Desert Living Trail (CDL Trail)* is a work in progress that links desert residents with their environment. Its purpose is to demonstrate efficient, useful, sustainable, and harmonious ways to work with nature in the Phoenix valley. As the local environment has changed, so too has the nature of the *CDL Trail*.

This spring, as you visit the recently reopened trail, which we expect to be flush with new growth and vibrant color, you may be surprised to see citrus and other fruit trees. You may wonder if this represents a departure from the Garden's mission of displaying desert plants. Since I am the one who originally suggested and pushed the idea of including citrus trees, I feel obligated to share the perspective behind the Garden's decision to plant them.

Reshaping the *CDL Trail* began with the work of a large committee of staff, volunteers, and trustees. As an ecologist, I think about the theme of sustainability a lot and I had the opportunity to share my views during the planning process. The first meeting quickly yielded a unifying theme: "Working with Nature." Those three words seemed like a simple formula to follow, but it soon became apparent that working with nature meant very different things to different people. Later in that meeting, as we discussed ways the exhibit could contribute to conservation and sustainability, I provided this provocative input:

"One of the most significant things any resident of the Phoenix valley can do to contribute to conservation and sustainability on a *global* scale is to *plant and care for a citrus tree on their home property.*"

I had not made this bold statement without having given it a lot of careful thought, so this is how I continued...

Arizona Citrus Production

Do you eat oranges, grapefruits, and other citrus fruits? Where do you get them? If you don't grow them yourself, you probably buy them at the nearest supermarket.

Where do those oranges come from? A decade or more ago, much of the citrus fruit available from early winter through late spring came from groves right here within the Phoenix metro area. Now, though, most citrus you buy bears labels indicating that the fruit comes from some other place—some not so distant, like California and Texas, but increasingly from places as far away as Peru and even Australia.

The first Arizona citrus groves were planted in the Phoenix area in 1889. After the creation of dependable irrigation supplies through the Salt River Project, citrus production mushroomed during the first half of the 1900s. Arizona became a major producer, and citrus became one of the five C's of the state's economy, along with cotton, cattle, copper, and climate.

That era abruptly ended within only the last decade, largely because of urban growth as the Valley's citrus groves were converted into housing, strip malls, and parking lots. Just two years ago, the Valley's last commercial citrus packing house closed in Mesa. At its peak, as recently as the mid-1990s, it annually packed over a million cartons of fruit, much of which was used locally. However, by 2009, the commercial production of oranges and grapefruit in Arizona had dropped to the point that the U.S. Department of Agriculture no longer included those two crops in its reporting of the state's total agricultural production. By 2010, there simply wasn't enough citrus produced in the valley to keep the last packing house in operation, so it closed.



A cluster of ripened fruit on my prized Kinnow mandarin orange tree in Tempe.



Widespread citrus groves south of Camelback Mountain. 1932 photo courtesy McCulloch Brothers photograph, Herb & Dorothe McLaughlin Collection, Arizona State University Libraries (top). Replaced by a growing city, 2004. Photo courtesy of City of Phoenix Parks & Recreation Dept. (bottom).



Citrus from the far side of the world – but at what environmental cost?

Buying Globally ...

The impact of urban growth on the Valley's commercial citrus production capacity has environmental consequences that are far-reaching, but little contemplated. The disappearing local supply of citrus led to an increasing dependence on fruit produced and shipped from other places. Every carton of oranges produced in the Central Valley of California requires burning diesel fuel to truck it here. Every mandarin orange from Australia requires burning of jet fuel to fly it to Phoenix. Therein lies one of the unforeseen, hidden costs of the loss of the Phoenix area's commercial

capacity to produce citrus – the use of large amounts of fossil fuel to import oranges and grapefruits grown in places far, far away.

Although such long-distance commerce may be good for business in the short run, it is environmental folly in the long. The environmental costs of this kind of commerce are not borne solely by us now: they will continue to impact our children and our children's children. Children of the future, not just here, but all around the world, will pay the eventual, full price of our needlessly large and wasteful carbon footprints. As a general rule regarding sustainability, the further away the source of a food item, the greater the overall detrimental environmental impact of importing that item. The Phoenix metropolitan area has become one of the larger, long-distance import societies on the face of the planet, now even relying on distant sources for the citrus fruit that once was readily produced here.

Recent Phoenix newspaper ad for California citrus. It is mistaken to believe that growing citrus for personal use in the Phoenix valley is a wasteful use of water and that production of the citrus you eat is better left to other places like California. Conservation of water is as big an environmental issue in citrus-producing areas of California as it is in Arizona.



... or Growing Locally?

Large-scale, commercial citrus production in the Phoenix valley has faded, but we can do far more than simply lament the loss of a former era. *We owe it to the rest of the world to do more for ourselves.* There is no reason why widespread, diffuse plantings of citrus trees in our own yards and gardens cannot supply a significant part of our needs. I grow grapefruits and mandarin oranges at my home and from December through May those trees produce more than enough to supply my family's needs during that season.

Although a citrus tree does require more water than a mesquite of similar size, the use of a bit of our precious water resources to grow some of the food we consume is a prudent and wise use of that water and of the Earth's resources in general. That is the view that the Desert Botanical Garden wishes to relate by including citrus trees in the *CDL Trail*. The Garden has the expertise to not only provide good advice regarding horticultural care, but to also share a vision of the difference one person can make by planting and using citrus from their own yard. If you frequently enjoy citrus fruit and you pick them from your own tree, you are taking meaningful, local action that helps meet the global need for environmental stewardship.

At the 1939 dedication of the Desert Botanical Garden, founder Gertrude Divine Webster stated that one of the Garden's purposes was to "conserve our Arizona desert flora – fast being destroyed." The culprit responsible for that destruction in the early 1900s was not urban growth, but rather irrigated agriculture, including widespread citrus groves. Ironically, the loss of those citrus groves due to urban growth now has environmental consequences every bit as serious as the original loss of wild desert habitat observed by Mrs. Webster. The Garden remains committed to conserving the native desert flora. In addition, our perspective regarding conservation must broaden to include the whole Earth and the global consequences of everything we do. With the updated *Center for Desert Living Trail*, we strive to teach by example.

Desert Discovery Trail

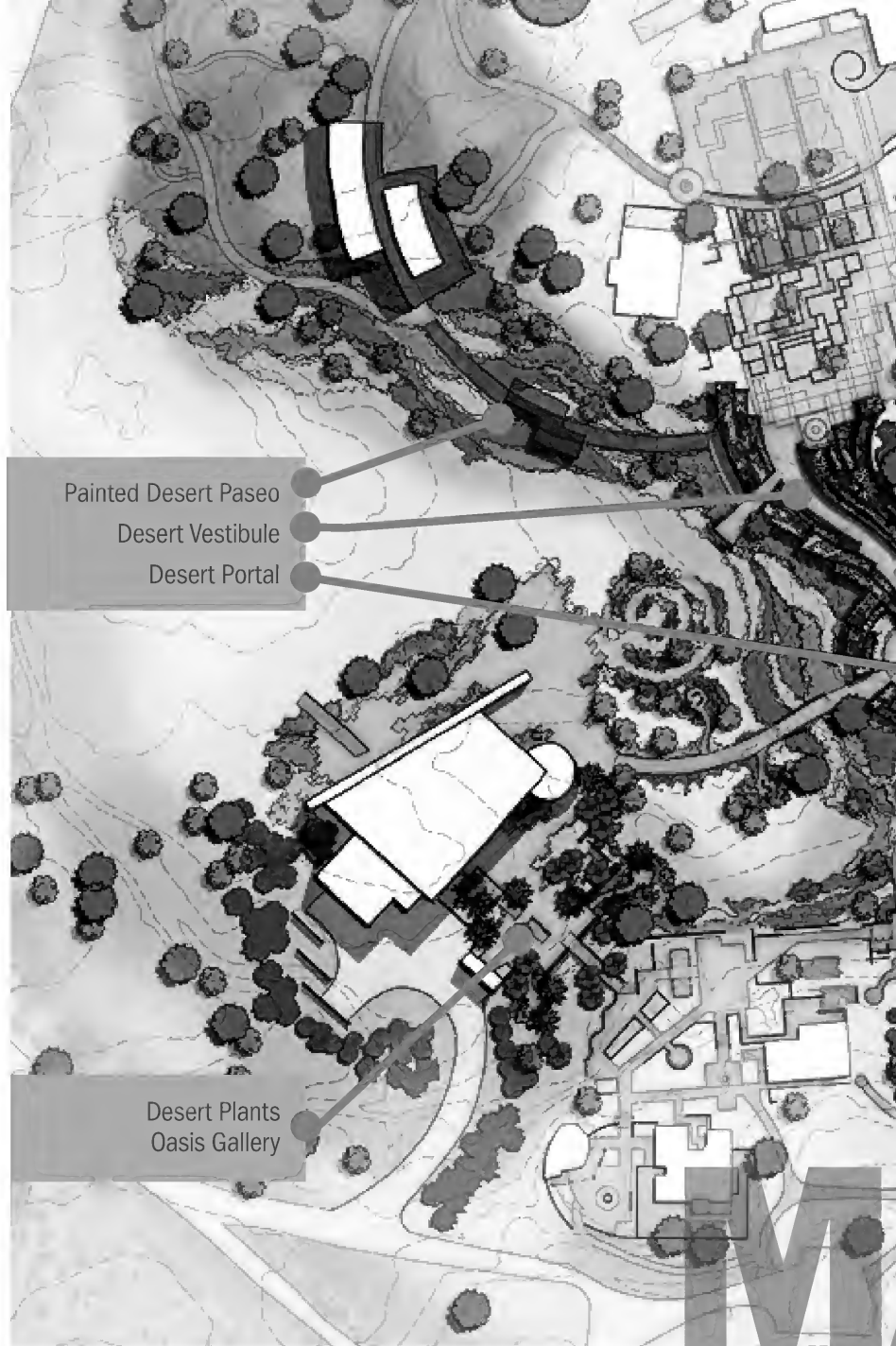
by Elaine McGinn, Director of Planning and Exhibits

As the Desert Botanical Garden completes its 2006- 2011 strategic plan, it continues to look forward to the next twenty years and what it will take to remain a relevant and vibrant resource for the conservation and display of desert plants. Focusing on the characteristics that distinguish us from other botanical gardens, we intend to capitalize on our unique desert environment to stimulate sustained interest in and curiosity about desert plants and their habitats.

In keeping with our innovative spirit and commitment to education and discovery, we are committed to planning for the future through strategic decisions, investment, and development of exhibits and programs. Our most recent endeavor to achieve these goals is the recently completed master plan for the *Desert Discovery Trail (DDT)*, the core trail of the Garden.

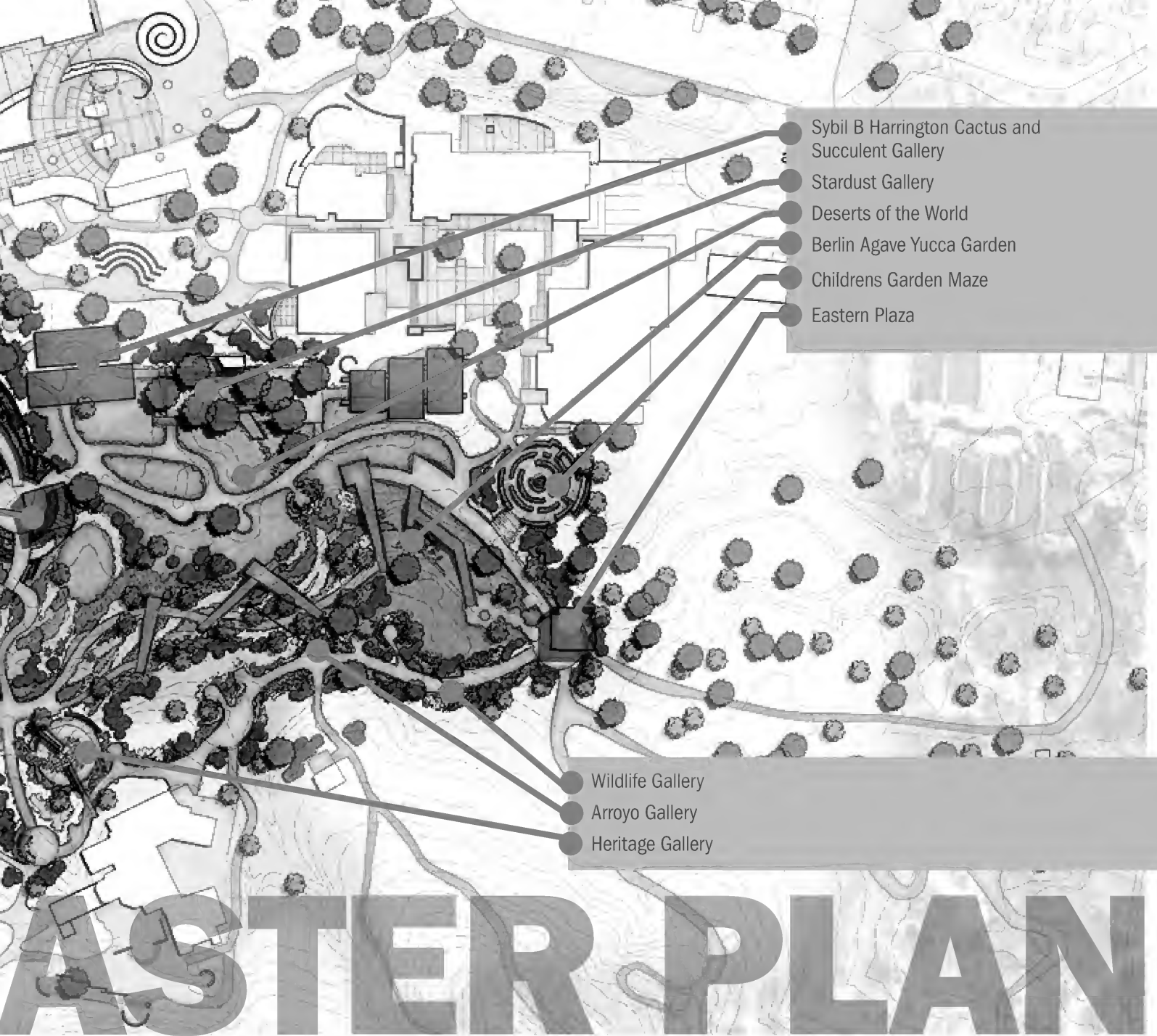
The master planning process began in earnest in October 2010, when we received an Organizational Enhancement Award from the Virginia G. Piper Charitable Trust as part of my Piper Fellowship. This award supported the strategic challenge of building compelling, innovative exhibits that broaden community connections to the Garden. It funded the timely hiring of a landscape designer to collaborate with our exhibit development team in evaluating and improving the design aesthetic of the *Desert Discovery Trail*.

Prior to receiving the award from Piper, a strategic planning task force, which included Garden staff, board, and volunteers, had been meeting to develop



the foundation for the master planning process. That task force established clear objectives for what we wanted to achieve with the *DDT* Master Plan, including an approach to master planning that would honor our past while establishing a high standard for our future. The overarching goal of the master plan was to develop an evolving outline for the *DDT*'s future. The team felt strongly that planning and design must respect the Desert Botanical Garden's existing atmosphere, cultural heritage, identity, and ecological health. Not only would we plan for the addition of new galleries along the core trail, but we would also increase learning opportunities, accentuate landscape features, and enhance circulation and visitor amenities.

In February of 2011, we hired studioOutside to collaborate with the Garden in developing the *DDT* Master Plan. The selection of studioOutside was based on their extensive expertise in public garden design, their holistic approach to gardens, programming and visitor



experience, their horticultural knowledge, and their inclusive and communication-based planning process. The lead designer, Tres Fromme, is recognized nationally for his work in public gardens including Longwood Gardens, Atlanta Botanical Garden, and the United States Botanical Garden.

With studioOutside at the table to further facilitate the planning process, the team participated in a series of design charrettes (intense, short-term workshops to generate creative ideas) to assess the current displays along the *DDT* and to identify, prioritize, and focus future exhibits and galleries into organized themes that supported the Desert Botanical Garden experience. Critical to the planning was careful analysis of visitor wayfinding, interpretation, vistas and view points, circulation, tribute gardens, and pull-offs for tours and destinations.

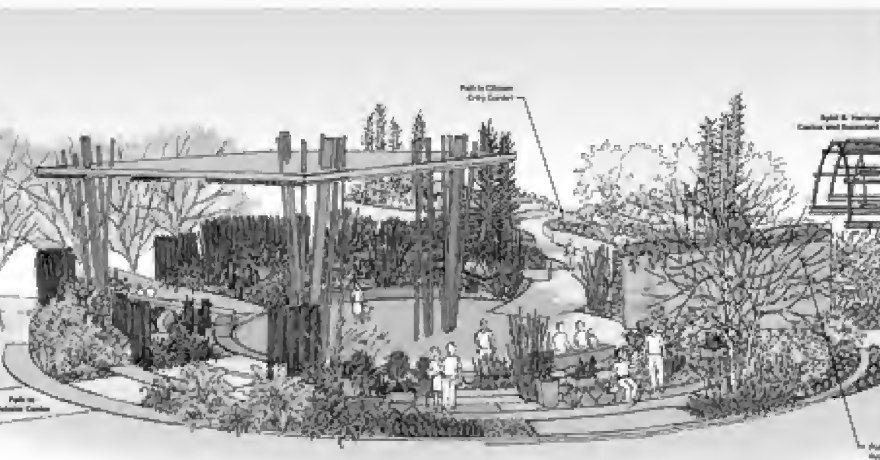
By July, the *DDT* Master Plan had begun to evolve into a dynamic framework that identified key areas for future planning and design. Each area builds upon the Garden's identity, message, and collections to showcase a full palette of desert plants from around the world in an engaging and aesthetic manner. Below are brief summaries of some of the key areas highlighted in the diagram above:

Desert Vestibule

This new gallery draws visitors from the Ottosen Entry Garden southward into the *Desert Discovery Trail*. The planting design is bold, in contrast with the relative lushness of Ottosen. The tiered planters have a canyon like effect that will be illuminated at night with an enchanting glow.



Plan view of Desert Vestibule and the Jan and Tom Lewis Desert Portal.



Concept rendering of the Jan and Tom Lewis Desert Portal.

Desert Portal (See sidebar page 11)

Deserts of the World

This area is an expansion and enhancement of the existing naturalistic plantings. Plantings add to the existing collections and emphasize the diversity and beauty of desert vegetation. Interpretive themes possibly include the story of the world's deserts, their conservation, and how people are able to live with and steward desert ecosystems.

Stardust Foundation Plaza

Enhancements to this Plaza located between the Sybil B. Harrington Cactus and Succulent Galleries have the potential to create a true visitor destination. The addition of canopy trees will provide the Plaza with welcome shade and improved visitor amenities will include a soothing water feature, improved lighting, Wi-Fi, and a sound system.

Eastern Plaza

This Plaza is a 40' diameter gathering space linking the DDT's northeastern and southeastern segments with the Berlin Agave Yucca Forest and the Plants and People of the Sonoran Desert Loop Trail. Visitor amenities include shaded seating provided by a trellis structure and drinking fountains and interpretation.

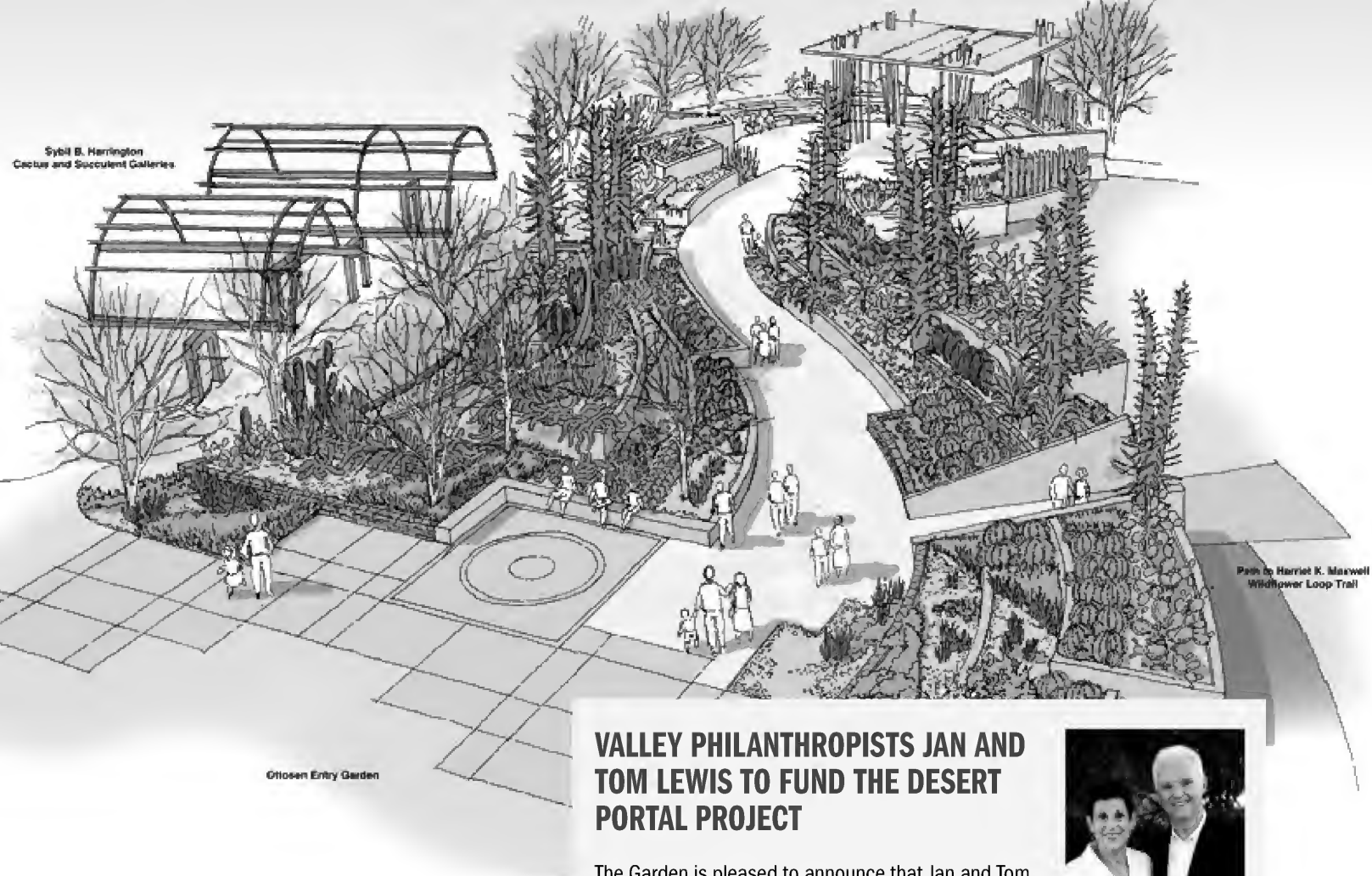
Heritage Gallery

The site of the collection's oldest plantings honors the vision and legacy of those who made the Desert Botanical Garden the world-renowned institution it is today. Three new features north of the Webster Center comprise this Gallery—the Founders Garden, the Stewards Wall, and the Cardón Plaza. This is an ideal place to share the story about the Garden's past, present, and future.

Painted Desert Paseo

The Paseo's primary purpose is linking the DDT with the Harriet K. Maxwell Wildflower Loop Trail. It will be the not-to-miss spring horticultural celebration, filled with wildflowers.

