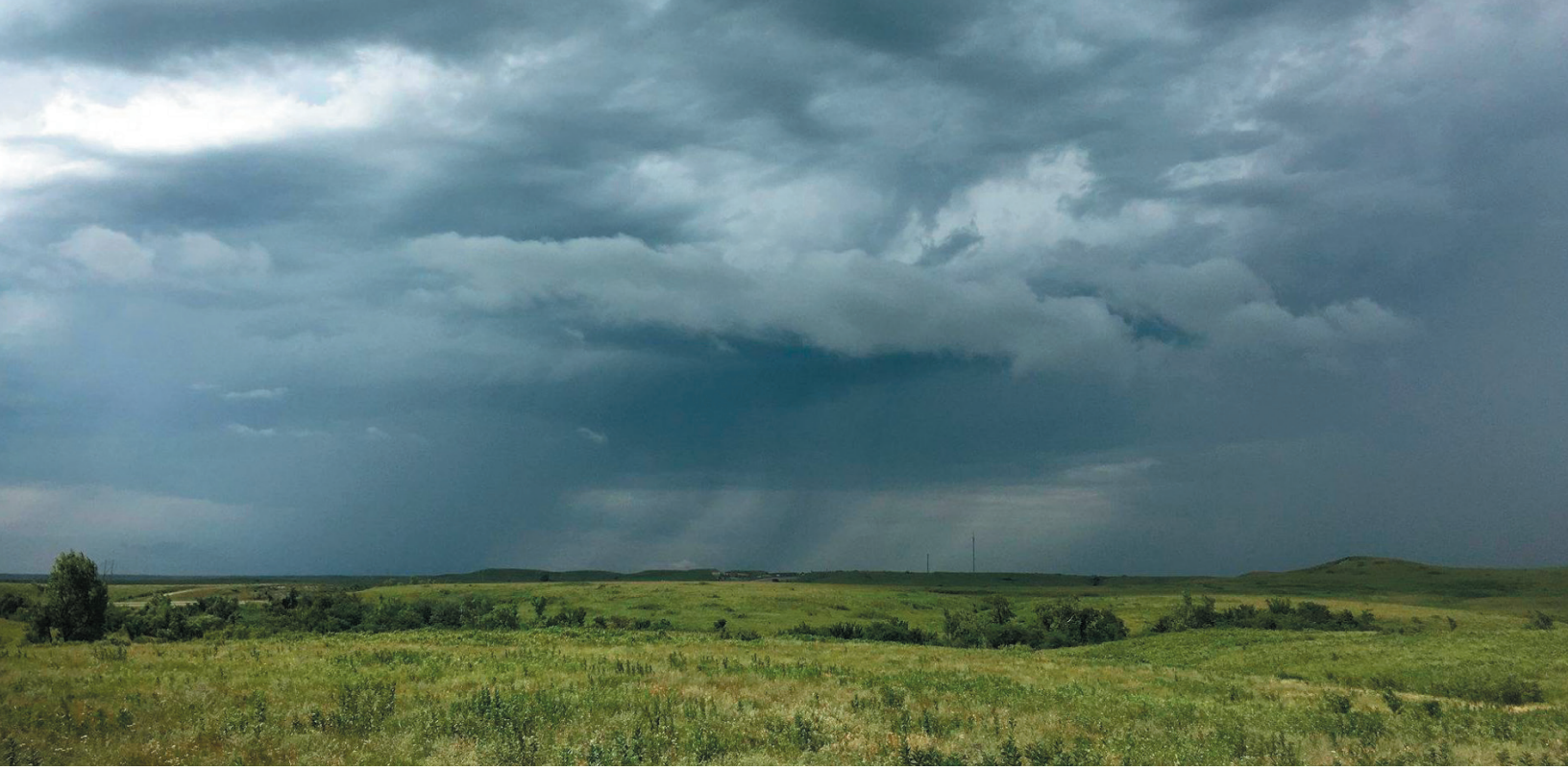


*Storm brewing over the Konza Prairie Biological Station. Photo by Sarah Winnicki-Smith*

