



CHICAGO BOTANIC GARDEN

Alicia Foxx
PhD Candidate
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Good afternoon, my name is Alicia Foxx and I am a PhD student in the Plant Biology and Conservation graduate program, jointly offered by the Chicago Botanic Garden and Northwestern University. I am here today to ask for your support for the Garden's annual budget allocation. This allocation helps to leverage important outside funding raising efforts for projects like the Garden's science program.

I wanted to share with you my story.

I grew up in Chicago and moved to Maywood for high school. I have always enjoyed plants for their beauty, but it wasn't until I took a plant physiology class as a biology major at Elmhurst College that I began to understand how deceptively complex, extremely fascinating, and critically important plants are. At Elmhurst I conducted an independent research project with my undergraduate advisor on plant competition, and I was too intrigued to stop there. When I was a senior I applied to the Chicago Botanic Garden's graduate program. In what felt like a fingers-crossed moment, I was accepted into the program and in 2012 I began working with Dr. Andrea Kramer to conduct research on native plant species that is aimed at improving the outcomes of native habitat restoration. I received my Master's degree in 2014 and am currently pursuing my PhD degree.

In my work, I seek to understand how plant characteristics like root size and structure influence their interactions with their environment and other plants, and ultimately their ability to survive. We know very little about what goes on belowground in native plant communities, and this information is needed to make sure restoration efforts replicate natural process and ensure desired outcomes like preventing erosion and supporting wildlife. While my work is focused on plants and habitat in the western United States, I also have the opportunity to study and use the resources of the Garden's natural woodlands, waterways and river. I hope some of the tools I use and processes will translate to other systems like those in the Chicago region, including the Forest Preserves.

I feel fortunate to be in a graduate program that allows me to conduct meaningful research in the beautiful open landscapes of Utah and Colorado without having to relocate out of Chicago. Through this work I have experienced camping and hiking on mountain trails for the first time, and have grown my network of collaborators around the country and the world (one of my PhD committee members is from France). I am proud to be part of the Chicago Botanic Garden and its commitment to plant biology research and conservation.

Like so many Garden staff members and volunteers, my work has been an important tool for mentoring students from different backgrounds, allowing me to engage students ranging from elementary school through to college students. As someone whose career path was initiated and truly benefited from working with a mentor, I am dedicated to being an effective mentor, providing mentees with experiences to help them shape their futures. Upon receiving my PhD, I plan to continue conducting research and mentoring students, either as a professor or as a research scientist.

Thank you for your time today and I'm happy to answer any questions you might have.

Chicago Botanic Garden Blog

Rooting for Native Plants

Undercover Science

Competition is heating up in the western United States. Invasive and native plants are racing to claim available land and resources. Alicia Foxx, who studies the interplay of roots of native and invasive plants, is glued to the action. The results of this contest, says the plant biology and conservation doctoral student at the Chicago Botanic Garden and Northwestern University, could be difficult to reverse.

Cheatgrass, which is an aggressive, invasive plant with a dense root system, is in the lead and spreading quickly across the west. Native plants are falling in its wake—especially when it comes to their delicate seedlings that lead to new generations.

Foxx is one of the scientists working to give native plants a leg (or root) up. She hypothesizes that a carefully assembled team of native plant seedlings with just the right root traits may be able to work together to outpace their competition.



Alicia Foxx (left) participates in seed collection in southeastern Utah.

“We often evaluate plants for the way they look above ground, but I think we have to look below ground as well,” she said. Foxx’s master thesis focused on a native grass known as squirreltail, and her hypothesis addressed the idea that the more robust the root system was in a native grass, the better it was at competing with cheatgrass. Now, “I’m looking more at how native plants behave in a community, as opposed to evaluating them one by one. . . How they interact with one another and how that might influence their performance or establishment in the Colorado plateau.”

In the desert climate, human-related disturbances such as mining, gas exploration, livestock trampling, or unnaturally frequent fires have killed off native plants and left barren patches of land behind that are susceptible to the arrival of cheatgrass.



Seedlings in the growth chamber

“Some of our activities are exacerbating the conditions [that are favorable for invasive plants]. We need to make sure that we have forage for the wildlife and the plants themselves, because they are important to us for different reasons, including the prevention of mudslides,” she said. “We are definitely confronted with a changing climate and it would be really difficult for us to reverse any damage we have caused, so we’re trying to shift the plant community so it can be here in 50 years.” Garden conservation scientist [Andrea Kramer, Ph.D.](#) advises Foxx, and her mentorship has allowed Foxx to see how science theories created in a laboratory become real-life solutions in the field. “I think I’m very fortunate to work with Andrea, who works very closely with the Bureau of Land Management...it’s really nice to see that this gets replicated out in the world,” said Foxx. Seeds from their joint collecting trip in 2012 have been added to the Garden’s Dixon National Tallgrass Prairie Seed Bank.

Alicia Foxx loves to walk through the [English Walled Garden](#) when she steps away from her work.

In a way, Foxx is also learning from the invasive plants themselves. To develop her hypothesis, she considered the qualities of the invasive plants; those that succeeded had roots that are highly competitive for resources. After securing seeds from multiple sources, she is now working in the Garden’s greenhouse and the Population Biology Laboratory to grow native plants that may be up to the challenge. She is growing the seedlings in three different categories: a single plant, a group of the same species together, and a group of species that look different (such as a grass and a wildflower). In total, there will be 600 tubes holding plants. She will then evaluate their ability to establish themselves in a location and to survive over time.



On the right: a sunflower seedling (*Helianthus annuus*) next to a native grass (*Pascopyrum smithii*)

There has been very little research on plant roots, but Foxx said the traits of roots, such as how fibrous they are, their length, or the number of hair-like branches they form, tell us a lot about how they function.

“I’m hoping that looking at some of these root traits and looking at how these plants interact with one another will reveal something new or solidify some of the theories,” said Foxx.

She aims to have what she learns about the ecology of roots benefit restorations in the western United States. It is possible that her findings will shape thoughts in other regions as well, such as the prairies of the Midwest. Future research using the seeds Foxx collected could contribute to the National Seed Strategy for Rehabilitation and Restoration, of which the Garden is a key resource for research and seeds for future restoration needs.

The Chicago native has come a long way since she first discovered her love of botany during high school. After completing her research and her Ph.D., she hopes to nurture future scientists and citizen scientists through her ongoing work, and help them make the connections that can lead to a love of plants.