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Footprints on the Prairie: Examining the Interlocking Land Histories of the Liberty Prairie Reserve, Illinois

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Preface

I am enamored by prairies. Before I moved to northeastern Illinois at the age of 13, I had limited interaction with prairie landscapes (beyond gesturing into the grasslands of eastern Washington at the age of 3 and proclaiming, “there are buffalo out there!”). Living in an area that was once a sweeping field of grasses and flowers, broken up by the occasional stand of oak with a sky so expansive that it cradles the earth, I remain enchanted by a romantic ideal I can no longer see or touch or smell. What remains of what was once North America’s most expansive landscape is scattered across the center of the continent in bits and pieces. These prairie remnants have been sheltered from the destructive path of history, either by human protectors or geographical coincidence. For me, the prairie fragments are a reminder of the abundance that can be fostered in this land; they are a guide forward from devastation.

When I enter the prairie fragment just a few miles from my house, the first thing I notice is the calling birds. Light trills and enthusiastic tonal pitches fill the air as dawn turns into day. The rising sun casts a stark relief on the undulation of the land, emphasizing with broad strokes the interaction between topography and flora. The hilltops are populated by the short grasses and forbs that characterize this land; the slopes are braced by looming brushstrokes of whites and yellows, purples and blues. In the lowlands between, tall wetland reeds signal where water accumulates. A red-winged blackbird rests on these sturdy marsh plants, turning his head to gently search for something I cannot hope to identify.

This landscape is far from the sweeping plains of two hundred years ago. The roar of a road is audible underneath the layers of birdsong, and single-family homes blink through the trees. Here, the residential and agricultural are in constant play with an ecosystem that would be foolish to characterize as anything other than human-shaped. I cannot claim to have purged

myself of the colonial delusion of pristine grandeur and find myself searching my imagination for the days when this fluid landscape was dominant across the upper Midwest, rather than existing only in an isolated periphery. I can only just imagine the rolling slopes of glacial till prairie continuing behind the next rise.

The landscape before me is a song of resilience. Facilitated by an internal capacity for renewal and deep care from the hands that have planted the saplings and sowed the seeds, the ecosystem continues its process of rebirth. I watch a multitude of birds swoop and dive over a land of which no single entity can claim to be architect. In conservation stories, there is no Greek hero – only a tapestry of individuals who daily construct this environment by the fortune of living their lives within it. In my field of vision, an ant crawls; bees and butterflies flit from bloom to bloom. The flowers open themselves toward the sun, and the grasses sway languorously in the wind. I am excited to dig into that which I cannot see, the soil and the life within it – an opportunity for humility which I am grateful to accept.

Acknowledgements

This thesis is the product of a community that has supported me both throughout my life and during my past four years at Scripps College. First, I want to thank my parents, Tamara and Patrick, and Donovan, for their unconditional love and support (and for letting me use their kitchen oven to dry dirt). I want to thank my friends for enthusiastically listening to my research and supporting me with study sessions and words of encouragement. Thank you to the environmental analysis class of 2022 at Pomona College, for providing a community to discuss ideas and write together. Thank you to all the people who have offered me advice throughout this process: the Libertyville-Mundelein Historical Society, the Libertyville Commission of Open Space, and the biology department at the College of Lake County, among many others. Thank you to the Scripps College EA Award and Pomona College EA Department for providing funding for this project. Finally, a HUGE thank you to my advisors and readers – Dr. Char Miller, Dr. Marc Los Huertos, Dr. Charlotte Chang, Dr. Colin Robins, and Dr. Kevin Vennemann – for all the time and effort they put into helping me pursue this ambitious goal. Thank you for your faith in me and willingness to advocate for this project; the countless emails, meetings (first over Zoom, and then in person), advice, and enthusiasm. I could not have done this without any of you – THANK YOU!

Introduction

This thesis is truly the culmination of my undergraduate experience at Scripps College and my journey through my major in the Pomona College Environmental Analysis Department. I took EA 10: Introduction to Environmental Analysis in the Spring of 2020, and my final for the course was a paper titled "The Role of the Prairie Ecosystem in the Mississippi River Valley." This paper was my first step in reckoning the ecology and history of Midwestern prairies through the lens of an environmental analysis student. That semester, we left school because of the COVID-19 pandemic. Finishing the spring semester of my sophomore year at home in Illinois encouraged me to consider the landscapes of the Midwest in this final paper, just as it would later encourage me to think about prairie ecology when I was first conceptualizing my thesis in early 2021.

In my original plan for my thesis, I set out to study how effective current prairie restoration strategies are at restoring soil microbial communities. As I began to explore this question, I found myself unable to turn away from questions that seemed fundamental to this study, but were beyond the scope of a scientific paper: what were the stories of the people who had lived on this land? How have the broader historical processes that shaped the Midwest impacted the land I hope to study? What does prairie restoration look like within these contexts? These questions were the driving force behind this thesis, "Footprints on the Prairie: Examining the Interlocking Land Histories of the Liberty Prairie Reserve, Illinois."

I was still determined to examine the microbial communities that had originally inspired my thesis. I remained curious about how effective the strips and patches of prairie that I observed on my weekly runs on the trails near my house were at restoring ecosystem functions beyond aesthetics. Were the microbial communities that are fundamental to soil-based ecosystem

functions effectively restored? And how do those microbial communities change along the borders between the prairie patches and the cornfields they are typically surrounded by? The result of these inquiries is in the second part of my thesis, published separately under the title "Examining Soil Microbial Diversity in Transition Zones Between Corn Fields and Restored Prairie in the Upper Midwest."

Left: A frigid day walking through the a protected area of the Liberty Prairie Reserve in January of 2022, with temperatures of -5°F. Photo by Anna Burns.

Right: Prairie vegetation before a corn field in July of 2022, with power lines running from the ComEd Power Plant to residential areas of the Reserve. Photo by Anna Burns.

Although these theses are published separately, they both emerge from my desire to understand how my corner of Lake County, Illinois functions – historically, ecologically, and microbially. The theses draw on and complement each other and they reflect my fundamental drive to understand the community I have called home for nearly ten years.

This thesis begins with the local history of the Liberty Prairie, the land where I conducted the ecological field-work that I later discuss in my second thesis on soil microbial diversity. I examine the Indigenous histories of the land, and the conflicts between the Bodwéwadmi and Euro-American settlers that resulted in the land being farmed for cattle, corn, and soy for over a hundred and fifty years. I then take a step back and analyze the broader historical contexts of

Midwestern agriculture, from foundational policies to sustainability narratives. From there, I explore the landscapes that agriculture replaced, detailing the ecology of the once-ubiquitous prairie landscape. Finally, I discuss the history and politics of prairie restoration, which ties this thesis to my later scientific examinations of prairie microbial life.

My thesis is a meditation on the prairies, a landscape that has captured my imagination since I moved to Illinois in 2013, but continually evaded my understanding. I would catch glimpses of prairie life on my walks home from school or running on local trails, but could not construct the sweeping prairie landscapes of the past from these small discrete fragments. Through this thesis, I hope to construct a local memory of the histories that created northeastern Illinois as I know it today.

Chapter One

Songs of resilience: Local histories of the Liberty Prairie

Figure 1.1. Liberty Prairie with blue sky and chicory flowers. Photo by Anna Burns.

In the beginning, there was ice, water and wind.[1] Glaciers retreated northward into the Arctic with awesome power, carrying exposed soils away with them as they crawled across the land. As the Illinoian and Wisconsinan glaciers pulled from the land, they also gave, depositing rocks and sediments across their path as reminders of where they had been. The wind followed, shifting and weathering and wearing through the abundance of the glacial void. With that wind came rain, pooling across a landscape that did not deign to differentiate between water, soil and sky. The glaciers had left the gifts of space and sediments, a rich milieu that formed fertile ground for the establishment of plants. This is the soil that begat the prairie, ten thousand years ago.[2]

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[1] Calsyn, D. (2005). *Soil survey of Lake County, Illinois* (2nd ed.). United States Department of Agriculture and Natural Resources Conservation Service, 2-3.

[2] Prairie Research Institute. (n.d.). *Glaciers smooth the surface*. Illinois State Geological Survey.

With the warmer Holocene climates that caused the retreat of the glaciers came the 'second coming of the grassland.'[3] The spruce forests of North America turned to pine, then to mixed woodlands, and finally to grass as the climate favored vegetation that was better-adapted to warmer weather. However, the temporality of climate variation meant that cooler, moister climates returned, encouraging the growth of forests where grasslands had been. But this moist climate also encouraged greater vegetation growth, which opened the path for the great mediator of the prairies – fire, either started by lightning or people. Thus, the prairies and forests of North America developed a cyclical relationship of forest growth, fire, and grassland renewal that formed the landscapes of the Midwest.

Paleoclimatic evidence for prairie pedogenesis[4]

The genesis story with which I open this foundational chapter is informed by paleoclimatic modeling, a field that attempts to reconstruct historic climates through archaeological dating[5], computational methods,[6] and paleo-ecological remnants such as fossilized pollen and plants.[7] This modeling supports the Lake County soil survey's records of local soil formation (e.g. pedogenic) processes, indicating the relationship between Holocene climactic trends and the formation of prairie soils in Northern Illinois.

The Last Glacial Maximum of the Pleistocene era occurred approximately 25 to18 kya,[8] after which a nine thousand year warming period led to the retreat of glaciers across Europe and North America.[9] The subsequent Holocene period (beginning circa 10,000 BCE) is characterized by

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[3] Courtwright, J. (2011). *Prairie fire: A Great Plains history*. University of Kansas Press, 21.
[4] Pedogenesis is the process of soil formation.
[5] Roberts, N. (2014). *The Holocene: An environmental history.* John Wiley & Sons, Inc. 10-28.
[6] Mayewski, P. A., et al. (2004). Holocene climate variability. *Quaternary Research*, *62*(3), 243–255.
[7] Baker, R. G., et al. (1992). Patterns of Holocene Environmental Change in the Midwestern United States. *Quaternary Research*, *37*(3), 379–389.
[8] 1 kya indicates one thousand years before present.
[9] Roberts, N. (2014). *The Holocene*, 92.

extreme and frequent climate variations potentially caused by orbital and solar variability; other potential contributors are atmospheric ash and greenhouse gas presence.[10] Importantly, this recent evidence undermines the common misconception that a steady climate was an enabling factor for the onset of widespread human settlement in the Holocene period. While there is evidence for more extreme fluctuations in the Pleistocene, Holocene modeling and records still display significant climate variability.

The Soil Survey of Lake County, IL indicates six major sources for pedogenic parent material in the region: till, outwash, lacustrine and organic deposits, alluvium and loess.[11] The first three materials were formed during the glacial retreat of the late Pleistocene era: till (ice-deposited sediment), outwash (water-deposited sediment in front of melting ice sheets), and lacustrine deposits (from glacial lakes) were extant as the Illinoian and Wisconsinan Glaciers retreated. The latter three pedogenic parent materials were the result of Holocene climate processes, which are reflected by paleo-climate models of the Midwest.

In the period immediately after glacial retreat, standing water proliferated the Lake County region. This water created an anoxic environment where dead plant materials could not decay and instead accumulated, leaving behind a nutrient-rich sapric layer (partially decomposed organic matter).[12] Alluvium was deposited by flowing water along rivers and streams.

The last of the Holocene-era parent materials is loess, a wind-deposited sediment (typically silt). P.A. Mayewski et al. modeled wind as a proxy for climate during fluctuation periods in the Holocene.[13] They joined the GISP2 (Greenland Ice Sheets Project 2) chemistry series with periods of rapid climate change (RCCs) developed by Denton and Karlèn in 1973

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[10] Mayewski, P. A., et al. (2004). Holocene climate variability. *Quaternary Research*, *62*(3), 251.
[11] Calsyn, D. (2005). *Soil survey of Lake County, Illinois* (2nd ed.). United States Department of Agriculture and Natural Resources Conservation Service, 11-12.
[12] Calsyn, D. (2005). *Soil survey of Lake County, Illinois* (2nd ed.), 12.
[13] Mayewski, P. A., et al. (2004). Holocene climate variability, 243-255.

(which remains the golden standard for Holocene paleo-climatic modeling).[14] They found that Midwestern North America was a site of increasing wind strength for RCCs from 9 to 3.8 kya.[15] After this period between 3.5 to 2.5 kya, the GISP2 model suggests that the region became (and remained) less windy. These periods of increased wind supports the strong presence of loess materials in prairie soils, depositing nutrients from non-glaciated regions that supported plant life in the Holocene period.

After the aquic environment of the immediately-post glacial period, paleo-climatic modeling indicates that the northern Midwest underwent a significant drying period. A study by Winkler, Swain and Kutzbach[16] radiocarbon-dated pollen cores from six lake beds in southern-central Wisconsin (approximately 100 miles from the Liberty Prairie Reserve) to deduce the extent of shorelines through the Holocene as a proxy for precipitation volume.[17] Lake-bed circumference time series indicated that there was on average a nineteen percent decrease in precipitation during the mid-Holocene from 6.5 to 3.5 kya compared to the present.[18] This is a decrease of 140mm of precipitation annually, with current annual precipitation levels at 790 +/- 12.57 mm for the region. The study also suggests that average July temperatures in the region were at least 0.5°C warmer than the directly preceding and following periods.

The pollen core analysis of Baker et al. along the forest-prairie boundary of the northern Midwest provides further evidence for this dry and warm period.[19] Pollen cores collected from Southern-Central Wisconsin (and indicative of the broader Southern Wisconsin-Northern Illinois

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[14] Denton, G.H. & Karlèn, W. (1973). Holocene climatic variations: Their pattern and possible cause. *Quaternary Research, 3,* 155-205.

[15] Mayewski, P. A., et al. (2004). Holocene climate variability. *Quaternary Research*, *62*(3), 249.

[16] Notably, this study is nearly 40 years old; much of the available literature on Midwestern paleoecology is from the 1980s and 1990s. These studies remain the foundational texts of the field.

[17] Winkler, M. G., Swain, A. M., & Kutzbach, J. E. (1986). Middle Holocene dry period in the Northern Midwestern United States: Lake land pollen stratigraphy. *Quaternary Research*, *25*(2), 235–250.

[18] Winkler, M. G., et al. (1986). Middle Holocene Dry Period, 246.

[19] Baker, R. G., et al. (1992). Patterns of Holocene environmental change in the Midwestern United States. *Quaternary Research*, *37*(3), 379–389.

region) indicate that the area was predominately vegetated with mesic deciduous forests between 9.5 to 5.5 kya, with arboreal pollen abundant in the core samples.[20] However, in the following period between 5.5 to 3.4 kya, there was a sharp rise in non-arboreal pollen from characteristic prairie grasses. This rise in prairie grasses coincides with the period's warm and dry climate, which favored the proliferation of more heat- and drought-resistant plants and led to the establishment of prairies where before there had been forests.