The DDT Master Plan is an evolving outline that has progressed from imagining possibilities to creating concepts that build upon, connect, and enhance existing elements into a holistic experience. The plan includes renovations to infrastructure, the addition of new plants and hardscape, improved lighting, shade, and drinking fountains, interpretation, and spaces for gatherings for tours and events. It takes into account previous planning initiatives and the relationship to future Garden expansion as expressed in the 20-Year Physical Master Plan, which was published in 2008. It also allows the Garden to evaluate sequencing of possible projects as part of its ongoing, strategic planning processes. It will take many years to complete the plan and realizing its completion will require flexibility and further planning.



VALLEY PHILANTHROPISTS JAN AND TOM LEWIS TO FUND THE DESERT PORTAL PROJECT



Concept rendering of the Desert Vestibule leading to the Jan and Tom Lewis Desert Portal.

The Garden is pleased to announce that Jan and Tom Lewis have committed a one million dollar lead gift to fund the Desert Portal project. This gift was conceived by Mr. Lewis as a surprise for his wife to honor and recognize her love, involvement in, and appreciation for the mission and the beauty of the Garden.

The cost for completing all areas in the *DDT* Master Plan is a little over \$10 million. For the Strategic Plan 2012–2017, the Board of Trustees has approved \$3.5 million for renovations to the *DDT*. I am delighted to share that the first project from the Master Plan to be implemented will be the Desert Portal; made possible by a generous donation from Jan and Tom Lewis.

The Desert Portal will be the central hub of the *Desert Discovery Trail (DDT)* and will be a key location for orienting people to the entire core trail experience. It will offer shaded seating beneath a dramatic trellis structure and a new gathering space for tours and intimate gatherings. As described in the master plan, “Tiered planters define the Desert Portal’s northwest and northeast quadrants, creating an amphitheater-like backdrop and directing views west to Papago Butte, southeast into the arroyo, and to the Garden Butte. Plantings focus on the stunning range of desert plants from around the world and illuminate their most striking aesthetic characteristics.”

The outcome of the *DDT* master planning process met our goals and expectations by emphasizing the trail’s role as the core of the Garden visitor’s experience. Thank you to The Virginia G. Piper Charitable Trust, studioOutside and all the stakeholders who have participated in this exciting and creative group process. Your expertise, perspectives, and ideas generated a compelling vision for a future that celebrates the Desert Botanical Garden’s legacy of outstanding exhibition, education, research, and conservation.

Some of the planters will contain permanent plantings representative of the Garden’s collections, while others will feature rotating displays of rare and endangered species or seasonal displays of color. Interpretative signs will orient visitors to the *DDT* and prepare them to optimize their time in the Garden. **Design development for the Jan and Tom Lewis Desert Portal will be ongoing through 2012, and construction will begin in the summer of 2014.**

Mrs. Lewis has been a very active Garden Board Member (2004–2011). In addition to participating on the Strategic Planning Committee and Children’s and Family Garden Task Force, she has held numerous leadership positions for the Executive, Patrons Circle, Chihuly Desert Towers, and Tending the Garden Campaign committees, among other commitments. Mr. Lewis is the Owner and CEO of T.W. Lewis Company, a long-time local homebuilding firm known for its quality and customer service. Through the T.W. Lewis Foundation, Jan and Tom have provided more than 100 college scholarships to local students and support a wide variety of organizations that improve the quality of life in the Valley.



TOP

Garden renovation projects for 2012

by Brian Kissinger, Director of Horticulture and Kenny Zelov, Assistant Director of Horticulture



As we begin implementing the concept of *perpetual renewal* at the Garden, we have identified ten key areas as highly noticed, well-traveled locations within the Garden that are in need of attention and renovation.

1. APS Agave Spiral

In an effort to create a safety barrier and restrict access to the Chihuly *Desert Towers*, we have installed a perimeter bed at ground level that encircles the spiral with a lower level of desert plantings, along with landscape lighting and steel edging.

2. Desert Discovery and Wildflower Trails

We are continuing the upgrade of permanent steel fencing to replace the chicken wire that protects plants from wildlife along the *Harriet K. Maxwell Desert Wildflower Trail* and areas within the *Desert Discovery Trail*.





3. Seasonal display beds
Beginning at Admissions and continuing into *Ottosen Entry Garden*, we are replacing existing ornamental grasses with colorful seasonal displays in contrast to the surrounding landscape.



4. Boppart Courtyard
We are adding shade trees, accents, and multiple understory plantings.



5. Schilling Entry Arbor
We are replacing the decomposed granite around the fountain with lovely permanent cobble stones.

6. Wheelchair Storage
We are creating additional fencing and a covered area to house the strollers, wheelchairs, and scooters in an area that is accessible but not visibly prominent.

7. Elliot Patio
We will take advantage of the nearly frost-free positioning of this area in the Garden for a highly detailed planting display. As many of the older plantings in the bed fade, we will rejuvenate this historic showcase.

8. Echinopsis Bed
We are replacing the soil and rearranging the plantings in the bed to enhance the health and overall look of this amazing cactus genus. Boulders and top dressing will also be added.



9. Miscellaneous Projects
We are enhancing the agave beds with additional boulders and the relocation of trash barrels from prominent visual locations to less conspicuous areas. We are planting additional trees in an effort to reduce the amount of shade cloth required during summer months.

10. Center for Desert Living Trail
We will continue with the installation of an edible garden, patio area, electrical work, and the addition of interpretive signs.





Butterfly COLOURATION studies

by Ronald L. Rutowski and Kimberly V. Pegram
School of Life Sciences, Arizona State University, Tempe, AZ

Natural history destinations such as the Desert Botanical Garden are rich in potential as venues for scientific research. The protected and patrolled landscapes and enclosures, and the plants and animals they contain, present opportunities for research projects that often are not possible in field situations where individual animals can be very difficult to follow, and expensive equipment may be at risk. With these thoughts in mind, we approached the Desert Botanical Garden in the spring of 2010 about the possibility of doing research on the grounds and in the *Maxine and Jonathan Marshall Butterfly Pavilion*. We were thrilled with the very positive reception that our proposal and subsequent activities have received and welcome this opportunity to share some of what we have discovered in our work at the Garden.

Our field and laboratory research at Arizona State University has for some years focused on the pipevine swallowtail butterfly, a strikingly-colored and conspicuous inhabitant of the Sonoran Desert that is a regular visitor to the Garden. The coloration of this butterfly has two key elements. First, orange spots in a field of brilliant, iridescent blue adorn the lower hindwing surfaces of both males and females, and second, the upper hindwing surfaces have a bright iridescent blue reflection, but in males only. By definition, iridescence means the blue on both wing surfaces is directional, that is, only visible to viewers from specific positions relative to the wing surface. In our lab, we are especially interested in how the directionality of the blue coloration on these wing surfaces factors into their use and perception as signals for others.

Color and courtship in butterflies

We worked on these issues during the summers of 2010 and 2011, using the Marshall Pavilion when it is closed as an exhibit. Specifically, we explored what roles the iridescent blue areas play among pipevine swallowtails. Because only males have the iridescent blue on the upper hindwing surface (Fig. 1), a key potential explanation is that this blue is a sexual signal. We tested this possibility in two contexts, sexual recognition by males and mate choice by females. In the first case, we maintained a population of 10 to 15 male pipevine swallowtails in the Marshall Pavilion and then presented them with models made from both male and female butterflies to see if they treated them differently (Fig. 2).

As we expected, the males were much more interested in the female models than in the male models, but this appeared to be because females produce a chemical signal that males do not and not because of the sexual differences in the coloration of their upper hindwing surfaces. These results surprised us; in other species of butterflies, males do distinguish females from males using sexual differences in color.

Our second experiment focused on the question of whether females pay attention to male upper hindwing coloration when choosing a mate. We began by placing eight males in the butterfly exhibit, four of which had the iridescent blue on their upper hindwing surfaces obliterated with a black marking pen; on the other four the coloration had not been changed. We then placed three virgin females in the exhibit, each of which had a uniquely colored fluorescent powder applied to the end of her abdomen (Fig. 3).



Fig. 1 Only males have the iridescent blue on the upper hindwing surface.



Fig. 2 A male rapidly approaching (foreground) a model butterfly pinned to a plant in the Marshall Pavilion (background).



Fig. 3 Female with colored fluorescent powder applied to the end of abdomen.



Fig. 4 A mating pair of pipevine swallowtails. The warning color of the ventral hindwing surface is clearly seen in both the male and the female.

After 24 hours, we captured all eight males and three females and inspected the end of each male's abdomen to look for fluorescent powder. When butterflies mate, they join the ends of their abdomens together for more than an hour (Fig. 4) which, in this case, provided an opportunity for transfer of the fluorescent powder from female to male. In each run of the experiment, only three males had mated, each with a different female. By running this experiment eight times, with new animals each time, we found that females were much more likely to mate with males whose iridescent blue on the upper wing surfaces had not been changed. In other words, females appear to choose their mates on the basis of their upper hindwing coloration.



Fig. 5 Motion activated camera trained on one of the models.

We are excited about this result for at least two reasons. First, this is one of only three or four other studies testing whether female butterflies do prefer brightly colored males, as Charles Darwin first suggested about 140 years ago. Such studies are difficult to do outside of enclosures such as the Marshall Pavilion at the Garden. Second, this information will provide critical guidance for our future studies on iridescent coloration and courtship behavior in this butterfly.

Butterfly Coloration and Predators

In other studies throughout the grounds of the Garden, we examined the role of hindwing interactions between pipevine swallowtails and their predators. The pipevine swallowtail is terribly distasteful to predators, such as insectivorous (insect-eating) birds. Work by others has clearly shown that this butterfly advertises its distastefulness using the bright coloration of the lower surfaces of the hindwings; in other words, it displays a warning coloration. However, the question remained: Which specific color features of the lower hindwing surfaces effectively deter predators from attacking pipevine swallowtails? We proposed that both the orange spots and iridescent patch (Fig. 4) could be warning signals, because they are bright against the otherwise black background coloration of the lower hindwing surfaces. But, we also wondered if the iridescent directionality of the blue makes it less effective as a warning signal.

To test these ideas, we placed butterfly models out in the nonpublic areas of the Garden, such as near the pumpkin patch and south of the *Center for Desert Living Trail*, in the springs of 2010 and 2011. For each run of the experiment, 25 models were placed out (Fig. 3) for 72 hours and each one checked three times a day to see if it had been attacked. Among the 25 models there were five different model types, each with a different upper hindwing color pattern: 1) orange and iridescent blue (just as they are in nature), 2) just the orange spots, 3) just the iridescent patch, 4) no color (all black), and 5) orange spots with a non-iridescent (matte) blue. Over two years, there were fourteen runs of the experiment for a total of 350 models, 70 of each model type.

In all, 40% of the models were attacked. We were able to see what was attacking the butterflies by using video and motion activated cameras trained on some of the models (Fig. 5). Birds were the culprits; in the eleven recorded attacks, all were by insectivorous birds such as the cactus wren, the curve-billed thrasher, the Abert's towhee, the northern mockingbird, and the brown-crested flycatcher. Getting such data would not have been possible in an unprotected area where cameras are likely to be stolen.

Some model types were attacked more than others. The black ones were attacked most often because they did not have the warning colors. The other four model types were all attacked about the same number of times. This tells us that orange and iridescent blue are both effective warning colors and that it did not matter to the birds if the blue was iridescent, just that it is blue. In parallel with these studies on the warning coloration at the Garden, we have been doing laboratory experiments with curve-billed thrashers. These have also shown that iridescent blue can function as a warning signal.

In closing, the access to the Garden, both on the grounds and in the Marshall Pavilion, has greatly expanded the kinds of experiments and observations we can do. We have learned a great deal and have reported the results at national and international meetings and seminars. Ultimately, we plan that the results will appear in the scientific literature. Additionally, we are very excited about what we will learn in the future. Thanks again to the Garden for making this possible!

Acknowledgements

We are very grateful to all the staff and volunteers at the Garden who have helped us. We especially want to thank Joe McAuliffe, Elaine McGinn, and Sue Lanker. We also owe a special thanks to the rangers for allowing us access to Garden grounds and keeping our equipment safe.



Pipevine swallowtail on a bromeliad, genus *Guzmania*, in the seasonal butterfly exhibit.



Spring Butterfly Exhibit Celebrates Its 10th Anniversary

The *Maxine & Jonathan Marshall Butterfly Pavilion*, which first opened in 2002, is a screened structure of slightly less than 3,000 square feet. It began as a seasonal exhibit featuring North American butterflies and several species of moths, including both mature butterflies and chrysalises. Currently, we receive only mature butterflies.

During the typical eight- to nine-week exhibit, almost 8,500 butterflies are released into the Marshall Pavilion after arriving from butterfly farms in Florida. We receive approximately sixteen species of butterflies each season, along with several species of moths. Some of our repeat visitors have wondered why we don't have all of the various types at the same time. To answer, it depends on when they are available. The malachite, for example, is obtainable only at the time of its maturation, in the late spring. Others, such as the Julias and the painted ladies, mature and are available during the entire season.

A typical run of the exhibit may see more than 80,000 visitors, with many guests coming every week. Some people come just to relax and recharge, but the butterfly exhibit has also been the site of several marriage proposals—it's no wonder, the Marshall Pavilion is always gorgeous with its profusion of blooming plants and lushly arrayed flowers. Enjoy visiting this year's 10th anniversary exhibit.

March 3 - May 13 / 9:30 a.m. - 5 p.m. / Daily
Members: Free / General Admission: \$3.50
Children under three free with paid Garden admission.

Sponsored by the Fred Maytag Family Foundation



by Tina Wilson, Director of Education and Shawn McCrohan, SDA Field Trip Coordinator

What do First Lady Michelle Obama and the Desert Botanical Garden have in common? They both support giving parents helpful information on diet and exercise while fostering environments that support healthy choice.

First Lady Michelle Obama has launched an initiative called *Let's Move!*—a comprehensive initiative dedicated to solving the problem of obesity within a generation. Combining comprehensive strategies with common sense, *Let's Move!* is about putting children on the path to a healthy future during their earliest months and years. The Desert Botanical Garden has joined the *Let's Move!* initiative as a member of the American Public Gardens Association. Because of their impressive reach and great potential for impact, museums and gardens are invited to launch community efforts to fight childhood obesity using interactive exhibits, outdoor spaces, and programs that encourage families to eat healthy foods and increase physical activity.

Watch Us Move!

The Desert Botanical Garden has set two goals to help meet the *Let's Move!* initiative. First, we are promoting physical fitness and nutrition awareness

within our school field trip program to more than 20,000 students and educators through the *Watch Us Move! Challenge*. Along with their Garden Educator, students are using pedometers to calculate the distance they have walked during their two-hour visit. Mileage is regularly added to a growing agave stalk found on our website. We hope to reach 45,000 miles by the end of the school year!

The second goal involves collaborating with Fabulous Food Fine Catering and Events, the Garden's food service provider, by offering healthy food choices for children and young people. The Garden and Butterfly Cafés now have *Let's Move!* menu selections that include whole grain and organic ingredients, as well as fruit and vegetable snack options.

Preparing Garden Educators for the *Watch Us Move! Challenge* was an important component of meeting this initiative. The Garden worked with Phoenix-based personal trainers Kimberly Elliot and Andrew Hangartner from Alpha Elite Training to educate staff and volunteers about exercise and nutrition. Part of the training included a “boot camp” that led Garden Educators through a series of exercises including dynamic stretching for warm up, cardiovascular exercise, core strength building, and static stretching.

To make field trips even more exciting, Kimberly and Andrew found ways to tie in *David Rogers' Big Bugs* exhibit with *Let's Move!* by having Garden Educators and students mimic the ways that these bugs move in nature. Praying mantises are



BIG STATISTICS

18% of Arizona children ages 10-17 are obese. **This rose by 46% between 2003 and 2007**, which is the biggest increase of all the states.

The average elementary student spends only **24 to 28 minutes** per day at recess.

8 - 18 year olds spend an average of **7.5 hours a day using entertainment media**, including, TV, computers, video games, cell phones, and movies.

The average American now consumes **fifteen more pounds of sugar** a year than in 1970.

More than 23 million Americans, including **6.5 million children, live in low-income** urban and rural neighborhoods that are **more than a mile away from a supermarket**. These communities, where access to affordable, quality, and nutritious foods is limited, are known as **“food deserts.”**

Many Phoenix area restaurants are embracing the **“Farm to Table” philosophy**, which supports local **sustainable food sources** for communities, increasing awareness of where food comes from.

The number of calories burned while **gardening is approximately 272 per hour** for a 150 pound person.

Walking each trail in the Garden equals **1.25 miles**.

known for their fast predatory reflexes — a perfect opportunity for jumping jacks. Dragonflies and damselflies use their wings to fly; students practice arm lifts, which demonstrate the amount of energy and strength needed for this movement.

“Ever seen an overweight bug? NO, THEY MOVE!”

Garden Educator Mary Ann Dillon said, *“I think this is where we can really make a difference in the future health of our children and country.”*

Let's Move! is a natural fit for the Sonoran Desert Adventure Field Trip Program because each tour is based on a two-hour walk around the Garden. The average tour travels about 1.5 to 2 miles, with stops along the way to investigate and explore plant science. It's also a great way to help teachers meet some of their objectives for physical fitness standards as part of



their schools' curriculums. Visit our *Let's Move!* webpage to see the various exercises students are doing. Find it at dbg.org/education-programs/lets-move.

In addition to working with students and teachers, the Education Department is offering a *Let's Move!* class for children and parents that promotes vegetable gardening, cooking, and outdoor physical activity. The new *Cacti Nature Quest* and *Desert Detective Bingo* sheets are excellent self-guided activities for families too, as they combine movement with learning. The activity sheets are available at Admissions. Throughout the spring, look for the *Let's Move!* logo to identify programs and activities for you and your family.

garden news

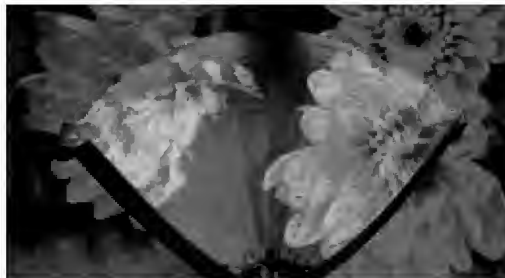
The Ambassador's Council

The Garden's Board of Trustees is pleased to announce the creation of The Ambassador's Council.

Guided by current Trustee and former Board President Oonagh Boppart, the Council was established in October 2011 to honor and recognize significant individual commitments, service to the Board, and ongoing contributions to the Garden.

Executive Director Ken Schutz and Board President Kate Baker have hosted two programs for the Council this season to provide briefings about the Board's strategic planning work, highlights of upcoming programs, and a tour of the improved horticulture greenhouses that are home to important plant specimens, including rare and endangered plants.

Membership in the Council is by Board invitation and will continue to grow in the coming years. The definition of "ambassador" is a high ranking diplomat who represents a nation, or an institution, to advance its goals. The name "Ambassador's Council" was chosen for the new group in recognition of its members' demonstrated leadership in their support of the Garden over a period of years and continued representation of the institution in a positive way throughout the community.



An Inspired Collaboration: Dance in the Desert

The Garden will continue exploring the intersection of art and nature in May, via a major collaboration with Ballet Arizona. The idea behind Dance in the Desert was inspired by long-time Garden supporter Carol Schilling. Because of her leadership role on the Ballet Arizona Board, and her enthusiasm and knowledge about dance, Executive Director Ken



Schutz sought her advice two years ago about moving forward with the Garden's presentation of MOMIX's *Botanica*. Mrs. Schilling enthusiastically encouraged the project, and suggested that the Garden should also consider partnering with Ballet Arizona's visionary artistic director, Ib Andersen. She brought the two organizations together and from these conversations came the striking concept for an original ballet presentation in the Garden's dramatic Papago Park setting.

The Garden is pleased to announce that its collaboration with Ballet Arizona has resulted in *Topia*, a world premiere production by Ib Andersen. *Topia*, roughly translated as "Landscape," will challenge each audience member to see world-class ballet and a world-class garden in a new light. With its revolutionary, 80-foot-wide performance space positioned within the dramatic backdrop of the Desert Botanical Garden, *Topia* will present a unique perspective of dance amid the natural beauty of Arizona. Inspired by the landscaping techniques of ancient cultures, Mr. Andersen's vision will move all to contemplate the vastness of the desert of life, and the struggle to express those contemplations in a singular space. Dance and art unfold together to reveal the complex beauty of the desert.

Performance dates: May 2-5, 9-13*, 16-19, 23-26

Doors open at 6 p.m. Food and beverages will be available until 7:25 p.m. Performance begins promptly at 7:30 p.m. There is no intermission. Guests can purchase food from Fabulous Food Fine Catering & Events. A cash bar will be available, as well as wine by the bottle for purchase.

Reserved tables of four

\$45 (per seat) / Garden Members & Ballet Subscribers
\$50 (per seat) / General Public

General seating

\$35 (per seat) / Garden Members & Ballet Subscribers
\$39 (per seat) / General Public

BALLET
ARIZONA



* The May 13 performance is dedicated to Mother's Day. Visit dbg.org for further event details. Tickets can be purchased at the Ballet Arizona box office at 602 381.1096 or through ticketmaster.com. Service fees apply.

Self-Guided Activities for Families

Desert Detectives Bingo and Cacti Quest

This year the Education Department added more layers to the way that families can experience the Garden on their own. Families with younger children (ages 3-8) can complete a *Desert Detectives Bingo* sheet while wandering the Garden. The two versions, *Plant Adaptations* and *Animal Signs*, are printed in both English and Spanish and can be completed anywhere in the Garden.



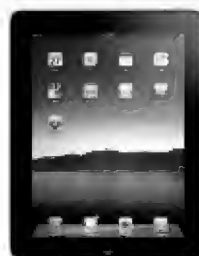
Also, starting this fall we introduced an experience for older children (ages 8+): The *Cacti Quest*. The *Cacti Quest* is like a scavenger hunt and involves interpreting lyrical, imaginative clues and reading a simple map to find specific destinations. Many organizations throughout Arizona are joining the Nature Quest community. Nature Quests are a fun, interactive way to get kids outside. Read more about Nature Quests in Arizona by visiting www.naturequestaz.org. *Cacti Quest* is sponsored by Emerson Network Power.

Both self-guided activities are free with Admission to the Garden and can turn a 45-minute visit into a 45-minute adventure!

Free Wi-Fi at the Garden

The next time you come to the Garden, you will be visiting the Valley's latest hotspot. Wi-Fi hotspot that is! Partially funded by a generous grant from the Arizona Community Foundation, the Garden installed a new Wi-Fi system that will allow visitors to access the system at no charge from six Wi-Fi hotspots located around the Garden. The locations, chosen because they are natural gathering places, include the area in front of Admissions, *Ottosen Entry Garden*, *Ullman Terrace*, the *Center for Desert Living Trail*, *Boppart Courtyard* and the location of the bi-annual plant sales.

The Wi-Fi system has been added to the Garden's indoor facility rental spaces as well. Now, at any meeting, conference, or other event in Dorrance Hall, Webster Auditorium, Whiteman Conference Room, or the education classrooms, you can connect to Wi-Fi.



dinner on the desert 2012

**Kathy and Chuck Munson, Co-Chairs
Saturday / April 28, 2012**

The 26th Annual Dinner on the Desert fuses the sights, sounds, and flavors of the Americas.

This electric yet sophisticated evening begins at *Ottosen Entry Garden* with a signature cocktail, gracious welcomes, and lively music. The setting sun invites guests to take in the grandeur of the Garden as they make their way to the silent auction in Dorrance Hall to bid on plants, pots, garden art, and exceptional experiences while sampling an array of innovative hors d'oeuvres. The evening continues in the magical setting of the *Stardust Foundation Plaza* with a bold and fresh Latin-inspired dinner catered by Copper Square Kitchen/Hyatt Regency Phoenix. Dance your way back to *Ottosen Entry Garden* for decadent desserts and live entertainment under the stars. Dinner on the Desert proceeds support the Garden's research, conservation, exhibition, and environmental education programs, nurturing respect and appreciation for our unique Sonoran Desert home.

