The Field Institute Insider

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Scientific Newsletter of the McDowell Sonoran Conservancy

Feature Article

A flora tells the story of biodiversity in the Preserve

Also Inside

Phenology: It’s all about synchrony

New species documented in the Preserve

Generous donations fund the Field Institute

Fall lecture series recap

ERP news

Human impact studies in 2015

Citizen science education
This is the time of year when we start to see tiny spring plants emerging from the ground, and it also marks the start of the fieldwork season for many of the Field Institute studies. Understanding plants is fundamental to these studies . . . but why plants? In this issue you’ll read about the importance of plants to the work that we do, and to many future projects. In addition, we highlight upcoming trail impact projects, citizen science training, and the generous funding we’ve received for some exciting new opportunities for the Field Institute! Finally, even a year after our flora and fauna surveys have ended, citizen scientist discoveries continue to show us that Scottsdale’s McDowell Sonoran Preserve is more dynamic and diverse than we ever knew. So keep your eyes open on the trail, and your camera ready!

### Table of Contents

- A Catalog of Plants Speaks Volumes About Biodiversity ........................................1
- The Phenology Project — Timing Is Everything .......................................................3
- New Species Captured! On Paper, That Is..............................................................4
- New Funding for the Field Institute........................................................................5
- The Field Institute Fall Lecture Series — Keeping Nature Natural .......................6
- Update: Field Institute Human Impacts Studies ......................................................8
- Training Field Institute Citizen Scientists..............................................................9

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An ephemeral pool reflects a saguaro growing on Powerline Road near the 136th Street Trailhead. Similarly, a catalog of plant life, called a “flora,” reflects an ecosystem’s diversity. Photo by M. Jensen.
A Catalog of Plants Speaks Volumes About Biodiversity

By Steve Jones, principal investigator for flora

In the scientific world, a catalog of plants is called a “flora.” A flora documents the vascular plant species found within a defined area, in our case, Scottsdale’s McDowell Sonoran Preserve. Knowing the plants of an area is invaluable in understanding and protecting biodiversity.

Documenting an area’s plants is a straightforward process of collecting and identifying specimens from the field. Entire plants or portions of large plants are collected, pressed flat, and dried. Specimens are most valuable if they include as many different plant parts as possible. The specimens are mounted on a herbarium sheet, along with a label listing collection information. These sheets are permanently stored in an institutional herbarium, where they remain available for further research.

But why study plants? Why not study fauna instead? Because plants offer a big advantage to researchers.

Plants are static organisms and are easier to observe than animals, which not only move about, but also generally try to hide from prying eyes. In addition, most reptiles and arthropods, and many birds and mammals, have evolved colors and patterns to blend in with their surroundings, further discouraging our direct observation. For these groups, live traps, motion-triggered cameras, and direct observation are used in building species lists. But these techniques
require more detailed planning and effort than simply collecting plants.

Land managers interested in establishing the baseline ecological condition of an area usually will begin with a study of the vegetation. A flora, or plant catalog, can inform land managers of the likelihood of the presence of certain creatures. For instance, knowing the food preferences of browsing and grazing mammals allows land managers to judge an area’s potential as habitat for those mammals. Conversely, ecologists studying the diets of mammals can consult a flora for help in identifying food plants utilized by their subjects.

A flora also informs other scientific disciplines about the potential for the presence of species of interest. Plants provide habitat for animal species, and the presence of a plant species can indicate the possible presence of an animal associate. Insects in particular can be picky about their food preferences, especially butterflies. Adult butterflies will lay eggs only on plants that their larvae can eat. An example is the pipevine swallowtail butterfly. Its larvae feed only on the Dutchman’s pipevine (Aristolochia watsonii).

Knowing whether and where threatened and endangered plant species occur is also valuable knowledge for land managers, who often have a legal responsibility to protect them. Knowing the plant species associated with threatened or endangered animal species is also helpful in determining the presence and condition of populations of those animals.

Land managers are also interested in the presence of problematic plants, such as nonnative plants with a potential to displace native plants, or plants that otherwise might have an impact on the biodiversity of an area. Also, knowing which plant species occur in disturbed areas is predictive of what might happen in other areas that suffer a disturbance.

Naturally, floras are valuable to botanists as well. For instance, there are a dozen published floras for preserves, parks, and areas of interest in Maricopa County alone. Comparing and contrasting these floras increases general botanical knowledge of the Sonoran Desert, of central Arizona, and of the state as a whole.