Thus the formation of the prairie characteristic of Midwestern North America was mediated by glacial sediments, increased wind and temperature, and decreased precipitation during the Holocene era. These abiotic factors were crucial to the establishment of the prairies, but humans were pivotal to their cultivation and resilience.

Keepers of the Fire: Indigenous prairie cultivation

The earliest recorded human history in Northeastern Illinois began in the late Pleistocene twelve thousand years ago, when hunter-gatherer groups would pass through the region on their seasonal hunting routes.[21] The beginning of the Holocene marked a shift to the Archaic Period (10 to 3.5 kya), when the warmer climate provided enough resources for sedentary groups to establish themselves in the region.[22] Population growth continued in villages through this period, and by the Woodland Period (3500 to 1000 years ago) plant cultivation in what is today called Lake County was abundant.[23] Cultural practices held by the Bodwéwadmi and other tribes began during this era, such as square homes built from bent saplings and covered with woven reed mats.

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[20] Baker, R. G., et al. (1992). Patterns of Holocene environmental change in the Midwestern United States. *Quaternary Research*, *37*(3), 386.
[21] Dunn Museum. (2022). Humans of the Ice Age [Museum label]. Libertyville, IL.
[22] Dunn Museum. (2022). A changing landscape [Museum label]. Libertyville, IL.
[23] Dunn Museum. (2022). Local resources; Trade; Society [Museum label]. Libertyville, IL.

By the Mississippian Period (1000 to 1600 CE) two separate cultural entities had formed in the northern Illinois region.[24] Each had a distinct location, pottery type and housing structure which differentiated them from the other; archaeologists refer to these groups as the Oneota and Langford peoples. What they called themselves has not been recorded by colonial knowledge systems. The cultural and political organization of Indigenous groups during the so-called Protohistoric Period (1600 to 1673 CE) between the Oneota and Langford peoples and those encountered by colonists is also left unrecorded in – or erased from – colonial memory.[25]

At this point in discussing the Indigenous histories of Northeastern Illinois, I want to be transparent about my sources and the power structures they both come from and enable. Information about the First Peoples prior to European colonization is largely available to me through colonial institutions, including museums and universities. The information in the preceding paragraphs comes from the Dunn Museum, which is managed by the Lake County Forest Preserve. The museum states on their website that their exhibit on the First Peoples was created "with guidance from local Native American tribe members on authenticity."[26] Even with this care taken in constructing the exhibit, the very nature of archaeological understanding of the First Peoples upholds settler colonialism in violent ways. For example, what the museum refers to as the Protohistoric Period upholds the idea that history began with European arrival. This reflects a settler-colonial narrative of history while simultaneously attempting to tell the histories of other civilizations, a stark disparity between impact and goal.

In the following section of this Indigenous land history, I have taken care to primarily reference sources curated by Indigenous groups and tribal entities that have been made publicly available on the internet. For many reasons, including oral traditions and protection of cultural

[24] Dunn Museum. (2022). Local resources; Trade; Society [Museum label]. Libertyville, IL.
[25] Dunn Museum. (2022). Native peoples before European contact [Museum label]. Libertyville, IL.
[26] Dunn Museum. (n.d.). *Exhibitions.* Lake County Forest Preserve.

knowledge, much information about Indigenous cultural groups is not available to settlers; this is the right of Indigenous peoples, and I respect the boundaries they put forth as a researcher at a college and settler on their lands. With this context in mind, and gratitude for the information that the Potawatomi Prairie Band and Forest County Potawatomi have shared, I attempt to use the next pages to record a history of the Indigenous peoples of this land.

Nine thousand years after the glaciers retreated north to the Arctic, the Neshnabek (Original People) began moving from their homes on the great salt water (Atlantic Ocean) to the western Great Lakes.[27] While there, the Neshnabek hunted and gathered, gaining sustenance primarily from wild game, rice, acorns, and fish.[28] In the sixteenth century, the Neshnabek separated into the Three Brothers: Ojibwe (Keepers of the Faith), Odawa (Ottawa, Keepers of the Trade), and Bodwéwadmi (Potawatomi, Keepers of the Fire). Conflict with the neighboring Iroquois Confederacy, who were armed with European colonizer-supplied firearms, forced the Bodwéwadmi to relocate to southern Wisconsin and northern Illinois in the mid-17th century.[29] While there, the Bodwéwadmi lived in fluid clans that congregated during hunting season, and separated into smaller sedentary villages during the winter.[30] Although the Bodwéwadmi did not recognize static political groups, today there are seven politically designated Potawatomi tribes recognized by the governments of the United States and Canada. Of these, my narrative focuses on the Prairie Band Potawatomi, whose homelands are in southern Wisconsin and northern Illinois; these lands include the Liberty Prairie Reserve where my field-work was conducted.

Once the Bodwéwadmi moved to the western shore of Lake Michigan, they maintained their cultural traditions of hunting and gathering while also utilizing the fertile soils of the region

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[27] *Timeline of Potawatomi history.* (n.d.). Forest County Potawatomi.
[28] Sultzman, L. (1998). *Potawatomi History.*
[29] *Historical timeline*. (n.d.). Prairie Band Potawatomi Nation.
[30] Sultzman, L. (1998). *Potawatomi History.*

for agriculture.[31] They lived in summer villages of rectangular bark-covered houses, gathering for a fall bison hunt before separating into smaller winter villages of domed wigwams. The Bodwéwadmi adapted to their new home by exchanging knowledge with the neighboring Sauk, Fox, Kickapoo, and Winnebago tribes to begin cultivating fields of corn, beans, and squash, as well as medicinal herb gardens. It is likely that during this time, there was also cultural exchange concerning prairie-burning practices that were common among the Indigenous peoples of the grasslands. They burned the prairie – to enhance hunting, to improve pasture, burn off brush, collect insects, clear land to increase yields of agriculture, and sometimes by accident.[32] In doing so, they kept the oak forests at bay, and were fundamental to the renewal of the Midwestern grasslands. This burning was a spiritual, reciprocal responsibility in the grassland people's roles as caregivers of the land.[33] They burned to modify the environment not only for their survival but also for the benefit of nonhuman beings.

A series of 43 treaties between the Bodwéwadmi and various governmental entities began in 1789, and resulted in the gradual removal of their lands.[34] The largest of these was the 1833 Treaty of Chicago, which forcibly removed the Potawatomi, Chippewa and Ottawa tribes from their lands along Lake Michigan. This treaty was the result of violence during the Blackhawk War, which is named for Ma-ka-tai-me-she-kia-kiak [Black Hawk] who led his asakiwaki [Sauk or Sac] tribe in war against the United States after they were forced to sign a treaty and cede their lands under coercive conditions.[35] In his autobiography, he dictates that

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[31] Sultzman, L. (1998). *Potawatomi History*.
[32] Stewart, O. C. (2022). *Forgotten fires: Native Americans and the transient wilderness.* University of Oklahoma Press, 114.
[33] Wall Kimmerer, R., & Kanawha Lake, F. (2001). The role of Indigenous burning in land management. *Journal of Forestry*, 38.
[34] *Timeline of Potawatomi history.* (n.d.). Forest County Potawatomi.
[35] LaPier, R. R. & Beck, D. R. M. (2015). *City Indian: Native American activism in Chicago, 1893-1934.* University of Nebraska Press, 4.

> here for the first time, I touched the goose quill to the treaty, not knowing, however, that, by the act I consented to give away my village. Had that been explained to me I should have opposed it and never would have signed their treaty, as my recent conduct will clearly prove. What do we know of the manners, the laws, and the customs of the white people? They might buy our bodies for dissection, and we would touch the goose quill to confirm it and not know what we were doing.[36]

The United States Military entered on-going intra-Indigenous conflicts, with the Sioux continuing previous wars and fighting against the Sac. The war ended with a massacre of Sac women and children by the Sioux warriors on behalf of the United States government; Black Hawk estimates in his autobiography that at least sixty Sac women and children were killed, along with sixteen Sioux warriors.[37] The largest loss of Indigenous lands in the Chicago area took place in the near aftermath of this violence, which was leveraged against tribal leaders in negotiations.

Within the Treaty of Chicago, the boundaries of the expropriated lands could only be defined by their proximity to natural features and Indigenous homelands: "along the western shore of Lake Michigan, and between this Lake and the land ceded to the United States by the Winnebago nation… bounded on the north by the country lately ceded by the Menominees, and on the south by the country ceded at the Prairie du Chien."[38] The government could not conceive the land beyond narratives of removal; not by what was, but by what had been taken away. In total, twenty-eight million acres of Bodwéwadmi land was taken by the United States under the guise of westward expansion.[39]

Nineteenth-century colonizers were fully aware of the extent to which Indigenous fire practices maintained the prairie. In one of many such primary sources included in *Forgotten*

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[36] Black Hawk. (1882). *Autobiography of Ma-ka-tai-me-she-kia-kiak, or Black Hawk* (J.B. Patterson, Ed.), 54.
[37] Black Hawk. (1882). *Autobiography of Ma-ka-tai-me-she-kia-kiak, or Black Hawk,* 110.
[38] *September 23, 1833 – Treaty of Chiago.* (n.d.). Forest County Potawatomi.
[39] *Historical timeline*. (n.d.). Prairie Band Potawatomi Nation.

Fires, Chester Loomis wrote in 1835: "The heat and fury of the flames driven by a westerly wind far into the timbered land… destroying the undergrowth of timber, and every year increasing the extent of prairie in that direction, has no doubt, for many centuries added to the quantity of open land found throughout this part of America."[40] In spite of this knowledge, after the removal of the Bodwéwadmi and other Great Plains Indigenous tribes from Illinois, burning of the prairie ceased. This elimination of fire management can be understood within the framework of colonial ecological violence, an attempt at culture erasure of Indigenous peoples by punitively breaking cycles of ecological knowledge.[41]

As populations of European colonizers ballooned across the Midwest, fire became a threat rather than a tool or means of survival.[42] With colonization came industrial agriculture and sedentary towns, which were not compatible with a fire landscape. The delicate cycles of fire and renewal that maintained the Great Plains were disrupted, and the prairie began to fade into patchworks of field and forest. As a result, the heavily prairied region of southern Wisconsin and northeastern Illinois became largely forested.[43]

The Prairie Band Potawatomi of northern Illinois and southern Wisconsin were forced to move to a reservation in Platte County, Missouri before the region was annexed by the state.[44] The pain of separation persists in a land that remains contested, and its legacy is remembered by the Bodwéwadmi survivors of the United States' policy of Indigenous genocide. Beginning in 1838, the Citizen Potawatomi peoples were marched at gunpoint across their lands in Indiana, Illinois, Missouri and Kansas.[45] Today, this forced march is remembered as the Potawatomi Trail

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[40] Loomis, C. (1825). *Notes of journey to the Great West in 1825.* Pamphlet. Cited by Stewart, 118.
[41] Bacon, J. M. (2019). Settler colonialism as eco-social structure and the production of colonial ecological violence. *Environmental Sociology*, *5*(1), 63.
[42] Courtwright, J. (2011). *Prairie fire: A Great Plains history*. University of Kansas Press, 25.
[43] Axelrod, D. I. (1985). Rise of the grassland biome, central North America. *The Botanical Review*, *51*(2), 191.
[44] *Historical timeline*. (n.d.). Prairie Band Potawatomi Nation.
[45] Willard, S. (2013). *Trail of death caravan to travel Sept. 23-28.* Citizen Potawatomi Nation.

of Death.[46] Of the eight hundred and fifty-nine people who were forced from their homes, forty-one perished and were buried in unmarked graves along the Trail. This tragedy is remembered every year through the Trail of Death Commemorative Caravan, which follows the original 1838 path for 660 miles from Indiana to Kansas.

After a violent thirty-year process of removal to Iowa and various regions of Kansas, The Prairie Band of Potawatomi was formally recognized in 1867. They were relegated 576,000 acres in Jackson County, Kansas; today, 35,447 acres of this original allotment remains due to government policies that continually reduce Reservations.[47] As of 2020, there are approximately twenty-eight thousand registered Potawatomi tribe members, with four thousand people registered under the Prairie Band Potawatomi.[48] In 1994, all seven Potawatomi bands met for the First Potawatomi Gathering, where members of the nation annually exchange their cultures and histories.[49] Language revitalization is a current priority of the Prairie Band, which has fewer than ten fluent speakers.[50] In response to this need, the Tribe's Language and Culture Department developed a plan to revitalize the language and began offering classes in 2007.

For the current beneficiaries of the Potawatomi peoples' removal from the lands around Lake Michigan, it is easy to contextualize Indigeneity within the past. Settler societies in the United States are constructed to erase their history, because to remember would be to challenge the very roots of our existence in these landscapes of Indigenous erasure. However, to turn away from our history would be to further jeopardize our humanity. These painful questions are our

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[47] *A look at our land: Prairie Band Potawatomi Tribal Land Office.* (n.d.). Prairie Band Potawatomi Nation.
[48] Sultzman, L. (1998). *Potawatomi History.*
[49] *Historical timeline*. (n.d.). Prairie Band Potawatomi Nation.
[50] Rupnick, J. (n.d.). *Prairie Band of Potawatomi Nation.* Southern Plains Tribal Health Board.

birth right, and this story is not yet concluded. The survivors of the Treaty of Chicago remain, keeping the flame of their culture alive even as they are separated from their lands.

Local histories: Parceling and commodifying the prairie landscape

Shortly after the removal of the grasslands Indigenous peoples, Euro-American colonists began a process of parceling northeastern Illinois into farmland and villages, which constitute the form of this land into the current day. Shortly after the Treaty of Chicago was signed, the first settler of what would become Libertyville traveled to the area. George Vardin built a cabin in 1835, in what is today the center of town (near Cook Memorial Public Library).[51] Although Vardin would leave within the year, the region was called Vardin's Grove until it was incorporated first as Independence Grove in 1836, and then finally as Libertyville in 1837 after the establishment of the post office.

The land that now comprises the Liberty Prairie Reserve was first settled in 1863 by Julius Bull, who built a farmhouse and barn on two hundred and twenty acres west of Milwaukee Avenue.[52] These buildings are still standing. Bull only resided on the land for a short period before the Casey family purchased the property they would own for nearly the next hundred and thirty years. Edward Stearns Eckerson (E.S.E.) Casey and his wife Deborah Peterson moved to what would henceforth be known as Casey Farm in 1865, following Peterson's parents from New York to northeastern Illinois. They brought with them five children: Morton Peterson, Louise Hannah, Chauncey Israel, Henry Edward, and Adkins Melanchthon. When they moved to the region, Libertyville had a population of two hundred. The Casey family raised dairy cows and feed, operations that were aided by increased storage capacities when the upright silo was

[51] Murrow, J. (2018). *The settlers that followed: Colonial encounters, Native American expulsions, and the founding of Libertyville, 1634-1836 C.E.* Cook Memorial Public Library.
[52] Lane, A., & Phillips, M. (2018). *A history of the Casey family farm*. Libertyville-Mundelein Historical Society 1.

invented in the 1870s, and when the Chicago market opened with the addition of a Libertyville train line in 1880. E.S.E. Casey died of a heart attack in 1897, leaving the farm to his sons Chauncey Israel and Adkins Melanchthon.