Tickets start at \$500. Reservations are limited. Please call Esther Battock at 480.481.8182 for more information and reservations.

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Page 2 Ottosen Entry Garden - Adam Rodriguez
Page 3 California poppies, *Eschscholtzia californica* ssp. *californica*, firecracker penstemon, *Penstemon eatonii* and Thompson's yucca, *Yucca thompsoniana* - Adam Rodriguez
Page 4 Saguaro (b), Cardón (f) - Adam Rodriguez
Page 6 Kinnow mandarin oranges - Joe McAuliffe
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Pages 8-11 *Desert Discovery Trail* Master Plan - studioOutside
Page 12 *Berlin Agave Yucca Forest* - Adam Rodriguez
Page 12 APS Agave Spiral 1) - Renee Immel. plant protection fencing 2) - Kenny Zelov
Page 13 Ottosen Entry Garden 3), Boppart Courtyard 4), Schilling Entry Arbor 5), *Center for Desert Living Trail* 10) - Adam Rodriguez; Seasonal Display 3), Wheelchair storage 6), *Echinopsis* bed 8), Agave bed 9) - Kenny Zelov; Elliot Patio 7) - Leland Gebhardt Photography

Page 14 Pipevine swallowtail - Adam Rodriguez
Page 15-16 Figures 1 through 5 - Dr. Ronald Rutowski
Page 17 Pipevine swallowtail on a bromeliad - Adam Rodriguez
Page 17 Julia butterfly - Adam Rodriguez
Page 18 Let's Move at the Garden - Shawn McCrohan
Page 19 Students on field trip- top, physical fitness trainers- bottom- Shawn McCrohan
Page 19 Students doing push-ups- middle - Wayne Will
Back cover Plant Sale - Adam Rodriguez

in appreciation

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*Those whose gifts have been realized.

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The Desert Botanical Garden Mission

The Garden's commitment to the community is to advance excellence in education, research, exhibition, and conservation of desert plants of the world with emphasis on the Southwestern United States. We will ensure that the Garden is always a compelling attraction that brings to life the many wonders of the desert.



SPRING PLANT SALE

sponsored by *THE ARIZONA REPUBLIC*

Garden Members' Preview Friday / March 16 / 7 a.m. - 5 p.m.

Open to the Public Saturday / March 17 / 7 a.m. - 5 p.m. **AND**
Sunday / March 18 / 9 a.m. - 5 p.m.

No admission charge to enter the plant sale.

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SONORAN QUARTERLY

FOR MEMBERS AND FRIENDS OF THE DESERT BOTANICAL GARDEN

PHOENIX, ARIZONA JUNE 2012, VOLUME 66, NO. 2



Desert Journal



Garden Advisory: Construction Ahead!



The Garden will be humming with activity this summer.

Summer, usually a time of quiet dormancy at the Garden, will be very different this year.

We will continue to be open every day (except the Fourth of July) from 7 a.m. to 8 p.m. and our members and visitors will still be able to enjoy all the trails and plants. But instead of being a quiet place patiently waiting out the summer heat, the Garden will be humming with activity as we undertake three critically needed capital improvement projects.

The first is an expansion of our parking area to include 240 additional spaces. An innovative design will make these new spaces both attractive and environmentally sensitive. Their creation will alleviate the need to turn visitors away during the busiest times of the year such as the spring wildflower season, plant sales, and *Luminaria* events.

The second is the creation of a new sit-down restaurant adjacent to the Ottosen Entry Garden. Our new restaurant will serve breakfast, lunch, and dinner with a combination of “grab and go” food and/or sit-down service whenever the Garden is open. A full service restaurant has been sorely needed at the Garden for many years and we are delighted to be adding this amenity for all of our members and guests.

The third is the expansion of the Nina Mason Pulliam Desert Research and Horticulture Center to create a new plant DNA laboratory and four additional office spaces for Garden researchers, visiting scholars and graduate students. This expansion will also incorporate a rainwater harvesting system and other green technologies, allowing the Garden to model best practices in sustainable construction.

In addition to these three infrastructure projects, we will also install Phase II of the *Center for Desert Living Trail*, featuring exciting new demonstration gardens, a patio garden, new signage, and a new irrigation system.

All of these projects will begin in early June and be completed in time for the busy fall and winter seasons. On behalf of all of our staff members, I promise we will do everything we can to make your visits during the summer as pleasant as always, and to strive to minimize the effects of the building process.

Ken Schutz,
The Dr. William Huizingh
Executive Director

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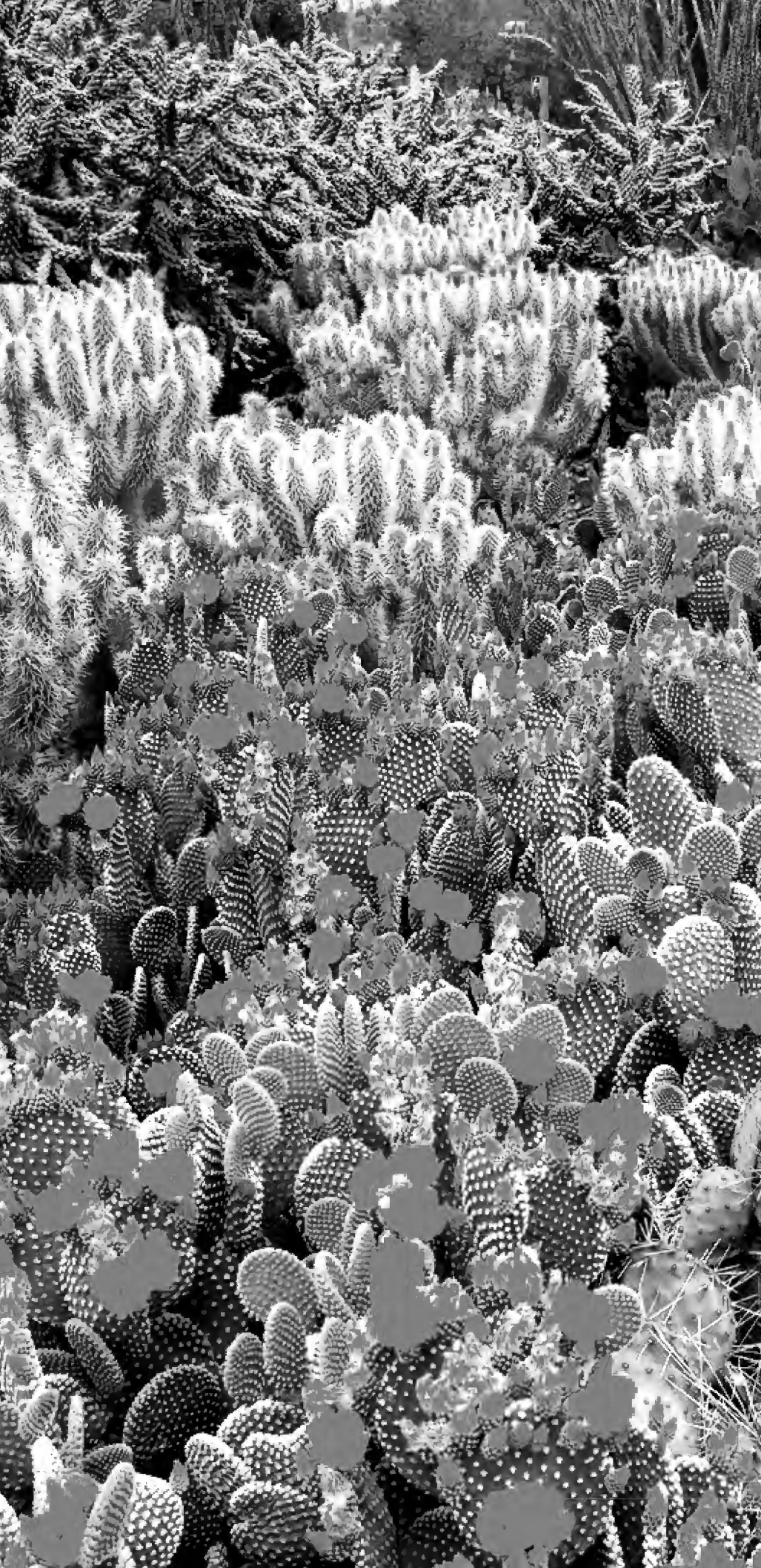
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On our Cover

Hedgehog or claret-cup cactus, *Echinocereus triglochidiatus*, is a native perennial succulent. Colors can range from scarlet to orange-red, and yellow at center. It flowers from March to June depending on location and variety, and can remain open day and night for two to three days.

Back Cover

Flashlight Tours
Thursdays and Saturdays
May 26 – September 1 / 7 p.m.

CORRECTION

On page 7 of the December 2011 issue it is stated that Liscum Diven passed away in May 2001. The correct year is 2011. We regret this error.



Rare Plants as Treasures and Challenges

by Wendy Hodgson, M.S., Curator of the Herbarium, Research Botanist
Shannon Fehlberg, Ph.D., Dorrance Family Foundation Conservation Biologist
Kimberlie McCue, Ph.D., Program Director, Conservation of Threatened Species and Habitats

Arizona is beauty in all shapes, sizes, forms, and colors. Within her borders are more national parks, monuments, and other public lands than in any other state, reflecting great biological, geological, and cultural diversity. The interplay of all these factors has resulted in one of the state's most extraordinary forms of beauty, its flora.

With more than 4,000 plant species occurring in the state, Arizona is outranked only by California, Texas, and Florida for overall plant diversity. With Nevada, it shares the distinction of having the greatest number of rare plants in the American Southwest (not including California). However, high numbers of rare plants also mean high numbers of threatened plants. In Arizona alone, seventeen plant species are listed as threatened or endangered under the Endangered Species Act. Overall, in the Southwest north of Mexico there are approximately 700 rare plant species considered to be imperiled or critically imperiled, representing 10% of the region's flora. It is no wonder then that studying and conserving rare plants and their habitats has been a focus of the Garden for many decades; indeed, the Garden identified research and conservation of rare plants as an important part of its mission when it was founded in 1939.

What is a Rare Plant?

A question we are frequently asked is, "How do you define "rare" when it comes to plants?" Most simply, a rare plant is a species with low numbers, few populations, a limited geographic range, or some combination of these three factors (Arizona Rare Plant Committee, 2001). Considering that no single definition can adequately take in the many types of rarity, botanists' recurrent challenge is to determine which species are truly rare.

Another commonly asked question is, "What causes a plant species to be rare?" This is particularly important when it comes to conservation, because knowing why a species is rare may lead to a better understanding of how best to protect it. Some species are rare "by nature," that is there is something inherent in the evolutionary history, habitat requirements, or other biological factors that cause it to be rare. There are many more species that are rare today, however, because of human influences such as development and land management policies and uses.

Are there plants inherently rare for which no protection of populations or habitat will be needed to ensure the species' survival in perpetuity? Yes, there are. The trick for scientists is to determine which species fall into this category and which species are rare but can be helped by mitigating the pressures that could cause their extinction.

Understanding Rare Plants

Working with rare plants is like being a detective. Just the process of finding them in the wild is a challenge because, well, they're rare! The work of finding, identifying, and studying them is worth the effort, though. Many of these plants present incredibly beautiful blooms, or have strange, unusual forms, are exquisitely tiny, may have important connections with native peoples, and are part of the complex intricacies of ecosystems of which scientists still have little knowledge.

The Garden's herbarium currently holds more than 70,000 specimens and is consulted regularly by Garden researchers and other scientists interested in rare, native Southwestern plants.

The place to begin when one sets out to find rare plants is usually an herbarium (a collection of dried plant specimens systematically arranged for reference). Herbarium collections serve as the primary basis for identifying known species, describing newly discovered species (many of which are determined to be rare), gathering location information and tracking trends in plant populations over decades or even centuries. The Garden's herbarium currently holds more than 70,000 specimens and is consulted regularly by Garden researchers and other scientists interested in rare, native Southwestern plants (see March 2010 and March 2007, *The Sonoran Quarterly*).

**Arizona Hedgehog Cactus,
Echinocereus arizonicus subsp.
arizonicus.**

Cacti are an iconic feature of the Sonoran Desert region. However, many cactus species are severely threatened by illegal collection, mining, urban development, and agriculture. In fact, the first five plants to be listed as endangered in Arizona under the federal Endangered Species Act were cacti, including the Arizona hedgehog cactus.

The Arizona hedgehog cactus is a beautiful dark green, multi-stemmed plant that produces brilliant red flowers from late April to mid-May, making it attractive to collectors. The plant is found in only one highly localized area in central Arizona.

With support from the U.S. Fish and Wildlife Service (USFWS), the Garden's Research Department has initiated a project that will study the underlying genetic diversity of this species. Currently, nothing is known about the genetic makeup of Arizona hedgehog cactus populations. The data produced from this project will assist in defining population boundaries and will help identify populations with the greatest evolutionary potential, greatest extinction risk, and highest conservation priority. This information will be fundamental to implementing the USFWS Priority 1 Recovery Task of propagating stock for introduction into the commercial horticulture trade in order to relieve collecting pressures from wild populations.



*Arizona Hedgehog Cactus,
Echinocereus arizonicus subsp.
*arizonicus**

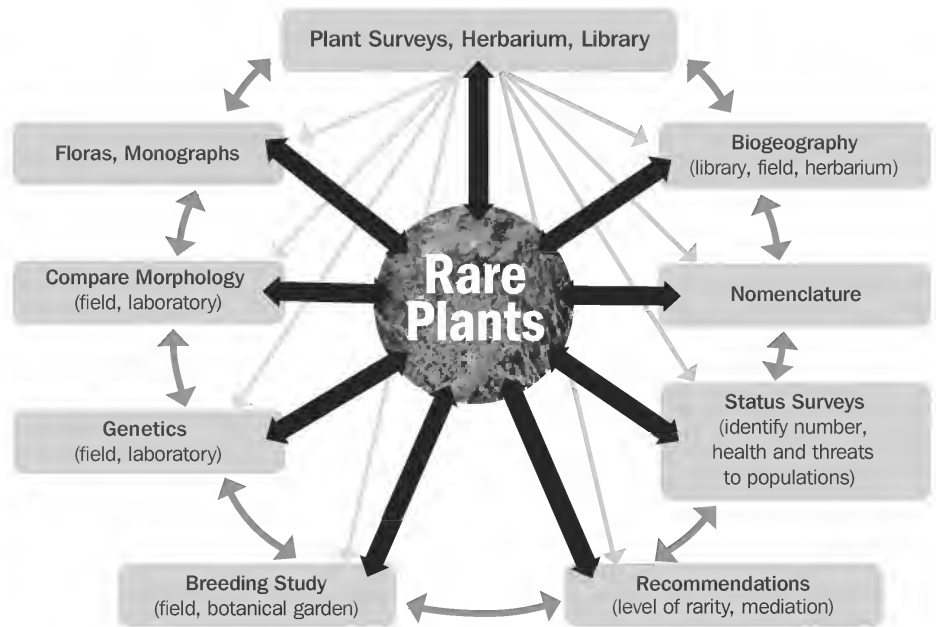


Figure 1. The study of rare plants involves many disciplines and actions (modified from Barkley 2000).

Beyond simply knowing where rare plants are, many other gaps in knowledge often need to be filled. For instance, for the vast majority of plants, only some basic facts of morphology (structure of an organism) and provenance (general location) are known. Little if any information is available on reproductive biology, demography, cytology, genetics, anatomy or geographic distribution patterns (Heywood 2001). As the Garden's Research Department has grown, so has our capacity to address many of the questions that must be answered before we can fully understand a species and how best to conserve it. These questions are often interconnected as are the activities and disciplines needed to answer them. (Figure 1)

A New Alliance is Created

In 2006, a Southwest Rare Plant workshop was held in Flagstaff, Arizona. At that time, it was determined that the status of 88% of the approximately 700 rare plants in the Southwest was not known—that is, we had no idea if their populations were stable, increasing, or decreasing. It became most apparent that *this* trend needed to change.

Consequently, on December 10 and 11, 2011, the Desert Botanical Garden hosted a gathering of botanists to discuss rare plant conservation in the American Southwest. This workshop was funded by the National Park Service and was directed by Dr. John Spence, ecologist for the National Park Service. The regional focus covered seven states



*Huachuca Water Umbel,
Lilaeopsis schaffneriana var. recurva*

Huachuca Water Umbel, *Lilaeopsis schaffneriana var. recurva*

Arizona is home to unusual wetlands, including the highly threatened ciénegas found in the southeastern portion of the state (see Summer 2011 *Sonoran Quarterly*). As important sources of perennial water scattered among semiarid landscapes, ciénegas are home to an astonishing diversity of plant and animal life. One unique plant found growing here is the Huachuca water umbel.

Huachuca water umbel is herbaceous and semi-aquatic (it can grow submerged in a few inches of water) with bright green leaves that are typically only one to two inches long. During the summer, it may produce tiny white flowers (measuring less than 1/16th of an inch) that are hidden at the base of the leaves.

It was listed as an Endangered Species in 1997, and the wetlands in which it grows were listed as Critical Habitat in 1999. The Garden's Research Department has a long history of work related to the preservation and recovery of the Huachuca water umbel. The Garden's first collections of this species were made in 1991 as part of our collaboration with the Center for Plant Conservation. We continue to maintain a living collection of this species in the conservation greenhouse and have provided more than 60 plants for reintroduction to three sites at Fort Huachuca in southeastern Arizona. Garden researchers are also completing a genetic diversity study of Huachuca water umbel populations. From this genetic work, we now have a greater understanding of the importance of clonal growth and population connectivity in the species and are using this information to assist the USFWS in development of a recovery plan for the Huachuca water umbel.

(AZ, CA, CO, NM, NV, TX, and UT) and six geographical provinces: Colorado Plateau, Great Basin, Madrean Sky-Islands, and the Chihuahuan, Mojave, and Sonoran Deserts.

The group identified long-standing issues of concern, namely that botanists are few, funding and time is limited, new species are constantly being described, and plants and their habitats continue to be negatively impacted. It was widely agreed that little information on the status or trends for the vast majority of the Southwest's threatened plant species existed and that a coordinated response to the conservation of the region's rare plants was sorely needed.

In an unprecedented move, the group unanimously decided to organize as the Southwest Plant Conservation Alliance. The Alliance will foster communication among those working with rare plants, with the Desert Botanical Garden acting as the coordinating body.

Several initial steps were identified as key in moving the agenda forward:

- 1) Finalize an updated species list on SEINet (the Southwest Environmental Information Network, <http://swbiodiversity.org/seinet/index.php>).
- 2) Prioritize species using a novel but proven method.
- 3) Organize the next rare plant conference to be held at the Garden in spring 2013.
- 4) Include the Alliance and its work on high profile species on the Garden's website.
- 5) Develop ideas for a conservation action plan.
- 6) Investigate funding sources.
- 7) Initiate outreach to potential partners and stakeholders.
- 8) Develop educational and outreach tools for engaging the public.

Connecting with the public in general as well as with other botanists is critical to the success of rare plant and habitat conservation. We believe there are numerous individuals and organizations that would be pleased to know about and help in rare plant work in the Southwest. The newly created Southwest Plant Conservation Alliance, which is closely connected with SEINet and the Garden, will help us to make those connections.

References:

- Arizona Rare Plant Committee. 2001. *Arizona Rare Plant Field Guide*.
Barkley, T. 2000. Floristic studies in contemporary botany. *Madroño* 47: 253-258.
Heywood, V. 2001. Floristics and monography – an uncertain future? *Taxon* 50: 361-380.

DESERT TORTOISES *in the Garden*

by Tom Fatz, Docent and Horticulture volunteer



One morning about 30 years ago, while riding her bike to work, Wendy Hodgson (at that time a horticulturist, now the curator of the Garden's herbarium) spotted a desert tortoise ambling across Galvin Parkway in Papago Park. Not wanting it to get run over, she scooped it up, carefully placed it in her red pannier and brought it into the Garden for safekeeping, where she released it.

That may have been one of the first tortoises to take up residence in the Garden, at least in recent times. Previous to that, Russ Haughey, superintendent of horticulture at the Garden from 1975 to 1980, had never observed a desert tortoise here despite having walked almost every square foot of the grounds. Russ suspects that all of the desert tortoises now living on the property were either released here or are the offspring of released tortoises. The first mention of tortoises I could find in the Garden's library archives was a photo of a hatchling tortoise taken in the fall of 1984.

We do not know if the tortoise that Wendy rescued is still living at the Garden, but with a potential lifespan of eighty years or more, it is certainly possible. We sometimes wonder if it could be the one that is nick-named Patches, the most easily recognized of the Garden's resident tortoises. Patches acquired her name about twenty years ago after a run-in with a vehicle in the Garden's parking lot resulted in her shell being patched up with epoxy and fiberglass by a veterinarian.

Life as a Tortoise

Desert tortoises remain fairly inactive during the early, dry spring and summer months if poor winter rains have yielded little vegetation for them to eat. During the early hot and dry summer, while we hide out in our air-conditioned 'dens' at home, desert tortoises also stay cool in their underground dens. Once the summer monsoon rains begin, however, the tortoises will emerge from their burrows more frequently to feed and search for mates. Patches, like her relatives, is most active during the monsoon summer in late July, August, and September, when annual plant growth means a higher availability of food for them. Once things cool off in the late fall, we likely won't see much of Patches or her kin again until March, although she may come out to sit in the sun occasionally on particularly nice winter days.

Patches is not shy in her efforts to perpetuate her species and does so enthusiastically, often on the main trail when she encounters one of the Garden's male tortoises. In late June she will likely lay and bury about six eggs, which will hatch in September or October. She may never see her babies and wouldn't recognize them if she did. The hatchlings will soon enter hibernation themselves, perhaps without ever having eaten a meal. They can survive until spring on the food in the yolk sacs attached to their lower shells.

Tiny new embryos will develop in Patches' body while she sleeps, fertilized from the sperm she has stored in her body from matings that occurred as long as two summers ago. Talk about long-distance relationships! Sperm storage is linked to precipitation and physiological responses to drought

Adopting a Desert Tortoise

First determine whether or not you are able to create the burrow and yard enclosure a desert tortoise requires, as well as provide the care and treatment that it will need. If you have a dog or a pool, it must be fenced separately from the tortoise.

If you decide you would like to adopt a desert tortoise, visit the AGFD Captive Desert Tortoise Care website at www.azgfd.gov/tortoise, and review the checklist to be sure you have fulfilled the requirements. In some cases, a tortoise adoption expert may request permission to visit your yard for a closer look at your tortoise habitat, to ensure that it will meet the needs of the tortoise.

You may adopt a desert tortoise if you live in the Phoenix, Bullhead City, Kingman, Lake Havasu, Tucson, and Yuma areas. Desert tortoises cannot survive the severe winters that occur in the northeastern or southeastern regions of the state. Contact information for desert tortoise adoption facilities are listed below.



Phoenix:

Phoenix Herpetological Society
602.550.1090
www.phoenixherp.com

Bullhead City /Kingman /Lake Havasu:

AGFD Region III Office
928.692.7700

Tucson:

Arizona-Sonora Desert Museum
520.883.3062
www.desertmuseum.org/programs/tap.html

Yuma:

AGFD Region IV Office
928.342.0091



conditions appear to inhibit egg laying during dry years when there would be little vegetation for the hatchlings to eat. Female tortoises begin to lay eggs when they are about fifteen years old; it's likely, however, that only two of the many dozens of eggs they will each lay in their lifetimes will survive into adulthood. Baby tortoises are extremely vulnerable to numerous predators until their shells grow and harden. The only natural predator that can crack open the hard shell of an adult tortoise is a mountain lion, so Patches should be fine if she just stays out of the parking lot.