A flora of Scottsdale’s McDowell Sonoran Preserve was recently completed and published in the journal Canotia. It is available to the public on Canotia’s website www.canotia.org/volume10.html. Expanding upon the flora, and in part with the knowledge gained from it, the Field Institute has also mapped the vegetative communities within the Preserve. This map is currently being used to develop a reference map for the Ecological Resource Plan [see page 7], and to select study sites for various monitoring projects, including those looking at animals.
The Phenology Project
Timing Is Everything

By Barbara Powell, McDowell Sonoran Conservancy steward

We all witness the positive and negative effects of timing in our own lives, and how timing influences personal outcomes. The same can be said for the earth’s ecology—timing is everything. If timing is not right, or if timing changes, then our ecosystems are affected. Scientists have learned that many interactions in nature depend upon timing, and changes in timing can sometimes affect the entire ecosystem.

The branch of science that studies the timing of the biological or lifecycle events of plants, animals, and microbes is known as “phenology.” Phenology is essentially like nature’s calendar. Flowers blooming, fall leaves turning color, insects emerging, or birds migrating, are just a few examples of phenological events. The timing of these lifecycle events are significant, and a change in the timing of one event can greatly impact other lifecycle events. Phenology studies this delicate balance.

The Central Arizona Conservation Alliance, led by program coordinator Stacie Beute, has been grant funded to study phenological changes, among other things. Beute is tasked with coordinating a large effort of gathering data to answer this primary question: How do iconic, widespread, and ecologically important species of the Arizona flora respond to variation in climate (and, by extension, to alternative scenarios of climate change)?

The Central Arizona Conservation Alliance is gearing up to study our parks and preserves, and the Field Institute will proudly assist. We are excited to be plugged in to this immense project and contribute to the study of plant phenology and the impact of climate change in an overarching way. For the Field Institute, the timing couldn’t be better.

Mismatches Cause Great Concern
Phenological mismatches occur where the timing of the availability of a resource changes, but the timing of the demand for that resource does not. Example: In England, the pied flycatcher has declined by 90 percent since its food source—the caterpillar—is not available as food, because English oak trees leaf too early. The results of this ecological mismatch can be devastating. These shifts in phenology cause great ripples throughout many food chains.
New Species Captured!
On Paper, That Is

Field Institute volunteers and citizen scientists continue to track down more new species, adding them to our list of flora and fauna found in Scottsdale’s McDowell Sonoran Preserve.

You may have browsed the Ten Most Wanted list of flora and fauna published in our January 2014 issue of The Insider. On it was the Inca dove, which you’ve probably seen in your backyards, but never in the Preserve. Well, someone documented one on the Preserve—finally!

And speaking of birds, we documented a black phoebe, usually seen close to water, and true to form, it was spotted at the 128th Street tank after the monsoon rains. A bushtit is another great find because it is rarely seen in the lower elevations.

Moving on to invertebrates, an alert hiker found a Phoenix talussnail [see the back cover], a species of snail whose population may be in trouble in the Preserve and elsewhere. Also, a golden paper wasp buzzed past another alert person with an eye for flying insects and a camera in hand.

For the first time ever, a butterfly count was conducted last fall to see what was visiting the late autumn flowers in the Preserve. The outcome was fantastic because it added eight more butterflies to our Preserve list—the variable checkerspot, black swallowtail, orange sulfur, mallow scrub-hairstreak, variegated fritillary, common buckeye, ceraunus blue, and two-tailed swallowtail. Keep an eye out for another butterfly count next year.

Last but not least, we added three more plant species to our list—rock hibiscus (Hibiscus denudatus), Fendler’s threeawn (Aristida purpurea longiseta), and mesa tansyaster (Machaeranthera tagetina).

You can access our current lookout lists of species that we expect to find in the Preserve. If you find one of the species listed, please take a photo, record the GPS point or describe were you are, note the time or day and weather conditions, and send your find to Melanie Tluczek at melanie@mcdowellsonoran.org.
New Funding for the Field Institute

This past quarter has brought a shower of funding to the Field Institute for two very exciting projects, and a new Field Institute staff position.

The Globe Foundation awarded the Field Institute $50,000 to conduct a radio-collar study on mule deer in Scottsdale’s McDowell Sonoran Preserve, allowing the Field Institute to learn more about mule deer migration routes, mule deer use of land features and Preserve resources, and mule deer interaction with the developed areas surrounding the Preserve. The Salt River Pima Indian Community granted an additional $50,000 as part of a City of Scottsdale funding package. The total of $100,000 will allow Field Institute to partner with the Arizona Game and Fish Department to collar 15 to 16 mule deer, the number needed to get a good sense of how they are using the Preserve and surrounding area.

