



Ozark Milkvetch (*Astragalus distortus*) is an herbaceous perennial that grows exclusively on shale barrens in the mid-Atlantic. Shale barrens are characterized in part by rocky soils that lack a well-developed organic layer. Photo by A. Weeks.

Mid-Atlantic Hunt for Ozark Milkvetch

by ANDREA WEEKS and EMILY POINDEXTER

This spring, I was fortunate to receive a research grant from the Maryland Native Plant Society to support conservation efforts on Ozark Milkvetch, a rare native legume. This study will use genetic techniques and fieldwork and will constitute the Master's thesis research of my incoming graduate student, Emily Poindexter, at George Mason University in Fairfax, Virginia. Our first full field season of relocating this species in the mid-Atlantic has concluded with exciting discoveries that we want to share with the society's membership.

What is Ozark Milkvetch and why study it?

Ozark Milkvetch (*Astragalus distortus* Torrey & A. Gray; Fabaceae) is a small,

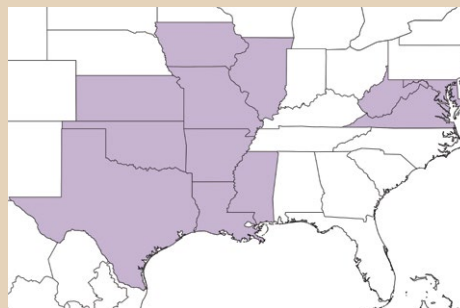


Fig. 1. Ozark Milkvetch is native to twelve US states. Map by A. Weeks.

pink-flowered herbaceous perennial native to Maryland, Virginia and West Virginia (Fig. 1). While it is broadly distributed in the sunny glades and grasslands of the south-central United States, it is extraordinarily rare in the mid-Atlantic and is restricted to shale barren ecological

communities. It has a state conservation ranking of Imperiled (S2) in Maryland and West Virginia and Critically Imperiled (S1) in Virginia. Knowledge about Ozark Milkvetch populations in the mid-Atlantic is dangerously out of date given the need to protect this rare species. For instance, Ozark Milkvetch had the ranking of State Historical (e.g., possibly extirpated) in Virginia until 2022. When we relocated a large population of it in the Massanutten Mountains last year, the Virginia Natural Heritage Program upgraded its ranking to S1. Many historical stations of the species have not been revisited in decades. One of our project goals is to relocate as many populations as possible to analyze this species' genetic diversity in order

to inform conservation management decisions in the mid-Atlantic.

Ozark Milkvetch also presents an evolutionary and taxonomic puzzle that our project will solve with comparative genetic methods. Its disjunct distribution suggests that mid-Atlantic and south-central US populations may be separate evolutionary lineages that would warrant separate taxonomic status. As currently circumscribed based on morphology, *Astragalus distortus* comprises two varieties: *A. distortus* var. *distortus* and *A. distortus* var. *englemannii*. The former grows in both regions, whereas the latter is mostly restricted to Texas, Arkansas, and Louisiana. We will sample south-central US populations to test these taxonomic hypotheses and to clarify the evolutionary relationships of Ozark Milkvetch populations across the country.

What are emerging insights about Ozark Milkvetch's persistence in the 21st century?

Using the tried-and-true fieldwork strategy of due diligence, collaboration, and persistence, with a little bit of luck, we have relocated live populations of Ozark Milkvetch at six historically tracked stations in Maryland, Virginia and West Virginia. We have also discovered in Maryland and Virginia three new stations for the species. Our working dataset for exploration included all historical element occurrences of the species tracked by the states' Natural Heritage programs, localities drawn from herbarium specimens that were collected in the mid-Atlantic from the late 1800's onwards, and geological maps that showed the location of probable shale barren communities in the tri-state area. Assembling these data, obtaining scientific collection permits and coordinating land-owner permissions took months of work ahead of the narrow window for fieldwork in April and May when Ozark Milkvetch flowers and can be spotted easily.

From this year's fieldwork, we share three emerging insights about this species' persistence in the mid-Atlantic in the 21st century:



Fig. 2. Half of the historic stations for Ozark Milkvetch (*Astragalus distortus*) in the mid-Atlantic area we visited this year—including the River Road barren in Montgomery County, Maryland (left), which has become invaded by Amur Honeysuckle — no longer harbor this species. Uninvaded, high quality shale barren ecological communities—such as this one in the Green Ridge State Forest in Allegany County, Maryland (right)—receive bright sunlight at ground level and support healthy Ozark Milkvetch populations. Photos by A. Weeks.