Because we cannot predict when Patches or the other Garden tortoises will put in an appearance to delight our visitors, we currently keep two adopted tortoises, Penny and Poppy, in our Education complex for our children's programs and flashlight tours. Nothing evokes questions quite like the sight of a tortoise sauntering down the path. Here are a few of the most commonly asked: "How big do they get?" The largest was almost fifteen inches long and weighed fifteen pounds. "What do they eat?" They're vegetarians. We know of 199 species of desert plants that they eat. Favorites are grasses, globemallows, and a desert vine (*Janusia gracilis*). They crave this vine so much that Arizona Game and Fish Turtle Coordinator Cristina Jones once watched one climb more than twelve inches up a shrub to get some. A seasonal treat is ripe, red cactus fruits, which dye their faces pink. "Do they bite?" Not unless threatened, although a tortoise will occasionally approach a female visitor's open-toed shoes to investigate the bright red 'fruits' (i.e., red-painted toenails) to see if they are something edible.

Helping our Tortoise Friends

We do not know if Patches is the tortoise that Wendy rescued on Galvin Parkway, but she did the right thing in saving that tortoise from the immediate hazards it faced after someone likely released it near this busy city road. Keep in mind, though, that it's illegal to take them home.

When out in the desert, please enjoy wild tortoises from a distance without picking them up. Wild tortoises will often urinate when picked up in an instinctive attempt to discourage predators from eating them. Their large urinary bladders can store over 40% of the tortoise's

body weight in water, urea, uric acid, and nitrogenous waste. This desperate effort to survive can seriously deplete their bodies' water reserves, and could result in death. Desert tortoises can live for a year without drinking any standing water by using the water stored in their bodies. They obtain the moisture they need from the vegetation they eat. When it does rain, they will take advantage of it and sometimes even come out of hibernation to drink from rain puddles.

When we show our desert tortoises to Garden visitors, we caution them not to release captive tortoises of any species, even the native desert tortoise, back into the wild (or into the Garden). In addition to the limited chances of these pampered pets surviving, they also have the potential of introducing pathogens into the wild populations. In recent years, for instance, there has been an outbreak of a highly contagious respiratory illness that has decimated entire subpopulations of wild desert tortoises in the Mojave Desert. Unfortunately, when captive tortoises begin to exhibit symptoms, rather than taking them to the vet some owners release them into the wild under the false hope that they might recover. Competition, predation, parasites and diseases from introduced, nonnative flora and fauna are among the biggest causes of plant and animal endangerment and extinction, second only to habitat destruction.

Many captive-raised tortoises are available this year from the Arizona Game and Fish Department (AGFD) for adoption to suitable homes (see page 9 for more information). An adopted tortoise may outlive you, so please give considerable thought to becoming a tortoise caregiver before you apply. It's important to keep captive male and female tortoises separate to prevent breeding; there are already more captive tortoises than the conservation agencies can find appropriate homes for each year.

To learn more about tortoises, read *The Sonoran Desert Tortoise: Natural History, Biology, and Conservation*, which is available in the Schilling Library at the Garden. It is the source of much of the information in this article and has a whole chapter on the care of captive tortoises. Thanks to Russ Haughey, Wendy Hodgson, Cristina Jones, Barbara Larson, Laurie Nessel, and Audrey Owens for helping me with this article.

Oh, and please check under your car before backing up in the parking lot on warm days!

Walking into a Sustainable Future

by Colin Tetreault, Principal, S2 Consulting, LLC

Open your dictionary, locate the entry on “sustainability” and think to yourself, “I’ve heard of this sort of thing before.” Then get ready to become more engaged in moving the Desert Botanical Garden forward as it collaborates with S2 Consulting, LLC in planning a more sustainable future.

Chances are good that you have already heard the term “sustainability” in our current social milieu. It is a phrase that is coming more and more into use within the language of business, the environment, society, politics, and our individual lives. What does sustainability mean to the Garden, to you – its valued members – and how do we use it to chart a new and collaborative path forward? In order to answer these questions, a basic primer of the concept may be helpful:

Sustainability is a powerful lens through which to view the natural, built, and social world around us.

Sustainability helps us to think constructively about things in ways that challenge our perceptions and beliefs, promoting movement in a long-term strategic direction.

Sustainability helps to add value to the environment, society, and to economic structures.



So what does this mean to the Desert Botanical Garden? It means that the Garden’s leadership is dedicated to thinking about and implementing strategies that will have a positive, lasting impact on the world around it, in all possible ways. Over the last several months, the Garden, with S2 Consulting, has started along a continual path in a more sustainable direction. Chiefly, we will work together to advance our thinking on how the Garden operates, the experiences it provides, and the impact that it has on the environment.

Using the concepts of sustainability, we are going to address some of the following areas: How can the Garden, as an organization committed to preservation and conservation, operate in a more responsible way? How can the Garden act as an agent for positive change and education within the community? How can it engage with its members and the community at large to add value to the experiences that the Garden can provide? How will we ensure that the Garden is here for years to come? What are the innovative and creative means by which the Garden can advance the city and region as a whole?

We are excited about helping the Garden move in this direction. The Garden’s leadership and staff are committed. For the most comprehensive approach though, we will also need you. Your thoughts, input and ideas are crucial and will add significant value to this undertaking. Over the next few months, expect to be engaged in shaping the future of the Garden’s sustainability efforts, which will be reported back to you in future issues of *The Sonoran Quarterly*. Working in collaboration, we can ensure that the Garden’s path not only moves forward, but that it does so in a smart and sustainable manner.

ARIZONA FOUNDATIONS INVEST IN GARDEN CAPACITY BUILDING

by Julie Winslett Wagoner, Institutional Giving Manager

The Desert Botanical Garden always has a variety of exciting projects underway, regardless of the time of year. These include dynamic and engaging events, festivals, educational programs, and exhibits that our visitors can participate in and enjoy.

Many of our projects are designed not only to provide you with a great experience while you're at the Garden, but also to increase our ability to fulfill our mission more effectively. They may help to improve the efficiency of our operations, generate additional revenue, or otherwise ensure our ongoing organizational sustainability. These are carried out behind the scenes, so you may not even know they are taking place.

Capacity Building at the Garden

The Garden has been guided by a strong, visionary Board of Trustees throughout its history, which consistently prioritized capacity building projects long before the term became common among grant makers. This is evidenced by the many enhancements made to facilities and visitor amenities over the past fifteen years, resulting in an ever stronger connection between visitors and the desert environment through increased research capabilities and improved exhibition display areas. As defined by the National Council of Nonprofits, "Capacity building refers to activities that improve and enhance a nonprofit's ability to achieve its mission and sustain itself over time." The definition precisely describes the Garden's commitment to constant innovation and development.

Private foundations, both locally and nationally, are increasingly awarding capacity building grants as a way to make a lasting investment that can enhance

an organization's effectiveness and impact. They can provide much-needed underwriting for a wide range of projects, from the creation of a fund development plan or the purchase of computer software and hardware, to more complex projects such as organizational restructuring or even mergers. Regardless of the scope of these projects, the end goal for most private foundations making these types of investments is to make strong nonprofits even stronger. Here we spotlight just two of the Garden's most recent capacity building grants, each designed to have a beneficial impact that will endure for many years to come.

Investing in Audience Development

Last June, the Garden was invited to submit a proposal to the Flinn Foundation through its new Participation Enhancement Program. The privately funded foundation created this two-year grant program to help large arts and cultural institutions develop and implement strategies for building relationships with their audiences. Its ultimate goal is to help groups generate additional earned revenue to weather these difficult economic times.



"While Arizona organizations traditionally do well in this area," explains Jack Jewett, president and CEO of the Flinn Foundation, "it's critical to emphasize earned revenue even more during these tough economic times, when funding revenues from government, corporations and other traditional sources have declined or disappeared."

This invitation came shortly after the conclusion of the spring 2011 season, which saw a decline in attendance after a decade of tremendous growth. The timing couldn't have been better, as the Garden had already determined that it was time to reinvest in its marketing strategy in an effort to attract new visitors, reengage its core audience and encourage members to become more involved.



The Flinn Foundation awarded a \$50,000 grant to support our proposed strategies, which resulted in a comprehensive spring campaign featuring a full-color tabloid insert in *The Arizona Republic*, online advertising and complementary e-mail, direct mail, website and social media elements. You can view the tabloid insert on the Garden's website at dbg.org/media-center/press-kit.

Preliminary results indicate that the campaign was a great success in reaching a broader community, rebuilding attendance and enhancing donor and member loyalty. In March alone, our 2012 attendance was 21% higher than in 2011 and we gained 40% more members than in the previous March. The real measure of success will be determined by the 2012-13 season during which we anticipate a 10% growth in attendance over the 2011-12 season as a result of the campaign.

Until then, we will continue to assess the impact of the marketing campaign throughout the summer. We will then report our findings to the Flinn Foundation, which will consider a second year of grant funding to the organizations that demonstrate success in implementing their plans.

The Community Foundation's grant enabled us to invest in this important amenity, one that was essential for event planning services to remain competitive with local venues in attracting clients. With the availability of Wi-Fi in key event sites, the Garden can continue attracting major business meetings and social events.

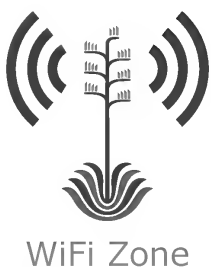
The addition of Garden Wi-Fi does much more than impact earned revenue – it dramatically enhances our visitors' experiences. Anyone having a smartphone can now go online during their visit to learn more about the plants and wildlife encountered. Home gardeners can upload an inspirational photo of their favorite flower or plant to social media sites like Facebook or Pinterest to share with friends. Guests attending a *Music in the Garden* concert or one of our cultural festivals can post comments about the featured entertainment as it takes place. Looking forward, Wi-Fi will not only impact how guests access information, but it may also affect how the Garden presents it.

Strengthening Our Future

The Garden will implement several more capacity building projects over the next five years such as the expansion of the parking lot, which will impact our long-term sustainability. With investments from generous community stewards such as the Flinn Foundation, the Arizona Community Foundation and many other thoughtful supporters, the Garden will continue to be a local leader in environmental education and conservation and will continue to be a compelling attraction that brings to life the many wonders of the desert.

Enhanced Amenities Enhance the Visitor Experience

The second capacity building grant received in 2011 supports complimentary Wi-Fi services throughout the Garden. The Arizona Community Foundation awarded a \$15,000 grant through its Open Competitive Grant Cycle, which, according to its guidelines, is offered to “build on the strengths and assets of Arizona's nonprofit organizations and agencies that are striving to improve the quality of life throughout the state.”



BY THE NUMBERS

Annual Report Online

The Desert Botanical Garden's 2011 Annual Report is available online at dbg.org/annualreport.

We have included an excerpt of the Annual Report's "By the Numbers." Please take a moment to read more about 2011 at dbg.org/annualreport.

ATTENDANCE	438,339	EDUCATION AND TOURS	
MEMBERSHIP HOUSEHOLDS	26,133	School Tour Participants	27,263
HORTICULTURE		Children in Camp	89
Acres at Desert Botanical Garden	145	Children in Seedlings Preschool Program	130
Acres under Cultivation	50	Girls Scouts	669
Attendance at Biannual Plant Sales	15,142	Adult Education Class Participants	4,357
LANDSCAPE AND GARDENING		VOLUNTEERS	
Desert Landscaper School Graduates 2011	46	Individual Volunteers	1,040
Desert Landscaper School Graduates Total	1,201	Individual TEEN Volunteers	84
Plant Hotline Questions (Calls-782 / Emails-520)	1,302	Community Organizations and Corporations New Volunteers	91 134
Ask a Gardener Visitor Interactions	1,058	New TEEN Volunteers	51
LIVING COLLECTION		Total Active Hardy Perennials (10+ years)	141
Total Accessioned Plants	26,682	Total Hours Contributed	77,532
Total Accessioned Seeds	4,168	Total TEEN Hours Contributed	2,135
Total Number of Species	4,135	Awards for 100+ Hours in 2011	266
New Accessions Added	193	Length of Service Awards:	
New Species Added	18	500 hours	34
Rare and Endangered		1,000 hours	13
Rare and Endangered Seed Collections	409	2,000 hours	11
Rare and Endangered Plants	965	3,000 hours	3
HERBARIUM		4,000 hours	2
Total Specimens	70,000	5,000 hours	1
STAFF PUBLICATIONS	5	6,000 hours	3
SCHILLING LIBRARY		8,000 hours	1
Books	7,619	20,000 hours	1
Botanical Prints	600	21,000 hours	1
Journal and Newsletter Titles	342	Docent Interpreter Interactions with the Public	103,429
Maps	2,376	STAFF	
		Full-time	78
		Part-time and Seasonal	108

SUMMER CONSTRUCTION PROJECTS

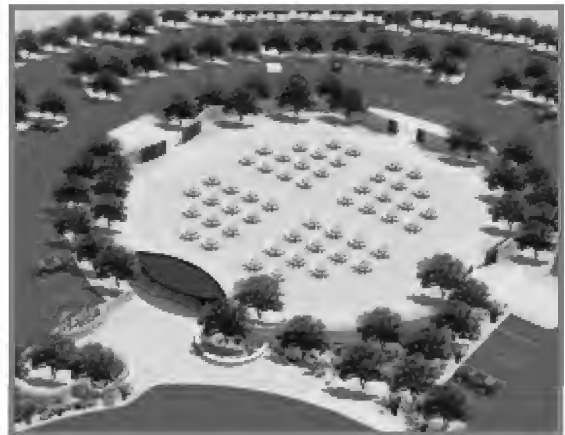
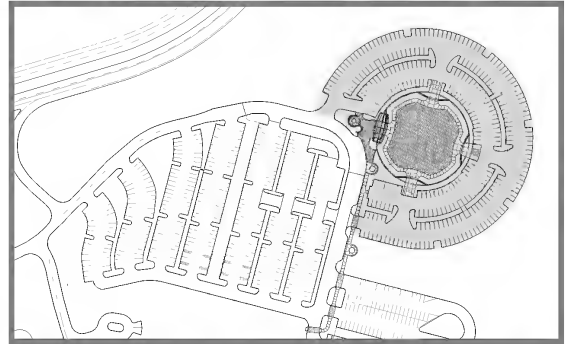
by MaryLynn Mack, Deputy Director

Expanding the Parking Area

With a generous grant from the Virginia G. Piper Charitable Trust, construction on the parking area expansion will begin this summer. Improving this amenity was one of the preliminary initiatives outlined in the Winter 2010 *Sonoran Quarterly*, and long desired by many members.

The circular design by John Douglas of John Douglas Architects will also accommodate events such as Plant Sales in the center area, thus expanding capacity even more. Research and horticulture staff worked with members of the operations department to ensure that natural washes and historic creosote bush plants were protected in the overall design. Additionally, many sustainable elements will be incorporated, including passive irrigation, electric vehicle charging stations and recycled building materials.

Scheduled for an October opening, the expanded parking area will offer increased accessibility for visitors, particularly during peak spring days, plants sales and other special events and exhibitions.



Enhancing the Research Center

Expansion of the Nina Mason Pulliam Desert Research and Horticulture Center will begin in June 2012, with an expected completion in October. Many thanks to the Nina Mason Pulliam Charitable Trust and to Marilyn and Cliff Douglas for their support of this project. The expansion will provide new, state-of-the-art laboratory facilities, a large open floor plan for office space, an improved area for volunteers in the horticulture program and a rainwater harvesting system for use in the Garden's plant propagation program.

Designed by John Douglas of John Douglas Architects, the expansion will allow the Research Department to employ molecular biology approaches to the study of desert plants and actively participate in advanced training of graduate and post-doctoral students.

For additional information on summer projects visit our website at dbg.org/renovations.





The Great Pumpkin Festival



Chiles & Chocolate



Seedlings Preschool Class

Families at the Garden

What do *David Rogers' Big Bugs*, Pumpkin Festival, Butterfly Exhibit, TEEN program, and family workshops have in common? They're all fun events for families where play evolves into learning, which develops into caring. The Garden is a great place to become connected to the natural world.



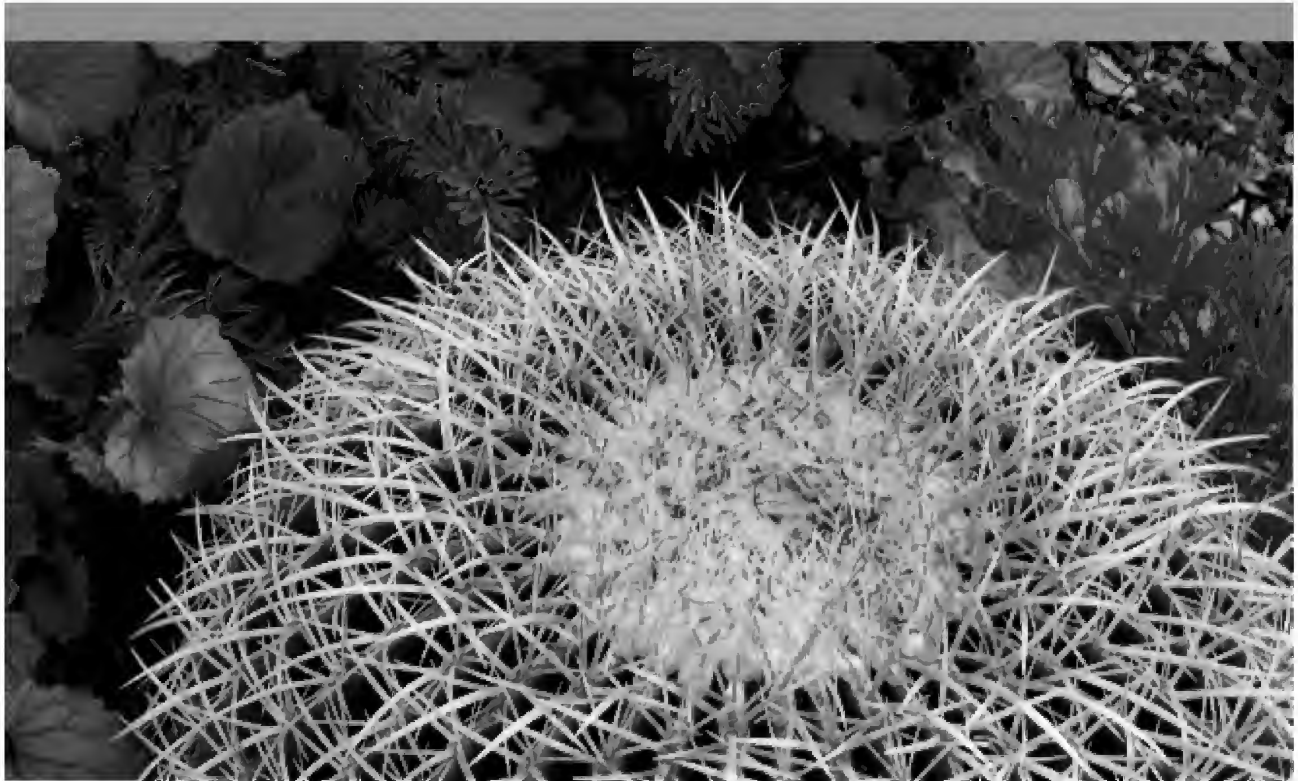
Breakfast with the Butterflies



David Rogers' Big Bugs Member Preview



Summer Flashlight Tours



Register Now for Desert Landscape School

A leader in sustainability since 1997

The Desert Landscape School (DLS) is rolling out a new six-module format for the class of 2012- 2013. Changes to the curriculum are based on a survey of hundreds of the Valley's green industry employers and DLS alumni. Each module consists of an area of study that was comprehensively reviewed and revised by a team of educators that included several Certified Desert Landscape Professionals.

DLS's certification program continues to focus on skill development. Design, the key to creating vibrant, sustainable

landscapes, is now woven into each module. This component is supported by an expanded plant palette that includes under-used plants and new cultivars. Landscape maintenance techniques and irrigation troubleshooting complete the student's new set of skills.

The installation project remains as the distinctive cornerstone of the program. Students incorporate their new skills and knowledge into the design and installation of a residential landscape for a home in a nonprofit program.

The Desert Landscape School is ready for the future with the new six-module format. View the class schedule online at dbg.org/landscapeschool and sign up today for your opportunity to join the 1,200+ program graduates who are moving our cities toward a more sustainable future.





A Dream Wedding

The Garden has become known as a beautiful setting for weddings and events, so it isn't surprising that we frequently receive notes of thanks from clients who were pleased with our venues and services. When they also take the time to share their experiences on their social media sites, their testimonials are taken to heart by future wedding couples dreaming of their own perfect day. It is a pleasure to share one recent testimonial with you:

“When Sam and I were planning our wedding, we dreamed of having our special day at the same place where we had our first date and got engaged. The Desert Botanical Garden was the perfect venue for us. Everyone enjoyed the spectacular setting of Ullman Terrace with the up-lit Garden butte as our backdrop. We could not have asked for a more perfect wedding. The Desert Botanical Garden will always hold a special place in our hearts.”

Sam & Jamie Idriss – Married March 26, 2011

To reserve a venue in the Garden for your special event, please contact Amber Hahn by email at ahahn@dbg.org or at 480.481.8159.

In Appreciation

The Garden's donor honor roll, usually featured in *The Sonoran Quarterly*, appears in the 2011 Annual Report and may be viewed online at dbg.org/annualreport.

Virginia G. Piper Fellowship Awarded to MaryLynn Mack

Deputy Director MaryLynn Mack has received a Virginia G. Piper Fellowship award. The highly competitive Fellowship is awarded to nonprofit leaders to enhance skills, link to best practices, and participate in self-designed professional development sabbaticals. The primary focus of Mack's Piper Fellowship is to gain insight into a child's experiences in cultural institutions. Her goal is to broaden her understanding of the overall visitor experience from a child's perspective and to bring back ideas and best practices for use in the strategic planning of a Children/Family Garden space, one of the Garden's

2012-2017 initiatives. She will immerse herself in many different experiences, including a week-long course at the Disneyland Leadership Institute, executive mentoring at Sesame Street/Children's Television Workshop, and internships at cultural institutions that embody sustainability, creativity and innovation.

The Piper Fellow Program will also provide funding for Garden staff development and an opportunity to apply for an organizational enhancement award.

Design for a Living World Exhibit Wrap-up

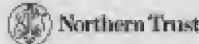
The Garden began 2012 with a much-anticipated new exhibition, *Design for a Living World*, which was previously shown at the Cooper-Hewitt National Design Museum in New York and The Field Museum in Chicago. Developed by The Nature Conservancy, *Design for a Living World* featured the works of ten notable designers who used sustainable materials from around the world to create beautiful objects.

On January 12th, more than 200 guests of The Nature Conservancy and the Desert Botanical Garden joined event hosts Melani and Rob Walton and co-hosts Pamala and Will Keiper for an exciting evening of celebration. As guests joined exhibit designers Paulina Reyes, Ezri Tarazi and exhibit photographer Ami Vitale (pictured above), they were encouraged to "celebrate the source" by discussing the origins of materials. Additionally, nearly 250 guests attended a subsequent exhibit preview and reception on January 14th and another 100 members of The Nature Conservancy and Desert Botanical Garden Legacy Society enjoyed a luncheon and tour of the



exhibit the following week. Throughout the duration of *Design for a Living World*, more than 13,000 visitors who explored the exhibit were prompted to consider the connection between man-made products and the natural world.

