# THE CENTER FOR NATIVE POLLINATOR CONSERVATION: ONE ZOO'S JOURNEY AROUND THE WORLD WITH NATIVE BEES

Edward Spevak
Curator of Invertebrates, Saint Louis Zoo
One Government Drive, Saint Louis MO 63110

How do we make an impact? How do we find our niche? What can we do differently that other institutions have not done? How can we make it holistic and go from "fence to field" and can we tie it to our other conservation efforts? How do we engage the public and make them care about conservation. These were my thoughts before I interviewed at the Saint Louis Zoo and after I was hired. One answer came to mind for all these questions, pollinators, but especially native bees!

In 2007, the Native Pollinator Conservation Initiative (NPCI) was unofficially established. Within the Saint Louis Zoo's WildCare Institute there are twelve Conservation Centers that have their own budget, are promoted by the Public Relations Department, can have the Development Department solicit for donations and are able to apply for internal research and conservation grants. As the NPCI was not official I had to prove its worth before there was the chance of reaching a goal of being established as a WildCare Conservation Center. In 2011, NPCI officially became the Center for Native Pollinator Conservation (NPCI) and has succeeded beyond any initial expectations and continues to grow and expanded.

The WildCare Institute Center for Native Pollinator Conservation focuses on the importance and diversity of native pollinators for the maintenance and survival of wildlife, ecosystems, and agriculture. The goals of the Center include:

- Educating people about the importance of pollinators for the plants and wildlife around them
- Developing and supporting local, national and international collaborations to develop pollinator conservation programs and research
- Advancing our understanding and appreciation of native bees and other pollinators

The following are the programs, projects and initiatives in which the CNPC are involved and plans for developing and future projects.

## BEES AT THE ZOO

In order to educate both our guests and our staff we needed to first look at getting our own house in order and that means developing pollinator exhibits at the zoo and changing attitudes through management initiatives. During my interview for the Saint Louis Zoo I was asked about the "Missouri Meadow" next to the Insectarium. I answered that it was "neither Missouri nor a meadow." This area had once been a path to a restaurant in the center of the zoo and during the design and development of the Insectarium this path was closed and made into a loop with

various plantings established that would be invertebrate friendly. Guests would often enter the path hoping to get to the restaurant but would find only a simple loop and leave somewhat annoyed. The only indication that this was the Missouri Meadow was a donor plaque that was occasionally obscured by vegetation.

To make this area an asset an arbor leading to the loop was added with the label Missouri Meadow in large letters emblazoned across it. Graphics were added describing bee diversity, their value, and what people can do to help bees and other pollinators. Working with the Horticulture Dept. we worked to replace all species past the arbor with Missouri natives and in the area leading up to the Meadow the Horticulture Dept. could plant anything they wanted as long as it was pollinator friendly. Over the years we have added bee hotels as nesting sites for twig and tunnel nesting bees. It had now become a de facto "Bee Exhibit."

However, just making the Missouri Meadow bee friendly has not always been welcomed by our guests. As the first sign you see upon entering the Meadow is "Missouri the Show Bee State" guests with fears, often out of ignorance I have found, see t sign and leave fearing being stung. However, it must be pointed out that we have never had a "bee sting" call in this area by our guests as when bees are behaving normally, foraging for pollen and nectar, they have no desire to sting. It has taken several years but we now occasionally hear guests upon entering the Missouri Meadow that this area "was designed for the bees."

Inside the Insectarium we have renovated our observation hive and also maintain two working hives off exhibit. We use the working hives for honey production which we bottle and give as gifts to donors. We have also used these hives for behind the scenes tours. We updated a section of the building to talk about bee diversity and how we depend upon them for our food and agriculture. We also discuss the four major commercially managed bees, i.e., honey bees (*Apis mellifera*), Eastern bumble bees (*Bombus impatiens*), alfalfa Leaf-cutter bee (Megachile *rotundata*) and the blue orchard mason bee (*Osmia lignaria*) and show how they are managed for crop pollination services.

When possible we have exhibited other species of bees, especially Eastern carpenter bees (*Xylocopa virginica*) and Eastern bumble bees. We usually maintain several colonies of bumble bees off exhibit and are currently working on a new indoor exhibit for them.