1. Ozark Milkvetch is probably an obligate heliophyte, as has been demonstrated experimentally for other plant species similarly restricted to shale barren ecological communities (Baskin & Baskin 1988). Such plants require bright sunlight to complete their lifecycle and cannot compete successfully in heavily shaded conditions. We base our hypothesis on the observation that Ozark Milkvetch was absent from half of the historically

tracked stations that we visited this season and most of these sites were heavily shaded by invasive plants, such as Japanese Honeysuckle (*Lonicera japonica*), Amur Honeysuckle (*Lonicera maackii*) and Autumn Olive (*Elaeagnus umbellata*) (Fig. 2, left). Every site where we encountered living populations of Ozark Milkvetch had full sun exposure at ground level.

continued on page 10



Fig. 3. Anthropogenic habitats can harbor Ozark Milkvetch. An old power line right-of-way that is kept clear of underbrush (left), harbors Ozark Milkvetch, which can be seen along the bottom-center edge of the image. An ungrazed pasture that includes invasive star-thistle (*Centaurea stoebe*) and is mown by the landowner to prevent soil erosion and encroachment by woody plants (right), also provides habitat for Ozark Milkvetch. Photos by A. Weeks.



Fig. 4. Lena Artz (1891-1976) was born in Woodstock Virginia and grew up along the North Fork of the Shenandoah River at the foot of the Massanutten Mountains. In 1935, she earned a Master of Arts degree from George Washington University, in Washington DC. Her thesis research, “*Plants of the shale banks of the Massanutten Mountains*” described the vascular flora of the shale barren ecosystems within this mountain range. From Wikipedia, en.wikipedia.org/wiki/Lena_Clemmons_Artz, accessed October 14, 2023.

Artz’ research has been critical to finding extant populations of Ozark Milkvetch in the mid-Atlantic and inspired the design of our “Wanted” poster that ultimately led to the discovery of a new station for the species in Virginia. Poster by A. Weeks.



II. Ozark Milkvetch can thrive in habitats that are disturbed by people. Of the nine living populations we have observed, three are found in power line rights-of-way and in an ungrazed pasture. People mow these areas occasionally to exclude trees and shrubs (Fig. 3) yet do not necessarily remove all invasive plants. Two of the new populations that we discovered were found thriving in these types of anthropogenic habitats. This suggests that simple management tactics, such as physically removing encroaching woody species, might be part of an effective strategy that would protect existing populations of Ozark Milkvetch or restore this species to historical stations that no longer support it.

III. Local knowledge is a key part of the emerging story of Ozark Milkvetch in the mid-Atlantic. Relocating some

extant populations would have been impossible without the foundation of research created by Lena Artz (Fig. 4), who is a hidden figure of mid-20th century Virginian botany. Lena Artz (1891-1976) dedicated her life to documenting the flora of the Massanutten Mountains in Virginia, which are rife with shale barren ecological communities (Weeks submitted; Wikipedia Contributors 2023). Her herbarium specimens of Ozark Milkvetch were critical to our relocating this species in Virginia in 2022, and her paper, “Notes on *Astragalus distortus*” (Artz 1937), reported that extensive populations were once present in Fort Valley, the central valley of the Massanutten. By searching most of the roadsides in Fort Valley this spring, we relocated one new location in a power line right-of-way (Fig.

3, left). Because most of the land there is privately held, we created a ‘Wanted’ poster and hung it at Fort Valley’s only gas station, in the hope that nearby property-owners might notice other populations on their land.

Three weeks later, we were contacted by an individual with information that led to our recording the second new location for Ozark Milkvetch, on land from which they had painstakingly removed all invasive shrubs in recent years. Based on this encouraging result, Emily will expand postering and start a social media campaign in the tri-state area in Spring 2024 to engage more landowners in the hunt for this special plant.

We are grateful to John Parrish and Rod Simmons for helping us relocate the probable historical station of Ozark

ACKNOWLEDGMENTS

Sabiha Basit (who was supported by a Research Experience for Post-Baccalaureate Students supplement to US National Science Foundation award #2022918), for her assistance with collecting historical locality data for Ozark Milkvetch, and Clara Thiel, Sarah Brown, and Angela Moxley, who guided our fieldwork in western Maryland.