The Casey brothers continued farming together until sometime before 1930, when Chauncey Israel sold his portion of the land. Adkins Melanchthon continued farming with his three sons, none of whom were interested in continuing the family trade. His middle son, Adkins Burnell, led an illustrious career at the Northern Trust in Chicago but continued to help his parents on the farm.[53] He married Helen Morse of Michigan in 1944, and she also contributed to the management of the Casey family farm. Adkins Melanchthon died in 1956, and Adkins Burnell died in 1978, leaving Helen Morse Casey to manage the land her grandfather-in-law originally settled.

Helen Morse Casey managed the Casey family farm for the next thirty years. By this time, the farm's production had shifted to a profitable (and storable) corn and soybean rotation. Her obituary in the Daily Herald praises her as a "strong woman, known for her sharp mind"[54]. It also records that she could be found driving the family's antique tractor on the steep slopes of the Casey farm "well into her nineties." Casey decided to sell the land in 2007 at the age of ninety-five; however, the question of the Casey family farm's future was a highly contested political debacle.

Negotiations over the future of the Casey farm took place for years "over coffee and pie at the dining room table."[55] One of twelve centennial farms in Lake County, public interest was high in preserving the historic site. The Liberty Prairie Conservancy, Libertyville Township

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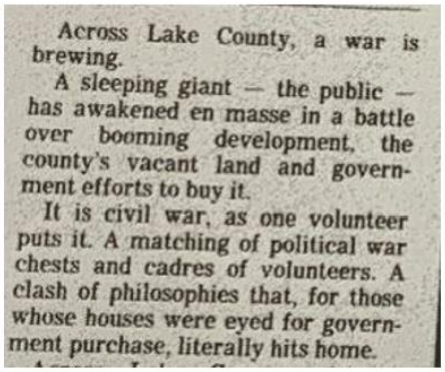
[53] Lane, A., & Phillips, M. (2018). *A history of the Casey family farm*. Libertyville-Mundelein Historical Society, 2.
[54] *Helen Morse Casey.* (2012, July 18). Daily Herald.
[55] Zawislak, M. (2007, November 7). *3-way deal saves Casey Farm.* Daily Herald, pp. 1, 10.

Photos (counterclockwise, from top left):
Figure 1.2. The Civil War-era Julius Bull barn still stands today.[56]
Figure 1.3. E.S.E. Casey.[57]
Figure 1.4. Deborah Peterson Casey.
Figure 1.5. Chauncey Israel Casey.

Open Space District and Lake County Forest Preserve District wished to use the land to create a prairie reserve, expand the Independence Grove Forest Preserve, and link systems of bike paths between Libertyville and Grayslake. However, Helen Morse Casey was vehemently opposed to the Lake County open space movement. This issue polarized the 1989 village elections into what local reporters referred to as a "Civil War," with Helen Casey proudly leading the "cadres of



Across Lake County, a war is brewing.

A sleeping giant — the public — has awakened en masse in a battle over booming development, the county's vacant land and government efforts to buy it.

It is civil war, as one volunteer puts it. A matching of political war chests and cadres of volunteers. A clash of philosophies that, for those whose houses were eyed for government purchase, literally hits home.

Figure 1.6. The opening paragraphs of Vander Weele's 1989 article.

volunteers" for whom the issue "literally hits home."[56] She was quoted in the article on behalf of the five hundred and eighty-nine citizens who signed her petition to prevent the forest preserve from purchasing her land: "without exception, the people who signed the petitions said, 'I believe in open space, but I don't believe in taking people's homes.'"

Here, the legacies of colonization rear their ugly head to harm those who had profited for generations; land that was once parceled away can always be purchased again. Ownership and property are enmeshed in a bloody net that can harm just as quickly as it can confer privilege. Eventually, she agreed to sell the remaining thirty-four acres of the Casey farm to the three public entities for three million USD on the condition that the homestead would remain. The land was purchased with substantial aid from two private donors (including the Dorothy and Gaylord Donnelly Estate). Fifteen acres went to the forest district, five acres to the open space district, and the remaining nineteen acres went to the Liberty Prairie.

The soil of the Liberty Prairie holds all these stories – the burning practices of the Bodwéwadmi people and their care of the land; their subsequent violent removal; the generations of settlement, cows and soy and corn; and most recently, a multi-faceted effort towards conservation. Prairie conservation is inherently a political act: legacies of genocide and ownership on a sprawling landscape that refuses to be contained by artificial boundaries means that preservation stories unfolding today are inextricably linked to a violent and greedy past.

[56] Vander Weele, M. (1989, March 19). *Election battle lines drawn over open-space candidates.* Daily Herald, pp. 1, 8.

These are the questions that Trevor Herriot found himself asking as he wrote *Towards A Prairie Atonement* – how to protect an ecosystem while weighing its legacies of pain:

> walk through a place isolated or damaged by the extractive impulses of our species, and, if you are quiet enough, attentive enough, you will be able to read its narrative of loss. The gift of any place, in soil and leaf and limb, remains remote until you expose your soft human belly to its brokenness. You may worry that, if you let down your guard and acknowledge what is missing, the sadness will overtake you. And it may for a spell, but if you stay your thoughts will soon enough turn to the survivors. A kind of intimacy settles in, dissolving the sorrow in gratitude for what remains and hope for what could yet be restored, reconciled.[57]

The prairie survives. So does its native peoples, from Lake County to Kansas, and its colonizers. It is our duty to be "quiet enough, attentive enough" to shoulder the burden of our history, to accept the immense privilege of stewarding the land for the countless species of birds, grasses, forbs, trees, mammals, and microbes that reside there. The North American prairies are a story of loss – but even more so, they are a song of resilience.

[57] Herriot, T. (2016). *Towards a Prairie Atonement.* University of Regina Press.

Chapter Two

A brief history of Illinois agriculture

> The Corn Belt is at once the most typical American region and the most productive. Its abundance – overabundance, even – somehow makes it more typical, a fulfillment of the true bounty of the American land… its very middleness has long caused pundits and scholars to seek within its bounds the typical in American life. The middle is the average, the average is typical of the whole, yet the average is also found to contain the very best the nation can offer. Where in America would one expect to find a typical family farm, with barns and cows and chickens and fields of golden grain? Where would one seek a typical community, with shops and schools and churches and clean, frame houses? Where would one expect to find that national values had achieved their highest expression, in the greatest good for the greatest number of people? The answer, in all cases, is obvious.
>
> – John C. Hudson in *Making the Corn Belt*.[58]

The Casey Farm is more than the story of a family on a piece of land – it is part of the larger story of agricultural development in Illinois and across the Midwest. The Midwestern farm has captivated the American imagination for generations. What Hudson identifies as the "typical family farm, with barns and cows and chickens and fields of golden grain" has gripped white, middle-class American society with a nostalgia of what the nation was, and an aspiration for what it could be again. Adam Calo defines a yeoman farmer mythology where "farming is an individualistic, heroic endeavor, typified by anachronistic white landowning farmers who overcome hardship through grit, perseverance, and marketing ingenuity."[59] This myth is entangled in the very roots of the United States as a country; Thomas Jefferson touted the self-sufficient yeoman farmer as the ideal participant in American democracy. The subtext of the myth is that a white land-owning gentry needs labor to actually do the work of agriculture – and for hundreds of years of American history this labor was done by enslaved and indentured peoples, including the enslaved peoples at Jefferson's own Monticello Plantation. It also required

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[58] Hudson, J. C. (1994). *Making the Corn Belt: A geographical history of middle-western agriculture*. Indiana University Press, 61.

[59] Calo, A. (2020). The Yeoman myth: A troubling foundation of the beginning farmer movement. *Gastronomica*, *20*(2), 14.

state-sponsored land grabs as well as federally-funded water and transportation infrastructure.[60] The Jeffersonian myth of the American yeoman farmer was successfully incorporated into laws including the Homestead Act (discussed in "Key developments in the history of U.S. agriculture") and shaped a national narrative of agriculture as a site of "individual triumph and sacrifice."[61] The idealized Midwest feeds into this fantasy, the ultimate manifestation of the independent American spirit: where anyone can provide for himself[62] and his family off the land. Here, the mythologized land has particular attributes: it must be empty, a blank canvas on which the farmer can tame the wilderness into submission, straightening the rows and planting the seeds for useful plants. It must be fertile, capable of producing bounty. And it must be heritable, so that the legacy of the farmer can be continued by his children, and for generations immemorial.

This myth is alluring, especially for those of us who are implicated in American histories of violence. It is easy for me to view my ancestors, and the ancestors of my communities, in this light – people doing the best they could to eke out a living on the land. The Casey Family heritage barn fits into this schema, providing tangible proof of a past where life was better, and everything was much less complicated. Of course, the truth is a great deal messier: the land owned by the first colonial farmers of the Midwest was not found, but stolen; it was not empty, but cleared. The fertile soils the sod-breakers stumbled upon were not coincidence, but the result of careful Indigenous management. The labor was not sourced from hardworking white men providing for their families, but by enslaved and indentured people. For those who implicitly uphold the United States' colonial project, it is expedient to obscure the history of the Corn Belt

[60] Calo, A. (2020). The Yeoman Myth: A Troubling Foundation of the Beginning Farmer Movement. *Gastronomica, 20*(2), 15.
[61] Calo, A. (2020). The Yeoman Myth, *Gastronomica*, 15.
[62] Here, I intentionally use masculine pronouns to reflect the yeoman farmer myth's focus on white, male landholders as discussed in Calo, 14.

in favor of the myth of the yeoman farmer. But to truly love the land and advocate for its restoration requires me to peel back the layers of deceit and follow the thread of history to understand the legacies that have imprinted themselves in the soil.

The foundations of the Corn Belt

At the basis of the Corn Belt economy of the Midwestern United States is soil. Eighteenth- and nineteenth-century agriculturalists drained the wet prairies of Illinois and Iowa, providing a rich soil that remains among the most productive in the Corn Belt after over a century of farming.[63] These drained wet prairies include the Liberty Prairie Preserve where the Casey family once farmed, and where I conducted my field-work. These lands required little management for them to produce bumper crops, because they had been so carefully managed by Indigenous groups, such as the Prairie Potawatomi Band, for generations.[64] Corn production in North America had a long tradition before the establishment of the Corn Belt during the 18th and 19th centuries; the oldest paleobotanic evidence of domesticated corn is in cave settlements from between 6,000 and 20,000 BCE.[65] The crop was a primary food source for many Indigenous peoples in North America, with many considering corn to be a sacred gift from the gods.[66]

By 1840, islands of agriculture west of the Appalachian Mountains began to expand; by 1850, the foundations of the modern Corn Belt were recognizable in the stretch between Ohio and Iowa.[67] While Lake County, Illinois is located along the northern boundary of Corn Belt depictions in the mid-nineteenth century[68], the timeline of the region's agricultural development

[63] Hudson, J. C. (1994). *Making the Corn Belt: A geographical history of middle-western agriculture*. Indiana University Press, 13.
[64] Hudson, J. C. (1994). *Making the Corn Belt*, 62.
[65] García-Lara, S., & Serna-Saldivar, S. O. (2019). Corn History and Culture. In *Corn* (pp. 1–18). Elsevier, 4.
[66] Dunbar-Ortiz, R. (2014). *An Indigenous Peoples' History of the United States*. Beacon Press.
[67] Hudson, 9.
[68] Hudson, 9.

closely mirrors that of the rest of the Corn Belt counties, and so is included in this historical trajectory.

During the 1840-1860 era, farms largely grew corn as food stuffs for beef cattle and hogs.[69] The Casey Farm, established shortly after this era in 1863, filled a similar role in raising corn with which to feed dairy cows. In 1860, corn emerged as a cash commodity in eastern Illinois, and for the first time corn was sold out of the cycle of the individual farm's closed-loop animal feed system. By 1880, the Corn Belt had expanded such that nearly any land capable of producing commodity corn was in production.[70] It was around this time that the phrase 'Corn Belt' joined the vernacular in popular literature, although it did not refer to the modern incarnation of upper Mississippi River Valley states until 1912.[71]

Today, the Corn Belt largely lies within what the United States Department of Agriculture has named the "Heartland" farm resource region.[72] The Heartland Region includes twenty-two percent of the United States' farms (the highest of any region), with the most cropland (twenty-seven percent) and highest value of national crop production (twenty-three percent), primarily in cash grains and cattle farms. The moniker "Heartland" itself implies that this region is the lifeblood of the national spirit and economy, further perpetuating the ideal of the Midwest as the ultimate manifestation of what America could be – the most fertile, the most abundant, and the most lucrative. Today, corn is the cereal grain with the highest level of international production, with 1 billion metric tons produced in 2016 on 200 million hectares; the Corn Belt represents thirty-eight percent of this astounding amount.[73]

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[69] Hudson, J. C. (1994). *Making the Corn Belt: A geographical history of middle-western agriculture*. Indiana University Press, 7.
[70] Hudson, J. C. (1994). *Making the Corn Belt*, 12.
[71] Hudson, 1.
[72] Economic Research Service. (2000). *Farm resource regions*. United States Department of Agriculture, 2.
[73] García-Lara, S., & Serna-Saldivar, S. O. (2019). Corn History and Culture. In *Corn* (pp. 1–18). Elsevier, 1.