We have also been working at educating the general zoo staff on the role of pollinators and how to deal with them. Like most of our institutions we get the occasional reports of wasp and bee nests and activity. Historically whenever any found a wasp or bee nest it was usually sprayed to the detriment of the bees and wasps and the ecosystem services they provide. Today when zoo staff report wasp or bee activity the Invertebrate Dept. is notified and one of the staff checks it out to determine whether it is a possible issue for staff or guests. If it has the potential of being a problem we notify our contracted pest control company to deal with it. Often times we find that the perceived problem is not a problem at all, that they animals in question are not aggressive or the observed nest is in an area that would not be a problem for staff or guests. We try not to have any staff spraying pesticides especially when it is not needed.

## IDENTIFYING AND SURVEYING BEES

How do we get people to conserve wildlife, especially bees? Lecture them? Show them a documentary? Ask them to give money? We can try all these things but most importantly we need to get them involved. We need to get them out in the field "where the wild things are."

Getting people into the field is but the first step in affecting conservation actions. To affect change people need to know what they are conserving. Field guides have the potential to expand the education of individuals regarding bumblebees as well as other types of bees. It has been argued that education alone is insufficient to instill change, yet is undeniable that the advent of fields guides for various taxa has inspired and encouraged people to explore the natural world (Cheesman and Key 2007), swelled the ranks of concerned individuals (Pearson and Shetterly 2006) and increased conservation advocacy (Brussard and Tull 2007).

Field guides abound for a variety of taxa from birds and mammals to reptiles and fish. For invertebrates there are numerous general and regional field guides and a number of specific guides focused on butterflies and moths, dragonflies and damselflies and beetles but there are very few guides for bees.

Due to the lack of bee guides in the U.S. I contacted May Berenbaum, Ph.D. at the University of Illinois-Urbana-Champaign to discuss the possibility of developing the first regional guide to bumble bees for Illinois and Missouri. May introduced me to Sydney Cameron, Ph.D., a bumble bee researcher at UIUC and in June of 2008, the University of Illinois with the Saint Louis Zoo produced the Bumble Bees of Illinois and Missouri as part of the University of Illinois' Beespotter Program. This guide is also available as a downloadable pdf from the Beespotter (http://beespotter.mste.illinois.edu/topics/key/) and the Saint Louis Zoo's website (http://www.stlzoo.org/conservation/wildcare-institute/center-for-native-pollinator-conservation/).

In 2010, working with Pollinator Partnership and the Missouri Department of Conservation the CNPC produced a two page bee guide. This guide focuses on ten "types" of bees that could be readily observed in Missouri. It is not a typical guide as some bees are discussed only to family e.g. Halictidae, Andrenidae, Megachilidae, and Colletidae, two to genus, e.g. *Bombus*, and *Melissodes sp.*, a couple to type or lifestyle, e.g. cuckoo bees (*Nomada sp*. and *Triepeolus sp*.) and carpenter bees (*Ceratina* sp. and *X. virginica*) and two to species (*A. mellifera* and *Peponapis pruinosa*.) The goal of the guide is to get people to start understanding and appreciating the diversity of bees in their garden and in the wild.

As part of its goal to understanding and appreciating bees the CNPC has been surveying bees to get a better understanding of bee diversity in our area and how that understanding can improve habitat management practices. Most of the recent bee surveys have been undertaken in three prairie restoration sites within Forest Park where the zoo is located. These surveys serve two functions: 1) to identify what species of bees are present within Forest Park, and 2) to look at differences in bee species diversity and composition between different ages of prairie restorations and plant compositions. We have also worked with students and our Zoo Alive Teen Volunteers to give them the experience of field research and survey techniques.

Finally, we have begun working with companies to bio-monitor their campus to attain a rating under the Sustainable Sites Initiative. This rating is comparable to a LEED certification for buildings but for outdoor habitat. We worked with Novus International in St Charles, MO to survey pollinators on their campus. They are focused on native landscapes and have completely replanted their site with native vegetation and wildlife friendly plantings. As part of the certification process bio-monitoring and surveying are required to quantify the effects of habitat improvements. Various teams survey a variety of taxa. The CNPC along with the Invertebrate Dept. surveyed pollinators over a three year period and found an increase in overall bee numbers and species diversity. We are hoping to get other companies interested in doing similar projects that will allow them to green their campuses and support pollinators.