The MNPS Research Grants Program was established to support research on Maryland’s native plant species and plant communities. Studies can be conducted within Maryland as well as outside of the state as long as the results are applicable to Maryland native plants. Research on invasive species (plants, animals, and pathogens) that threaten Maryland’s native plants are also welcome. The 2024 Call for Proposals will be announced on February 1 and the deadline for submission is March 25. For more information, go to mdflora.org/grants.html

Milkvetch in Montgomery County, Maryland (Fig. 2, left). The original location data were not precise. They called our attention to the proposed River Road Shale Barrens Conservation Park in Montgomery County, Maryland (Montgomery County Planning Commission, 2022). This fascinating area spans part of the geological outcropping of shale in the county. It still harbors some shale-barren specialist species and is an excellent candidate for habitat restoration through consistent removal of invasive plants.

What's next for the Ozark Milkvetch project?

This academic year, Emily will extract DNA from the leaf-tissue samples of Ozark Milkvetch that we collected this season and will use genotyping-by-sequencing to measure population genetic diversity among the mid-Atlantic populations. While the snow flies this winter, we will be busy planning a spring-time social media campaign to raise awareness of this species among landowners in Maryland, Virginia and West Virginia as well as charting out a long-distance road-trip throughout the south-central US to collect more populations of Ozark Milkvetch. We anticipate that in two year's time we will be able to answer the foundational questions of this project and to report a more complete understanding of this species' conservation genetics, taxonomic boundaries and evolutionary origin. Stay tuned!

Personal Reflection by Emily Poindexter

Note: Emily Poindexter is a new graduate student in the Weeks Lab at George Mason University in Fairfax, Virginia. Her thesis work will study the phylogeography and conservation needs for Ozark Milkvetch (pictured in the lower half of the image).

My passion for rare plant conservation originated in natural history collections and my own boots-on-the-ground experiences. A couple of years ago, I worked as a summer field botany technician for the Virginia Department of Conservation and Recreation, surveying US Forest Service tracts. During this time, I got to visit populations of the imperiled Small-whorled Pogonia Orchid (*Isotria medeoloides*) and discover new populations of the rare Swordleaf Phlox (*Phlox buckleyi*). For a summer, it felt like I was taking part in this incredible, botanical scavenger hunt. I wanted to stay in the game forever. Then when the summer work ended, and I realized I wasn't going to be a part of following up on those populations, I knew I had to make my life about the scavenger hunt and the science.

Since then, I've been working at the US National Herbarium. There, I get to see the work produced by millions of fellow scavenger hunt enthusiasts from the past two centuries. Every day, I interact with the life's work of scientists, past and present, from all over the world. And it's only made me yearn more to find my place among them.

When I came across the opportunity to work on the *Astragalus distortus* project, I leapt at it. This project, so far, has been a classic example of the intersection between historical collections and modern field botany. I feel immensely privileged to be able to walk in Lena Artz' footsteps and to have seen a few of the rare mid-Atlantic populations of *A. distortus* with my own eyes. My experience in the field this past summer has been rather bittersweet upon reflection. It's devastating to know that in some instances human interactions have wiped out habitats where it was historically known, and those populations are not coming back. But it also makes me feel incredibly hopeful to have hiked the shale barrens where it's currently being protected and to know that there are other hard-working biologists and naturalists out there who also care about this plant and its ecosystem.



Emily Poindexter. Photo by A. Weeks.

LITERATURE CITED

- Artz, L. 1937. Notes on *Astragalus distortus*. *Claytonia*. 4:24–25.
- Baskin, J.M. and C.C. Baskin C.C. 1988. Endemism in Rock Outcrop Plant Communities of Unglaciated Eastern United States: An Evaluation of the Roles of the Edaphic, Genetic and Light Factors. *Journal of Biogeography*. 15:829–840.
- Montgomery County Planning Department. 2022. Rustic Roads Functional Master Plan Update: Road Profiles Appendix - Working Draft. Part 3: Montevideo Road through Stoney Creek Road. pp. 288–291.
- Weeks, A. submitted. A belated biography of Lena Artz, a hidden figure of 20th century southeastern US botany. *Castanea*.
- Wikipedia Contributors. 2023. Lena Clemmons Artz. In Wikipedia, The Free Encyclopedia. https://en.wikipedia.org/w/index.php?title=Lena_Clemmons_Artz&oldid=1155811233. Retrieved August 3, 2023.