The Charro Foundation has granted $2,500 to help the Field Institute develop 3-D maps of Brown’s Ranch and Stoneman Road, two areas whose history the PastFinders have been piecing together for many years. The grant will help pay for preparation of 3-D maps that may detect details as small as hidden vestiges of the Stoneman Road.

The Bob and Renee Parsons Foundation donated a generous gift to the McDowell Sonoran Conservancy to hire a director of the McDowell Sonoran Field Institute during the first half of 2015. The new director will be responsible for building upon the existing structure of the Field Institute, drawing in new resources, and positioning the Field Institute within the broader community. “This position will be transformative for the Field Institute and the Conservancy,” said Melanie Tluczek, McDowell Sonoran Field Institute manager. “[Hiring a director] will allow us to reach out and start working regionally while we continue the excellent work that we are doing in the Preserve.”

A graceful mule deer trots across the majestic backdrop of Brown’s Mountain. Mule deer will soon be the focus of a new study by the Field Institute in partnership with the Arizona Game and Fish Department, and funded by the Globe Foundation and the Salt River Pima Indian Community.
“Ask the right questions. That’s the answer.”

That was the advice from biologist Dave Brown, summing up the panel discussion that served as the final presentation in the four-part Fall Lecture Series sponsored by the McDowell Sonoran Field Institute.

Thought-provoking questions were in abundance throughout the presentations in the series that focused on what it means to “keep nature natural.” Conservation management practices, native and nonnative plants, human impact, restoration, and other topics were covered by the speakers.

The series explored nontraditional viewpoints on resource management as the Field Institute works to finalize recommendations for an Ecological Resource Plan (ERP) for the McDowell Sonoran Preserve. Although not directly linked to the ERP effort, the series was designed to provide diverse historical, ecological, and philosophical background on some of the key topics.

“We were really pleased with the presentations from the speakers in the series,” said Melanie Tluczek, Field Institute manager. “The whole idea was to help us explore as many different points of view as possible and get people talking, and they certainly helped us achieve that.”

For example, speakers reminded the audience that “invasive plants” is not a single, simple issue, that the environment is continually in flux, and caution is necessary in identifying and designating plants as invasive. Restoration questions and discussions centered on “how” and “how much” is appropriate based on historical use and other factors. And ways of balancing impact of trails and user access were also thoroughly discussed.

Speakers in the series included Brown, a biologist and noted author with Arizona Game and Fish and Arizona State University; Dr. Juliet Stromberg, a plant ecologist and associate professor at ASU who studies the influence of human activities on plant populations; Dr. Matthew Chew, an ecologist, conservation historian, and faculty member at ASU; Dr. Helen Rowe, a restoration ecologist and Research Professor at ASU who studies environmental protection in human-dominated landscapes; and Erick Lundgren, an experienced field biologist now in the doctoral program at ASU.

Dr. Stromberg, ASU plant ecologist, offered an intriguing perspective on jumping to conclusions about invasive plants. A never-before-seen plant species suddenly appeared on the Galapagos Islands, and it was feared to be an invader. Serendipitously, a study that involved taking deep core samples of the islands was underway at the same time. The core samples representing thousands of years of evolution contained seeds of the very same “new” plant just discovered on the islands. The plant was actually a native and was making its way back into the environment!
Planning for the Future
Update on the Ecological Resource Plan

By Melanie Tluczek, McDowell Sonoran Field Institute manager

It has been a year since we started work on the Ecological Resource Plan (ERP), a joint project with the City of Scottsdale for protecting the natural resources of Scottsdale’s McDowell Sonoran Preserve. We are finally nearing completion, thanks to funding by the Helen K. and Arthur E. Johnson Foundation and APS (Arizona Public Service), consulting services from our partners at EPG (Environmental Planning Group), input from the Field Institute Science Advisory Committee, a steward ERP review committee, and members of the public.

Over the past quarter we narrowed down from broad objectives to specific resources. These resources ranged from sensitive plants to soils, to water sources. Much of the work involved assessing each resource and determining its condition and the appropriate next step. Many times the next step was to monitor the resource for changes, which would be an early warning sign for environmental impact.

On October 23, 2014, the Field Institute held its second public ERP meeting. The purpose was to inform the public about and discuss these specific resources. After a presentation, the audience broke into small groups facilitated by McDowell Sonoran Conservancy (MSC) stewards from the citizen science program. Each facilitator had been trained by John Griffin from EPG on how to listen impartially and record the group’s responses. The groups discussed their values and concerns related to select resource topics, and those responses were recorded and compiled. A video of the ERP meeting was later posted on the MSC website so that anyone who missed the meeting could watch the video and then submit comments via an online survey.