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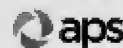
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 Page 10 Desert tortoise eating prickly pear fruit - Gene Almendinger

Page 11 Ottosen Entry Garden Terrace - Adam Rodriguez
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 Page 12 Family exploring in the Garden - Gene Almendinger
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 Page 17 Golden barrel - Adam Rodriguez
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 Page 19 Garden guests - Amy Vitale, Paulina Reyes, Melani Walton, Rob Walton, Ezra Tarazi, Pamala Keiper, Will Keiper and M. Sanjayan - Flash Gordon Murray
 Back Cover Desert spiny lizards - Adam Rodriguez; California leaf-nosed bat - Charles Cobene; Queen of the Night - Gene Almendinger



SONORAN QUARTERLY

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The Desert Botanical Garden Mission

The Garden's commitment to the community is to advance excellence in education, research, exhibition, and conservation of desert plants of the world with emphasis on the Southwestern United States. We will ensure that the Garden is always a compelling attraction that brings to life the many wonders of the desert.



WiFi Zone

FREE WI-FI is available in five locations within the Desert Botanical Garden: the area in front of Admissions, Ottosen Entry Garden, Boppart Courtyard, the Center for Desert Living Trail, and Ullman Terrace.

Partial funding provided by The Arizona Community Foundation.

WHO KNOWS WHAT YOU WILL SEE ON A FLASHLIGHT TOUR

THURSDAYS AND SATURDAYS
May 26 – September 1 / 7 p.m.

Flashlight tours are a sensory adventure where you will see, hear and feel the desert night. The self-paced stroll along the main trail to 10 discovery stations is perfect for families and children of all ages. Included with membership or paid Garden admission.

For additional information call 480 941.1225 or visit dbg.org.



SONORAN QUARTERLY

FOR MEMBERS AND FRIENDS OF THE DESERT BOTANICAL GARDEN

PHOENIX, ARIZONA SEPTEMBER 2012, VOLUME 66, NO. 3



Desert Botanical Garden



Fall: A Season of Abundance

As I write, temperatures are still rising above 110 degrees each day. With any luck, when you read this, the average daily high may have fallen to the low 100s. Such weather makes it hard to contemplate autumn but, in reality, it's just around the corner!



There are always reasons to celebrate fall at the Garden...

There are always reasons to celebrate fall at the Garden, and this year will be no exception. In fact, the coming months will be a period of great abundance with several new facilities coming on line. First, there will be more parking at the Garden (240 more spaces in all), greatly reducing congestion during key member events like plant sales and *Luminaria* celebrations. Second, the Pulliam Research Building will have an all new DNA lab, providing our scientists with more than 1,200 square feet of additional work space. And finally, late in the year our new restaurant—named Gertrude's in honor of our founder—will open.

Fall also marks the start of a new year for the Desert Landscape School. We're rolling out an enhanced curriculum and will expand our class schedule from one to four days a week. As you will read inside, we are also preparing to launch a brand new series of classes for homeowners (called Landscape for Life™), which will help you create your own little corner of paradise at home.

This year's lineup of fall festivals and special exhibits is also a cornucopia of fun. Don't miss the Monarch Butterfly Exhibit, Carolina Escobar's *Whispers of a New World* art installation, or the large, whimsical works by Philip

Hass entitled *The Four Seasons*. This year's Pumpkin Festival, *Día de los Muertos* celebration, and the Chiles & Chocolate Festival will be better than ever. And we have even planned a special day at the Garden for you and your dog(s)!

So, hang in there. Summer is almost over. Fall will soon be here. And the Garden will be brimming with opportunities for you and your friends and family to get outside, cool off, and enjoy all that nature has to offer.

Ken Schutz,
The Dr. William Huizingh
Executive Director

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In Appreciation

On our Cover

Texas rainbow cactus, *Echinocereus dasyacanthus*, usually flowers from March - May. It requires little watering and can be placed in sunlight to partial shade. Photo by Adam Rodriguez.

Back Cover

Fall Plant Sale

Members' Preview: October 19, 2012

Open to General Public: October 20-21, 2012

Visit dbg.org/plantsale for more information.



Garden Researchers Report Two New Species of Agave

by Wendy C. Hodgson, M.S. and Andrew Salywon, Ph.D.

It is a typical mid-June 105 degree day as we bushwhack our way up a hill through dense, thorny vegetation. Perspiration drips down from our foreheads, clouding our eyes. We joke to each other that we must be crazy to be hiking around all day in this heat, but this is exactly the time we need to be out. We are hunting. Not for trophy animal racks or elusive, record-length snakes, but for plants—plants new to science. Are we in the unexplored and species-rich tropics? No, we are in the Verde Valley just 85 miles north of Phoenix, searching for new species of *Agave*.

A recent article in *The Arizona Republic* (May 24, 2012) noted that approximately 18,000 new species of plants and animals were discovered last year. One of these was a sponge-like mushroom named *Spongiforma squarepantsii* after the cartoon character SpongeBob SquarePants™. Who says scientists don't have a sense of humor? The article also said that nearly two million species have been described in the last 250 years and that an estimated 10 million still await discovery!

Some may wonder why we would look for new plant species in Arizona, considering that botanists have studied the plants here since the mid-1800s and that the book *Arizona Flora* was published more than 50 years ago (Kearney & Peebles, 1960). One might think that all the plants that occur here are already known. It is a fact, though, that almost every year new species of plants are discovered in our state. Finding them isn't easy, as most are not common and widespread, but rather are rare and found in localized sites. Such is the case for the particular agaves we seek. We are looking for agaves that were once raised as domesticated plants brought here by ancient peoples, and which have been found only in long-abandoned pre-Columbian fields near archaeological structures.

Agaves and Humans

As we tramp over rocks and hills, the landscape before us looks unremarkable to the untrained eye. With our years of experience to guide us, though, we begin to see traces of a past civilization where there are a few rocks here and an agave or two there. The people who lived in settlements like the one we have come upon planted and prized agaves as an important resource for food, fiber, beverages, and medicines. Native Americans likely cultivated agaves in Mexico since at least 400 B.C. Dr. Howard Scott Gentry, the Garden's first research botanist, *Agave* expert and author of *Agaves of Continental North America*, believed that, because agaves can be easily cultivated, they were a critical part of early agricultural development in Mexico (Gentry, 1982). He called the human-agave relationship a "symbiosis" because people benefitted from the various *Agave* products and in return tended and dispersed agaves across the landscape.

Early European explorers in Arizona observed native people harvesting and utilizing wild agaves. It was not until the mid-1970s, however, that archaeologists began finding evidence that pre-Columbian Native Americans may have been actively cultivating perhaps at least two different species of agaves. For example, archaeologists C. Miksicek and Susan and Paul Fish discovered thousands of acres of ancient (from the period 700-1450 A.D.) Hohokam agricultural fields just north of Tucson near Marana. Despite the absence of agaves today, rock piles, which serve as mulch for growing agaves, and agave roasting pits with charred agave leaf remains provided evidence that these areas were used to grow and cook agaves for consumption. Subsequently, similar structures and charred agave remains were identified throughout southern and central Arizona by other archaeologists. Because these archaeological sites contained only fragmentary remains of charred agaves, identifying which species of agaves were cultivated was extremely difficult.

Agave Research at The Desert Botanical Garden

While these archaeological studies left little doubt about extensive *Agave* cultivation in southern Arizona, scant attention was given to other areas of Arizona and which agaves had been cultivated. This is where our research comes in. In 1984, Hodgson began studying and documenting agaves in the Southwest after having worked with Dr. Gentry. Independent of the archaeological work being done on cultivated agaves, Hodgson and the late Rick DeLamater, a research associate at the Garden in the 1980s, became interested in the Hohokam agave (*Agave murpheyi*) and conducted extensive fieldwork on this plant. It soon became apparent that it reproduced mainly by vegetative means and was found associated only with archaeological sites and not in the "wild." Based on those findings, they concluded that this was a pre-Columbian domesticated species that still existed in the modern landscape as a living archaeological artifact!

Realizing how important agaves were to pre-Columbian peoples and that through vegetative reproduction domesticated

agaves (a species bred to accentuate traits that benefit humans) can persist in the same fields for more than 500 years, Hodgson decided to focus on agaves associated with archaeological sites. This led to the discovery of the Tonto Basin agave (*Agave delamateri*) and the Grand Canyon agave (*Agave phillipsiana*) as species new to science and published in the peer-reviewed journals *Haseltonia* and *Novon* in 1995 and 2001, respectively.

We are excited to report that the two new species of agave that Hodgson discovered will be published in the next issue of *Brittonia*, a peer-reviewed botanical journal published by the New York Botanical Garden Press.

Making the Discoveries

In 1994, while searching in Verde Valley for additional populations of the Tonto Basin and Grand Canyon agaves, Hodgson noticed a small group of agaves that her years of observation and work in the field told her was another unusual and unknown type. They resembled small Tonto Basin agaves in leaf shape, but the flowers were quite different. Soon she found additional populations of the unusual agave, providing material (leaves, flowers, fruits) for study. Though this agave was present near well-known archaeological sites, no one had previously recognized it as unique or even bothered to document it. The Tonto Basin, Grand Canyon, and this new agave are examples of cryptic species—plants mistakenly identified as more common species, but which upon further investigation are found to represent totally new, different species.

We have since named this new agave *Agave verdensis* after the Verde Valley, the only place where it is known to occur. The populations are located near archeological remains of villages or fields associated with the Sinagua culture, which occupied

It is a fact, though, that almost every year new species of plants are discovered in our state. Finding them isn't easy, as most are not common and widespread, but rather are rare and found in localized sites.

the area from about 1100-1400 A.D. We gave it the common name of Sacred Mountain agave, to refer to the nearby Sacred Mountain archaeological site.

In 2003, additional searches by Hodgson for the Tonto Basin, Grand Canyon and Sacred Mountain agaves not only yielded more populations of each, but also an additional, new type never before documented. It was similar to the Sacred Mountain agave, yet subtly different in leaf shape and color, teeth shape and number, flower color, and fruit characteristics. Additional populations were found with the assistance of Sedona botanists Jean Searle and Max Licher. We named the plant *Agave yavapaiensis* for the county in which it occurs, as well as for

the Yavapai tribe that may have used this plant many years ago. We gave it the common name of Page Springs agave because it occurs only in the Page Springs area of Verde Valley. Like the Sacred Mountain agave, the Page Springs agave may have been a regionally important, signature plant for the Sinagua people who occupied this area more than 600 years ago. Interestingly, we have found the Tonto Basin, Grand Canyon, and Sacred Mountain agaves growing together on an amazing site south of Sedona. Finding these together supports our theory that early inhabitants of the region grew more than one type of these versatile plants, selecting and harvesting them for various purposes.

Importance of Agaves in Arizona

What makes our findings even more remarkable is that all of these agaves—Hohokam, Tonto Basin, Grand Canyon, Sacred Mountain, and Page Springs—are domesticated plants with distinct lineages that represent a window into the past. How far back we do not know. What we do know is that these species have persisted in the landscape for centuries because they reproduce not by seed, but by underground offshoots (“pups”). Pre-Columbian farmers selected for characteristics that could be easily maintained by actively cultivating and

domesticating the plants, providing their families with food, fiber, and medicine. Characteristics such as their cloning habit (can produce many plants quickly while maintaining the selected characteristics), small teeth on leaves that are easily cut (making harvesting easier), and sweetness (the baked hearts are used for food and beverages) were advantageous. One might view them as archaeological artifacts because the plants we see today are in essence genetically the same as those plants farmed centuries ago. Such is not the case for most domesticated crops propagated by seed, whose lineages have long been genetically altered or lost over time.

With each new archaeological or botanical find, we confirm that agaves were an exceedingly important domesticate during pre-Columbian times in Arizona and adjacent Mexico. Of the 21 *Agave* taxa (species or subspecies) in Arizona, 12 are endemic (found only in Arizona), and of these, five (Tonto Basin, Grand Canyon, Sacred Mountain, Page Springs and Hohokam agave) are pre-Columbian cultivars. We propose that these five cultivars may have originated in northern Mexico and were traded and/or transported north, as far as the Grand Canyon. Further research in northern Mexico, particularly in Sonora and Chihuahua, will be necessary



Fig. 1. Habitat in which the new species *Agave verdensis* grows. **Fig. 2.** Wendy Hodgson conducting fieldwork on the new species *Agave yavapaiensis*. **Fig. 3.** The illustration of *Agave yavapaiensis* that accompanies the scientific publication of this new species, by artist Sandy Turico, Desert Botanical Garden, Botanical Art and Illustration program graduate. **Fig. 4.** Flowers of *Agave yavapaiensis*. **Fig. 5.** Vegetative reproduction of *Agave yavapaiensis* via “pups.” **Fig. 6.** Agaves of Arizona bed at the Desert Botanical Garden.

to identify their wild ancestors. In the process, we may also discover additional ancient cultivars not yet known to science.

Perseverance Pays Off

Perseverance, passion, experience, and the occasional spark of good luck helped in recognizing and locating these plants and will help with identifying other, not-yet-named species. These traits were necessary, too, for bringing the suspected two new species through the long process that is now culminating in their being scientifically described. Hodgson's research on these as well as other agave species got a substantial boost when Salywon joined Garden staff five years ago, bringing his expertise in molecular studies to this and other projects.

Over the last 21 years, the time and energy spent surveying what Hodgson suspected were ancient agave fields yielded not only four new agave species, but led to the hypothesis that these species are part of a larger complex of ancient domesticated crops selected and farmed for multiple uses. These findings were based on recognizing patterns that became apparent over years of accumulating knowledge through field observation and investigation. Such findings lent support to Hodgson's developing theory that agaves were not only extremely important to Arizona pre-Columbian inhabitants, but that people actually cultivated and traded several types. This original theory of Hodgson's is not yet found in any textbook, but has important implications in the study of Southwest prehistory, agriculture, domestication, and agave/human coevolution.

Questions, Questions, and More Questions

As with most research, the more questions we think we answer the more questions arise. From where did our agave domesticates originally come? What other information can they provide to botanists, archaeologists, and others? What can we learn from the ancient cultivation practices used on these plants that can help us live more sustainably today? How many other plants have we overlooked that are actually new species or domesticates?

To answer these and other questions requires a multi-disciplinary approach. We are collaborating with archaeologists such as Garden volunteer Dr. Jane Williams, nutritionists, ecologists, and molecular geneticists and biogeographers such as Drs. Kathy and Al Parker from the University of Georgia. One thing is certain—we are reminded that botanists must look at “natural” landscapes as possibly having been modified by man and look at plants within these landscapes with a more discerning eye. So, as we continue to hike desert mountains and valleys, we will keep our eyes open for signs of ancient people and the plants they brought to these landscapes.

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All of the agave domesticates mentioned in this article can be seen in the small bed located near the entrances to the *Marshall Butterfly Pavilion* and the *Schilling Library*, which features Arizona agaves. These plants, which were collected in the field, may be used not only for interpretation to the public, but can also serve as a backup to the populations in the wild. Many wild plant populations are vulnerable to development and other human impacts, as well as to the drought we have experienced for a number of years. In the future, look for new interpretive signs that will tell the amazing story of these special plants.

Contemporary Art EXHIBITS

COMING THIS FALL TO THE GARDEN

by Grace Soave, Exhibits Manager

The Desert Botanical Garden is pleased to present two breathtaking contemporary art exhibits. Each exhibit will be a unique addition to the already impressive desert landscape. Carolina Escobar's sculptures are very organic in shape, vibrant in color, and will challenge visitors to use their imagination, while Philip Haas' gigantic sculptures are full of life and botanical abundance.

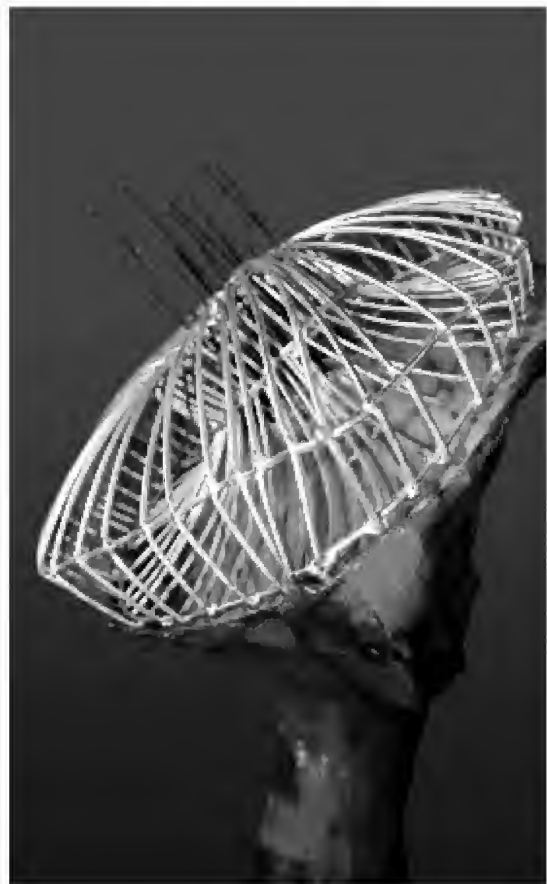
Whispers of a New World: Sculpture by Carolina Escobar is the premier showing of Escobar's most recent sculptures and will be on display in Ottosen Gallery and on the Garden's *Desert Discovery Loop Trail* from October 5, 2012 through May 27, 2013. Each piece was created specifically for this exhibit and offers the artist's unique interpretation of desert plants.

The Ottosen Gallery works will include Escobar's two-dimensional pieces, each resembling the flowing forms of her sculptures and the rich colors found in nature. The larger, three dimensional pieces will be displayed outside, along the Garden's Core trail.

Escobar is an extremely talented local artist working in a studio located in Phoenix. She studied sculpture and architecture at universities all over the United States and has received numerous awards for her pieces.

She chose the title, *Whispers of a New World* because she says, "I am dreaming of a new world. I see these forms, shapes, colors, and what they may imply as 'whispers,' a peek, of what a new world to come might look like."

For additional information visit dbg.org/whispers.



"Barrel Cactus," welded wire and resined fabric.



“The Four Seasons” at Dulwich Gallery, England.

Philip Haas: *The Four Seasons* is an exhibit of four monumental, earthy and exuberant sculptures that will delight your eyes. On display from late October through April 28, 2013, in Stardust Plaza. Haas’ sculptures are inspired by the Italian artist Giuseppe Arcimboldo’s Renaissance painting series *The Four Seasons*. Arcimboldo’s imaginative portraits were whimsical, puzzle-like paintings composed of fruits, vegetables, flowers, and related objects.

Haas is primarily known for six feature films, most recently *The Situation* (2006). His best-known work is the Oscar-nominated *Angels and Insects*

(1995). He has made 10 documentaries and has taught in the creative writing and visual arts departments at Princeton University. Haas says, “I started *The Four Seasons* project wanting to bring Arcimboldo’s Renaissance painted nature imagery into the twenty-first century physical world. I can’t think of a better venue than the Desert Botanical Garden in Phoenix to inaugurate the American tour of this work, where the sculptures will arrive in the New World, resting amid the cactus, having fled their earlier homes as paintings in European museums.”

Each 15-foot tall by 15-foot diameter fiberglass sculpture will travel from

England and they are scheduled to arrive for installation at the Garden in mid-October.



Philip Haas.

Check out the installation process at dbg.org/fourseasons.



Everything You Want to Know about *Las Noches de las Luminarias*

by John Sallot, Director of Marketing

For the past three years the Garden has been gathering feedback about its ticketed events. Shortly after one takes place, a survey link is sent to online ticket buyers. The data gathered helps us make adjustments and improvements. *Las Noches de las Luminarias*, our largest event, generates the greatest amount of feedback, with several questions that come up each year. To give our members the information they need, we are taking this opportunity to answer your most frequently asked questions:

1 How does the Garden decide when to cancel because of rain?

Rain is good for our plants and great for our wildflower bloom, but it is the worst thing that can happen on a night of *Luminaria*. The decision to cancel because of rain is one of the most difficult to make. We watch weather.com, the National Ocean and Atmospheric Administration Website, and frantically dial Royal Norman at KTVK, Channel 3, looking for the best information available. We make the decision to cancel or move forward at 2 p.m. If we do cancel, we begin a series of steps to let everyone know including sending an email to all of the online ticket buyers, posting the information on our Website and in social media, alerting the news media, and contacting volunteers, staff, the caterer, and musicians.

If it is raining at the Garden at 2 p.m., then we must cancel. Even if it stops raining prior to the start of the event, there simply isn't enough time to replace the 8,000 wet luminarias and candles, get the catering going, and recall all of the volunteers, staff, and musicians. The more agonizing decision is made if, at 2 p.m., rain is imminent or expected to start prior to 9 p.m., and we must decide whether or not to cancel. We have had occasions when we have canceled because of predicted rain and it turns out to be a perfectly delightful night. On the other extreme, we occasionally make the call to move forward with the event and then it rains. When we do cancel, you may always opt to exchange your tickets for another open night of *Luminaria* or take a refund.



2 Sometimes there isn't enough parking. What's your policy on capacity?

If you have been attending *Luminaria* for a long time, you probably remember parking at the Phoenix Municipal Stadium parking lot and riding a bus to the Garden. Back then, *Luminaria* was only three nights and we sold 3,500 tickets per night. The trails were a bit more crowded then and you spent extra time getting to and from the Garden. In 2003, *Luminaria* expanded to 12 nights and we lowered the nightly capacity to 2,100 tickets. The expanded parking lot that opened in 2002 allowed us to park everyone at the Garden, ensuring an inclusive event. Since then, we have learned that on Friday nights people come from work rather than home and bring two cars, while on other nights people tend to carpool. So for the last several years capacity on Friday nights has been reduced to 1,800 tickets. Over the last decade, we have actually lowered overall capacity to make the event more enjoyable and parking easier. With the addition of 240 new parking spaces this summer, we will increase capacity by about 13%, or 270 tickets per night.

3 How do you set pricing and why do you sometimes discount tickets?

Las Noches de las Luminarias is the Garden's single largest fundraising event and is the result of tireless effort on the part of volunteers and staff. The funds raised support our horticulture, conservation, research, and education programs. Currently, *Luminaria* member tickets are \$20 and general public tickets are \$25. If you consider that an adult admission to the Garden

is \$18, members pay only an extra \$2 and the general public an extra \$7 for the experience – which we think is a pretty good deal.

Some years, if there is a night of *Luminaria* that is not selling well, we have offered discounted “rush” tickets the morning of the event. We never know when this will happen and we do it only as necessary. We understand the frustration this may cause you if you planned ahead and bought your tickets at full price. We do have a belief that “The plane must fly full,” which means that we need to use every opportunity to sell any remaining tickets.

We are making a significant change with pricing and discounts this year based on your feedback. Now, much like an airline, the earlier you buy your tickets the less expensive they will be. Member tickets will go on sale Monday, September 10 and if you buy your tickets by October 31, you will save \$5 on each adult ticket – taking the price from \$20 to \$15. On November 1, the ticket price will go back up to \$20. If you are not a member, then now is the time for you to join and save!

If we find ourselves needing to sell discounted “rush” tickets for a night of *Luminaria*, we will publicize the offer through email and social media with a \$5 discount on general public tickets. This will take the price from \$25 down to \$20, but not lower than the regular member price. Please keep in mind that we may still offer last minute discounted tickets outside of this price structure if necessary.

4 Why does it seem that there are fewer entertainment options?

Prior to 2003, when we hosted only three nights of *Luminaria*, we were able to book the same musical acts for each night. Many of the acts could not expand when *Luminaria* went to 20 plus nights and would be available for only part of the event. We had to book other acts to fill in. If you look at an invitation from that era, it does look as though there were a lot more entertainment options, but if you count the locations and the nights, you will see 10 exciting musical acts offered. In 2007, when we celebrated 30 years of *Luminaria*, we went back to booking only entertainment that was available every night of the event to ensure consistency and quality. Sadly, some of the old favorites could not return. More recently, your feedback helped us decide to eliminate one of the entertainment areas because the music spilled over into other areas.