In Illinois alone in 2017 (the time of the latest Agriculture Census in the United States), a whopping seventy-three thousand farms comprised seventy-six percent of land use in the state, covering twenty-seven million acres.[74] The vast majority of agricultural profits are from crops, with a crop market value of 13.8 billion USD and a livestock market value of 3.2 billion USD. The primary crop production in Illinois is corn for grain, which is grown on eleven million acres (nearly forty percent of Illinois' farmland). Soy nearly matched corn in acres of production, with 10.6 million acres dedicated to soybeans.[75] Compared to counties in the Illinois Valley, northeastern-most Lake County represented a proportionally small section of Illinois agriculture in 2021, with 6,400 acres dedicated to corn[76] and 10,500 acres dedicated to soybeans.[77] Livestock production throughout the state is largely consolidated in 5.5 million layer hens and 5.3 million hogs and pigs; cattle (both for beef and milk) number at 1.1 million.[78]

While livestock plays a comparatively small role in the Illinois agricultural economy today, it fulfilled an important role in establishing the Midwest as the "Heartland" of American agriculture. Beginning in the 1830s, ranchers were attracted to lowland, marshy prairies in states such as Illinois for their low price point.[79] In particular, the owners of cattle farms accumulated large land holdings in areas that were difficult to plow; for example, by 1870 in Champaign County there were ten cattle farms of over a thousand acres. However, the cattle industry began

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[74] Census of Agriculture State Data. (2017). *State summary highlights: 2017* [Chart]. USDA National Agricultural Statistics Service, 4.
[75] Census of Agriculture State Data, Illinois. (2017). *Specified crops by area harvested: 2017 and 2012* [Chart]. USDA National Agricultural Statistics Service, 1.
[76] Illinois Corn County Estimates. (2022). *Corn area planted and harvested, yield, and production by county - Illinois: 2021*. USDA National Agricultural Statistics Service Heartland Region, 1.
[77] Illinois Soybean County Estimates. (2022). *Soybean area planted and harvested, yield, and production by county - Illinois: 2021*. USDA National Agricultural Statistics Service Heartland Region, 1.
[78] Census of Agriculture State Data (2017). *State summary highlights* [Chart], USDA, 4.
[79] Hoganson, K. (2012). Meat in the middle: Converging borderlands in the U.S. Midwest, 1865-1900. *Journal of American History*, *98*(4), 1027.

to decline in Illinois by the twentieth century.[80] This was due to increasing land values as corn and wheat cultivation became more profitable, and improving technologies for draining wetlands that were previously better for grazing than crop cultivation. Eventually, the cattle industry shifted to Texas, fueled by increased access to transportation to meat packing plants (many of which were in Chicago) and East Coast markets. However, it was still common for cattle to be raised in the eastern grasslands but finished on corn in Illinois and Iowa, before being processed in Chicago and shipped to the East Coast.[81] Relative to other states, Illinois' 1.1 million cows ranks the industry twentieth in profits and twenty-sixth in heads of cattle in the country, a decline from the heyday of the mid-nineteenth century when Illinois was on the eastern edge of cattle farming.[82]

Hog raising has a stronger foothold in current-day Illinois agriculture than cattle, with the state ranking 4th in the nation for this livestock in 2007.[83] Initially, combined hog and corn feed farm operations were largely limited to the eastern Midwest in states such as Ohio, where Cincinnati was the processing point for pork.[84] This shifted following the completion of the I&M Canal in Chicago in 1848, which within three years was transporting enough corn that Chicago was the country's biggest corn market.[85] As the city and its industry grew, railroad lines were built, increasing Chicago's capacity for processing agriculture commodities. These railroads opened access for easier livestock transport (compared to driving pigs and cattle hundreds of

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[80] Hoganson, K. (2012). Meat in the middle: Converging borderlands in the U.S. Midwest, 1865-1900. *Journal of American History*, *98*(4), 1029.

[81] Reynolds, C. R., et al. (2014). Nineteenth-century butchery and transport for a market economy: Plum Grove as a case study for commercial transactions in the Midwestern USA. *Anthropozoologica, 49*(1), 47.

[82] Hatfield, J.L. et al. (2014). *Climate change in the Midwest: A synthesis report for the National Climate Assessment.* NCA Regional Input Reports, 72.

[83] Hatfield, J.L. et al. (2014). *Climate Change in the Midwest*, 72.

[84] Warren, W.J. (2007). *Tied to the great packing machine: The Midwest and meatpacking.* University Of Iowa Press, p. 8.

[85] Hudson, J. C. (1994). *Making the Corn Belt: A geographical history of middle-western agriculture*. Indiana University Press, 131.

miles by horse), and packing houses opened alongside railroad depots to slaughter and pack the meat from distant farms.[86] In the first year of the Chicago Union Stock Yards, two-thirds of the 960,000 hogs processed came from farms in Illinois. The notorious meat-packing industry in Chicago is famously described in Upton Sinclair's *The Jungle*[87]; Carl Sandburg begins his poem "Chicago" with the line, "Hog Butcher for the World."[88] Due to a complex set of reasons that are beyond the scope of this thesis – in summary, a shift from terminal markets like Chicago to direct buying between livestock farmers and processing plants beginning in the 1920s[89] – Chicago's meatpacking industry began to decline. However, hog agriculture still plays a vital role in the Illinois economy, with the industry raking in 1.4 billion USD in profits in 2020.[90]

The final pivotal commodity in Illinois agriculture is soybeans. In 2007, Illinois ranked only behind Iowa in acres of soybeans, with 8.4 million acres dedicated to its production.[91] By 2017, that number had expanded to 10.6 million acres.[92] Soybean cultivation in the United States was only beginning to take root in the early twentieth century, when a limited fifty thousand acres of soybeans mainly in North Carolina were grown for hay.[93] Soy farming slowly grew, facing impediments such as xenophobia toward a traditionally Chinese crop, as well as an association with femininity that made many white Americans reluctant to incorporate it into their diets.[94] It didn't truly take off until World War II, when the soy industry was mobilized to feed livestock for the U.S. military and overseas allies, leading to a rampant growth in acreage that

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[86] Hudson, J. C. (1994). *Making the Corn Belt: A geographical history of middle-western agriculture*. Indiana University Press, 132.
[87] Sinclair, U. (1906). *The Jungle.* Penguin Books.
[88] Sandburg, C. (1914). *Chicago.* The Poetry Foundation.
[89] Warren, W.J. (2007). *Tied to the great packing machine: The Midwest and meatpacking.* University Of Iowa Press, 17-28.
[90] Economic Impact of Agriculture. (2020). *Illinois.* University of Arkansas Division of Agriculture.
[91] Hatfield, J.L. et al. (2014). *Climate change in the Midwest: A synthesis report for the National Climate Assessment.* NCA Regional Input Reports, 72.
[92] Census of Agriculture State Data. (2017). *State summary highlights: 2017* [Chart]. USDA National Agricultural Statistics Service, 4.
[93] Roth, M. (2018). *Magic bean: The rise of soy in America.* University Press of Kansas, 1.
[94] Roth, M. (2018). *Magic bean*, 4.

subsequently translated to a post-war soy boom.[95] While soy remains steadfast in the Asian-American diet and began to enter the white American diet (particularly in the form of tofu) in the 1960s through the 1980s, it still retains its primary value through animal feed and oil.[96] In particular, growth of the soybean industry in Illinois has largely been fueled by soy animal feed exports. Schnitkey, et al. at the University of Illinois projected that forty-eight percent of Illinois' 2021 soybean crop would be exported, while fifty-two percent of the crop would be used as domestic crush (which is then processed into animal feed, in particular supporting the previously discussed swine industry).[97] Soybean exports from Illinois to China was a 10.5 billion USD industry in 2011, by far the greatest export market (followed by the 1.7 billion USD Mexico market).[98] Most of these exports are dedicated to livestock feed.

This rapid development of agriculture in Illinois and across the Midwest is certainly miraculous, and if one takes the myth of the yeoman farmer at face value, it is a story of hard work and perseverance. However, none of the agriculture discussed in the previous pages is possible without access to farmland; this initial growth of Midwestern agriculture was fundamentally shaped by the broader trajectories of the United States' territorial expansion and the capitalization of land. The historical events which took place in the same era as the first iteration of the cash corn craze and the livestock feed farms both allowed the foundation of the Corn Belt to occur and sowed the seeds for the systemic failures in Midwestern agriculture which persist to this day.

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[95] Roth, M. (2018). *Magic bean: The rise of soy in America.* University Press of Kansas, 9.
[96] Roth, M. (2018). *Magic bean*, 13.
[97] Schnitkey, G., et al. (2022). *Long-term corn and soybean use with implications for planting decisions in 2022 and beyond.* University of Illinois FarmDocDaily.
[98] SoyIllinois. (2011). *Facts & statistics for the Illinois soybean industry*. Illinois Soybean Association, 17.

Key events in the development of U.S. agriculture

The Corn Belt's agriculture industry has been upheld by government aid since the time of its conception in the mid-nineteenth century to today. On May 20, 1862 (a year before Julius Bull would establish what would become the Casey Farm, and then Liberty Prairie), President Abraham Lincoln signed the Homestead Act into law.[99] The Homestead Act permitted any head of household (who was either an American citizen or had demonstrated their intention of becoming one) to claim 160 acres of 'unappropriated land' in one of the thirty 'public domain states' (including Illinois). The only requirements beyond citizenship were an initial fee of about ten USD, and a commitment to working the claimed land for five years. This act remained in place for one hundred and twenty years (until 1986), processing four million claims on 270 million acres of land.[100] Just like the land of Casey Farm, the 'unappropriated' land that was a prerequisite for the Homestead Act came from the seizure of Indigenous lands across the west. Although neither Julius Bull nor the Casey family took advantage of the Act, the timeline and geographies of their farm are a piece of the era in which the Homestead Act dominated American agriculture, and so is worth discussing in the broader historical contexts of Midwestern agriculture. Although the Act is largely associated with the westward expansion of the late-nineteenth century, the peak year for claims was 1913. Typically relegated to the past, the legacies of the Homestead Act endure not only in the agricultural implications that I will discuss next, but also in the lives of the estimated ninety-three million descendants of homesteaders who are living today.

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[99] Mercier, S., & Halbrook, S. (2020). *Agricultural policy of the United States: Historic foundations and 21st century issues*. Palgrave MacMillan, 50.

[100] Homestead National Historic Park Nebraska. (2021, August 8). *Homesteading by the numbers.* National Park Service.

The Homestead Act is firmly embedded in the American identities of expansion, and so displays the contradictions inherent in this ideal. In *Good Lands,* Frances Kaye identifies this dissonance between the outward advertisement and the internal motivations for the Homestead Act. She identifies the former's motivation as the mythology that persists to this day: using the family farm to develop an agricultural empire on what was perceived as a void in the heart of the nation.[101] Even this public goal presupposes that the prairie lands were deficient, in spite of the richness of the Earth that was cultivated by the grassland Indigenous peoples.[102] Improvement of this so-called deficient land was a requisite for a Homestead claim; and "for most of the Great Plains, 'improvement' meant ploughing up native grasses and replacing them with what James Malin has called domestic grasses: wheat, corn, or so on".[103] The marketing of this public goal was incredibly effective, and it persists in the narratives of today's yeoman Midwestern farmer. However, the actual motivations for the Homestead Act manipulate the values of the small family farm in favor of something more lucrative: capital.

Kaye suggests that to envision the true nature of the Homestead Act (and other allotment acts of the late-nineteenth century), one must shift their mindset "from the formation of *homes* to the formation of *capital*."[104] The key revelation is that the commons were not taxable, and so for the land to be profitable for the government and finance institutions, it needed to be allotted and privatized. The result of this was that from 1870-1910, just twenty percent of new farms in the Midwest were subsistence homesteads; the remaining eighty percent were commercial farms.[105] The nature of these land grants changed the constitution of land holdings in the Midwest, succeeding in "moving the public domain into the private sector and turning 'free land' into

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[101] Kaye, F. W. (2011). *Goodlands: A meditation on the history of the Great Plains*. Edmonton AU Press, 146.
[102] Kaye, F. W. (2011). *Goodlands,*165.
[103] Kaye, 165.
[104] Kaye, 145.
[105] Sampson, F. & Knopf, F. (1994). Prairie conservation in North America. *Bioscience*, *44*(6), 420.

capital for the rapid development of the West".[106] Commodifying the land required destroying the commons of the Indigenous peoples and erasing their memory from the colonial conscious, fulfilling the Gilded Age desire for quick capital formation.[107] The yeoman values of individualism and grit were shaped to aid in wealth accumulation, which set the wheels in motion for extractive twenty-first century U.S. agriculture. This carefully crafted narrative was wildly successful, shaping the attitudes of expansionism that plague the American psyche today. In the hundred and twenty years that the Homestead Act was in place (from 1862 to 1986), seventeen percent of the public land in the United States was claimed for farming, doubling the acreage of farms in the United States from 407.7 million acres in 1870 to 841 million acres in 1900.[108] The commodification of land succeeded in forming capital: within the same time period of 1870-1900, the gross output value of the agriculture sector skyrocketed from 2.18 to 6.41 billion USD.

Privatization of land was not the only strategy for capital formation in the Corn Belt. The success of commodity agriculture in the Midwest represented an investment opportunity for the American elite, and from the beginning of the parcelization of the commons the model of tenant farming was widely adopted.[109] Tenants who needed to pay an annual rent to their landlord "raised more corn than any other crop," which they tended to raise more intensively, and sell off-farm more frequently, than farmers who owned their land. This system was so profitable to landlords that by between 1910 and 1925, tenancy was the standard farm model on the Great Plains. During this era, forty percent of farms in McHenry County, Illinois (Lake County's

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[106] Kaye, F. W. (2011). *Goodlands: A meditation on the history of the Great Plains*. Edmonton AU Press, 144.
[107] Kaye, F. W. (2011). *Goodlands*, 14.
[108] Mercier, S., & Halbrook, S. (2020). *Agricultural policy of the United States: Historic foundations and 21st century issues*. Palgrave MacMillan, 50.
[109] Hudson, J. C. (1994). *Making the Corn Belt: A geographical history of middle-western agriculture*. Indiana University Press, 189.

westerly neighbor) were tenant operated.[110] This rate is likely equivalent to the farm tenancy rates in neighboring Lake County, where the Casey Farm was located. Tenant farming managed by the Casey Family began sometime in the early twentieth century, after the Casey sons began their careers off the farm; during this time, the farm switched from raising dairy cows (and the corn to feed them) to crop-soy rotation farming, which had a more secure return on investment.

The next major legislation to impact the formation of the Corn Belt was the Agricultural Adjustment Act (AAA) of 1933, which remains the backup federal agriculture policy if any of the more recent Farm Bills should expire.[111] The AAA provided stipulations for parity pricing for commodity crops; in other words, the government would subsidize farmers for the value of their crop production based on prices from 1910-1914 (which, notably, was considered the golden age of agriculture because of its unusually high crop prices and quality of rural life).[112]

In exchange, the farmers would take fewer crop commodities to market, taking measures such as leaving fields fallow and reducing livestock breeding. The goal of the AAA was to pay farmers to produce fewer commodity crops (including corn), a pattern which is indicative of the massive overproduction of U.S. commodity crops through the 20th century. In 1939, parity payments from the federal government comprised 35 percent of American farmers' net cash income.[113] This policy was immediately unpopular, and exacerbated the food insecurity of American society's most vulnerable during the Great Depression – namely, people who were Black, immigrants, working class, houseless, or a combination thereof – as scarcity increased

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[110] Hudson, J. C. (1994). *Making the Corn Belt: A geographical history of middle-western agriculture*. Indiana University Press, 190.

