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2023 - Transportation in the Flint Hills

Transportation in the Context of Ecology

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Recommended Citation

Capizzo, Tony (2023). "Transportation in the Context of Ecology," Symphony in the Flint Hills Field Journal.

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The Field Journals are made possible in part with funding from the Fred C. and Mary R. Koch Foundation.

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Biodiversity Hotspot
Amanda Gehin

TRANSPORTATION IN THE CONTEXT OF ECOLOGY, OR, FROM MONARCH BUTTERFLIES TO PORCUPINE GRASS

“There are several ways not to walk in the prairie, and one of them is with your eye on a far goal, because you then begin to believe you’re not closing the distance any more than you would with a mirage. ... On the prairie, distance and the miles of air turn movement to stasis and openness to a wall, a thing as difficult to penetrate as dense forest. I was hiking in a chamber of absences where the near was the same as the far, and it seemed every time I raised a step the earth rotated under me so that my foot fell just where it had lifted from.”

William Least Heat-Moon, “PrairyErth” (1991)

Tallgrass prairie is a landscape defined by movement. This might at first seem counterintuitive; after all, the deep roots of native prairie plants, those roots that allow them to thrive in hot, sometimes arid conditions, also anchor those species to the ground from which they sprouted. However, since the glaciers retreated at the end of the most recent glaciation period 11,000 years ago, the tallgrass prairie has existed as a shifting mosaic of grasses and other plants influenced by the interactions between herbivorous bison, elk, pronghorn and insects and fires caused by lightning and humans.

Transportation in the context of ecology happens at every scale imaginable, from continent-spanning migrations to a seed’s journey from flower to soil. These journeys are often interwoven among species, such as the migratory monarch butterflies that rely on milkweeds along their migratory pathway to support successive generations.

The epic migrations of the monarch butterfly span the continent from Canada to Mexico. Along the way, the prairie provides fuel

for multiple generations of monarchs. Milkweed leaves provide food for the caterpillars, and the milkweed's flower nectar fuels the adult butterflies.

THERE ARE 85% FEWER MONARCH BUTTERFLIES TODAY THAN JUST 20 YEARS AGO.

Unfortunately, the monarch has seen precipitous population declines in recent years, in part due to loss of prairie habitat. There are 85% fewer monarch butterflies today than just 20 years ago.

The conservation partnership known as the Monarch Highway aims to change that trend. The initiative is a collaborative agreement among state departments of transportation and other partners in six states from Minnesota through Texas. The partnership aims to improve pollinator habitat and further public awareness of pollinator conservation along the Interstate 35 corridor. The location is particularly apt: I-35 neatly traces much of the historic length of the tallgrass prairie through historically what would have been some of the most productive monarch habitat.

Large-scale programs like the Monarch Highway are supplemented and expanded by local efforts, such as those led by the Prairie Stewards volunteer group at Tallgrass Prairie National Preserve in the

Flint Hills. Prairie Stewards are one of many groups engaged in citizen science to learn more about the migratory pathways used by monarch butterflies.

Prairie Stewards tag monarch butterflies before they fly south to their wintering grounds in Mexico; the monarchs they tag either originate in the Flint Hills or are passing through. The tags are specially designed for butterflies, with a small, lightweight sticker and unique identifier that is placed on the underside of the wing. In 2021, 15 of the monarch butterflies tagged at Tallgrass Prairie National Preserve were later found across and in three different sites in Mexico: Cerro Pelon, El Rosario and Sierra Chincua.

Pollinators move freely about the landscape, but the plants they rely on are rooted in place and therefore have evolved ingenious strategies to reproduce, sometimes across tremendous distances. The grand migration of the monarch butterfly is enabled by seed dispersal of milkweed plants on a smaller scale that ultimately provides nectar for adults and food for caterpillars. Fourteen different species of milkweed exist in the Flint Hills, and they all rely on wind for seed dispersal. When the milkweed pods split open, the "coma" (fluffy hairs) attached to the seed begin to dry; eventually, the passing breeze tugs the seed loose. An individual milkweed seed

can travel more than 500 feet from the parent plant.

While the monarch butterflies receive well-deserved fanfare because of their impressive migratory journey, the vast majority of pollinators complete their life cycles locally. As with monarchs, many of these pollinators rely on the nectar produced by flowering plants for sustenance, and the butterflies and moths often require very specific plants for their caterpillars to eat.

The byssus skipper, a type of butterfly, is one example of a stay-at-home pollinator. Their wingspan is less than two inches, so their local excursions across the prairie can be just as arduous as the travels of high-mileage monarchs.

Byssus skippers lay eggs on the leaves of eastern gamagrass (*Tripsacum dactyloides*) in June and July, and the caterpillars must eat enough of the plant to survive through the winter before pupating into adult skippers the following spring. Much of the lowland prairie where eastern gamagrass grows has been converted to row-crop agriculture, but scattered stands of eastern gamagrass that remain in Flint Hills pastures are highly prized by ranchers due to their prodigious production of high-quality forage.