## POLLINATOR WEEK AND THE POLLINATOR DINNER

In 2007, Pollinator Partnership (P2) and the North American Pollinator Protection Campaign (NAPPC) was able to get Congress to declare the last week (or lately the week before the last week) of June National Pollinator Week. P2 and NAPPC work to inform individuals, government officials, other NGO's, farmers and growers, etc. of the importance and value of pollinators. NAPPC is a coalition of representatives from universities, research institutions, conservation organizations, government agencies, ag-businesses, etc. to work on various topics regarding pollinators through various task forces, including pesticides, utility right of ways, honey bee health, bumble bees, faith-based initiatives, and monarchs.

The CNPC and the Saint Louis Zoo has been participating with National Pollinator week by supporting the annual P2/NAPPC poster, writing articles for Stlzoo Magazine to raise awareness of pollinators and most importantly by hosting the Annual Pollinator Dinner.

The Pollinator Dinner is designed to be an educational event not necessarily a fund raiser. It is open to all and the price is set to pay our expenses and hopefully have some money left over to support the CNPC. During the first hour of the dinner guests can imbibe honey bourbons, honey ales, and hard ciders, snack on donated Blue Diamond Almonds, taste varieties of honey and visit various exhibitors to learn about pollinators, agriculture, and native plantings. The dinner over the last six years has had an average of eight exhibitors during the cocktail hour. Some of the exhibitors have included the Xerces Society, Missouri Dept. of Agriculture, Missouri Dept. of Conservation, Missouri Prairie Foundation, Saint Louis University, Eastern Missouri Beekeepers Association, and Center for Plant Conservation. For the dinner for all items on the menu the pollinators responsible are identified and following the dinner there is a presentation on bees and what the CNPC has been doing. For the last few years we have also received a variety donations to give away as door prizes. This year marked the Sixth Annual Pollinator Dinner and was themed around the monarch butterfly. We brought in Gary Nabhan as a guest speaker to talk about the relationship between monarch, bees and food security. Also, all guests received two packets of milkweed seeds and two milkweed plants to start their own monarch gardens.

## BEES AND FOOD SECURITY

In the past, gardens, like kitchen gardens and "Victory Gardens" supplied a great deal of the food we ate. Today in the United States the US Department of Agriculture estimates that 23.5 million Americans do not have ready access to fresh fruits and vegetables. The establishment of new forms of urban agriculture and the improvement of existing community gardens through the incorporation of pollinators seems to be more relevant today than ever. These gardens can provide food and also serve as sanctuaries to help conserve many of our disappearing pollinators. Worldwide over 800 million people participate in agriculture grown within city limits providing many of the fresh fruits and vegetables in their diets. Economically this amounts to over $500 million worth of fresh produce produced in urban environments. Additionally, we are losing a large variety of fruits and vegetables in cultivation as well as their wild relatives, with over 6400 varieties and species in the United States alone (Khoury et al. 2013).

With these aspects in mind the CNPC has begun working with Gateway Greening, the community garden organization for Saint Louis, to provide advice and classes on best pollinator practices for community gardens and urban agriculture. Information is provided on how to create bee nesting habitats in the form of bee blocks and bee hotels, which species pollinate which crops, and that bee diversity is more important than bee abundance for maximum pollination services.

**PAUSE (POLLINATORS/ART/URBAN AGRICULTURE/SOCIETY/ENVIRONMENT)**

As part of the effort for urban agriculture the PAUSE project was developed. P.A.U.S.E. (Pollinators/Art/Urban Agriculture/Society/and the Environment) was a joint project between the Saint Louis Zoo, Tohono Chul Park in Tucson, Arizona and the National Museums of Kenya in Nairobi. The project was developed to help educate people about the vital role of pollinators in agriculture and the environment and how we are one worldwide community connected through the food we grow and upon the pollinators those foods rely.