[111] Mercier, S., & Halbrook, S. (2020). *Agricultural policy of the United States: Historic foundations and 21st century issues*. Palgrave MacMillan, 195.
Directly following this bill in 1934, the Homestead Act was largely defanged by then-President Roosevelt's New Deal agriculture policies, when his administration allocated most of the unclaimed public lands for conservation (ibid 50).

[112] Mercier, S. & Halbrook, S. (2020). *Agricultural policy of the United States,* 195.

[113] Mercier & Halbrook, 220.

already high food prices.[114] The result was a series of protests as frustrated people waited in food lines while farmers plowed their fields under. Additionally, Black farmers were excluded from the policies of the AAA (along with the rest of the New Deal policies of the Roosevelt administration), exacerbating wealth inequalities and land ownership disparities between Black and white Americans.[115] This structural racism is set in the foundation of Illinois agriculture: in 2017, only eleven farms had a Black producer, and of these, only seven farms had a Black principal producer.[116] This appalling inequality is the result of years of enslavement, anti-Black agricultural policy, and other federal policies to limit the access of Black Americans to wealth, among many other reasons, that continue to shape the racial politics of, and racism within, Illinois agriculture.

The AAA-capped scale of the Corn Belt through the 1930s sustained tenancy rates and farm size; in this decade, the average farm size in Illinois had not grown since the era of the Homestead Act.[117] But during World War II, this pattern began to change. With the advent of the War, war technology was adapted by U.S. agriculture, and tractors, hybrid seeds, inexpensive fertilizers, and pesticides increased productivity of the farms that were already producing more than the commodity crop market could handle.[118] After 1939, commodity corn production in the Corn Belt tripled as farmers widely adopted war-time technology;[119] in 1930, there was only one

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[114] White, A.F. (2014). *Plowed under: Food policy protests and performance in New Deal America.* Indiana University Press, 1-5.
[115] Wiecek, W. M. (2012). Structural racism and the law in America: An introduction. *Kentucky Law Journal, 100*(1), 5.
[116] Census of Agriculture State Data. (2017). *Black or African American producers: 2017* [Chart]. USDA National Agricultural Statistics Service, 1.
[117] Hudson, J. C. (1994). *Making the Corn Belt: A geographical history of middle-western agriculture*. Indiana University Press, 192.
[118] Mercier, S., & Halbrook, S. (2020). *Agricultural policy of the United States: Historic foundations and 21st century issues*. Palgrave MacMillan, 22.
[119] Hudson, J. C. (1994). *Making the Corn Belt,* 12.

tractor for every four farms, but by 1950 the number of tractors had quadrupled to equal the number of farms.[120]

Production and scale continued to grow, and the federal government struggled to maintain loan schemes where farmers could hold their crops as collateral if market prices were below the loan rates.[121] This pattern continued through the 1970s, when the federal government began limiting commodity crop acreage that could be held as collateral, and supply controls were set. The result of this was that from the mid-1980s to the mid-1990s, severely reduced farmer financial support forced farmers to change their planting decisions according to market prices, again driving up the cultivation of the reliable cash crops. Slightly altered forms of subsidy payments were included in the 2008 and 2014 Farm Bills, the latter of which introduced countercyclical crop insurance programs that would provide subsidies in years where commodity crop supply outstripped demand.[122]

The capitalization of the commons in the Midwest was arguably too successful, producing crops at a scale that exceeds requirements for sustenance (as I will explore in "Directions toward sustainability"). The federal government has struggled since the early twentieth century to keep the massive acreage of commodity crops afloat in the face of overwhelming supply. This supply problem sets the stage for discussions of the movement for sustainable agriculture, and the complicated relationship between extractive agriculture and corn crop production.

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[120] Hudson, J. C. (1994). *Making the Corn Belt: A geographical history of middle-western agriculture*. Indiana University Press, 192.
[121] Smith, V. H., & Glauber, J. W. (2019). The Future of US Farm Policy. *EuroChoices*, *18*(1), 42–43.
[122] Smith, V. H., & Glauber, J. W. (2019). The future of US farm policy, 44.

Directions toward sustainability

The sustainability of commodity crop agriculture in the United States has been the subject of increasing scrutiny as the twenty-first century develops. State and federal policies in Illinois provide multiple (and at times conflicting) strategies for a future of sustainable agriculture within the state. The phrase "sustainable agriculture" is at best a nebulous term, with diverse interpretations. The USDA and the 1990 Farm Bill describe sustainable agriculture as an industry that enhances environmental quality and uses resources efficiently, with the goal of building food systems that can be managed in perpetuity.[123] However, La Via Campesina (an international peasant farmer's movement) sees a future in sustainable agriculture where market regulations and bans on industrial farming from governing bodies ensures the scaling of peasant farming across the food economy.[124] These are just two examples of the multitude of opinions on how to change food systems so that they can continue to feed people for generations to come. They key thread in all of these arguments for sustainable agriculture is that the food systems can't stay the way they are. In this section, I outline three of the currents strategies that are attempting to increase the sustainability of Illinois agriculture to paint a picture of the scale and breadth of available solutions, as well as their impact on the health of the people and land in the state.

One of the foremost strategies for increasing the sustainability of Illinois agriculture is the state government's Partners for Conservation Program.[125] This program offers state funding for sustainable agriculture grants, conservation practice cost-shares, stream bank stabilization and restoration, and soil and water conservation districts. The Illinois Congress approved of these

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[123] Gold, M. V. (1999). Sustainable agriculture: Definitions and terms. *National Agricultural Library, the United States Department of Agriculture.*

[124] La Via Campesina. (2021). *The fight for more sustainable agriculture and agroecology continues at COP26.* [Press release].

[125] Illinois Department of Agriculture. (n.d.). *Sustainable agriculture*. Illinois Bureau of Land and Water Resources.

measures in 2008 under the condition that they must be voluntary and incentive-based.[126] However, this and other federal conservation programs have not seen wide adoption by Illinois farmers. In 2017, there were 73,000 farms in Illinois encompassing 36 million acres (over three-quarters of land in the state);[127] of this acreage, a mere 2.4 percent of farmland was part of a conservation or wetland reserve program, a decrease from 3.2 percent in 2012. Therefore, while infrastructure in Illinois exists for farms to adopt the set of sustainable practices outlined by the Partners for Conservation Program (which includes measures such as field border strips, no-till planting systems, and cover crops), the initiative to adopt these practices has not only remained low, but decreased.

A second voluntary sustainability initiative is farm-level organic certification, which is managed by the United States Department of Agriculture. Organic certification offers marketing incentives for adopting organic practices, which include implementing tillage practices that minimize soil erosion, crop rotations, cover crops, addition of compost or manure to boost soil nutrients, and limitation of synthetic additives to those deemed organic by the USDA.[128] In return for adopting farming practices that protect soil, water, and human health, marketing commodities as organic increases their value, in spite of slightly reduced yields per acre. Notably, there is quite a bit of overlap between practices subsidized by Illinois' Partners for Conservation Program and practices required for organic certification, which adds to the marketing incentive that certification provides.

[126] Partners for Conservation. (n.d.). *Conservation 2000.* Illinois Department of Natural Resources.
[127] Economic Research Service. (2021). *State Fact Sheets: Illinois*. United States Department of Agriculture.
[128] Soil fertility and crop nutrient management practice standard, 7 C.F.R., § 25.203 (2012).

Crop	Yield (bushels/acre)	Production Cost ($/Bushel)	Gross Revenue ($/Bushel)	Net Returns per Acre ($)
Corn (Organic)	127.1	5.99	8.94	1136.27
Corn (Conventional)	186.2	3.76	3.76	700.11
Soy (Organic)	35.0	15.47	20.39	713.65
Soy (Conventional)	48.2	8.81	10.26	494.53

Table 2.1. A comparison of yields between organic and conventional corn and soy grain crops in Illinois. Data is averaged from 2016-2020 annual averages for the state of Illinois, and is sourced from Langemeier (2021).[129]

In spite of these incentives, organic certification is even less popular than enrollment in conservation programs;[129] less than 0.17 percent of Illinois farms were certified organic in 2017.[130] Potential reasons for the lack of organic certification, despite shown profit increases, include that conventional grain farms typically use modified seeds, chemical weed control, and rotation of continuous row crops for production.[131] Each of these practices prohibit farms from organic certification, and would need to be changed for the farm to be considered organic. The necessity of overhauling infrastructure in most conventional grain farms to adopt organic practices is a majorly prohibitive factor that precludes Illinois farms from organic certification.

An alternative method for increasing the sustainability of Illinois farms has less to do with how crops are grown, and more to do with how they are processed and used. A directive from the federal Department of Energy encourages intensifying monocrop commodity yields for use as biofuels, which dictates a more sustainable end-use for products, rather than increasing the sustainability of crop production itself. The prevalence of biofuel has risen rapidly within this century as a touted alternative to fossil fuels; greenhouse gas emissions are 34 percent lower on

[129] Census of Agriculture. (2019). *Farms, land, and value of sales on certified organic farms.* United States Department of Agriculture, National Agricultural Statistics Service.
[130] Economic Research Service. (2021). *State fact sheets: Illinois.* United States Department of Agriculture.
[131] McBride, W. D., et al. (2015). *The profit potential of certified organic field crop production.* United States Department of Agriculture, Economic Research Service, 5.

average from corn ethanol production than from gasoline extraction.[132] Currently, the United States is the leading producer of biofuels, producing 53 percent of the global supply (332 million barrels/year), and Illinois is the fourth largest biofuel producing state (3.4 million barrels/year). Further, the state is the third largest consumer of domestic biofuels in the country (4.3 million barrels/year).[133] The U.S. Department of Energy is seeking to expand Illinois biofuel production, and estimates that Illinois agriculture can support 9.9 million metric tons per year of biofuel stock.[134] It is a highly marketable idea; as a source of domestic fuel, it has been coopted in the name both of sustainability and nationalism. Kaye scathingly opines, "if our farms are no longer needed to feed the hungry world, we need to redirect the sense of heroism at the root of the Great Plains self-image. Our biofuels, then, can protect us from dependence on the oil policies of the Middle East."[135] The plan is also economically savvy, as the more crops are processed, the greater their value: corn is cheaper than corn meal, which is cheaper than a box of corn breakfast cereal. This means that crops grown directly for food (which require limited to no processing) are the first to be replaced by biofuels, whose processing increases their value.

Each of these three avenues for increasing agricultural sustainability in Illinois has their benefits and drawbacks. While raising grains for biofuel consumption decreases reliance on fossil fuels, its dependence on conventional agricultural methods means that it continues to degrade soil, water, and human health. But although organic and conservation programs offer more sustainable alternatives to these practices, they are not widely adopted, in spite of incentive programs. While these avenues are certainly not the only methods for increasing the

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[132] Center for Sustainable Systems. (2021). *Biofuels factsheet.* University of Michigan.
[133] Francis, M. (2020, July 24). *EIA now estimates biodiesel production and consumption by state.* U.S. Energy Information Administration.
[134] Bioenergy Technologies Office. (2015, September). *Benefits of biofuel production and use in Illinois*. U.S. Department of Energy.
[135] Kaye, F. W. (2011). *Goodlands: A meditation on the history of the Great Plains*. Edmonton AU Press, 156.

sustainability of Illinois agriculture, they are at the heart of the discussion around sustainability in Corn Belt food systems.

The history of agriculture in the Midwest is a tale of expansion, intensification, and commodification that directly led to the demolishing of the vast prairie landscapes. In the next chapter, I will begin to discuss prairie ecology, and what prairie restoration could look like in the schema of Midwestern agriculture.

Chapter 3
Prairie ecology: The prairies as dynamic systems

Thus far, I have discussed local and regional contexts for the history of the prairie landscape in the Midwest – but I have yet to detail exactly what a prairie is. Prairies were one of the first landscapes studied by American ecologists, with scholars at the University of Nebraska such as Charles Bessey and Frederic Clements struggling to categorize a landscape that was already fast disappearing in the late-nineteenth century.[136] Clements would later be credited with establishing ecology as an academic field, and his childhood in Nebraska and prairie studies guided him to conceptualize ecology as a field with a mission – a mission to find a way for people to fit into the landscape, rather than destroying it.[137] Bessey and Clements were some of the first in a rich lineage of ecologists from the Midwest who dedicated their careers to understanding the prairies. This lineage includes noted University of Nebraska ecologist J. E. Weaver, who wrote *North American Prairie* in 1954. This foundational text in prairie ecology describes how

> the vast prairie is in summer a land of waving grasses. Except for its grandeur of expanse and the abundance of varicolored flowers, it appears almost monotonous in the general uniformity of its cover. The dominance of grasses, the paucity of shrubs, the absence of trees, except along rivers and streams, and a characteristic drought-enduring flora constitute its main features.[138]

This early description is largely consistent with the 2011 Forage and Grazing Terminology Committee, which defined prairies as "nearly level or rolling grassland, originally treeless or

[136] Kingsland, S. E. (2005). *The evolution of American ecology, 1890-2000.* Johns Hopkins University Press, 152.
[137] Kingsland, S. E. (2005). *The evolution of American ecology*, 151.
[138] Weaver, J. E. (1954). *The North American prairie.* University of Nebraska, 3.

with a few scattered trees, and usually on fertile soils."[139] Typically, the term prairie is exclusively used in a North American context.[140]

In this chapter, I will examine the ecosystem that Weaver referred to as "an inextricable mass of endlessly variable vegetation."[141] Fittingly, this chapter is a testament to the life of prairies. In a landscape so often constructed as devoid of life, or discussed in terms of loss and destruction, I find it vital to discuss what is there, rather than only what has been lost. There is no drive to conserve something that is already gone. But the dynamic and complex communities of prairie life (including the humans who reside in and care for them) are worthy of conservation. Beyond aesthetic appreciation, this chapter explores the multifaceted biological functions of the prairie ecosystem, describing the just-comprehensible intricacy of North America's largest vegetative province.[142] Notably, this chapter only discusses prairie soils indirectly, through discussions of disturbance, vegetation, and animal life. I will analyze the characteristics of prairie soils in much greater depth my second thesis, "Examining Microbial Diversity in Transition Zones between Corn Fields and Restored Prairie in the Upper Midwest," where I describe my study of the impacts of restoration on soil microbial communities.

The extent of the prairies

First, it will be useful to understand exactly what the pre-colonization extent of the prairies was, which can then inform where the prairies could be restored. The prairies constituted a large extent of North America, with various sources estimating that the landscape covered up to

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[139] Allen, V. G., et al. & The Forage and Grazing Terminology Committee. (2011). An international terminology for grazing lands and grazing animals. *Grass and Forage Science*, *66*(1), 6.
[140] Gibson, D. J. (2009). *Grasses and grassland ecology.* OUP Oxford, 3.
[141] Weaver, J. E. (1954). *The North American prairie*. University of Nebraska, vii.
[142] Sampson, F. & Knopf, F. (1994). Prairie conservation in North America. *Bioscience*, *44*(6), 418.