# WEATHERING THE STORM:

## A TALE OF EXTREME WEATHER AND THE GRASSHOPPER SPARROW

KOLEY FREEMAN

Growing up, my only knowledge of Kansas was the black -and- white farm fields from the movie, The *Wizard of Oz.* So when I relocated to Kansas in my late twenties, I was quite surprised to be greeted by the beautiful and lush tallgrass prairies of the Flint Hills. It also wasn't until I moved that I met and fell in love with a small, elusive bird, the Grasshopper Sparrow.

Whenever I tell someone that I study Grasshopper Sparrows I get one of two responses. The first is that they've either never heard of or seen a Grasshopper Sparrow, which is not an unexpected response. Grasshopper Sparrows are not a well-known species to non-bird enthusiasts. They don't frequent bird feeders, nor are they memorable for bright, flashy colors. I'll be the first to admit that they are quite drab on first inspection, but if you look closely enough you can see beautiful shades of rufous browns, pale grays, and hints of vibrant yellows. These secretive birds are great at blending in and hiding, scurrying through the tall grasses to avoid predators, and as a result it can be much easier to hear its distinctive insect-like song than to actually see one.

The second response usually involves a lengthy discussion about how they used to see Grasshopper Sparrows all the time but not as frequently, if at all, anymore. Unfortunately, this response mirrors what we are seeing in a population of Grasshopper Sparrows that breed at the Konza Prairie Biological Station just south of Manhattan, Kansas. The population is part of a grassland songbird project, led by my supervisor and mentor Dr. Alice Boyle, which has just wrapped up its tenth and final year. Every summer for the past decade, a crew of dedicated graduate students and field technicians have braved the early mornings and mid-day sun to monitor the movements and reproductive efforts of Grasshopper

Sparrows. But, as time has passed, there have been fewer sparrows to follow.

The Grasshopper Sparrow is a species of grassland bird, a group of birds that live and breed in open landscapes dominated by grasses and forbs. Since the 1970s, grassland birds have declined by a staggering 53 percent, the most of any group in North America. Such declines are considered to be largely a result of loss of habitat due to mismanagement and conversion of land to agriculture. Furthermore, shifting weather patterns throughout the prairies may also present an increasingly difficult challenge for grassland birds.

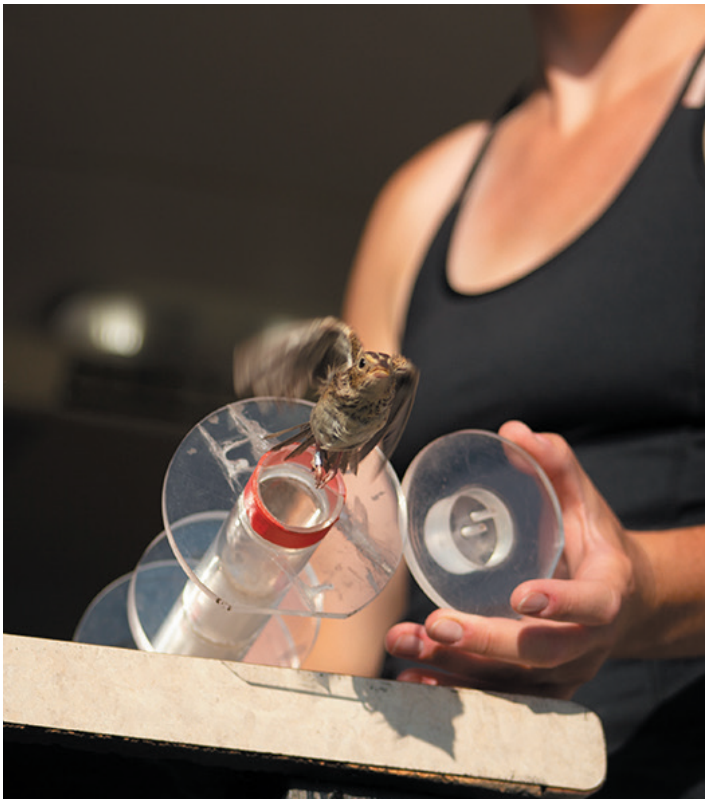
Grasslands are highly dynamic habitats. Without grazing and fire, the fields of grasses and forbs can quickly be taken over with shrubs and trees. Without precipitation, the grasses will not grow. Rainfall in the mid-continental grasslands of North America is variable, resulting in some drought years and other years with excessive rain. The amount of rainfall in a given year can have cascading effects up the food chain, impacting first the growth of the vegetation, then the abundance of insects like grasshoppers that consume the plants, and eventually Grasshopper Sparrows which eat the insects and nest in the grasses. But rainfall amounts and patterns in the area are changing.