Finally, the plan will be reviewed by the Field Institute Science Advisory Committee, the City of Scottsdale staff, MSC board of directors, the steward ERP review committee, partners from surrounding open spaces, and more. As we get results from our studies we will update ERP, looking for ways to continue improving on our efforts to protect the Preserve.

McDowell Sonoran Conservancy stewards organize their concerns about Preserve resources during the October 2014 ERP meeting. All groups at the meeting turned over their questions and comments to their facilitator for further discussion. Results were recorded and compiled for later study by the Field Institute. Photo by M. Brace.
Early 2015 marks the continuation of the trail impact study and the launch of a new phase of the nonnative-plants monitoring project.

The Field Institute will continue research into trail use within Scottsdale’s McDowell Sonoran Preserve and its impact on plant-community change, soil exposure, and trail depth. During the first year of the trail impact study (2014), more than 20 stewards assisted with gathering data. In 2015 the Field Institute will need nine volunteers for each scheduled day for fieldwork. Required training will be held on January 31 and February 19, 2015. These training sessions will teach volunteers how to measure trail depth, how to determine the percent coverage of plant species, and how to recognize soil crust, along with other skills necessary for the study.

Trail impact fieldwork will begin in late February and continue through mid-March.

In late March, the Field Institute will begin monitoring nonnative annual plants within the Preserve—a change from this past fall’s focus on nonnative perennial plants. Citizen scientists will examine annual plants, including Sahara mustard (Brassica tournefortii) and Bermuda grass (Cynodon dactylon), and will map individual plants via GPS or, in larger plant populations, take GPS points of the plant populations’ perimeters. By identifying nonnative species and examining the density and diversity of those species, the Field Institute will be able to determine whether or not nonnative plant populations are growing or spreading. During the study, no nonnative plants will be removed in the study areas. The data gathered will establish a baseline for observing nonnative plant species in future years, and the results will determine whether or not nonnative species are impacting native populations and should be removed. Volunteers for the project initially will include a small group of lead citizen scientists, but the Field Institute hopes to bring in more participants later in the study.

Nonnative fountain grass is commonly seen in the Preserve. Here Steve Jones, Field Institute principal investigator for flora, takes GPS points of its location. Is it invasive? Is it displacing native plants? The Field Institute’s mission is to find the answer. Photo by L. Miller.
Training Field Institute Citizen Scientists

By Dan Gruber, McDowell Sonoran Conservancy master steward and citizen scientist

The Field Institute has developed a unique model of citizen science—a permanent and growing group of stewards who are willing and able to participate in many different scientific projects. Our model depends on several critical factors—

• A self-sustaining, volunteer-led program that requires limited staff oversight
• Continuing opportunities for citizen science support
• A training curriculum that allows our volunteers to support a variety of research projects in many different roles

Becoming a Field Institute citizen scientist starts with training recommended for all stewards: classes in geology, desert ecology, flora, fauna, and human history, which provide basic grounding in the natural and human history of Scottsdale’s McDowell Sonoran Preserve. Melanie Tluczek, Field Institute manager, teaches Citizen Science 101, which covers such topics as the scientific method, basic field techniques, data collection and analysis, and conducting research in the Preserve.

Once deployed onto research projects, participating citizen scientists get additional preparatory training by principal investigators, who explain the questions being explored, research techniques, data collection requirements, and everything else needed to provide support for a project. Training often continues in the field under the guidance of the principle investigators, their academic students, or experienced citizen scientists.

The Field Institute constantly explores ways to expand citizen science education, because the more educated our volunteers are the more support they can provide. Recently, for example, volunteers were trained in certain features of a mapping software used by the Field Institute, and then did some basic mapping work almost never entrusted to volunteers. Our citizen scientists are extremely devoted, and with training and guidance they can provide a very high level of scientific support and even project management. No other nature organization that we know of applies citizen science to such a high level of participation.

Budding citizen scientists study plant parts at a two-day seminar offered by the Desert Botanical Gardens, which included one day in the lab and one day in the field identifying plants. This seminar is one example of opportunities available to Field Institute volunteers. Photos by S. Beute.
Phoenix talussnail, a new species recently found in Scottsdale’s McDowell Sonoran Preserve. It is deemed “a species of greatest conservation need” by Arizona Game and Fish Department in its State Wildlife Action Plan. The name “talus” derives from where the snails live—in talus slopes, which are piles of rock debris. Photo by M. Jensen.