The $200,000 P.A.U.S.E. project was a Museums Connect project, funded *[in part]* by an $86,000 grant from the U.S. Department of State's Bureau of Educational and Cultural Affairs and administered by the American Alliance of Museums. Because this is a US State Department project there would be a major emphasis on cross cultural exchange for students through visits to the other institutions and social media. Twenty eight students were selected to participate in the P.A.U.S.E. project, ten from Saint Louis, ten from Nairobi and eight from Tucson. Students were chosen that had a sincere interest in the environment, agriculture and pollinators. Students were also selected with a diversity of backgrounds, experiences, and education in order to create a balanced team that could work on all aspects of the project. These students spent ten months participating in video conferences with their peers in Nairobi and Tucson learning about pollinators, urban agriculture, and garden and sculpture design and exchanged information about what they learned and their lives on Facebook. In addition, students got to meet each other face

to face when three students from Kenya visited Tucson and Saint Louis and two students each from Tucson and St Louis visited Nairobi. These students would help in each other's gardens and experience local cultures, customs and cuisines to see what makes us different but also makes us all "the one family of man."

Two additional outputs of the project were to design or enhance a new or existing garden that incorporates pollinators, and design, build, and install a sculpture for the garden that would also serve as a nesting site for solitary bees. For Tohono Chul students and staff redesigned and expanded their Ethno botanical Garden focusing on traditional crops of the southwest and the American Indian communities. The bounty of this garden would be enjoyed by the Tucson PAUSE team as well as being served in the park's Garden Bistro. The seeds from the final harvest will be collected for return to Native Seeds SEARCH seed bank to be shared with others and local indigenous communities. The Nairobi team built a brand new garden in Uhuru Garden within the city of Nairobi. The garden outline is in the shape of a bee and as this garden is in the flight path of Wilson Airport, everyone arriving to Nairobi at this airport will see a large image of a bee and thereby educationally reaching an audience that few of us think about.

In Saint Louis, a 3.5 acre site as part of a newly established community garden group would be developed. The site includes a foot and bicycle path, a bus stop and an Ameren utility right-of-way but is mostly a "blank slate" where the possibilities seemed almost endless. After meeting with community gardeners and city officials, and talking with the students about different garden designs, pollinator habitats, and educational themes, it was decided to develop an all-encompassing design concept for the entire site and to create a community garden and pollinator park for the City of Florissant and a model for other communities, gardens, Gateway Greening and the Pollinator Center. The site will eventually include a prairie restoration, foraging forest and traditional settler's and "three sisters" gardens. Finally, an artistic sculptural piece will act as a focus for the gardens and serve as a place for harmless, solitary twig and tunnel nesting bees to raise their young.

## MISSOURI STATE PROJECTS

Within Missouri the CNPC was part of the Great Missouri Buzz Off along with Missouri Dept. of Agriculture, the Missouri Botanical Garden and the Missouri State Beekeepers Association to promote the value of bees for our agriculture. The CNPC has also sponsored a pollinator garden at the Missouri State Fair. State wide the CNPC has received a $50,000 grant to begin to develop Pollinator roadsides in Missouri. Working with Missouri Dept. of Transportation (MoDOT) and the Missouri Dept. of Agriculture sites are being identified for restoration that will help pollinators, reduce MoDOT costs for roadside maintenance and hopefully improve pollination services of crops near roadsides.

## BUMBLE BEE AND HONEY BEE CONSERVATION

On a broader scale, the Saint Louis Zoo organized and hosted, along with the Xerces Society, University of Illinois, and USDA-ARS Bee Research Laboratory, a Species Conservation Strategy Workshop for North American Bumble Bees. Experts from across North America, including Canada and Mexico; representing universities, government agencies, and conservation organizations, as well as researchers from the United Kingdom, Europe and Japan, met to develop a comprehensive conservation and research action plan for North American bumble bees. This plan will help direct the conservation and research efforts of the Center for Native Pollinator Conservation as well as the work of other individuals, organizations and agencies towards bumble bee conservation.