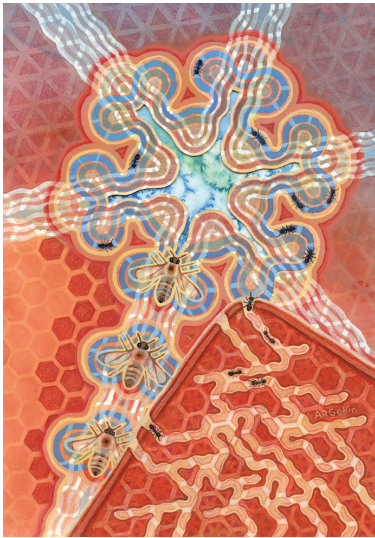
Eastern gamagrass produces seeds that can be dispersed by water, birds and rodents, but it most commonly spreads through shallow roots called rhizomes

that crawl, tentacle-like, under the ground. It is awe-inspiring to look over several acres of eastern gamagrass and realize that most of it probably started with just a single plant that grew and spread inch-by-inch and year-by-year.

Another native Flint Hills grass spreads through seeds that stick to fur (and clothing), relying on wildlife to transport it to new locations. Known as porcupine grass, porcupine needlegrass, big needlegrass or simply stipa, *Hesperostipa spartea* is one of the most fascinating of the native prairie plants. The seeds are a rich tawny color, with a sharp spike and a tuft of hairs at one end and a 3- to 5-inch-long "awn" (stiff bristle) on the other. The awn has distinctive light and dark alternating stripes that run the length of the bristle.

The needle-sharp spike and its tufts of hair are just as proficient at sticking to a pair of jeans as to a bison haunch. When the seed eventually drops off or is pulled off, it typically lands point-down in the soil with the long awn sticking up vertically. The light and dark stripes heat up at different rates in the sunlight and cause the awn to twist and curl upon itself. That twisting action augers the seed into the soil, providing seed-soil contact and giving that seed a better chance of successful germination.

Two butterfly caterpillars rely on porcupine grass as a larval food source:



Biomimicry and the Bee
Black Swallowtail and Golden Alexanders
 Amanda Gehin



the Dakota skipper and the common wood nymph.

Whether spread through rhizomes, blown by the wind or conveyed by wild animals, seed dispersal is critical to maintaining prairie. Unfortunately, not all seed transportation is good. Human dispersal of seeds across the globe, even with the best intentions, can have disastrous consequences. Sericea

lespedeza, for example, is an invasive legume that poses a significant threat to tallgrass prairie in the Flint Hills.

Sericea lespedeza was originally introduced to South Carolina from Japan in 1896 for erosion control purposes. People soon recognized its hardiness and high forage production potential and began planting it as a forage crop, at first in the southeastern United States. That

same hardiness and the plant's high seed production allowed sericea lespedeza to escape outside of its original intended location and purpose.

A sericea plant can produce 1,000 or more seeds per stem; mature plants have three to eight or more stems. Those seeds are incredibly long lived: Sericea lespedeza seeds have germinated after lying dormant for more than 50 years. All of these advantages provide sericea lespedeza the ability to spread rapidly in tallgrass prairie, crowding out diverse native plants.

Despite the threats to Flint Hills prairie, the landscape also has much going for it. Thanks to ranchers, the critical ecological processes of fire and grazing continue to be implemented. The prairie has evolved with these processes, and their presence in the Flint Hills continues to support prairie diversity, despite challenges such as invasive species and habitat fragmentation.

Those who are not on-the-ground stewards of prairie also can do their part

for conservation. Even simple actions like replacing exotic landscaping plants with native, ecologically appropriate alternatives — for example, replacing exotic crown vetch with native ground plum (*Astragalus crassicaupus*) — will decrease the chance of introducing another menace like sericea lespedeza and dramatically increase the value of that landscaping to native pollinators. As an added benefit, those deep prairie roots can cut down on maintenance and watering in the heat of the summer.

For those who are able, financially supporting conservation organizations that are active in the Flint Hills can also make a long-lasting difference. The ability of native prairie plants and animals to continue moving and migrating relies entirely on the availability of space and resources that the prairie provides. It is our shared responsibility to conserve what remains of the tallgrass prairie for the sake of nature and for people.

Tony Capizzo is manager of the Flint Hills Initiative for The Nature Conservancy in Kansas. The Flint Hills Initiative aims to protect Flint Hills prairie biodiversity through supporting working lands and community-based conservation. Tony joined the conservancy in 2010 after completing a Bachelor of Science in conservation biology at the University of Michigan. He and his wife, Bria, live in Cottonwood Falls, Kansas.