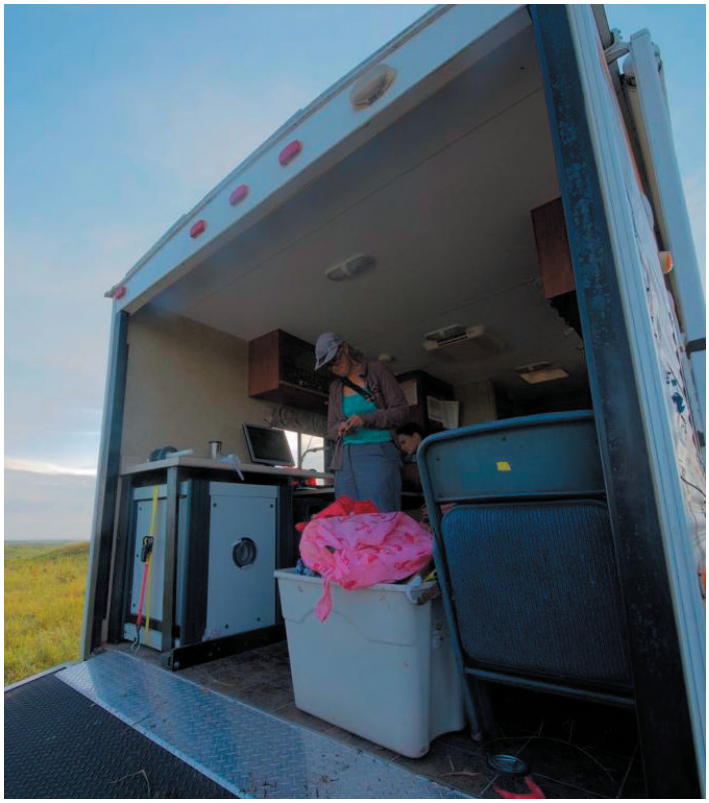
**It is predicted that by 2050, Kansans will experience double the number of days of heat waves as they do now.** Along with warming temperatures, summertime precipitation is expected to decrease, leading to longer periods of drought, drier soil, and higher risks of wildfires. During the summer it is predicted that there will be fewer periods of rainfall, but when it will rain, it will be in more intense downpours. The subsequent increase in severity of storms and intensity of rainfall may put extra strain on an already declining species. As a result, I am interested in understanding how a small-bodied grassland songbird like the Grasshopper Sparrow may respond to and survive these increasingly severe storms.

During poor weather, birds can use several behavioral strategies to survive. One option is to seek refuge in dense foliage, hunker down, and wait it out. Another is to avoid unfavorable weather by dispersing from the affected area. But for nests, movement isn't an option.