One of the great things about a garden is that it is always growing and changing. Whether it is a public garden or your backyard, there is always something new. *Las Noches de las Luminarias* is a Valley tradition and each year we work to bring you the best holiday event in town!

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LANDSCAPE FOR LIFE™

Creating a Sustainable Residential Landscape

by Angelica Elliott, Landscaping and Gardening Education Coordinator

Desert Botanical Garden will soon offer a new series of classes to homeowners interested in sustainable landscape practices. Landscape for Life™ explores how to design and create a healthy and beautiful residential landscape by implementing sustainable practices. The series augments existing programs like Desert Landscape School, Your Desert Home-Gardening Program, and interpretation on the Center for Desert Living Trail.

Landscape for Life™, developed by the United States Botanic Garden (USBG) and the Lady Bird Johnson Wildflower Center, is based on the principles of the Sustainable Sites Initiative™. SITES™ is an interdisciplinary effort led by the above gardens along with the American Society of Landscape Architects. It was created to promote sustainable land development, construction, and management practices by providing national guidelines and performance benchmarks. (Sustainable Sites Initiative, 2010, www.sustainablesites.org).



In May, the Garden was invited to USBG to participate in a training workshop for the Landscape for Life™ educational series in anticipation of bringing the program to you.

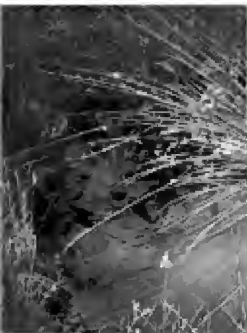
Purpose and Structure

Currently more than seven billion people inhabit the Earth. The rising population puts more pressure than ever on the planet's natural resources. It is projected that under the current "business as usual" scenario, humanity will soon (2030) need the capacity of two Earths to keep up with natural resource consumption (World Wildlife Fund, 2010. Living Planet Report 2010: Biodiversity, biocapacity, and development). Apart from that unlikely scenario, individuals can take action in small ways that add up to big results.

What can a homeowner do to reduce the pressure on precious natural resources? One way we can help is by working with nature rather than unintentionally against it. Residential landscapes make up a significant segment of our urban environment, so even the smallest changes to our landscape practices can have a substantial impact on the environmental health and human well-being of an entire area. The Landscape for Life™ series will investigate numerous ways that homeowners can make these changes, whether they live in the city or in rural areas.

What defines a sustainable landscape? The sustainable landscape considers the design, construction, and maintenance needs of the present without compromising the needs of future generations. A dynamic balance needs to be struck between the planet, profit, and people; in other words meeting the "triple bottom line."

Landscape for Life™ is composed of five lessons that explore the roles of the five universal elements of residential landscapes: water, soils, plants, plant practices, and materials. Participants will each be asked to create a base map of their own property. In a practical application, they will use the base maps to assess their sites and then learn how to implement sustainable practices by incorporating the five elements in their own landscapes. The classes are designed to engage the student and examine each topic through a combination of presentations, class discussions, exercises, and field trips.



Water: Thinking Outside the Faucet

Approximately 97% of the Earth's water is ocean saltwater and only 3% is freshwater. Drinking water is often used in landscapes without assessing the true environmental expenses of treating and pumping the water sources. In many cases, up to 50% of Valley homeowners' water usage may be used to irrigate their landscapes. A sustainable landscape is designed to minimize the use of drinking water for landscapes by using on-site alternatives such as gray water, water harvesting, and even air conditioner condensate. These alternatives will be explored in class along with ways to put them into action.

Soil: The Foundation of Landscapes

Understanding the role of soil is essential to the success of your garden. Many residential soils are overly compacted and over fertilized. In this Landscape for Life™ lesson, participants will be introduced to basic soil science concepts and will learn how to conduct simple tests to determine their own soil conditions. Once the soil assessment has been completed, students will use their base maps to record areas of compaction, erosion, or areas where the soil texture and structure abruptly changes. Finally, they will learn how to restore their soil along with stewardship practices that will assist in maintaining healthy soils.

Plants and Plant Practices: Selecting for Beauty and Function

Plants are a vital component of landscapes and contribute to many benefits as ecosystem services. Examples of ecosystem services include the production of food and renewable nonfood products, the creation of habitat, the enhancement of peaceful settings, and the mitigation of the urban heat island effect. Creating a sustainable garden includes selecting plants that are adapted to the site conditions and that require minimum inputs (potable water, fertilizers, and pesticides). This class will look at these roles as well as how to use vegetation around the home and buildings to increase energy efficiency. A well-planned design can cut heating and cooling bills by as much as 40%.

Materials: Creatively Managing Waste

Landscape materials can cause significant environmental damage by consuming energy and generating pollution from the manufacturing process, harvest, and transport. The life cycle of landscape material is often a linear process, known as "cradle to grave." Materials are being discarded rather than being reused or recycled. In a sustainable garden, the materials should ideally be reused or recycled, i.e. "cradle to cradle." When selecting landscape materials for the garden, one must take into consideration not only the immediate cost, but the environmental and human health impacts as well. Participants will explore the concepts of "reduce, reuse, and recycle" and how to apply these concepts creatively to minimize waste.



The Garden is pleased to present this series of classes to help homeowners become better stewards of the land, by implementing sustainable practices that can restore and protect the environment for future generations.

The class schedule for the Landscape for Life™ has not yet been set, but this fall we are offering a variety of landscape and gardening classes that will complement the Landscape for Life™ Educational Series. Classes include:

- Drip Irrigation Design
- Care for your Desert Garden
- Desert Adapted Plants
- Water Harvesting
- Composting
- Integrated Pest Management

Check dbg.org/education-programs/classes-trips and the Garden Calendar for listings. For more information about the Landscape for Life™ Educational Series, contact Angelica Elliott at 480 481.8171 or aelliott@dbg.org.

Special thanks to *Tending the Garden* campaign donors and Blue Cross®Blue Shield® of Arizona for supporting renovations to the *Center for Desert Living Trail*.



Photos by Rosalie O'Connor

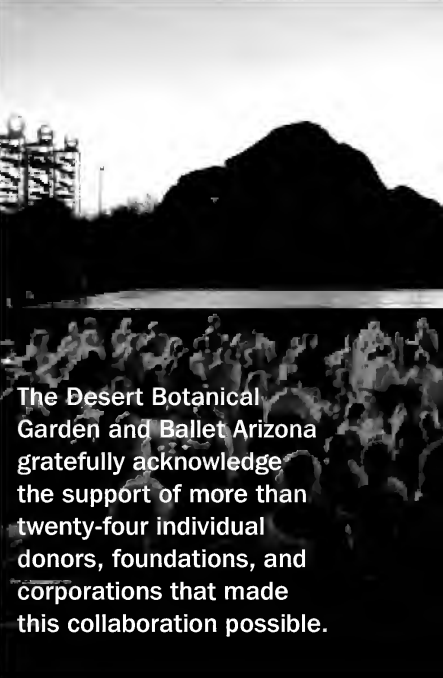


TOPIA *World Premiere*

Presented by Ballet Arizona and the Desert Botanical Garden

by Marcia Flynn, Director of Event Services

For seventeen nights in May 2012, the desert came to life as the full company of Ballet Arizona performed to sell-out crowds, whose only disappointment each night was that the performance had to end. It is not often that guests return two or three times to see the same performance, but this was so with *Topia*. Ib Andersen's brilliance in choreography, set to the music of Beethoven's Symphony No. 6, would have been more than satisfying in any theater setting. However, when it was performed in an outdoor desert venue on an 80-foot panoramic stage, with a view that had never before been seen, the aesthetic was amazing! Backlit in the afterglow of dusk, the Papago Buttes provided the ultimate stage backdrop. The colorfully lit saguaros, trees, and shrubs came to life as the dancers engaged them in their performance. During one of the performances, the moon appeared, sitting on top of one of the Papago Buttes while planet Venus gently rested on top of the other. What a perfect intersection of art, nature and the human experience: *Topia*. Guests left each evening expressing they had been given a gift such as they had never received before, thanking us for bringing the beauty of Ballet Arizona and the Garden together. That is the ultimate compliment for a collaboration of this nature. For information about Ballet Arizona, visit balletaz.org.



The Desert Botanical Garden and Ballet Arizona gratefully acknowledge the support of more than twenty-four individual donors, foundations, and corporations that made this collaboration possible.

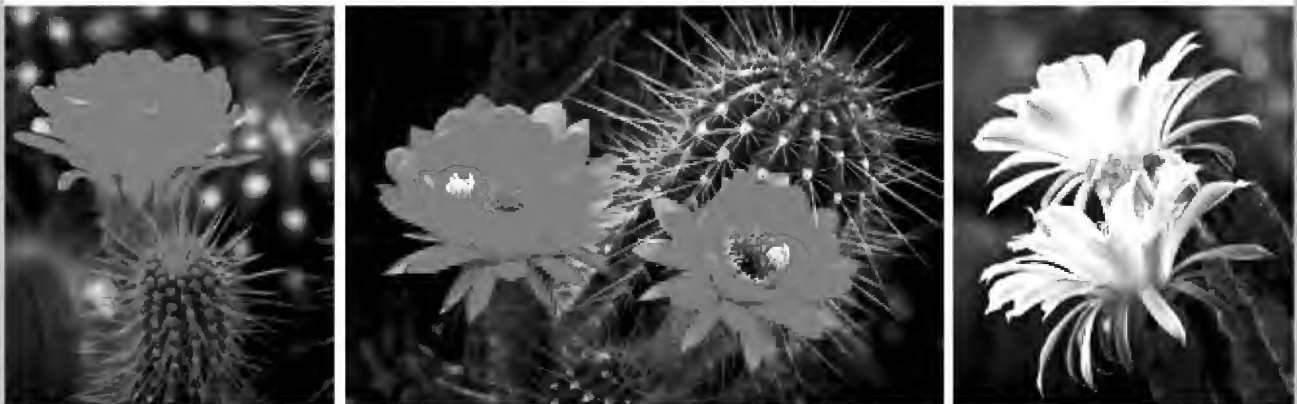
Horticulture Projects Update

by Brian Kissinger, Director of Horticulture



Last spring saw a special renovation project taking place, which was generously underwritten by Howard and Joy Berlin.

Enhancement of the *Berlin Agave Yucca Forest* was a major undertaking, as a large crane was needed to set a variety of specimen yuccas and large boulders into place. Large *Yucca elata* were added to the exhibit, as well as *Y. rigida*, *Y. faxoniana*, and *Y. rostrata*. Because transplanting of large specimens can have variable results, Kenny Zelov, assistant director of horticulture, and I sought out plants that were well-rooted and had been grown in Phoenix at the same elevation as the Garden. This should help ensure better success by matching the conditions under which they were grown to conditions at the Garden. With the addition of some nice organ pipe cacti to complete the look, the *Berlin Agave Yucca Forest* will be top-notch this fall.



The implementation of the top 10 renovation projects as described in the March 2012 *Sonoran Quarterly* has begun. We are still working on the *Echinopsis* bed renovation. The soil has been replaced, trees have been added, and we have set small boulders throughout the area. We will be planting soon and anticipate that it will be better and more striking than ever. We purchased many stellar hybrids that are very beautiful bloomers. Many of the existing plants will be reinstalled as well.

Other work is in full swing and should be ready for fall. The *Center for Desert Living Trail* phase two is happening as we go to press and we are planting trees throughout the Garden that will provide additional shade. The new restaurant landscape is also on the radar for late summer. All these areas of improvement are important for visitors, members, and staff and our attention to detail is critical.

Stay tuned to future issues of *The Sonoran Quarterly* for continuing updates, and thank you to all the volunteers who have braved the heat to help us realize our goals.



NEW PROFESSIONAL MEMBERSHIP PROGRAM

Monarch Society

Working Today to Conserve Tomorrow

by Lauren Svorinic, Individual Giving Associate



The Monarch Society is a unique membership program designed specifically for the Valley's emerging professionals. Members learn about the wonders of the Sonoran Desert while enjoying exclusive opportunities for networking and volunteerism.

The Making of the Monarch Society

The creation of the Monarch Society began with the Board of Trustees' approval of a 2006-11 strategic plan initiative to better serve the entire community by expanding the diversity of its audiences. Specifically, the initiative identified the need to cultivate the next generation of Sonoran Desert stewards by engaging them as members, visitors, and event attendees. In 2008 Teniqua Broughton, then Director of Programs at Free Arts of Arizona and an advocate for emerging leaders, was recruited by former Board President Oonagh Boppart to help lead the Garden's efforts to reach this audience. Informed by feedback from both online surveys and focus groups and aided by a leadership team of 12 emerging professionals, Broughton and Garden staff began to develop a new membership program for emerging professionals, which was named the Monarch Society.

Monarch Society Program and Activities

The pilot year of the Monarch Society launched in November 2010 with a brunch in Binns Wildflower Pavilion and a butterfly release appropriately located in the *Marshall Butterfly Pavilion*. Throughout the pilot year, the leadership team and Garden staff collected feedback from participants, with the aim of further developing the program to appeal to the Valley's emerging professionals. The result is a membership program that offers exclusive, mission-driven events, networking and opportunities for volunteerism. Last year, Monarch members enjoyed personalized landscape design tips from Director of Horticulture Brian Kissinger and Assistant Director Kenny Zelov, a private tour of the *Design for a Living World* Exhibition, a relaxing reception and participation in the Garden's Oaxacan Trunk Show, and even a summer dance party to beat the heat and "let loose." Monarch members also participated in a volunteer project with the Garden's horticulture department and were responsible for revitalizing a space in the Garden with new plantings.

Monarch Society Membership

The Monarch Society membership offers the same great benefits associated with being a Garden member, including free annual admission, members-only discounts and reciprocal admission to gardens across the country, plus four exclusive events annually and additional volunteer and networking opportunities. Membership to the Monarch Society is \$95 annually for a single membership or \$125 for a couple membership. For more information about the Monarch Society program, please visit www.dbg.org/monarch-society or contact Lauren Svorinic at 480 481.8147 or lsvorinic@dbg.org.



WINTERIZING YOUR ADENIUMS

by Tom Gatz, Docent and Horticulture Volunteer



Adeniums, native to Africa and the Middle East, thrive in the desert heat when given ample sun, water and fertilizer, but require absolutely dry conditions to survive the winter cold. Photos by Tom Gatz and Dan Smith.

We are expecting to have a good selection of adeniums, also known as the desert or Karoo rose, available at the Garden's Plant Sale this fall. If you purchase one of these beautiful plants, you will need these tips to make sure your adeniums survive the winter months. In a nutshell, treat adeniums like cold and water-sensitive succulents in the winter by keeping them dry and protecting them from frost. In the summer, treat them like sun and water-loving perennials with lots of heat, sun, water and fertilizer to encourage growth and blooming.

As temperatures cool off in October, cut watering back and stop completely by November, especially if the leaves begin to yellow and drop off (a sign that it is entering dormancy) and particularly for large plants in big pots that take longer to dry out. The blossoms persist into late fall on some cultivars, so in mild years you can keep them outside and dry until about mid-November, but bring them inside before freezing temperatures arrive or before they are subjected to a cold rain.

You can keep them inside by a sunny window during the winter where they might maintain some foliage (depending upon the species/cultivar) or, as I have done for the past 18 years, keep them totally dry in a dark, unheated garage where they will drop all their leaves and go dormant until spring. Never let them get wet and cold in the winter because they will rot. Some brave souls manage to keep their adeniums dry and alive outside on covered patios throughout the winter with only a little frost damage on the outer branches, but rain blown in by winter storms or the temptation by well-meaning spouses or winter visitors to water them "just a little bit" can be their undoing.

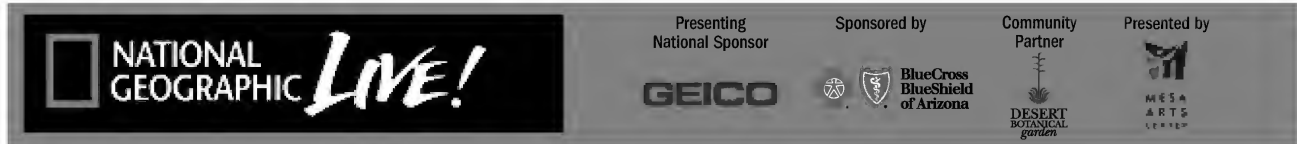
In the spring when the nighttime temperatures consistently warm-up to above 50 degrees, usually sometime in late March, bring your adeniums back outside. Limited watering is best

until it really warms up and new foliage is observed. Spring is also a good time to remove any crossing or floppy branches. Old wood (not new growth) cuttings can sometimes be rooted in pumice if generously watered. You can elevate the trunk over time when repotting to gradually expose their interesting thick, twisted roots. Pot them up in the spring in a well-drained soil mix; bigger pots result in bigger plants more quickly.

Adeniums thrive on plenty of water given several times each week during the heat of the summer. Established adeniums also appreciate fertilizer that is lower in nitrogen (the first number on the bag) and higher in phosphorus and potassium (the second and third numbers), which will prevent leggy growth and encourage blooming.

A long-time favorite, red-flowered variety with a long bloom period, upright stems and white bark is called 'Crimson Star.' It is a horticultural cross between *Adenium obesum* and *Adenium swazicum*. New cultivars are being developed every year so you will have lots to choose from. If you want one that will develop a really wide base (caudex) get an *Adenium arabicum*—though they don't flower as much as do the numerous cultivars and hybrids of *A. obesum*. In Phoenix, bigger adeniums in 10 inch-plus containers can take almost full sun. Smaller ones appreciate filtered or part sun but they will get floppy stems and not flower much if they are in too much shade. Visit dbg.org/gardening-horticulture/gardening-resources#desert for more information on caring for adeniums. A great book by local experts Mark Dimmitt, Gene Joseph, and David Palzkill, now available in the Schilling Library at the Garden, is entitled *Adenium: Sculptural Elegance, Floral Extravagance*. Check out <http://youtu.be/MHlcVDCJ2W8> to get additional tips on caring for adeniums.

Thanks to Cynthia Robinson and Dan Smith of the Central Arizona Cactus and Succulent Society for reviewing earlier drafts of this article.



2012/2013 Speaker Series Use the code “desert” when ordering tickets and 10% of your ticket price will be donated to the Garden by Mesa Arts Center.



Angela Fisher + Carol Beckwith

African Ceremonies: Documenting a Vanishing World

Wednesday / October 24
7:30 p.m.

Photographers and filmmakers Carol Beckwith and Angela Fisher are working against the clock to record the unique African ceremonies that are rapidly changing in the face of modernity. Join them for an eye-opening cultural journey, more than 25 years in the making. Beckwith and Fisher have traveled across 270,000 miles and to remote corners of 40 countries in exploration of many African cultures. In the process, these world-renowned photographers have produced 15 widely acclaimed books and made four films about traditional Africa.

Photo Credit: Courtesy Beckwith/Fisher

Visit www.nglive.org and learn about other exciting events.



Kenny Broad

Extreme Cave Diving: Exploring the Bahamas' Blue Holes

Wednesday / November 28
7:30 p.m.

Join Nat Geo Explorer of the Year for 2011 Kenny Broad for a fascinating dive deep into the beautiful but treacherous “blue holes” of the Bahamas. He risks this extreme exploration to gain valuable insights into freshwater resources, archaeology and climate change. Largely unexplored, unimaginably beautiful, and considered among the most hazardous places to dive, the flooded caves, or “blue holes,” of the Bahamas are a treasure trove of scientific knowledge. Broad, an accomplished cave diver, leads scientific expeditions to these fascinating environments. A witty, entertaining speaker and committed scientist, Broad will share the adventure and science of exploring this incredible underwater world.

Photo credit: Max Wallace



Tim Laman + Ed Scholes

Birds of Paradise: Extreme, Bizarre, Extraordinary

Wednesday / February 6
7:30 p.m.

Photographer and tree canopy researcher Tim Laman and Cornell University ornithologist Ed Scholes take us deep into the New Guinea rain forest to observe the secret lives, bizarre displays, and dazzling courtship antics of birds of paradise—a living laboratory of evolution. Working with Scholes, who has been conducting field research on birds of paradise for over 10 years, Laman captures images of nearly impossible subjects—from animals that glide through rain forest canopies to rare and endangered birds. His pioneering research in Borneo led to a Ph.D. from Harvard, and his photography has been featured in 18 *National Geographic* stories. Join Laman and Scholes as they recount their wild adventures in the New Guinea rain forest.

Photo credit: Tim Laman



Børge Ousland

Adventures in Polar Exploration

Wednesday / March 6
7:30 p.m.

Polar adventurer, avid outdoorsman, and former member of Norway's Marinejeger (the equivalent to our Navy Seals), Børge Ousland is the first person ever to cross Antarctica solo and unsupported, and the first to cross the Northwest and Northeast Passages by sea in a single season. Journey with him to the Poles in this charismatic and compelling presentation of bigger-than-life images, videos and stories. Ousland will report on his latest expeditions with photos and hair-raising video direct from the field.

Photo credit: Børge Ousland

Special Member Series Prices starting at \$78. Individual tickets also available.

Ticketing information:
480.644.6500

MesaArtsCenter.com/natgeolive
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One East Main Street, Mesa, AZ



U.S. Bureau of Land Management Grant Awarded

Garden researchers Andrew Salywon, Kevin Hultine, and Matthew King received a one-year, \$6,000 grant from the U. S. Bureau of Land Management to study *ciénegas* at Las Ciénegas National Conservation Area (LCNCA) in southeastern Arizona. As highlighted in the June 2011 *Sonoran Quarterly*, *ciénegas* are a type of wetland found in southeastern Arizona, New Mexico, Texas, and northern Mexico, and are one of the rarest and most endangered habitats in the southwestern United States. They provide critical habitat to several species of threatened and endangered plants and animals. Visit dbg.org/about-the-garden/sonoran-quarterly for the June 2011 article – *Ciénegas Rare Oases in the Desert*.

The project will construct the first digital maps of *ciénegas* in LCNCA and test the chemistry of groundwater and surface water bodies associated with these unique habitats. The maps will enable land managers and scientists to assess short- and long-term changes in habitat area that may result from groundwater pumping, range management or climate change. Water chemistry tests will help identify the sources of the water (i.e., rainwater or groundwater) that feed *ciénegas* and provide a baseline data set to detect shifts in water quality.

Look for results of this research project in future editions of *The Sonoran Quarterly*.

IOS Meeting in Cuba

Garden researchers Raul Puente and Andrew Salywon traveled to Havana, Cuba in early July to participate in the 32nd Congress of the International Organization for Succulent Plant Study (IOS). There they made three presentations about the Garden and their studies of cacti and agaves. The IOS is a nongovernmental organization that promotes the study and conservation of succulent and allied plants. The congress in Havana included 51 presentations

by participants from 12 countries, fieldtrips, and a tour of The National Botanical Garden of Cuba. Part of the group also participated in a post congress tour to eastern Cuba to observe some of the island's natural vegetation and native cactus species.

The Desert Botanical Garden has a long history of association with the IOS, having hosted previous congresses in 1992 and 2002. Puente and Salywon's representation at the current

Congress helped to secure that honor once again—the IOS has decided to hold its next Congress (in 2014) at the Desert Botanical Garden.



Agave legrelliana near Tres Ceibas de Clavellinas, Provincia Matanzas, Cuba.



Harrisia eriophora and *Pilosocereus robinii* near Cayo Santa Rosa, Provincia Holguin, Cuba.

Garden Trustee Wins Conservation Award

Trustee Emerita Nancy Swanson was honored with the Garden Clubs of America (GCA) Zone XII Conservation Award.

In his letter of support for the nomination, Garden Director Ken Schutz noted "Nancy has generously supported many programs related to the conservation of desert plants, including an annual GCA scholarship administered by the Garden, and a research fellowship that will allow Garden staff to visit arid land areas of South America and southern Africa, fostering an exchange of knowledge as well as rare and endangered plant germ plasm for the purposes of research, conservation, and education." The Garden celebrates Swanson's leadership and her love of gardens and gardening as well as her commitment to saving endangered plants of the Sonoran Desert and the American Southwest.