Internationally, the Center helped establish and organize the International Union for Conservation of Nature (IUCN) Species Survival Commission (SSC) Bumblebee Specialist Group (BBSG). A world-wide network of bumble bee researchers has been organized to undertake the task of reviewing the status of all 250 species of bumble bees to establish their conservation status of endangered, vulnerable, threatened or least concern. This will help to focus appropriate conservation and research efforts by countries and conservation organizations on bumble bee species of greatest concern.

At the Sixth Annual Pollinator Dinner the Honey Bee Health Coalition (HBHC) was announced. Recognizing that declines in honey bee and pollinator health have put agriculture, healthy ecosystems, and worldwide food security at risk, this diverse coalition was formed to promote collaborative solutions. The Honey Bee Health Coalition brings together beekeepers, growers, researchers, government agencies, agribusinesses, conservation groups, manufacturers and consumer brands, and other key partners in the U.S. and Canada to improve the health of honey bees and other pollinators, ecosystems, and the security of our food supply. The Saint Louis Zoo's CNPC is a partner in the HBHC and serves on the steering committee.

## MONARCH INITIATIVES

With the decline of the monarch butterfly the Saint Louis Zoo partnered with the City of St Louis, Missouri Botanical Garden and the Missouri Dept. of Conservation to launch the Milkweeds for Monarchs program to build 50 monarch gardens within the city and encourage the planting of an additional 200 gardens to celebrate the 250$^{th}$ anniversary of the founding of St Louis. This is the first city sponsored project for monarch conservation in the U.S. And to help develop those additional 200 gardens the CNPC launched the Milkweeds for Monarchs program with Gateway Greening to encourage the planting of milkweeds in community gardens throughout the area.

## FUTURE PROJECTS

The future of the CNPC is as broad as its name. The CNPC was intentionally named the Native Pollinator Center as almost every place on Earth has a native pollinator. It does not define taxa or location to allow for future flexibility with regions, conservation programs and species that require help or assistance.

The CNPC is looking at furthering its work with the National Museums of Kenya started with the PAUSE project. We are looking at three current areas of pollinator/bee surveys and research: 1) Coastal bees of Kenya and their role in pollination of fruit trees like mangoes, Cashew nuts, legumes etc. 2) Central Kenya where farmers grow a lot of horticultural crops like tomatoes, cucurbits, coffee, citrus fruits, avocado etc. In these two regions and many others areas in Kenya pollinators are poorly documented and 3) Work in Kajiado County near Amboseli National Park where a lot of grazing and tourist activities takes place in Kenya. For this area while a lot is known about the mammals and birds, there is no single record of bees as pollinators. As much as park managers put a lot of emphasis on preserving vegetation for the animals, pollinators for the vegetation have not been documented.

Finally, the CNPC is looking at working with other Saint Louis Zoo's WildCare Centers, especially the Galapagos and Sahelo-Saharan region, to incorporate a pollinator component as they may be keystone species in the form of ecosystem services that maintain the environment and habitats.

The Center for Native Pollinator Conservation began small working on zoo grounds and literally outside the doors of the Insectarium but has now moved beyond the perimeter fence to work locally, regionally, nationally and even internationally. Any institution can include pollinators in their conservation, research and education programs the only limit is imagination.

## REFERENCES


Brussard, Peter F. and John C. Tull. (2007). Conservation Biology and Four types of advocacy. Conservation Biology 21(1): 21-24

Cheesman, Oliver D. and Roger S. Key. (2007). The extinction of experience: a threat to insect conservation? In Insect Conservation Biology: Proceedings of the Royal Entomological Society's 23rd Symposium edited by A. J. A. Stewart, T. R. New, and O. T. Lewis, pp 322-348. CABI, Oxfordshire, UK

Colin K. Khoury, Stephanie Greene, John Wiersema, Nigel Maxted, Andy Jarvis, Paul C. Struik. An Inventory of Crop Wild Relatives of the United States. Crop Science, 2013; 0 (0): 0 DOI: 10.2135/cropsci2012.10.0585

Pearson, David L. and John A. Shetterly. 2006. How do published field guides influence interactions between amateurs and professional in entomology. American Entomologist 52(4): 246-252