Grasshopper Sparrows construct their nests on the ground using grasses and dead foliage to create a domed cup. These nests are well concealed, so to find them you need to have a good pair of hiking shoes, a lot of time and patience, and sometimes a rope. Searching for nests in what feels like an endless sea of grass is an acquired skill and one that I personally do not have much practice

*Female grasshopper sparrow on her nest. Photo by Sarah Winnicki-Smith*





*Left: Grasshopper sparrow being released after its body composition was estimated. Photo by Aja Wong. Right: The QMR used to measure body composition of live animals and is moved around the study area in a trailer. Here, Dr. Alice Boyle prepares a grasshopper sparrow for its scan. Photo by Koley Freeman.*

with, but I have had the pleasure of observing expert practitioners in action. A telltale sign that you are near a nest is that a female will flush, which is a startling event for both the bird and human involved. Her sudden takeoff can be triggered if you or the rope you're dragging gets close enough to her nest. From there, it is time to get on your hands and knees, gently moving around the vegetation until you find the opening to the nest the female flushed from.

Once found, the nests are checked regularly. We keep track of who the parents are by giving each a unique combination of colored bands on their legs, allowing us to subsequently identify who is who using binoculars. We also count how many eggs are in the nest, how many eggs hatch, and how many nestlings successfully fledge. However, the vast majority of nests don't have a happy ending. Roughly 60-70 percent fail each year, and the suspected causes of failure are numerous. Most are attributed to predation by snakes, mammals, and avian nest predators, but weather may also play a role. Because Grasshopper Sparrow nests are constructed on the ground, they are prone to flooding. Unfortunately, as soils dry and downpours become more intense the chances of nests filling with water increases, so future nests may be more prone to failure as a result of weather.

In addition to behavioral strategies, birds can also respond to poor weather by modulating their energy stores. Like humans, birds can break down fat and protein for energy. The majority of fat is located surrounding the organs and just under the skin, which in birds is thin and translucent, allowing for a good view of the yellowish fatty deposits. Fat is great for birds because it is relatively light and compact, perfect for flying. Alternatively, birds can get energy from musculature and organs by breaking down protein.

We can study the amounts of fat and protein birds have by measuring their body composition. First, we set up a net strung between two poles called a mist net. Then

with a bit of patience and luck we catch the bird, immediately remove it from the net, and begin to process it. Each bird caught gets a government issued metal band that goes on its leg with its own unique number so the bird can be identified if caught again. We also measure the mass and various parts of its body like the length of its wing to get an idea of its size and condition. Finally, the bird is placed in a small tube and placed in a quantitative magnetic resonance (QMR) machine that estimates body composition. The machine measures the bird's fat and lean mass, which includes the protein rich organs. The entire process is quick and within minutes, the bird is released back onto its territory.

We learn a lot from catching Grasshopper Sparrows. We can gain information about how old they are or whether they are carrying ectoparasites. But the QMR allows us to take a look at what is happening internally. By investigating the body composition of Grasshopper Sparrows, we know that they rely heavily on their fat stores rather than sources of protein to survive storms. The good thing is that birds are capable of rebuilding their fat stores quickly so as long as they have enough fat to survive a storm; they can start foraging once the rain stops to replenish their energy stores.

While storms can impact reproduction and survival, the role they play in driving population trends is still being investigated. Logically, if severe weather leads to higher rates of nest failure and a lower chance of survival, then populations should decline, but how much influence storms have on the population and whether there are other factors to consider is what we are focusing on next.

I hope that people learn from the plight of the Grasshopper Sparrow as they are emblematic of the challenges faced by inhabitants of the disappearing grasslands of North America. Grasshopper Sparrows represent only one example of how the changing landscape and climate can have dramatic consequences on species persistence. Research initiatives, such as Dr. Boyle's grassland bird project, are integral to understanding the natural world in which we live and also provide knowledge that can be used to shape conservation efforts, land management decisions, and policies.

Grasslands are in peril and are continually lost to woody encroachment and conversion to agricultural land, which does not bode well for the Grasshopper Sparrow. On Konza, Grasshopper Sparrows are found in highest abundance in areas that are burned every other spring and have little to no woody vegetation. Without suitable habitat, the sparrows may be forced to breed in less productive areas and have fewer areas to disperse to when avoiding storms. It is therefore essential to manage and preserve the grasslands effectively if we want the Grasshopper Sparrow to have a fighting chance against increasing climatic pressure.