Conservation of Mead's Milkweed in Missouri: New Insights, Persistent Struggles, and Ongoing Research That Guide Future Conservation Efforts

by Malissa Briggler

Mead's milkweed *(Asclepias meadii)* is a long-lived perennial currently found on tallgrass prairie remnants in Kansas, Missouri, Illinois, and Iowa, in addition to igneous glades of the St. Francois Mountains of Missouri (Figure 1). Unlike in the Glaciated Till Plains of the northern tallgrass prairie region, in southern Missouri tallgrass prairie, conversion to crop production was low because these regions were characterized by rocky and less productive soil. Missouri's most valuable and intact prairie systems that include populations of Mead's milkweed primarily exist in the Osage Plains Region located in the west-central and southwest portions of the state. Igneous glades within the St. Francois Mountains of the Missouri Ozarks also harbor populations of Mead's milkweed. These populations are isolated in a geographically small landscape, but appear to be faring better in regards to abundance and seed production than those existing in the Osage Plains Region. Mead's milkweed populations have declined with the overwhelming loss of tallgrass prairie and struggle even in

Figure 1. Distribution of Mead's milkweed populations currently tracked in the Natural Heritage Database.

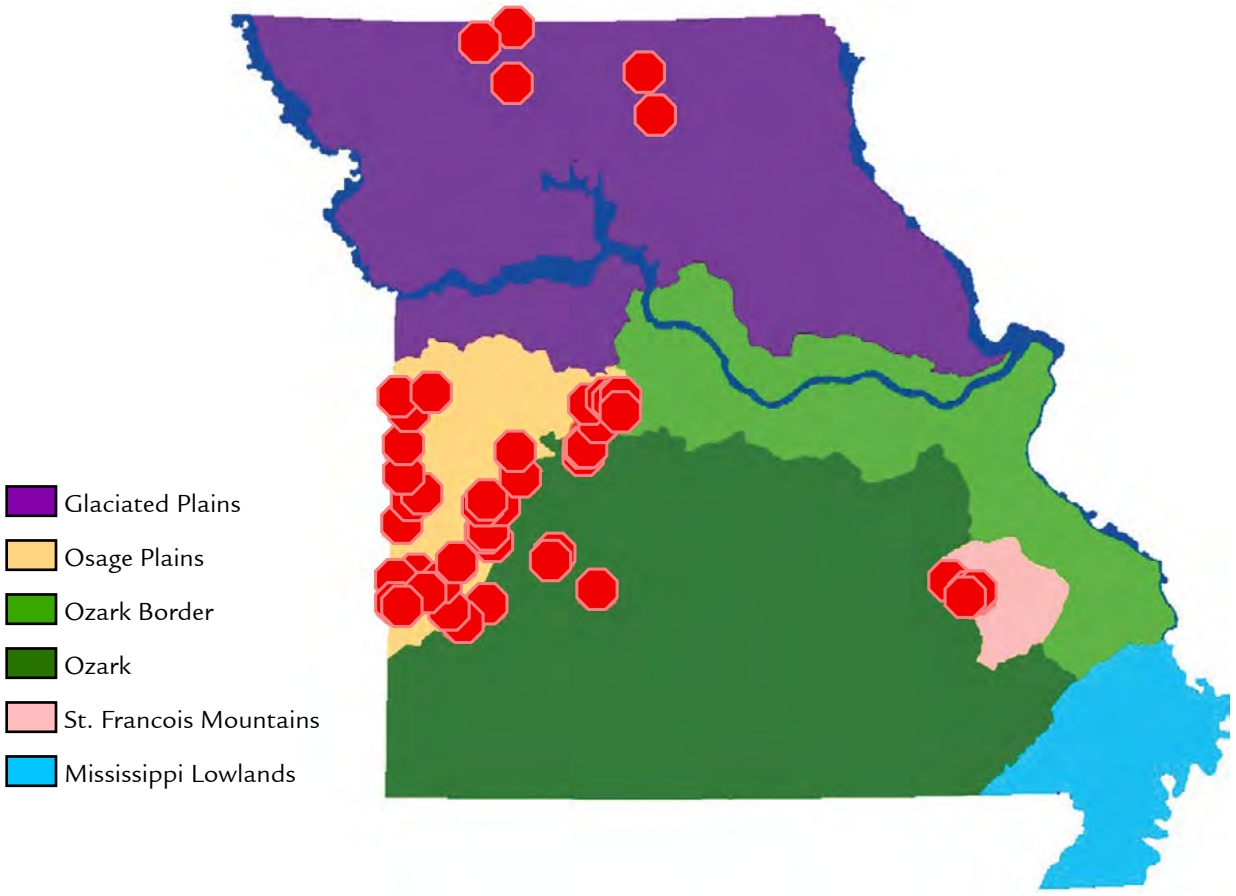

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Photo by Ron Colatskie

Image 1. Mead's milkweed and other vegetation uprooted and destroyed by feral hogs in the St. Francois Mountains.

protected, high-quality remnants. The species is currently listed as federally threatened and state endangered in Missouri.

Monitoring of Mead's milkweed populations occurs on state, federal, and privately owned land, as well as property owned by non-government organizations. The frequency and intensity of monitoring programs vary greatly. Some populations are monitored by counting stems every 3–5 years while other monitoring efforts involve long-term, permanently marked locations where each individual plant is mapped. Intensive monitoring on designated natural areas has remained a priority over the past thirty years. The Missouri Natural Heritage Program maintains the monitoring data in order that it can be integrated for strategic land management, conservation planning, and protection of the species. Currently, 65 populations tracked in the heritage database are occasionally or frequently monitored.