162 million hectares of the contiguous United States, [143] 65 million hectares of which was tallgrass prairie.[144] This indicates that prairie once covered twenty percent of the continental United States. Of this, the Department of Natural Resources estimates that there were twenty million acres of prairie in Illinois, two-thirds of the land area in the state.[145]

The geographic boundaries of the American prairie are determined by a variety of climactic characteristics. The simplest of them is that from east to west, the climate becomes drier (which influences the transition from tallgrass to shortgrass prairie, as well as the western-most boundary of the prairies).[146] More complex are the air currents that influence the northern and southern boundaries of the prairie. By the 1990s, American scientists had been recording climate data in the Midwest for upwards of a century and were able to analyze this data for patterns. The primary findings were that the dry westerlies over the Rocky Mountains caused a drier climate in the grasslands than in surrounding forested regions.[147] Consistent droughts were a vital characteristic of the prairies: the climate districts of the tallgrass prairies had severe to extreme droughts in ten to fifteen percent of years recorded, while the northern and southern forests only experienced such drought conditions between five to ten percent of years.[148]

Therefore, variation in precipitation regimes, determined by a geographic position at the center of the continent on the eastern side of the Rocky Mountains, influenced dry seasons which made the prairies inhospitable to forests. This allowed grasses and forbs to dominate the

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[143] Sampson, F. & Knopf, F. (1994). Prairie conservation in North America. *Bioscience*, *44*(6), 418.
[144] Frier, N. et al. (2013). Reconstructing the microbial biodiversity and function of pre-agricultural tallgrass prairie soils in the United States. *Science, 342*(6158), 621.
[145] Illinois Department of Natural Resources (n.d.) *Illinois Prairies.*
[146] Helzer, C. (2010). *The ecology and management of prairies in the central United States.* University of Iowa Press, 11.
[147] Changnon, S. A., Kunkel, K. E., & Winstanley, D. (2003). Quantification of climate conditions important to the tall grass prairie. *Transactions of the Illinois State Academy of Science, 96*(1), 44.
[148] Changnon, S. A., Kunkel, K. E., & Winstanley, D. (2003). Quantification of climate conditions, 43.

landscape, forming the distinct and complex webs of biodiversity that comprise the prairies to this day.

The formation of the prairies: Disturbance, climate and topography

Figures 2.1 and 2.2. The difference between lowland (left, Figure 2.1) and upland (right, Figure 2.2) prairie vegetation at the Liberty Prairie. Photos by Anna Burns.

While the geographic and climactic regimes described above determine the extent of the prairies, topography and disturbance are two of the key processes that maintain them.[149] Topography primarily impacts prairie communities through its effect on soil formation.[150] In particular, prairies tend to have higher percentages of vegetation cover in lowland areas, due to the typically deeper soils having higher water-holding capacities.[151] Conversely, diversity of vegetation tends to be higher in upland areas, where more limited water in usually-shallower soils prevents the dominance of any one plant species. A long-term study in Kansas from 1975-1993 accordingly indicated that prairie lowland regions had a significantly higher net primary productivity (mean of 755.50 g/m³) than upland regions (mean of 178.5 g/m³) regardless of

[149] Helzer, C. (2010). *The ecology and management of prairies in the central United States.* University of Iowa Press, 1.

[150] Collins, S. L., & Calabrese, L. B. (2012). Effects of fire, grazing and topographic variation on vegetation structure in tallgrass prairie. *Journal of Vegetation Science*, *23*(3), 571.

[151] Collins, S. L., & Calabrese, L. B. (2012). Effects of fire, grazing and topographic variation, 571.

whether the sites were burned ($p < 0.001$).[152] Instead, the net primary productivity was strongly related to differences in water availability in the upland and lowland environments.

Disturbance is another landscape-scale process that determines the community composition of prairies. The types of disturbance with the greatest impact on prairies are grazing and burning. Topography and disturbance also interact; the composition of plant communities changes according to topography because of the variable effects of disturbance on different soil types.[153] Generally, species richness tends to positively correlate with disturbance, although grazing and burning have different impacts on prairie biodiversity.[154]

Two of the most important prairie grazers are bison and cattle, although other fauna including insects, rodents, and deer also graze on prairie vegetation.[155] Generally, grazing increases species evenness and richness in prairies, because it increases habitat heterogeneity based on ungulate behavioral patterns such as preferential grazing.[156] Bison tend to have a greater positive impact on species richness, with a Kansas study finding that bison grazing increased species richness from 19-54 percent in 25 m² exclosure sites.[157] In contrast, an Oklahoma study found that cattle grazing only increased species richness by 2-15 percent in 1000 m² exclosures.[158] This is likely because bison preferentially graze dominant grass species, a

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[152] Briggs, J. M., & Knapp, A. K. (1995). Interannual variability in primary production in tallgrass prairie: Climate, soil moisture, topographic position, and fire as determinants of aboveground biomass. *American Journal of Botany*, *82*(8), 1026.

[153] Collins, S. L., & Calabrese, L. B. (2012). Effects of fire, grazing and topographic variation on vegetation structure in tallgrass prairie. *Journal of Vegetation Science*, *23*(3), 570.

[154] Collins, S. L. (1987). Interaction of disturbances in tallgrass prairie: A field experiment. *Ecology*, *68*(5), 1248.

[155] Helzer, C. (2010). *The ecology and management of prairies in the central United States*. University of Iowa Press, 18.

[156] Hartnett, D. C., Hickman, K. R., & Walter, L. E. F. (1996). Effects of bison grazing, fire, and topography on floristic diversity in tallgrass prairie. *Journal of Range Management*,*49*(5), 419.

[157] Hartnett, D. C., Hickman, K. R., & Walter, L. E. F. (1996). Effects of Bison Grazing, Fire, and Topography, 419.

[158] Collins, S. L. (1987). Interaction of disturbances in tallgrass prairie, 1245.

behavior that results in less competition for non-dominant grasses and forbs, and in turn increases species richness more than the less discriminating cattle grazers.[159]

While grazing tends to increase species evenness and richness, burning increases prairie vegetative productivity.[160] As I discussed in Chapter One, Indigenous peoples of the Great Plains used fire to manage prairies, before colonization prohibited these cultural practices. The benefit of such fires is that they increase the biomass of grasses, which have a competitive advantage over woody-stemmed plants and forbs in environments where light is not limited by mature plants.[161] The timing of burning is particularly important, as species richness and diversity increase for the first six to seven years after burning, before beginning to decline.[162] There is also significant interaction between grazing and fire disturbances; species diversity tends to be lower in burned prairie patches where grazing is absent compared to undisturbed patches.[163] This is likely because dominant grasses re-established after burning, and remained dominant without preferential bison grazing to control their spread. In contrast, species diversity was higher in prairies that are both burned and grazed than in undisturbed prairies, because grazers were able to curb the dominance of grasses in burned prairie patches. The result was that burned and grazed prairie fragments gained both the increased biomass benefit of burning, as well as the increased species richness and evenness benefits of grazing.

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[159] Hartnett, D. C., Hickman, K. R., & Walter, L. E. F. (1996). Effects of bison grazing, fire, and topography on floristic diversity in tallgrass prairie. *Journal of Range Management*,*49*(5), 419.

[160] Briggs, J. M., & Knapp, A. K. (1995). Interannual variability in primary production in tallgrass prairie: Climate, soil moisture, topographic position, and fire as determinants of aboveground biomass. *American Journal of Botany*, *82*(8).

[161] Spasojevic, M. J., et al. (2010). Fire and grazing in a mesic tallgrass prairie: Impacts on plant species and functional traits. *Ecology*, *91*(6), 1658.

[162] Gibson, D. J., & Hulbert, L. C. (1987). Effects of fire, topography and year-to-year climatic variation on species composition in tallgrass prairie. *Vegetation*, *72*(3), 182.

[163] Collins, S. L. (1987). Interaction of Disturbances in Tallgrass Prairie: A Field Experiment. *Ecology*, *68*(5), 1248.

Prairie flora

Figure 2.3. Prairie vegetation at the Liberty Prairie Reserve, with blooming chicory flowers in the foreground. Photo by Anna Burns.

Prairies are a landscape of herbaceous plants, with grasses dominating the landscape and competing with forbs[164] (broad-leaf plants,[165] including many of the characteristic prairie flowers such as the chicory in Figure 2.3). Although prairie grasses tend to comprise the bulk of prairie biomass, forbs contribute most of the species diversity.[166] A key distinguishing feature between these two guilds is that prairie grasses tend to be C4 plants[167], indicating that they initially form a four carbon molecule during photosynthesis, and tend to grow during the warm season.[168] In contrast, prairie forbs tend to be C3 plants (which typically are perennials, and grow during the cold season, fixing three-carbon molecules during photosynthesis). The primary result of the difference between the C4 grasses and C3 forbs is that they vary in their strategies to

[164] Shelford, V. E. (1963). *The ecology of North America.* University of Illinois Press, 331.
[165] Forage Information System. (n.d.). *Forbs.* Oregon State University.
[166] Grman, E., et al. (2021). Super-abundant C4 grasses are a mixed blessing in restored prairies. *Restoration Ecology*, 29(1), 2.
[167] Grman, E., et al. (2021). Super-abundant C4 grasses, 1.
[168] Department of Primary Industries. (n.d.). *What are C3 and C4 native grass?* New South Wales Government.

photosynthesize energy.[169] However, C4 grasses do not have a competitive advantage in resource-use efficiency; rather, they tend to dominate prairie vegetation because the bulk of their growth is in the early season, which is when resource availability is highest.[170] Therefore, the advantage of C4 grasses over C3 forbs is largely determined by resource availability at their respective growing times. This poses a challenge for prairie restorations, where forbs struggle to re-establish in the absence of disturbance patterns that curb grass growth (discussed on pages 47-48).[171]

The morainal section of the Northeastern Morainal Division of Illinois – which includes Liberty Prairie, along with all of inland Lake County – was sixty percent prairie before Euro-American colonization, with interspersed oak forests and wetlands.[172] The dominant flora of the mesic prairies in this region (including what is now encompassed in Liberty Prairie) included prairie dropseed, big bluestem, Indian grass, cord grass, and bluejoint grass (all of which are C4 grasses).[173] Weaver referred to big bluestem (*Andropogon gerardi*) as "one of the most widely spread and important dominants of the prairie," constituting up to seventy-five percent of ground cover across the North American prairies, in conjunction with its upland counterpart, little bluestem.[174] Common forbs in Illinois mesic prairies include rattlesnake master, prairie dock, compass plant, culver's root, alum root, and blazing star.[175] Overall, the Chicago Wilderness Region (a network of prairies and sand savannas which contains the Liberty Prairie) contains 595

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[169] Nippert, J. B., Fay, P. A., & Knapp, A. K. (2007). Photosynthetic traits in C3 and C4 grassland species in mesocosm and field environments. *Environmental and Experimental Botany*, *60*(3), 412.
[170] Nippert, J. B., Fay, P. A., & Knapp, A. K. (2007). Photosynthetic traits in C3 and C4 grassland species, 419.
[171] Grman, E., et al. (2021). Super-abundant C4 grasses are a mixed blessing in restored prairies. *Restoration Ecology*, 29(1), 6.
[172] Mohlenbrock, R. H. (2014). *Vascular flora of Illinois: A field guide* (4th ed.). Southern Illinois University Press, 9.
[173] Mohlenbrock, R. H. (2014). *Vascular flora of Illinois: A field guide* (4th ed.), 9.
[174] Weaver, J. E. (1954). *The North American prairie*. University of Nebraska, 23.
[175] McClain, W. E. (2003). *Prairie establishment and landscaping*. Division of Natural Heritage, Illinois Department of Natural Resources, 29.

rare plant species that are conservation targets.[176] Protecting this biodiversity is one of the primary goals of the Liberty Prairie Reserve, which manages their restorations for native species.[177]

Prairie fauna

Figure 2.4. A small toad rests on the gravel bike path in Liberty Prairie. Photo by Anna Burns.

The fauna within tallgrass prairies encompass species from the smallest grasshopper (*Encoptolophus sordidus costalis)* to the largest bison (*Bison bison)*.[178] Small mammals such as jack rabbits and plains harvest mice have important roles in distributing seeds from the prairie flora they consume.[179] Some of the most impactful prairie predators are kit foxes, gray wolves, coyotes, and hawks.[180] Burrowing mammals including ground squirrels, moles, and shrews[181] influence the aggregation of tallgrass prairie soils alongside above-ground compaction from deer,

[176] Panzer, R., Gnaedinger, K., & Derkovitz, G. (2010). The prevalence and status of conservative prairie and sand savanna insects in the Chicago Wilderness Region. *Natural Areas Journal*, *30*(1), 77.
[177] Conserve Lake County (2013). *Liberty Prairie Reserve Master Plan*. Chicago Metropolitan Agency for Planning, 61.
[178] Shelford, V. E. (1963). *The ecology of North America.* University of Illinois Press, 333.
[179] Shelford, V. E. (1963). *The ecology of North America*, 333.
[180] Shelford, 336.
[181] A characteristic prairie species – the prairie dog – is missing from this list, because it largely inhabited western shortgrass prairies, rather than the eastern tallgrass prairies such as the Liberty Prairie site.

elk, and bison.[182] Bison grazing is a vital source of ecosystem disturbance that directly increases plant biodiversity by preferentially grazing the dominant C4 grasses,[183] which I discuss in greater depth on pages 47-48.

Insects are incredibly diverse in the Chicago Wilderness region, with a long-term study finding 2403 species from 9 orders and 91 families between 1982 and 2010.[184] Of these, 390 species were only found in prairie remnants, suggesting that the prairie environment is an important environment for specialist insects; 411 insect species were conservation priorities. Insects are ecosystem engineers, structuring prairies through grazing, burrowing, and pollinating. In many regions of the North American prairies, herbivorous insects match the vegetation consumed by bison.[185] Similarly to ungulate grazers, the functional composition, rather than diversity, of grasshopper species has the greatest impact on prairie plant biomass.[186] Grass-feeding grasshoppers tended to decrease prairie biomass because they consumed dominant C4 grasses (similarly to bison), while mixed-feeding grasshoppers (similarly to cattle) fed indiscriminately off C4 grasses and C3 forbs. Ants are ecosystem engineers that affect soil structures through their tunneling, disperse plant seeds, and both protect and consume plants. There are 100 ant species found in tallgrass prairies (60 of which are common); however, none of these species are endemic, and most are found in forest ecosystems as well.[187]

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[182] Shelford, V. E. (1963). *The ecology of North America.* University of Illinois Press, 333.
[183] Elson, A., & Hartnett, D. C. (2017). Bison increase the growth and reproduction of forbs in tallgrass prairie. *The American Midland Naturalist*, *178*(2), 245–259.
[184] Panzer, R., Gnaedinger, K., & Derkovitz, G. (2010). The prevalence and status of conservative prairie and sand savanna insects in the Chicago Wilderness Region. *Natural Areas Journal*, *30*(1), 76.
[185] Helzer, C. (2010). *The ecology and management of prairies in the central United States*. University of Iowa Press, 18.
[186] Laws, A. N., et al. (2018). Effects of grasshoppers on prairies: Herbivore composition matters more than richness in three grassland ecosystems. *Journal of Animal Ecology*, *87*(6), 1734.
[187] Nemec, K. T. (2014). Tallgrass prairie ants: Their species composition, ecological roles, and response to management. *Journal of Insect Conservation*, *18*, 510.

