# Climate Change and the Flint Hills

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**Transect 2021 112 KPBS+2C (welkin)**
Erin Wiersma
*Created on the prairie by dragging, pushing, rubbing, lifting paper after a burn.*



# CLIMATE CHANGE AND THE FLINT HILLS

The word "dynamic" means something is changing. Weather is probably the most dynamic part of our lives as it changes constantly.

Sometimes that change is not obvious for several days, but dramatic weather transitions can occasionally be observed over just a few minutes. Either way, almost all changes in weather are transient, which is to say that they are not permanent and do not cause lasting effects.

Exceptions tend to be extreme. Floods can relocate dirt, boulders, roadways and mountains of human-created debris. Heat and drought can result in wildfires that decimate forests and neighborhoods. Tornadoes and severe thunderstorms can violently destroy infrastructure, rip up crops and trees, and leave paths in the landscape that can be seen for years. Of course, these extreme events have the power to claim lives, too, which is likely to cause the longest effects on a community.

When the scale of time and space is switched from weather to climate, we are forced to change our perspective. We can estimate the climate over the past few thousand years, and we know that a lone glacier reached the extreme northeastern portion of the Flint Hills about 400,000 years ago. However, it is the changes over human generations that are likely much more important. Adding humans as a variable complicates all of the processes and raises the stakes on any outcomes, so predictions are exceptionally difficult for local areas. To make it even more challenging, the Flint Hills are on the border of the hot, humid Southeast and the semi-arid Great Plains that see hot summers and cold winters. For at least the past century, the climate

of the Flint Hills has resembled the Southeast during the warm season and the Great Plains during the cool season, which means dry winters that limit the formation of forests except along streams.

Despite these challenges, climatic changes have been detected. Generally, the most obvious effects are that the coldest times (winter, nighttime) and locations (high altitudes, high latitudes) are warming the fastest. This is not true everywhere because multiple processes can create opposing outcomes. Nevertheless, the physics is rather simple: Warming reduces snow cover, which means that less sunlight is reflected during the day. The Flint Hills have seen a reduction in days with snow, and they have seen rather significant (50% or more) decreases in average snow depth over the last century, but winter temperatures have been surprisingly steady. The primary temperature change in the region has been the warming of summer nights, which is largely a result of increased humidity. Humid air requires more energy to warm and cool compared to dry air; therefore, humid days result in slower temperature changes. Characteristically pleasant summer evenings (when the heat of the day drops away quickly after sunset) are replaced by sticky air that retains its heat all the way through the night.

Consistent with the increased humidity, the Flint Hills are seeing more rain in every season except fall. If we dig deeper into the data, we realize that snowy days and snow accumulation have declined because warming has replaced some snowstorms with rainfall. Our rainy season is now stretched further across the calendar, yet we are seeing about the same number of rainy days and an increase in total rainfall. This means there are larger gaps between rain events, and rainfall is, on average, more intense than it used to be. This is consistent with other locations around the country, and it is why many projections suggest more floods as well as more drought. Increased humidity allows the storms that form to be more efficient rain producers, but soil cannot absorb all of the water from heavy downpours. Further, a longer growing season means plants will require more soil moisture earlier in the season, so the ground will tend to dry out sooner each year.

The landscape of the Flint Hills often seems unchanging compared to some others that are threatened (e.g., rainforests, coastlines, wetlands). Weather extremes tend to leave very visible remnants on other landscapes, but the Flint Hills show little, if any, damage even after hailstorms, flash floods, tornadoes or fire. Tallgrass prairie is surprisingly resilient, even to drought, as long as grazing is minimized. Despite its stable



**Hot August Sky Over Open Range**
**West of Matfield Green, Late Evening — 7 August 2021**
Philip Heying

appearance, grassland survival and health require dynamic disturbances such as fire, grazing and storms, and a greater mixture of those processes across the landscape leads to increased health and stability. Diversity builds protection from any single vulnerability that might allow widespread, catastrophic damage.

While weather extremes and other disturbances improve the health of the Flint Hills ecosystem, the complex, slow process of climate change is projected to cause a variety of disruptions to our landscapes and lives. As temperature and precipitation patterns in Kansas continue to change, we will likely spend more resources to sustain our iconic ecosystems and combat invasive species. Drought- and cold-tolerant species are likely to out-compete native species as the soils dry and winters warm. One such species of grass is Old World bluestem, which is presently spreading through the Great Plains and threatening native grasses. As increasingly warmer winters convert the climate to something similar to that of the Southeast, forestation will also become more likely. The shallow, rocky soil in many parts of the Flint Hills will continue to prevent extensive tree growth,

but some areas will require annual maintenance that is beyond the current model of burning every few years.

Even if we have the will and ability to manage our landscape for long-term preservation, there is no guarantee that it will continue to be hospitable for the native wildlife. Many species require some combination of landscape, climate and protection from human activities to thrive. Even if we can maintain the landscape and limit the exposure to humans, the changing climate may be too much to overcome. Around the world, biologists are detecting signs of climate change in the migration of animal habitats. Whether it is fish, birds, mammals or insects, we are generally seeing a shift toward the poles and/or higher elevations as the climate warms. Unfortunately, any species that drift northward from eastern Kansas will quickly find themselves in landscapes significantly different from the Flint Hills, which may not allow them to survive.

Ultimately, the Flint Hills are relatively tolerant of climatic shifts. The dramatic reduction in tallgrass prairie around the world has been driven almost exclusively by human destruction of those lands. So, a future with more floods, more drought and hotter summers is likely to include a version of the Flint Hills that is still very recognizable. The features that are less likely to survive include vulnerable wildlife (such as the greater prairie chicken) and some of the cultural and economic practices such as ranching, which may not be economical if drought results in less nourishing grass and less surface water for livestock. Wildlife may leave the area in search of a more hospitable climate, but they might also adapt. It may be possible to preserve some species of wildlife by further restricting human activities such as oil and gas extraction, hunting, and hiking in some areas, but those are cultural and economic restrictions that will be challenging to implement.

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**Winter Cornfield**
Ian Huebert