Monitoring data have provided valuable information to better understand and predict responses of Mead's milkweed to management. Mead's milkweed responds well to late season or dormant season burning. It also persists well under a frequent haying regime that more commonly occurs on private land. Populations of Mead's milkweed that are periodically burned or hayed have shown to be stable over the past two decades. A substantial and sustained reduction in stem counts has been seen in areas where fire and/or haying have ceased or undergone extensive periods (>5 years) of rest. A return of burning or haying can reverse this trend and increase stem counts, but consistent application over time is generally required.

Some populations of Mead's milkweed have undergone extensive damage by feral hogs (Image 1). While feral hogs are present in the Osage Plains Region, populations are greater in the

Photo by Mike Leahy, Missouri Department of Conservation

Image 2. A Mead's milkweed flower possibly pollinated with the help of a Brown-belted bumblebee *(Bombus griseocollis.)*

rugged terrain of the St. Francois Mountains, including the igneous glades containing populations of Mead's milkweed. Hog damage control on federal, state, and private lands include trapping, aerial gunning as well as electric fencing to deter hogs from entering glades with the best populations of Mead's milkweed. These efforts are instrumental to protecting populations from severe damage. Control efforts are making significant progress on feral hog eradication, but feral hogs remain a known threat in the region.

Another alarming trend occurring over the past twenty years is a lack of seed production. Some populations have produced over a hundred flowering stems with few, if any, developing a viable seedpod. Mead's milkweed can only pollinate and produce viable seedpods by cross pollinating with another genetically distinct individual (Image 2). This phenomenon is called obligate outcrossing. Historically, many of the native prairie remnants that support Mead's milkweed were managed by frequent or even annual haying. Biologists theorized that frequent haying of Mead's milkweed may have led to greater vegetative growth as plants were consistently harvested before seed production. Over time, the individual plants began producing more stems along their rhizomes, which are called ramets as they are not genetically distinct individuals. These multiple stemmed plants, though numerous, are unable to cross-pollinate, which is needed to produce genetically distinct individuals known as genets. It is theorized that

the lack of seed production is due to these large populations consisting of mostly ramets and not genets. Working with this assumption, some recovery actions included transplanting efforts to boost genetic diversity.