Dinner on the Desert 2012

On April 28th, the Desert Botanical Garden hosted a record 610 guests at the 26th Annual Dinner on the Desert, the Garden's spring-time annual fundraiser. Co-Chaired by Kathy and Chuck Munson, the lively event fused the sights, sounds and flavors of the Americas.

Guests enjoyed the setting sun as they took in the grandeur of the Garden while strolling to Dorrance Hall for the silent auction and the chance to bid on more than 300 striking specimen plants, exceptional pots, and garden-inspired art, plus unusual and exciting experiences.

The magical setting of the Stardust Foundation Plaza served as the background for an evening of bold and fresh Latin American-inspired cuisine prepared by Chef Dominic Vaccaro of Copper Square Kitchen/Hyatt Regency Phoenix. After dinner, an electrifying blend of Latin music by Quetzal Guerrero beckoned guests back to the Ottosen Entry Garden for the After-Party and dancing under the stars.

More than \$375,000 net was raised by Dinner on the Desert 2012 to benefit the Garden's annual programs.

Goodbye to Charlie Brenner

Last spring the Garden lost one of its longtime volunteers, Charlie Brenner. Brenner had been a volunteer for 18 years and served the Garden in so many ways.

Charlie volunteered as a Horticulture Aide, Docent, Day Captain, Research Assistant and with the Plant Hotline. He also assisted with Seedlings, Kids Corner, Garden Outreach, Flashlight Tours, Plant Sales, *Luminaria*, Library, Butterflies, Special Events and Festivals. Most of all, he was a birder. He was here nearly every day showing visitors and staff the owls, the roadrunner nests, and so much more.

Charlie received lots of fan mail from Garden visitors. Brenner's love of the Garden showed in everything he did. A special pin, *The Wise Owl*, was created to honor the 21,000 hours of service that Brenner contributed to the Garden and was presented to his family during the celebration of his life last May.

In 2011, a generous, anonymous donor established a fund to honor Brenner on the occasion of his 90th birthday, and gifts in his honor are now used to support educational programs at the Garden.



BACK BY POPULAR DEMAND



Last year Desert Botanical Garden and Ballet Arizona presented the Phoenix premiere of *MOMIX: Botanica*. Three sold-out performances in the Orpheum Theatre delighted audiences with high energy dance, magical puppetry and other special effects.

We are pleased that K.H.Arts is bringing *MOMIX: Botanica* back to Phoenix for three more performances in February and ask Garden members to mention the word "Garden" when purchasing their tickets. K.H.Arts will donate \$3 for every ticket purchased in this manner.

February 22-23, 2013
Friday, February 22 at 8 p.m.
Saturday, February 23 at 2 p.m. and 8 p.m.
Orpheum Theatre

Tickets on sale September 1 at
ticketmaster.com or 602.262.7272

Visit mosespendleton.com/works-botanica.html to learn more about *MOMIX: Botanica*.

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 Page 9 *The Four Seasons* - Matthew Hollow
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 Page 12 Residential backyard - Tom Gatz
 Page 13 Desert-adapted plants - Adam Rodriguez

Page 13 Water, soil, garbage dump - Landscape for Life™
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 Page 16 Echinopsis photos - Adam Rodriguez
 Page 17 Volunteer project (top) - Lauren Svorinic, Monarch Society volunteers (bottom) - Jeffe Tallman
 Page 18 Adenium 'Crimson Star' - Tom Gatz
 Page 19 Winter dormant *Adenium obesum* x *swazicum* 'Crimson Star' - Tom Gatz, middle and right, *Adenium crispum* hybrid 'Star of Happiness' - Dan Smith

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 Page 24 Fishhook barrel cactus, *Ferocactus wislizeni* - Adam Rodriguez
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 Back Cover Plant Sale - Gene Almendinger

in appreciation

The Desert Botanical Garden is grateful to all 26,848 members and donors for their support. Acknowledged in this section are annual Curator's Circle, Director's Circle, President's Circle and Founder's Circle members and donors giving \$2,500 or more over the year, from June 16, 2011 through June 15, 2012. Included are memberships and unrestricted gifts to support the Garden's annual operations.

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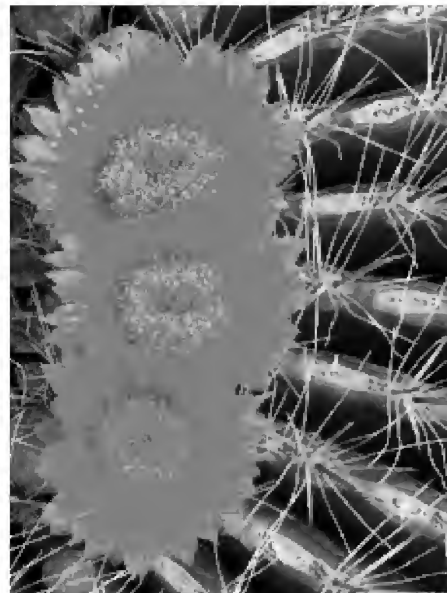
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Honor and memorial contributions are used to provide for the Desert Botanical Garden's horticulture, education and research programs. Gifts may also be recognized with benches & plaques. These contributions have been received from March 16, 2012 through June 15, 2012.

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The Desert Botanical Garden Mission

The Garden's commitment to the community is to advance excellence in education, research, exhibition, and conservation of desert plants of the world with emphasis on the Southwestern United States. We will ensure that the Garden is always a compelling attraction that brings to life the many wonders of the desert.



WiFi Zone

FREE WI-FI is available in five locations within the Desert Botanical Garden: the area in front of Admissions, Ottosen Entry Garden, Boppart Courtyard, the Center for Desert Living Trail, and Ullman Terrace.

Partial funding provided by The Arizona Community Foundation.



FALL PLANT SALE

Garden Members' Preview Friday / October 19 / 7 a.m. - 5 p.m.

Open to the Public Saturday / October 20 / 7 a.m. - 5 p.m. AND
Sunday / October 21 / 9 a.m. - 5 p.m.

No admission charge to enter the plant sale.





Conservation: Front & Center

The conservation of desert plants and their habitats has always been a critical part of the Garden's mission. Consider how our founders in 1939 could see that without intervention, many desert plants were on a path to extinction.

As our staff scientists in this issue of *The Sonoran Quarterly* so eloquently express, we are doing more than ever before to expand our collection of desert plants, and to dramatically increase our efforts to protect and preserve them.

For me, the image of the Garden as a Noah's Ark for plants perfectly captures the spirit of what we are becoming. But the real power in such imagery is this: there should be a time when an Ark is no longer necessary—a time when native plants can be returned to their natural habitats and thrive on their own again, without threat of extinction.

With this in mind I'm sure you can understand my great delight when, just as we were



finishing the final draft of this issue, we received word from the Nina Mason Pulliam Charitable Trust that the Garden's proposal to create a community-wide Conservation Alliance was approved! Thanks to the generosity of the Pulliam Trust and its commitment to protecting nature, the Garden will be able to invest \$300,000 over the next three years building a coalition of conservationists and volunteers. That coalition, consisting of multiple organizations and hundreds of individuals, will become a powerful new advocate for the conservation of mountain park preserves in Phoenix, Scottsdale, and Maricopa County.

Such success would not have been possible without the help of all our conservation partners and, especially, the 5 Communities Project sponsored by the Center for the Future of Arizona and The Arizona We Want Initiative. Readers can learn more by visiting the Conservation Alliance website at www.thearizonawewant.org/programs/communities/community-dbg.php.

Everyone at the Garden is grateful to all who made the Conservation Alliance a reality.

With best wishes,

Ken Schutz
*The Dr. William Huizingh
Executive Director*

We are doing more than ever before to expand our collection of desert plants...

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In Appreciation

On our Cover

A teddy bear cholla, *Cylindropuntia bigelovii*, stands out among a rich collection of cactus species in the Ottosen Entry Garden. Photo by Adam Rodriguez.

Back Cover

Las Noches de las Luminarias

The Valley's best holiday event comes to life at the Garden with more than 8,000 hand-lit luminaria bags and 10 musical groups performing nightly.

To purchase tickets visit dbg.org.



NEW LIVING COLLECTIONS PLAN FOR THE CACTUS AND AGAVE FAMILIES

by Dr. Joe McAuliffe, Director of Research, Conservation and Collections

To create the new collections plan, 14 staff members of the Research, Conservation and Horticulture Departments worked together for nearly two years to assess the current collection, determine needs and priorities for the future, and devise solutions for significant collections management challenges.

The Desert Botanical Garden has one of the world's most impressive living collections of the cactus and agave families (Cactaceae and Agavaceae). The breadth, prominence, and importance of those collections received national and international acclaim in 2010 when the North American Plant Collections Consortium (NAPCC), a group within the American Public Gardens Association (APGA), designated our Cactaceae and Agavaceae collections as the *National Collections* for these two families [see *The Sonoran Quarterly* Vol. 64(4), 2010, p. 4-7 for article by R. Puente].

In order to properly plan for the growth and care of the living collection, a team of Garden staff developed a far-reaching, comprehensive collection plan for both families. In July 2012 the Board of Trustees unanimously approved and adopted this new plan as a blueprint for further enlarging and improving the collection over the course of the next quarter century.

Parameters and Management Issues

A collection plan for any museum is more than simply a list of items (in our case, living plants) that the institution wishes to acquire. A thorough plan also includes detailed consideration of how the collections contribute to an institution's mission as well as how those collections will serve various groups. Acquiring, housing, and caring for any collection require resources such as facilities, personnel, supplies, and funding. A collection plan that is in accord with mission-related, institutional priorities helps ensure the wise use of limited

financial resources and also helps the process of procuring additional financial support.

To create the new collections plan, 14 staff members of the Research, Conservation and Horticulture Departments worked together for nearly two years to assess the current collection, determine needs and priorities for the future, and devise solutions for significant collections management challenges. With input from the Research and Horticulture Committee, one of the standing committees of the Board of Trustees, five groups of stakeholders that use the collections were identified. The five groups are (1) visitors, tourists, and horticulture hobbyists, (2) K-12 teachers and students, (3) conservation partners, (4) researchers and the higher education community, and (5) commercial horticulture partners. Input from representatives of these groups contributed to a plan that better serves many different needs.

Before considering details of how to enlarge the collection, the Collections Planning Working Group first grappled with issues related to effective management and care of the existing living collection. One of the issues involved development of a process by which seeds are acquired and used. This was needed because the Garden's seed collection had grown substantially but there was little coordination between acquisition efforts and specific plans for using the seed. A new process was created that facilitates the acquisition of seed resources that fit within the collection plan and also tracks these acquisitions to ensure that they are used as originally planned.

The second management challenge involved losses of species from the existing collection. Botanical gardens typically care for many thousands of different species, with the consequence that some species are represented by very few (sometimes only one or two) genetically distinct individual plants. Species represented by so few individuals are at great risk of loss from the collection, necessitating reacquisition from other sources if that species is desired as part of the collection. It was recognized that new information management tools and management processes were necessary in order to prevent these kinds of losses. Accordingly, the Desert Botanical Garden *Red List* process was created in which staff task groups regularly review updated collections records and identify species whose numbers have fallen to one or two individuals. The task groups then plan and prioritize management actions, such as propagation or acquisition of additional plants.

The name *Red List* was borrowed from the International Union for the Conservation of Nature (IUCN) *Red Lists* of endangered species. The IUCN *Red Lists* likewise provide tools that allow conservationists to recognize threatened species and devise strategies to prevent species extinctions.

Planning the Growth of the Living Collection

Once the group had created and implemented these two management approaches, work on planning how to increase the breadth of the current collections began in earnest. To do this, two new information databases were created that contain information on all known species of the two families, a variety of information about each species including geographical occurrence, environmental conditions, and conservation status, and whether or not the Garden currently has growing representatives or seeds of each species. These databases enabled a detailed assessment of current gaps within the Garden's collections, the assessment of horticultural requirements of different species, and planning for incremental increases in the collection over time.

For example, the gap analysis for the cactus family indicated that the Garden currently possesses about half of the approximately 2,000 species of cacti found in the Western Hemisphere, (see Figure 1), including about three-quarters of the species from the southwestern United States and the Baja California peninsula, Mexico. About half of the species from mainland Mexico are represented and about a third of all species from arid and semi-arid regions in southern South America (Peru, Chile,

and Argentina) are in our collections. A far smaller fraction of species from the humid tropics of Central America and tropical South America are held by the Garden, and this is understandable, as those species require environmental conditions that are difficult, at best, to provide in current Garden facilities.

The Collection Plan states that *“The Garden’s cactus and agave family collections will focus on species from warm temperate, subtropical, and tropical arid and semi-arid regions of the world. The Garden will acquire and maintain only those living plant species for which it has the facilities that provide the environmental conditions necessary for maintaining plant health and vitality. This is the first, foundational step to ensure the survival and perpetuation of plant species under our stewardship and care in the living collection.”*

Even though the focus of our current and future collections is on plants from the world's drylands, the Living Collection Plan nevertheless outlines a means by which the Garden will initiate the process of creating multi-institutional NAPCC National Collections for the cactus and agave families. By including other institutions from other climate regions in the U.S., the National Collections of the two families can be expanded to include species that are unsuited for the hot desert climate of Phoenix, such as those from the humid tropics. In this vision, a collection consisting of all species from both families can be created, with the Desert Botanical Garden taking the lead in creating and maintaining an integrated database.

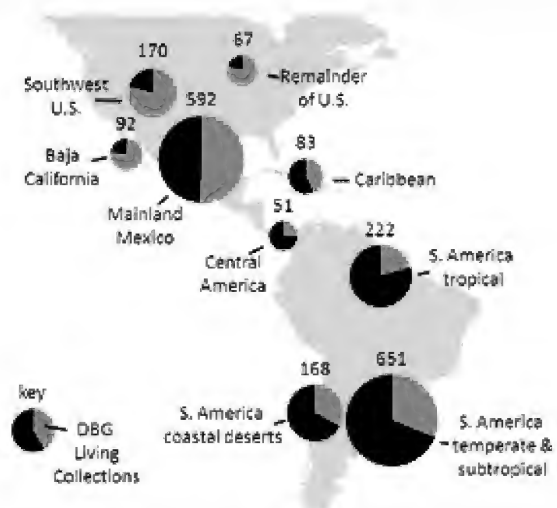
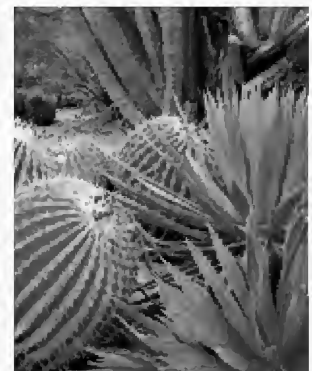


Figure 1: Map of western hemisphere showing the percentages of cactus species we have from different regions in our living collection. Illustration by Andrew Salywon.



Brandi Eide working in a propagation greenhouse, caring for new seedling cacti. Photo by Joe McAuliffe.



Cacti and agaves growing together on Garden grounds. Photo by Joe McAuliffe.



Joe McAuliffe in 1988 with a charismatic giant, *Pachycereus weberi*, in the Tehuacán Valley of tropical Mexico. Photo by Joe McAuliffe.

Key Goals for the Future

The Living Collection Plan for the cactus and agave families outlines short-, medium-, and long-term goals to be accomplished over the next 25 years.

Here are some of the main goals for each period:

Short-term goals (through 2016):

- Prevent losses of species from the existing collection through the *Red List* review process
- Acquire remaining species from the southwestern United States and adjacent Mexico
- Construct new horticultural facilities as part of 2012-17 Strategic Plan
- Create new propagation and seed storage facilities
- Begin process of creating multi-institution NAPCC National Collections
- Detailed planning of future South American acquisitions

Medium-term goals (2017-2021):

- Formally review effectiveness of *Red List* review and action process
- Begin full-scale acquisitions from South America
- Add species that require greenhouse conditions
- Coordinate process of expanding and documenting multi-institution NAPCC National Collections
- Initiate feasibility study for creation of a new, capstone exhibit as part of long-term goals

Long-term goals (2022-2036):

- NAPCC multi-institution efforts expand National Collections of Cactaceae and Agavaceae to represent all known species
- Creation of a dramatic, new capstone exhibit in a conservatory space on Garden grounds: “*Charismatic Megafloora of Tropical Drylands*”

The last item listed above is envisioned as a unique exhibit of giant succulent plants from seasonally dry, tropical regions of the world. This exhibit could include the most massive cactus that exists, *Pachycereus weberi*, which is found in semi-arid climates of tropical Mexico. Together with giant succulents like this from the New World, other plants that would be included are the wondrous and magnificent giant water-storing plants of the Old World,

including giant candelabra and tree euphorbias of southern Africa, baobabs and bottle trees of Africa, Madagascar, and Australia, and the bizarre dragon trees of the island of Socotra, off the horn of Africa. This exhibit would display these magnificent and unusual plants in a way that is not currently done at any botanical garden in the world. Creation of this exhibit in a dramatic conservatory structure by 2036 would be a spectacular way to usher in the Garden’s centennial in 2039.

The new Living Collections Plan represents the first time the Garden has developed such a thorough and detailed analysis of existing collections along with a vision for future collections. Over the next several years, similar efforts will be made to develop collections plans for other plant groups, including Old World succulents and trees and shrubs.

In addition, the Garden’s herbarium and library also represent important institutional collections, so detailed collection plans will be created for them.

Taken together, the considerable amount of thought and work that will go into all of these collection plans will make our institution a leader among botanical gardens and our desert collections among the most important and impressive in the world.



A New Name for a Growing Department

In July 2012, the name of the Research Department was formally changed to the *Research, Conservation and Collections Department*. The new name provides a clearer representation of the department’s broadened scope, which includes not only research on desert plants and environments, but also a vibrant, multi-pronged conservation program, curation of the living plant collection, and curation and management of the herbarium and library collections.

LIVING COLLECTIONS

The Search Is On!

by Kimberlie McCue, Program Director,
Conservation of Threatened Species and Habitats

Great botanical gardens have great plant collections and the Desert Botanical Garden is regarded as having one of the finest collections of desert plants in the world. These collections include the National Collections of Cactaceae and Agavaceae. However, as Dr. Joe McAuliffe relates in his report on our new collections plan, we are not content to rest on our laurels. The Garden is setting out to make a great collection even better. That is why I am very happy to announce that information on our wonderful plants can now be accessed and searched on the Garden's new plant database, called *Living Collections*.

The creation of *Living Collections* was funded by a grant from the Institute of Museum and Library Services. I reported on this grant and our vision for the new database last spring [see *The Sonoran Quarterly* Vol. 66(1), 2012, p. 4-5 for article by Dr. K. McCue]. Now the vision is reality! Whether you are planning a visit to the Garden, want to learn more about a specific desert plant, are a researcher, or a gardener, *Living Collections* will have something for you.

Using the Online Database

Your search begins at livingcollections.org where you can enter either the common name or scientific name of a particular plant. Please don't be intimidated by the thought of using scientific names. The database will start "auto-filling" as you type. For example, if you start by typing *Agave*, the database will show you five possible agave species in alphabetical order. Once you arrive at the page for a particular plant, you will find a lot of information, including the name

of the family the plant is in, the common name, the conservation status of the plant, if it has one (e.g. endangered or threatened), and the cultivation requirements (e.g. light and water needs, as well as frost and heat tolerance).



Across the top of the page you will also see tabs with labels such as Accessions, Images, and Map. By clicking on Accessions you will find a list of all of the individual collections of a particular plant that the Garden has. Click on one of the accession numbers to find detailed information on that particular collection. Under the Images tab you can see one or multiple images of the plant.

A very exciting feature of the database is found under the Map tab. Click here and you will see a map of the Garden with all the places that the plant you are interested in is located. Conversely, click on one of the location flags on the map and you will see information about that particular plant.

Extra Features

Adjacent to the scientific name of the plant you will see several icons; these are links to other relevant databases and websites. The links include Missouri Botanical Garden's Tropicos database, SEINet (Southwest Environmental Information Network), the Center for Plant Conservation, and GenBank (a database of DNA sequences).

Accessing *Living Collections* is not limited to your desktop or laptop. The database can be utilized from any mobile device with an internet connection. So, if you are in the Garden and see a plant about which you want more information, just access livingcollections.org from your mobile device and look it up! Also, when you link to *Living Collections* while in the Garden, the database will show you your location on a map of the Garden.

We began development of *Living Collections* in August, 2011. For our December 1, 2012 public launch we have mapped all of the Cactaceae and Agavaceae located on the core *Desert Discovery Trail*, *Plants and People of the Sonoran Desert Trail*, and the *Harriet K. Maxwell Desert Wildflower Trail*. However, mapping the collections will be an ongoing process, so if you become a regular visitor to *Living Collections*, you will notice more and more maps of plants coming online. We will also be expanding the gardening information that we provide for the plants. Like our living plant collection, the *Living Collections* database will be a dynamic, evolving resource that we hope you will enjoy.

We invite your input on the database. Please let us know about ease of use, features, and other types of information you would like to see in the future. Write to livingcollections@dbg.org.



Cardones (*Pachycereus pringlei*) near Webster Auditorium shown in their geographically accurate locations on the Garden's new basemap. Illustration by Veronica Nixon.

"Cultivators of the earth are the most valuable citizens."

– Thomas Jefferson



DBG *Community* GARDEN

by Kenny Zelov, Assistant Director of Horticulture

From October 2010 through January 2011, in support of the 2012-2017 Desert Botanical Garden Strategic Plan, the Garden convened a task force of board members, staff, volunteers, and local experts to explore the possibility of implementing a community garden on-site. The task force helped identify the challenges that other community gardens have faced and explored the educational programming possibilities and benefits that such a garden could generate.

The task force determined that the Garden can, and should, play an important role in increasing the visibility of community gardening in the Phoenix metro area. For the program to succeed however, we first needed to develop our institutional knowledge and skills. In other words, before the Garden can become a resource on this topic for the Valley, we must first become experienced community gardeners ourselves. The community garden, therefore, will not be open to the public initially, but may be used as an outdoor classroom as the project progresses.

Getting Started

After applying for and receiving a generous grant from The Steele Foundation, the DBG Community Garden project is now underway. The first phase of the community gardening initiative was the creation of an on-site DBG Community Garden with volunteers and staff, through which we can learn hands-on how to be community gardeners. The purpose of this first phase is to help our institution master the art of community gardening, provide an authentic working demonstration garden, serve as a teaching lab for workshops and classes in gardening best practices, and assess and share the results with the community.

In spring 2012, a steering committee composed of staff and volunteers was formed. To lead the process, Doreen Pollack, executive director of the Valley Permaculture Alliance was contracted. Pollack is a master gardener, a permaculture designer, and an experienced coach and green gardening consultant; she was also a member of the original task force that explored the feasibility of the new community garden. Pollack augmented the project's level of proficiency by helping staff understand their roles, supporting them in developing the project infrastructure, and guiding the decision-making process.