Additionally, many prairie ecosystem functions are dependent on pollination from insects. A three-year study of bee populations in Chicagoland prairies documented 115 species and 32 genera of bees, over 90 percent of which were native species.[188] Most of the identified bee species were soil-dwellers,[189] and the most common species were Sweat Bees (*Augochlorella aurata*), the Common Eastern Bumblebee (*Bombus impatiens*), and the White-Winged Metallic Sweat Bee (*Lasioglossum albipenne*).[190] Other important prairie pollinator species include butterflies. The Midewin National Tallgrass Prairie in Wilmington, Illinois (approximately eighty miles south of the Liberty Prairie Reserve) has documented 87 species of butterfly across six families, of which sixteen are rare species.[191] Common Illinois butterfly species include the Cabbage White (*Pieris rapae*), Common Wood Nymph (*Cercyonis pegala*), Pearl Crescent (*Phyciodes tharos*), Great Spangled Fritillary (*Speyeria cybele*), and Spring/Summer Azure (*Celastrina ladon/neglecta*).[192]

Finally, prairies are a pivotal nesting habitat for birds: out of the 435 bird species that breed in the continental United States, 330 species breed on the Great Plains.[193] Within the Chicago Wilderness Region alone, there are 46 conservation-concern bird species.[194] Notable species such as Prairie Chicken (*Tympanuchus cupido*), Henslow's Sparrow (*Ammodramus henslowii*), and the Short-eared Owl (*Asio flammeus*) nest in the thick bunched grasses on the

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[188] Tonietto, R. K., Ascher, J. S., & Larkin, D. J. (2017). Bee communities along a prairie restoration chronosequence: Similar abundance and diversity, distinct composition. *Ecological Applications*, *27*(3).
[189] Tonietto, R. K., Ascher, J. S., & Larkin, D. J. (2017). Bee communities along a prairie restoration chronosequence.
[190] Tonietto, Ascher, & Larkin.
[191] North American Butterfly Association. (2011). *Butterflies of the Midewin National Tallgrass Prairie.* United States Forest Service.
[192] Kucherov, N. B., et al. (2021). Butterfly declines in protected areas of Illinois: Assessing the influence of two decades of climate and landscape change. *PLOS ONE*, *16*(10), 7.
[193] Sampson, F. & Knopf, F. (1994). Prairie conservation in North America. *Bioscience*, *44*(6), 419.
[194] Panzer, R., Gnaedinger, K., & Derkovitz, G. (2010). The prevalence and status of conservative prairie and sand savanna insects in the Chicago Wilderness Region. *Natural Areas Journal*, *30*(1), 77.

ground of tallgrass prairies.[195] Prairie-nesting birds typically require species-specific vegetation structures, and are sensitive to fragmentation, rarely nesting in remnants less than 40 acres in size; therefore, continuous patches and high habitat heterogeneity are vital for these birds species.[196]

Contexts of prairie ecology

In this chapter, I provided a broad overview of the most important ecological factors that shape the tallgrass prairie landscapes in northeastern Illinois. I have discussed the droughts and disturbances which maintain the extent of the prairies across central North America, as well as their inhabitants, from birds to butterflies to bison. The prairies host astounding biodiversity of both plants and animals, just the surface of which is reflected in these pages.

This is an ecosystem worth preserving, worth restoring. More than a void, more than what was, more than what is gone, the prairies are vitally and forcefully alive. G. E. Patterson writes, "let's make a prairie one beautiful thing / we will have to remember again / our agreement to make a way / out of what we are given / the uprooting terror / of our undoing."[197] I strive to make the prairie "one beautiful thing" through this work, to ground myself in the life of the prairie. Although we need an estimation of destruction so that we may know how to move forward, I hope that by first establishing the prairies as a living ecosystem, the legacies of destruction will be situated in a dynamic narrative that is not a fate, but a starting point.

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[195] Grand, J., et al. (2019). *North American grasslands and birds report*. National Audubon Society, 9.
[196] Helzer, C. (2010). *The ecology and management of prairies in the central United States.* University of Iowa Press, 36.
[197] Patterson, G. E. (2020). *The keeping room*. Poets.org.

Chapter 4

The politics of prairie conservation

Fragmented landscapes: What remains of the prairie

I dedicated the third chapter of my thesis to discussing the life of the prairies – the intricacies of the landscape, the reciprocity between animals, plants, and soil, and the mediating forces of disturbance from fire and grazing. Unfortunately, the prairies of last chapter are a far cry from what exists today. Due to the historical processes of colonization and the agriculture industry discussed in chapter two, Sampson & Knopf estimate that since 1830, as much as 99.9 percent of the 162 million hectares in the North American prairie has been decimated.[198] This makes the tallgrass prairie the most declined ecosystem in North America. The prairie remnants that still exist are degraded, often isolated, and under pressure from cattle grazing and recreation; they are mostly found in cemeteries and nature preserves.[199] Of the 8.9 million hectares of prairie which once blanketed Illinois, only 930 acres remain; less than 0.01 percent of the state is protected prairie.[200]

This devastation has implications beyond the loss of plant biodiversity, and ripples across the interconnected species described in the previous chapter. Ecologists typically estimate that in the mid-eighteenth century (before colonization), there were 60 million extant bison (although estimates range from 30 to 200 million).[201] By the beginning of the twentieth century, compounding factors demolished their population down to the hundreds. Americans mass-slaughtered bison to sell their meat, hides, bones, and tongues, as well as to destabilize the Plains

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[198] Sampson, F. & Knopf, F. (1994). Prairie conservation in North America. *Bioscience*, *44*(6), 418.
[199] Frier, N. et al. (2013). Reconstructing the microbial biodiversity and function of pre-agricultural tallgrass prairie soils in the United States. *Science, 342*(6158), 622.
[200] Sampson, F. & Knopf, F. (1994). Prairie conservation in North America, 419.
[201] Koucky, R. W. (1983). The buffalo disaster of 1882. *North Dakota History Journal of the North Plains, 50*(1), 1.

Indigenous peoples, for whom bison was a primary source of cultural and nutritional sustenance.[202] These slaughters compounded the effects of drought, and diseases from grazing cattle, which further decimated the bison herds.[203] Today, the plains bison are locally extinct in much of the Great Plains.[204]

The decimation of the prairies did not end with the initial onslaught of colonization in the 19th century; the impacts of prairie habitat loss continue to negatively impact grassland species today. Across 42 identified species, grassland birds declined by 21 percent between the American Breeding Bird Surveys of 1966 and 2013, potentially due to combinations of habitat loss and agricultural practices, such as the use of bird-toxic pesticides, and mechanization that destroys nests.[205] The abundance of butterflies in protected areas of Illinois declined by 53 percent between 1999 and 2018; butterfly species richness declined by 27 percent over the same time period.[206] The decline in butterflies did not correlate to an increase in pesticides for agricultural use; rather, these declines were indicative of habitat homogeneity and fragmentation, as well as climactic shifts and invasive species.[207]

The devastation of the prairies is apparent; the path forward from this destruction is less clear. Pierce notes in her critique of prairie restoration narratives that farmers are often cited as

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[202] Isenberg, A. (2000). *The destruction of the Bison: An environmental history, 1750 – 1920.* Cambridge University Press, 3.
[203] Koucky, R. W. (1983). The buffalo disaster of 1882. *North Dakota History Journal of the North Plains, 50*(1), 29.
[204] Isenberg, A. (2000). *The destruction of the Bison,* 189.
[205]Stanton, R. L., Morrissey, C. A., & Clark, R. G. (2018). Analysis of trends and agricultural drivers of farmland bird declines in North America: A review. *Agriculture, Ecosystems & Environment*, *254*, 244–254.
[206] Kucherov, N. B., et al. (2021). Butterfly declines in protected areas of Illinois: Assessing the influence of two decades of climate and landscape change. *PLOS ONE*, *16*(10), 7.
[207] Kucherov, N. B., et al. (2021). Butterfly declines in protected areas of Illinois, 13.

the villains of the prairie; however, she argues, the histories of agriculture in the Great Plains should not be excluded from restoration plans as aberrations.[208] She notes that

> it is important for anyone undertaking a historical restoration to try to acknowledge as complete a history as possible. It wasn't a frivolity that erased the original prairies, but a need for food and the need to establish an economy of crops. We might want to take issue with the way agriculture has been conducted in this country, but is it necessary to erase that history to restore the prairies?

Pierce's distinction between the loss of the prairies and the simultaneous necessity of large-scale agriculture is valid – farming has an indelible presence in the Midwestern United States, and the impact of prairie restoration on this industry should not be taken for granted. While I contend that this sentiment fails to examine the capital formation processes discussed in Chapter 2, she raises an important critique: the Midwest is not a vacuum waiting to be filled by restored prairies. History did not stop after colonization and Euro-American settlement.

Today, the Midwest produces one-quarter of global corn and soybean supplies.[209] These crops have global implications: soybean farming was the driving cause of Amazon deforestation before a voluntary moratorium on soybean expansion into rainforests.[210] The ricocheting impacts of trade embargos between China (the world's primary soya consumer) and the United States (the primary soya producer, and second in imports to China behind Brazil) could lead to increased Amazon deforestation if the United States decreases their soya exports to China.[211] Corn exports from the United States increased by 103 percent between 2020 and 2021, largely driven by imports to China for feed to rebuild swine herds following disease outbreaks in

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[208] Pierce, C. (1994). The poetics and politics of prairie restoration. In Baldwin, A.D., Jr., de Luce, J., & Pletsch, C. (Eds.), *Beyond preservation: Restoring and inventing landscapes* (229). Regents of the University of Minnesota.

[209] Schulte, L. A. *et al.* (2017, December 12). Prairie strips improve biodiversity and the delivery of multiple ecosystem services from corn-bean croplands. *PNAS, 114*(50), 11247.

[210] Boucher, D., et al. (2011). Soybeans. In *The Root of the Problem: What's driving tropical deforestation today?* (pp. 31–39). Union of Concerned Scientists. 31.

[211] Fuchs, R., et al. (2019). Why the US-China trade war spells disaster for the Amazon. *Nature, 567,* 451-454.

2018.[212] Changes in global grain trades could have impacts on economies and food security, as well as harm vulnerable ecosystems (such as the Amazon) elsewhere in the world.

Beyond the cascading impacts of U.S. grain exports, the intensively farmed soybean and corn fields in the Midwest degrade air, water, and soil quality both regionally and downstream.[213] Agricultural nutrients from fertilizers wash down the Mississippi River into the Gulf of Mexico, causing hypoxic dead zones in the Northern Gulf that have too low of oxygen levels to support marine life.[214] The agriculture industry was also responsible for 5 percent of U.S. greenhouse gas emissions in 2020, and 74 percent of nitrous oxide emissions (the warming equivalent of 316 million metric tons of carbon dioxide).[215] The United States agriculture industry impacts global warming and water systems, beyond its effect on the loss of the prairie ecosystem.

Because of these realities, prairie restoration is necessarily a negotiation between the agriculture industry, and the desire to protect the North American grassland ecosystems for the benefit of the environment, the people who reside on them, and the ecosystem services they provide. In the context that ninety-five percent of the Corn Belt is privately owned, [216] making it challenging to enact large-scale restoration plans, most restoration strategies balance the requirements of both agriculture and the environment. A key example of these negotiations is the "war" between private landowners and the village of Libertyville during the attempts to create the Liberty Prairie Reserve, discussed in Chapter One. In spite of these challenges, prairie

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[212] Good, K. (2022). *2021 U.S. ag exports highest on record, corn the primary contributor.* University of Illinois, Farm Policy News.

[213] Schulte, L. A. *et al.* (2017, December 12). Prairie strips improve biodiversity and the de delivery of multiple ecosystem services from corn-bean croplands. *PNAS, 114*(50), 11247.

[214] Diaz, R. J., & Rosenberg, R. (2008). Spreading dead zones and consequences for marine ecosystems. *Science, 321*(5891), 926–929.

[215] Environmental Protection Agency. (2022). *Executive summary: Inventory of U.S. greenhouse gas emissions and sinks, 1990-2020,* 14.

[216] Tyndall, J. C., et al. (2013). Field-level financial assessment of contour prairie strips for enhancement of environmental quality. *Environmental Management, 52,* 736.

restoration has been underway in various iterations since the 1930s, with varying degrees of success.

Frameworks of environmental organizing: Conservation, restoration and beyond

As I turn from discussing the loss of the prairie to attempts at prairie restoration, it will be useful to establish some of the movements, agendas, and debates that contextualize attitudes towards prairie restoration. First, I will discuss some of the philosophical debates surrounding the function of preservation, conservation, and restoration; then I will provide a broad overview of historical efforts in prairie restoration. This exploration will guide the definition of restoration that I consider in second part of this thesis.

Although it has roots in transcendentalism and romanticism, the American conservation movement officially began during the early twentieth century, by which point the United States realized that the land it had claimed under the guise of manifest destiny was finite.[217] The goal of the early conservation movement was to place natural resources under government regulation, to create efficient resource use plans that would stymie the excesses of the Gilded Age.[218] This utilitarian theory of conservation was later challenged by the environmental movement that began in the 1960s in response to increasing awareness of pollution and its impacts on human health.[219] In the 1980s, a growing grassroots environmental justice movement began to organize around the recognition of the intersections between race, class, and the environment, particularly in terms of exposure to hazardous pollutants.[220] Further, Indigenous environmentalists have consistently advocated for ecological rights (such as to hunting and water), as well as the

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[217] Kline, B. (2011). *First along the river: A brief history of the U.S. environmental movement* (4th Ed.). Rowman & Littlefield, 59.
[218] Kline, B. (2011). *First along the river* (4th Ed.), 61.
[219] Kline, 90.
[220] Rhodes, E. L. (2003). *Environmental justice in America: A new paradigm.* Indiana University Press, 6.

protection of their land from threats like oil pipelines and mining.[221] These are a sampling of the movements that have shaped the American environmental conscious, impacting strategies and attitudes towards prairie protection.