However, biologists are also concerned that transplanting individuals across populations may decrease the genetic integrity of Mead's milkweed. The concept that a lack of genetic diversity results in low seed production was just a theory and there was concern that introducing plants from one population to another population across a great distance, or from a different prairie/glade habitat, could exacerbate a genetic decline instead of remove it. A phenomenon known as outbreeding depression can occur when two genetically distant groups that are adapted to different environmental conditions cross and produce offspring with reduced fitness. Thus, transplanting to stable populations was delayed until research determined whether outbreeding depression would be a possible consequence. In the meantime, transplanting efforts continued on native prairie containing just a few stems or at sites that had historic, but not extant, populations of Mead's milkweed.

Since 2011, biologists have planted over 700 Mead's milkweed seedlings throughout the tallgrass prairie range in Missouri. Eight sites were selected based on three criteria: suitable habitat, having a management plan for those lands that included burning or haying at least once every 3 years, and the proximity to only a few remnant plants or historic locations of Mead's milkweed. Twenty to thirty percent of seedlings have persisted at sites planted 13 years ago. Data also show that stems remain dormant on occasion. Between 2011 and 2017, 600 transplants were monitored each year. Presence data was collected at each transplant location. Observations of extended periods of dormancy were recorded as plants remained dormant for 1 or more years,

Photo by Emily Horner

Image 3. Wind-dispersed seed of Mead's milkweed waiting for the next breeze.

followed by a year that the plant produced a stem. These observations remain important for better understanding the life history characteristics of Mead's milkweed and to gather reasonable expectations from translocation efforts.

In 2018, Dr. Christine Edwards with the Missouri Botanical Garden began investigating genetic diversity and genotypic richness within and among 12 Mead's milkweed populations in Kansas and Missouri and their consequences for reproduction. Selected sites represent the extent of the species' geographic range and variation in population size, including populations that typically produce many stems (ramets or genets) but exhibit low seed production. Results were used to determine if low seed production was the result of a lack of genetic diversity or genotypic richness. Instead of confirming long held assumptions, her conclusions rejected the

Photo by Malissa Briggler

Image 4. Dr. Edwards plants Mead's milkweed grown from seed collected for genetic research. Increasing the number of flowering individuals is likely to improve seed production.

hypothesis that low seed production was due to a lack of genetic diversity within populations. Further, Edwards reported low genetic structure among populations of Mead's milkweed, indicating widespread genetic connectivity despite fragmented geographic distribution, likely because seed dispersal by wind allows individuals to move among sites (Image 3, previous page). High genetic connectivity and low structure suggests that outbreeding depression would not occur when transplanting Mead's milkweed among populations, although these results should not be taken as a recommendation to freely move and cross-pollinate Mead's milkweed across its range. Genetic integrity of populations, particularly in isolated habitats like the St Francois Mountains, remain an important concern.

One of the main conclusions of Edwards' study indicate reproduction was strongly connected to flowering population size, with a population of at least 50 flowering stems necessary for successful seed production. To understand why this is the case, Edwards has begun a 4-year study to identify other factors that may limit seed production in small populations (image 4). Potential pollinator and pollen limitation will be examined by studying the pollinator abundance and success rates of removing pollinaria. She will investigate other potential resource limitations by conducting hand pollinations and comparing the results of small populations to those of larger populations to determine whether other resources are or are not limited in small populations. A final goal of this work will be to augment smaller populations with seed-grown transplants in efforts to overcome reproductive limitations, increase seed production, and improve the population viability. Results of this work are forthcoming in 2026.

Recovery efforts for Mead's milkweed involve a tremendous amount of cooperation and partnership. Landowners include private individuals, Missouri Prairie Foundation, Nature Conservancy, Department of Natural Resources (MDNR), Missouri Department of Conservation (MDC), U.S. Army Corps of Engineers, and U.S. Forest Service. The Missouri Botanical Garden and Powell Gardens are important partners with MDC in conducting research and transplanting efforts. The U.S. Fish and Wildlife Service Ecological Services Field Office has provided expertise and assistance in securing funding. Statewide monitoring efforts involved several volunteers and led by staff of MDNR and MDC. Many challenges and threats keep the status of Mead's milkweed a great concern. However, ongoing research and collaboration provide a hopeful future.

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