One of the first steps of the steering committee was to develop a purpose statement to guide the initiative:

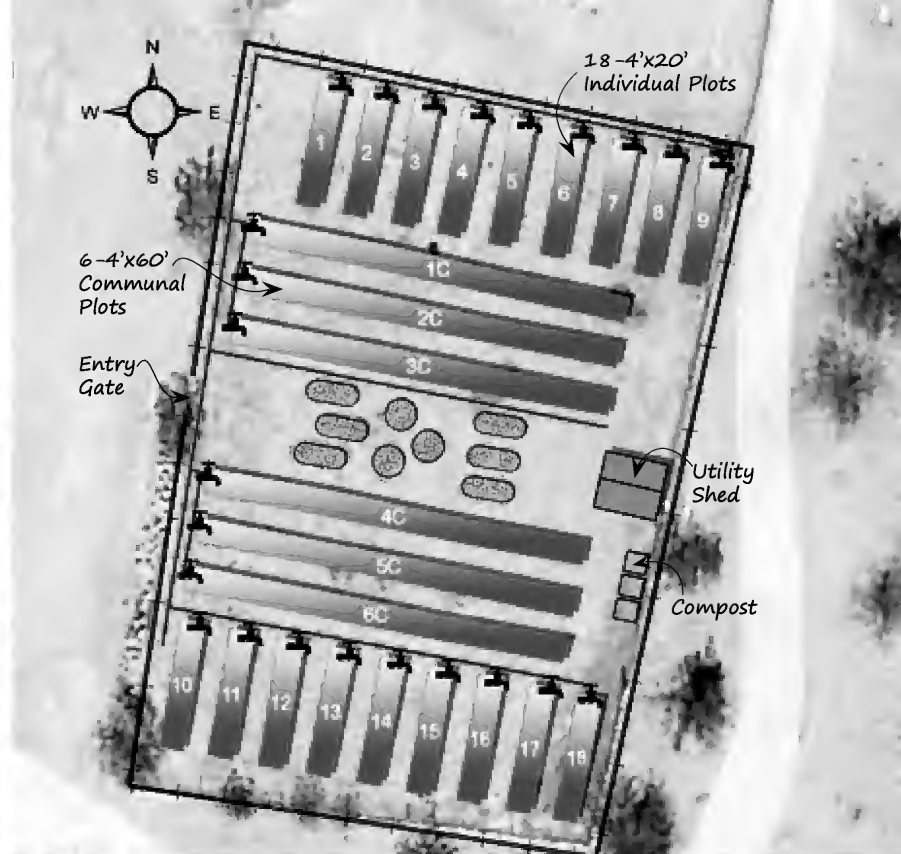
The Garden strives to be a leader in promoting community gardening in the Phoenix area by designing and implementing a community garden with staff and volunteer involvement. The community garden will serve as a model that demonstrates vegetable gardening best practices in the desert environment, promotes educational opportunities, and enhances and further develops a sense of community within the Garden. We will share our results with extended communities beyond the Garden.

Other tasks followed, such as the development of the participant application, the recruitment process, and content for the informational sessions; identification and implementation of subcommittees; and other important elements.

Getting Going

In the first few months, the steering committee opened the application process for staff and volunteers and created content and materials for a series of informational sessions. Interested individuals submitted an application which helped to establish their varying degrees of gardening knowledge.

Results from the responses revealed that 24 plots would accommodate the number of potential participants. A design consisting of 18 individual plots measuring 4'x20' and six communal plots measuring 4'x60' was created (see page 9). Three of the communal plots are reserved for groups of 18 gardeners and three for larger groups as follows: 1) Garden educators who lead school field trips, 2) weekend docents, and 3) staff from the Garden's



new restaurant, Gertrude's, opening January 2013. Considering the size of these groups, the total number of participants in this project may exceed 100.

The DBG Community Garden, about ¼ of an acre in size, is located adjacent to the pumpkin patch area used for the fall Great Pumpkin Festival. This area has been used in the past as a research plot for a variety of projects. Last summer the steering committee and a working group designed the space, purchased the tools and equipment to prepare the land, and performed a soil analysis, which confirmed that the soil is safe for growing and eating vegetables. We also learned that we should amend the soil with compost to add the nutrients needed for optimal health of the garden.

Acting on that information, the ground was tilled to loosen the compacted top layer. Subsequently, more than 50 gardeners turned out for a work day to remove the loosened earth, add compost, return the soil to the beds, and dig it all in to create a deep layer of suitable garden soil. Since then, on additional work days, wooden raised beds have been built, an irrigation system added, and soil and compost put into the raised beds. Perimeter fencing has also been installed around the area as a line of defense against desert wildlife, especially rabbits, and bird netting has been added.

Details of the Design

The community garden design will include a shaded communal meeting place with space for congregating and sharing ideas, a utility shed to

house garden tools and materials, strategically placed shade trees, and some stainless steel troughs that were repurposed from the *Center for Desert Living Trail*. In preparation for the upcoming growing season of edible crops, these troughs have been placed throughout the community garden and planted with flowers to attract pollinators such as bees and butterflies. Composting will be done on-site to help maintain a stable supply of organic material that can be added to the beds as the project continues.

To ensure the long term sustainability of the garden, the steering committee identified five subcommittees to address specific project needs. These committees are education, maintenance, best practices, social (for keeping it fun), and communications. These five subcommittees consist of staff and volunteers and will serve to involve the participants in the ongoing duties of the project as the steering committee hands over the leadership role to the working group members. The ongoing success of the community garden will be dependent on continued involvement from all. We are excited with how much we have done to this point and are anxiously monitoring the progress of the first planting. Visit dbg.org/communitygarden for updates and pictures.

The Garden thanks The Steele Foundation for supporting the on-site DBG Community Garden.



*inside
the*

DOCENT



by Tina Wilson, Director of Education

In support of the mission, the Garden offers a variety of educational experiences for our members and visitors. With more than 400,000 visitors per year, though, a lot of effort and commitment is needed to engage and teach so many. How do we do it?

There is one team of educators that is present seven days-a-week through the season and can work with adults, children, families, tourists, and local visitors. They can make you laugh, make you say “Ahhhh!” and make you fall in love with the desert. How many people do you know who can stop mid-discussion of the saguaro and its spines, be able to identify the bird that a guest just observed, keep their visitors engaged as hundreds of school children pass by, remain calm as a king snake slides through the tour group, top it all off with a smile, and have their group still wanting more?

This fabulous teaching team I describe is the Garden’s docents. The docent program has been a key component of the education department since 1977 and now claims 140 members who report more than 122,000 visitor interactions each season. Docents have introduced plant biology and desert ecology to many thousands of visitors through public tours and interactive discovery stations on the main trails.

The tours and discovery stations provide visitors with opportunities to actively discover the world around them through creative storytelling, hands-on props, real-life examples, and engaging conversation with some very charismatic personalities. In every interpretation experience, the Garden aims to promote conservation of the Sonoran Desert and foster a life-long desire to respect and care for the natural world.

Keeping Training Fresh

Over the past few years, docent training has taken on a new format with the help of the docent volunteer training team and staff. Training to become a docent has grown to include science classes in biology and ecology, completion of an eight week interpretation course, a mentoring period, and a pass/fail tour demonstration with members of the training team and guests. In all, a docent spends an average of 68 hours preparing for this job. A docent’s first tour is based on plant adaptation, but as they gain experience and participate in continuing education, layers of ethnobotany, plant and animal interactions, and ecology will enhance tour content.

The Garden’s docent program is nationally recognized and benchmarked frequently by other gardens and cultural institutions. To keep raising the bar, we are always identifying the most current best practices and standards

PROGRAM



in interpretation. In doing so, we continually update the visitor experience on tours and at discovery stations, thereby improving the program that other organizations model. The docent training team recently attended and participated in the National Association of Interpretation (NAI) program to become *Certified Interpreter Guides*. The team was then able to review the Garden's training course and make modifications in order to align with these national standards. As a result, public tours are interactive, engaging experiences where visitors can participate in their own learning.

In support of the focus on continual renewal, the Education department hired Kate Navarro as Interpretation Coordinator in September. Kate comes to the Garden with a formal background in Natural Resource Management and Environmental Education. She has extensive experience with interpretive programs, including positions as Chief of Interpretation for Mendenhall Glacier Visitor Center in Tongass National Forest near Juneau, Alaska; Visitor Services Officer for Queensland Museum and Science Centre in Brisbane, Australia; and Interpretive Ranger for the Katmai National Park in southern Alaska. With Kate's guidance, along with the volunteers of the training team, the docent program will be a constantly refreshed educational resource as well as a point of pride for the Garden.

If you haven't taken a docent led tour lately, I encourage you to join a tour any day at 10 a.m., 11 a.m., or 1 p.m. Be prepared to spend the next 40 minutes having one of the most relaxed and fun-filled experiences at the Garden, and to walk away having learned something new and interesting about desert life.

Photos left to right: A learning moment with Carlos Oldham and guests, Archer Shelton mentoring a docent in training, Tuesday docents discussing the morning's tours, Don Squire interpreting pollination during wildflower season, Gloria Eklund demonstrating her customer service techniques, Tour orientation before guests hit the trails - Courtesy of Desert Botanical Garden.



Community Partnering Brings Joy to Many

by Laura Hill, Special Events Manager

Every October, the Desert Botanical Garden is pleased to host another year of The Great Pumpkin Festival. This fall festival has become an annual tradition for countless Valley families, but for some, the event means so much more.

From the festival's modest beginnings in 2002, when it was a two-day event, to its current five days, the Great Pumpkin Festival continues to celebrate fall weather, fun activities, and the delights of the marvelous pumpkin. There are carnival style games, a petting zoo, delicious food concessions, musical entertainment and so much more. Brightly colored tractors are the stars of the show for the fun hayride out to the pumpkin patch, which is included with admission to the event. And, of course, every child 12 and under still gets a free pumpkin to decorate and take home—we purchase more than 10,000 pumpkins from a local distributor, ensuring that every child is able to find the perfect pumpkin.

From Merely Fun to Community Building

A few years ago, we received a phone call from the Foundation for Blind Children, which was interested in bringing a small group of children and adults out before the official start of the festival. When we saw the impact that the dried corn, gourds, and most importantly the pumpkins made on the visually impaired children, we knew we needed to do more and reach further.

One of the most amazing things about the Garden is its capacity to inspire, educate, and provide unique experiences. Building on this tremendous capability, in 2008 the Garden hosted a complimentary Pumpkin Festival day for eleven organizations focusing on special needs and at-risk youth. Members of those organizations were invited to attend free of charge, benefitting from the interactive, educational, and fun festival. In 2008, 300 children participated. In 2009, that number increased to 522. And in 2011, we were thrilled to see a record breaking 622 participants take part in this special day.

One of the highlights of the day was having the Phoenix Fire Department on-site with their fire truck, and seeing the delight on each child's face as they climbed around inside, pretending to be firefighters. As you will read on the next page, these special moments which stay with the children long after they leave the festival, and have such a genuine, positive impact on all those who take part.

Thanks to Sponsors

The Garden would not be able to host a complimentary day of this magnitude without the generous support of Craig and Cyndi Pearson of Pearson & Company. Each year, Pearson & Company is responsible for staffing the entire volunteer section of this special day with workers from their company, along with many family members. It is truly a family affair! Additional support for The Great Pumpkin Festival is provided by The Ferry Family Foundation in memory of Ernest S. and Virginia D. Ferry.

The Desert Botanical Garden is very pleased at having opportunities to build deeper connections with the community at large. By coming out to enjoy fall festivals yourself, you add your support to Garden activities and thereby aid us in these endeavors—fun for one turns into fun for many.

A Letter Tells it All

"In October we went on our first field trip to the Desert Botanical Garden's "Pumpkin Patch" Festival. When we first arrived, the children were so excited to see a great big, red fire truck at the entrance of the festival. Everyone had a turn to climb aboard and pretend to drive the truck. Afterwards, everyone participated in the many other activities available, including arts and crafts, pumpkin bowling, face painting and ring toss. The highlight of the trip was a hayride that took us to a pumpkin patch, hay maze and petting zoo. The children excitedly searched around to find their very own pumpkin to decorate with their parent. We had lunch together in the Desert Botanical Garden before heading back to school. The bus ride back was quiet as many students took the opportunity to nap. All had a great time!"

This field trip gave the students the opportunity to have real life, hands-on experiences that are so very important for young children to make meaningful connections. In our class we continued our learning by exploring pumpkins. The class first discussed the attributes of the pumpkins and made predictions of what they thought was inside. It was exciting to see the anticipation on their faces as we cut open the pumpkin to take a look inside. The students helped clean out the inside and we saved the seeds to use for other activities. The connection the students made from the field trip to the classroom enhanced their learning. They talked about what they saw and were excited about what they were learning in the classroom.

The families wanted us to express their thanks and appreciation to Desert Botanical Garden, A Stepping Stone Foundation, and all the generous contributors that make this program possible. They appreciate all the opportunities provided and shared that they feel like they are learning so much along with their children.

A Stepping Stone Preschool programs are one of a kind and would not be possible without your generous support. Thanks for all you do."

*- Janet Castaneda & Maria Flores,
A Stepping Stone*





WHISPERS OF A NEW WORLD:

Sculpture by Carolina Escobar

Drawn to the beauty of the plants in the Sonoran Desert, Carolina Escobar created this show specifically for the Desert Botanical Garden. "I'm dreaming of a new world," Escobar shares. "I see these forms, shapes, colors, and what they may imply as *whispers*; a peek at what a new world to come may look like."

Her outdoor sculpture is situated among the desert plants that initially inspired her work. Using vibrant colors and patterns, she transforms steel and resined fabric into echoes of the organic shapes found in the Garden. These sculptures, and her two-dimensional work, are on display in Ottosen Galley, on the *Desert Discovery Trail* and the *Harriet K. Maxwell Desert Wildflower Trail* through May 27, 2013.

For additional information visit dbg.org/whispers.





SUSTAINABILITY UPDATE

by Colin Tetreault, Principal, S2 Consulting, LLC

Frank Lloyd Wright, the father of organic architecture, once opined, “Study nature, love nature, stay close to nature. It will never fail you.” This aphorism was meant to convey the importance of drawing inspiration from – rather than directly copying – the amazing capacity of nature to address unique challenges with regard to how humans interact with nature, itself.

In the previous article [see *The Sonoran Quarterly*, Vol. 66 (2), 2012, pg 11], we established that the Garden was moving down the pathway of advancing sustainability. In the coming years, we want to be among the leading gardens putting sustainability concepts into practice. That’s no small goal.

That statement can cover many different components such as using water prudently, advancing our use of renewable energy, and creatively engaging the community in a collaborative manner to create long-term change. So how is the Garden going to achieve such an ambitious goal? The answers are literally in our own backyard. As Frank

Lloyd Wright recommended to his own fellows, we’re going to look at the Sonoran Desert’s natural environment for much of our inspiration.

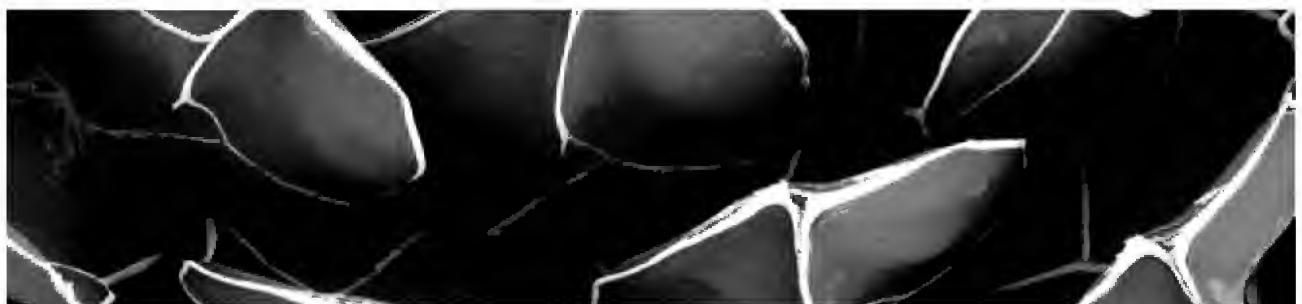
How do we think about water? Let’s learn from the archetypal saguaro cactus. The mighty saguaro has an extensive root structure that efficiently absorbs water. This is combined with the cactus’ ability to literally swell and retain significant amounts of moisture for future use during dry times. So let’s look comprehensively at where we, as a Garden, draw our water from and how we use it. Could we be more efficient with our water use? Can we establish better “roots” (rooftop or grey water rainwater harvesting, as examples) to help provide our water?

What about energy use? Look no further than the state tree of Arizona, the paloverde. Nature has found a way to allow this specimen to photosynthesize through its green bark, thereby finding the most resourceful manner in which to produce its energy from sunlight. Have you noticed all the lights, amenities, and other energy using facilities at the

Garden? What if the Garden could not only reduce its energy use significantly, but then produce the entirety of its energy needs on-site?

What about creating mutually beneficial relationships that advance all parties? Let’s look at the relationship of the desert mistletoe and the phainopepla bird. By producing fragrant fruit that is attractive and nutritious to the phainopepla, the mistletoe is able to get its seeds spread around a greater environment. The Garden has an amazing array of programs and educational classes. How does the Garden advance its mission of being a center for education and positive change beyond the borders of the Garden, itself? How can we – as an agent of positive change – work to spread our message throughout the Valley?

By looking to the ingenious solutions that nature has previously worked through and finding creative ways to apply them locally, the Garden will advance its goal of becoming one of the most sustainable botanical gardens in the nation.



A Research Sabbatical for Dr. Joe McAuliffe

After 22 years with the Garden, Dr. Joe McAuliffe, Director of Research, Conservation and Collections, is taking a year-long research sabbatical. The sabbatical will include travel and field research in arid regions of South Africa and Argentina. Most of the year, however, will be devoted to writing the results of ecological research projects conducted in the Sonoran Desert. During the last 10 years, much of Dr. McAuliffe's time at the Garden has been devoted to the administration of a growing research program. The sabbatical will allow him the opportunity to focus once again on his studies of the natural history and ecology of desert environments. During his leave, Dr. Kim McCue will serve as Acting Director of Research, Conservation and Collections.

Garden Shop

Open Daily 8 a.m. - 8 p.m.
Shop in the newly renovated Garden Shop for distinctive gifts, books, home and garden décor, gourmet foods and unique desert plants.

Gertrude's

Opening Early 2013
Join us for breakfast and bird watching, lunch and a leisurely stroll through the stunning grounds, or a perfect handcrafted cocktail at sunset and a beautiful, locally sourced dinner by Chef Stephen K. Eldridge.



APS Festival of Lights Parade

It began as a suggestion; it's now a part of the Garden's culture. The *Volunteers in the Garden* float in the APS Festival of Lights parade is a volunteer driven project. Volunteers create a design for the float based on the year's theme, construct it, and accompany it along the parade route. Over the years their efforts have earned three first place and three second place awards in the Community/Nonprofit category.

Held the first Saturday in December, this annual holiday event showcases a tremendous community spirit by all participants. On the Friday before, the parking lot of the North Phoenix Baptist Church, at Bethany Home Road and Central Avenue, is transformed by light, color, and music as the public enjoys the glittering floats that are in position for judging. It's a party and everyone is smiling.

The float brings to the community a sample of the magical moments to be had in the Garden. It also allows the *Volunteers in the Garden* the wonderful opportunity to share with the community their love for, and pride in, the Desert Botanical Garden.

Share Your Feedback and Win Two Tickets to *Luminaria* 2012

Let us know what you would like to see from the Garden – and be entered to win! We value your opinion, that is why we would appreciate your thoughts related the printed materials you receive from the Garden.

We invite you to complete a short online questionnaire about your experience with and expectations in regards to the printed materials you receive including event invitations, seasonal mailers and publications like *The Sonoran Quarterly*.

The purpose of the survey is to learn how to better meet your needs. To that end, the data will be analyzed by a third party to make sure we are providing the type of information you need – and in the way you need it. Your feedback will be anonymous and kept strictly confidential.

What's more, one lucky respondent will be selected at random and win two tickets to *Las Noches de las Luminarias*.

To take part, please visit dbg.org/survey. The survey will close Sunday, December 16. In advance, thank you for your time.

**K.H.ARTS presents
MOMIX: *Botanica***

Friday / February 22 / 8 p.m.

Saturday / February 23 / 2 and 8 p.m.

Orpheum Theatre

Back by popular demand! With an eclectic score ranging from birdsong to Vivaldi, *Botanica* reveals nature's changing imagery and shows off the endlessly renewable energy of the MOMIX performers. Unique costumes, projections and puppetry add an extra dose of fantasy to the elixir.

We are pleased that K.H.Arts is bringing MOMIX: *Botanica* back to Phoenix for three performances in February. Garden members, please mention the word "Garden" when purchasing tickets and the Garden will receive a \$3 per ticket donation.

Visit kharts.com to learn more about MOMIX: *Botanica*. Tickets available at ticketmaster.com or 602.262.7272.



**Ballet Arizona
presents *Topia* 2013**

May 14 - June 1

Desert Botanical Garden

Topia, an original ballet created by Artistic Director Ib Andersen, fuses nature and dance. Again this year, the ballet will be performed in an outdoor desert venue on an 80-foot panoramic stage. Andersen's brilliant choreography is set to the music of Beethoven's Symphony No. 6. In 2012 Ballet Arizona performed *Topia* to sell-out crowds at the Garden.

Tickets on sale at the Ballet Arizona box office, 602 381.1096 or ticketmaster.com. Garden members will receive 10% off their tickets when using promo code: VIPTopia.

Photo Credits

Page 2 Ken Schutz - Gene Almendinger
 Page 2 Toothpick cactus, *Stetsonia coryne* - Adam Rodriguez
 Page 3 *Echinopsis* sp.- Adam Rodriguez
 Page 4 *Sonoran Desert Nature Trail* - Adam Rodriguez Page 12
 Page 6 Toothpick cactus, *Stetsonia coryne* - Adam Rodriguez Page 13
 Page 7 Cardones on Desert Discovery Trail - Adam Rodriguez Page 14
 Page 8 DBG Community Garden sign - Kim McCue
 Page 9 Top left Amending existing soil - Pam Cooper, bottom left Adding hoop structures and

bird netting - Pam Cooper, top right
 Conceptual garden drawing - Veronica Nixon, bottom right Constructing wooden raised beds - Kenny Zelov
 Family enjoying Great Pumpkin Festival - Adam Rodriguez
 Antique fire truck, Pumpkin carving and Tractor - Adam Rodriguez
 Carolina Escobar on scissor-lift - Trinity install - Adam Rodriguez. Agave sculpture on *Desert Wildflower Trail* - Carolina Escobar. Installing Agave.

Escobar and Elaine McGinn, director of planning & exhibits - Adam Rodriguez. Escobar in Ottosen Gallery - Ashley Panter
 Page 16 Boojum tree, *Fouquieria columnaris* - Adam Rodriguez
 Page 16 Garden float - Gene Almendinger
 Page 17 MOMIX: *Botanica* - Max Pucciariello
 Page 17 *Topia* dancers - Rosalie O'Connor
 Page 18 *Cereus hildemannianus* - Robby Robinson
 Page 19 *Las Noches de las Luminarias* - Adam Rodriguez
 Back Cover *Las Noches de las Luminarias* - Adam Rodriguez

in appreciation

The Desert Botanical Garden is grateful to all 24,819 members and donors for their support. Acknowledged in this section are annual Curator's Circle, Director's Circle, President's Circle and Founder's Circle members and donors giving \$2,500 or more over the year, from September 16, 2011 through September 15, 2012. Included are memberships and unrestricted gifts to support the Garden's annual operations.

\$25,000 +

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Honor and memorial contributions are used to provide for the Desert Botanical Garden's horticulture, education and research programs. Gifts may also be recognized with benches & plaques. These contributions have been received from June 16, 2012 through September 15, 2012:

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The Desert Botanical Garden Mission

The Garden's commitment to the community is to advance excellence in education, research, exhibition, and conservation of desert plants of the world with emphasis on the Southwestern United States. We will ensure that the Garden is always a compelling attraction that brings to life the many wonders of the desert.



WiFi Zone

FREE WI-FI is available in five locations within the Desert Botanical Garden: the area in front of Admissions, Ottosen Entry Garden, Boppart Courtyard, the Center for Desert Living Trail, and Ullman Terrace.

Partial funding provided by The Arizona Community Foundation.



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