One of the primary ideological divides that American environmental movements have had to reckon is the balance between preservation and restoration. As defined above, conservationists advocate for a utilitarian approach to environmental management. Preservationists in the school of famed environmentalist Aldo Leopold reject utilitarian management under the assumption that human manipulation compromises ecosystem functioning, and therefore should be avoided.[222] A critique of preservation is that it often assumes that a static and pristine nature exists, and therefore can be frozen in a preserved state and left beyond the reaches of human interference.[223] This is problematic in several ways: first, nature is not static, but is "volatile and dynamic" and therefore not capable of being perfectly preserved; second, it assumes that humans and 'nature' are not only separate, but diametrically opposed forces; it ignores the role that Indigenous peoples had in constructing the landscapes Euro-American settlers experienced as 'pristine'; and finally, it emerged as a response to modernity at the turn of the twentieth century.[224]

Restoration provides a third framework for ecological management. The Society for Ecological Restoration initially defined restoration as the effort to restore community composition, as well as ecosystem structure and processes, to a pre-disturbance or historic

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[221] Whyte, K. P. (2018). The Dakota Access Pipeline, environmental injustice, and US settler colonialism. In C. Miller & J. Crane (Eds.), *The nature of hope: Grassroots organizing, environmental justice, and political change* (pp. 320–338). University Press of Colorado.

[222] Norton, B. G. (1986). Conservation and preservation: A conceptual rehabilitation. *Environmental Ethics, 8,* 212.

[223] Baldwin, A.D., Jr., de Luce, J., & Pletsch, C. (1994). Introduction: Ecological preservation versus restoration and invention. In Baldwin, A.D., Jr., de Luce, J., & Pletsch, C. (Eds.), *Beyond preservation: Restoring and inventing landscapes* (5). Regents of the University of Minnesota.

[224] Stanley, G. S. (1994). Restoration or preservation? Reflections on a clash of environmental philosophies. In Baldwin, A.D., Jr., de Luce, J., & Pletsch, C. (Eds.), *Beyond preservation: Restoring and inventing landscapes* (72). Regents of the University of Minnesota.

level.[225] A critique on the concept of historical recreation of a past environment is that these processes require "selection and interpretation" of pieces of the past,[226] often by groups with the most social capital. In *Beyond Preservation,* Pierce begs the question, "what do restorations restore to us? Certainly not the past… nothing is restored."[227] Allison notes in *Ecological restoration and environmental change: Renewing damaged ecosystems* that because restoration is necessarily the product of human agency and choices, from where to restore to what restoration methods are used, it is impossible to recreate the pre-human-disturbance ecosystem.[228] Restoration is a form of disturbance within itself. He argues that this does not mean restoration should not be attempted, but that this awareness should inform how cultural priorities and knowledge impact restoration outcomes.[229]

Alternate frameworks to the Society for Ecological Restoration definition includes reconciliation ecology, which "involves its practitioners in actively shaping (or reshaping) the natural world, creating (or re-creating) communities of species that can live together in an ongoing, self-sustaining way."[230] This attempts to reject the dualism of humanity-nature, instead proposing that "nature and humanity are… interdependent, and as a consequence their proper relation is cooperative, not adversarial. When each carries out its own proper functions, they work together to produce results that are wholesome and beneficial to both."[231] Reconciliation

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[225] Holl, K. (2020). *Primer of ecological restoration.* Island Press & The Society for Ecological Restoration, 7.
[226] Pierce, C. (1994). The poetics and politics of prairie restoration. In Baldwin, A.D., Jr., de Luce, J., & Pletsch, C. (Eds.), *Beyond preservation: Restoring and inventing landscapes* (pp. 226-233). Regents of the University of Minnesota, 227.
[227] Pierce, C. (1994). The poetics and politics of prairie preservation, in *Beyond preservation*, 227.
[228] Allison, S. K. (2012). *Ecological restoration and environmental change: Renewing damaged ecosystems.* Taylor & Francis Group, 7.
[229] Allison, S. K. (2012). *Ecological restoration and environmental change,* 19.
[230] Baldwin, A.D., Jr., de Luce, J., & Pletsch, C. (1994). Introduction: Ecological preservation versus restoration and invention. In Baldwin, A.D., Jr., de Luce, J., & Pletsch, C. (Eds.), *Beyond preservation: Restoring and inventing landscapes* (5). Regents of the University of Minnesota.
[231] Stanley, G. S. (1994). Restoration or preservation? Reflections on a clash of environmental philosophies. In Baldwin, A.D., Jr., de Luce, J., & Pletsch, C. (Eds.), *Beyond preservation: Restoring and inventing landscapes* (72). Regents of the University of Minnesota, 72.

ecology attempts to reject the dualistic assumptions of humanity and nature, instead opting to approach ecosystem restoration with an attitude of hybridity.[232]

Yet another approach to restoration relies on the concept of ecosystem dynamics. This approach departs from the earlier theories of ecosystem restoration where the culmination of the process was for the systems to reach a single, ideally restored state.[233] Instead, ecosystem dynamics theorizes that ecosystems behave stochastically (with a level of randomness) and have multiple stable states.[234] Other guiding concepts include that there are change thresholds and feedback loops that impede efforts to restore ecosystems when restorationists fail to account for interactions both within the ecosystem itself, and between adjacent ecosystems.[235] The ecosystem dynamics school of restoration attempts to ameliorate human restoration choices with the unpredictable, and to some extent unknowable, behavior of ecosystems.

Finally, restoration is necessarily a goal-oriented field, with the desired outcome being a healthier ecosystem (although, as I discussed above, there are several interpretations of what this could look like). Suding et al. evaluates that the goals of restoration should be to use scientific and historical knowledge to restore ecological integrity that is sustainable in the long-term, and benefits and engages society.[236] Anderson's survey of past prairie restoration projects summarizes that to achieve these goals, prairie restorations need to have four fundamental elements: a vision or goal for the restored ecosystem, an understanding of the science of the system's ecological processes, knowledge of the required restoration and management skills, and

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[232] Kidwell, J. (2016). Hybrid Encounters in Reconciliation Ecology. *Worldviews*, *20*(3), 238–250.
[233] Suding, K. N. & Hobbs, R. J. (2009). Models of ecosystem dynamics as frameworks for restoration ecology. In Hobbs, R. J. & Suding, K. N. (eds.), *New models for ecosystem dynamics and restoration*. Island Press & the Society for Ecological Restoration, 6.
[234] Suding, K. N. & Hobbs, R. J. (2009). Models of ecosystem dynamics as frameworks for restoration ecology, in *New models for ecosystem dynamics and restoration*, 8.
[235] Suding, & Hobbs, 13.
[236] Suding, K. N., et al. (2015). Committing to ecological restoration. *Science, 348*(6235), 638-640.

public support for the project.[237] Each of the aforementioned restoration frameworks approach these requirements differently, and each has strengths in addressing the goals. While the Society for Ecological Restoration's framework prioritizes the vision for the restored environment, the dynamic ecosystem theory informs the scientific knowledge of how that environment functions. Finally, the idea of reconciliation ecology offers a framework to incorporate public support and human interests into the restoration plan.

Building off of these theories of restoration, I will now examine the final requirement that Anderson identifies for successful prairie restoration: a knowledge of restoration and management skills. Although there are many valid critiques of restoration, some of which I explore in this section, restoration remains the dominant narrative of prairie organizing and science in the twenty-first century. I identify the cause for this dominance in the roots of the prairie ecology field. Early prairie scientists such as Charles Bessey, Frederic Clements, and James Weaver were motivated to study prairies because they had witnessed the destruction of these landscapes as children.[238] Prairie science was established in response to an ecological crisis, which reflects the realities of restoration as a crisis discipline.[239] Further, the fundamental commonality between all of the restoration frameworks discussed in this thesis is that they begin with an ecosystem that is degraded, typically by human activity. The North American prairies certainly fit this description, as up to 99.9 percent of the original ecosystem has been decimated by colonial agriculture and settlement structures. [240] Therefore, restoration provides a starting point to ameliorate a tragedy of a scale so broad that there is no clear place to begin. Because of

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[237] Anderson, R. C. (2009). History and Progress of Ecological Restoration in Tallgrass Prairie. *Illinois Natural History Survey Special Publication, 30,* 1.
[238] Kingsland, S. E. (2005). *The evolution of American ecology, 1890-2000.* Johns Hopkins University Press, 152.
[239] Allison, S. K. (2012). *Ecological restoration and environmental change: Renewing damaged ecosystems.* Taylor & Francis Group, 18.
[240] Sampson, F. & Knopf, F. (1994). Prairie conservation in North America. *Bioscience, 44*(6), 418.

these shared attributes between restoration and prairie ecologies, restoration is the framework I will use as I move forward with this thesis.

Historic efforts in preservation and restoration

The first efforts to restore the North American prairies began in the 1930s and 1940s, following the devastation of the Dust Bowl.[241] Intensive agricultural practices were already causing the loss of five billion tons of soil annually due to erosion; in the 1930s, a series of windstorms compounded the impacts of lending policies that encouraged intensive agriculture and the subsequent proliferation of plows to decimate the region's farms and displace three million people.[242] In response to the economic destruction of the U.S. agricultural economy, the Roosevelt Administration began some ill-informed efforts to restore the soils of the Great Plains. Without realizing that prairie soils are fed by prairie vegetation, the Civilian Conservation Corps ran a program from 1938 to 1941 to control wind erosion by introducing wind-block trees, which further disrupted the delicate balance of fire disturbance that had for centuries abated the forests neighboring the region.[243]

Even worse, during the same era the USDA Soil Conservation Service began seeding rangelands with "an exotic, crested wheat grass imported from Siberia."[244] A new arrival to the North American prairies, this grass spread ferociously, and is still an ecological threat nearly a century later. The Soil Conservation Service at this time also set aside 11.3 million acres of prairie; however, the goal was not restoration, but to preserve that land for human industry. For better or for worse, during this first era of U.S. prairie restoration efforts, "most conservationists

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[241] Smith, D. (2010). Prairie management. In Smith, D., Williams, D., Houseal, G. & Henderson, K. (Eds.), *The Tallgrass Prairie Center guide to prairie restoration in the upper Midwest* (135). University of Iowa Press.
[242] Montgomery, D.R. (2007). *Dirt: The erosion of civilizations*. University of California Press, 151-152.
[243] Sampson, F. & Knopf, F. (1994). Prairie conservation in North America. *Bioscience*, *44*(6), 420.
[244] Sampson, F. & Knopf, F. (1994). Prairie conservation in North America, 420.

believed that management was unnecessary," assuming that secondary succession would naturally follow initial seeding; therefore, most of these initial efforts were not lasting (excluding the introduction of non-native species).[245]

Concurrently to the federal prairie restoration programs in response to the Dust Bowl, the University of Wisconsin planted the first major prairie restoration in the Curtis Arboretum in 1934, which is still managed for restoration today.[246] Initially, university workers collected pieces of remnant prairie sod and planted them in the bluegrass that dominated the site after it was converted from row cropping to horse pasture, with limited preparation of the plot. This initial restoration attempt ended in 1940, but after collecting copious data on Wisconsin prairie remnants, site planting and monitoring began again in 1951. One of the most important contributions of the Curtis Prairie was that it was the first restoration project to use fire management, beginning in 1950.[247]

Building off the example of these early initiatives, interest in prairie restoration increased in the 1960s, as prairies began to be valued for landscape aesthetics, roadside cover, and forage; these projects primarily focused on establishing prairie plant communities, with little attention given to other organisms.[248] The field began to consider other organisms in the 1980s, including fungi, burrowing mammals, and invertebrates; however, each group was typically studied in isolation, with few comprehensive studies.[249] I begin my analysis of current restoration strategies from this juncture, analyzing how twenty-first century methodologies depart from, and continue the legacy of, the first prairie restoration attempts.

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[245] Smith, D. (2010). Prairie management, 135.
[246] Anderson, R. C. (2009). History and progress of ecological restoration in tallgrass prairie. *Illinois Natural History Survey Special Publication, 30*, 3.
[247] Anderson, R. C. (2009), History and Progress, 4.
[248] Anderson, 4.
[249] Anderson, 6.

Incorporating prairies and agriculture: Prairie strips

Because of the prevalence of private land ownership and commercial agriculture in the Midwest, most current prairie restoration involves replanting islands of prairie vegetation in between agricultural fields, on the sides of roads, or in other out-of-the way locations. The agency that legislates prairie restoration on a federal level is the Conservation Reserve Program (CRP) of the Farm Service Agency, a subsidiary of the U.S. Department of Agriculture. The CLEAR (Clean Lakes, Estuaries and Rivers) Initiative of 2018 is the current policy that includes provisions for prairie restoration.[250] The goals of CLEAR are to decrease erosion, and to improve water quality and wildlife habitat. Similarly to the federal grassland restoration policies of the New Deal era, this legislation largely exists to maintain the ecosystem services that benefit agriculture. This Initiative includes provisions for contour grass strips (also called prairie strips), stipulating that strips of "diverse perennial vegetation" of 30-120 feet in width should be planted in linear rows "within row crop fields." The goal is that these strips would reintroduce prairie vegetation in such a way as to not seriously disrupt agriculture, but still introduce the benefits that prairie biodiversity can offer in terms of ecosystem services (including increased pollinators, healthy soil, and decreased water and nutrient runoff).

In return, the CRP will provide 10-15 years of annual rent payments, payments of up to 50 percent for strip establishment, a 5 percent practice incentive payment, and a sign up incentive.[251] Finances are an important component of encouraging widespread adoption of prairie restoration, given the farming economy of the Corn Belt, where land is managed as intensively

[250] Farm Service Agency Conservation Reserve Program. (2019, December). *Clean Lakes, Estuaries and Rivers (CLEAR) Initiative.* United States Department of Agriculture.
[251] Farm Service Agency Conservation Reserve Program. (2019, December). *Clean Lakes, Estuaries and Rivers (CLEAR) Initiative.* United States Department of Agriculture.

as is profitable. Therefore, a key attribute of prairie strips is that they optimize the relationship between amount of land-use change required to benefit received.[252]

The main costs of implementing prairie strips are outlined by Tyndall et al. as follows: "(1) site preparation costs, (2) prairie strip establishment costs, (3) annual and periodic management costs, (4) relevant annual opportunity costs." When evaluating the upfront costs in isolation, they look daunting, costing around 6510 to 9490 USD per hectare over a 15-year period, depending on the quality of farm land converted.[253] In spite of these overhead costs, the ecosystem services and environmental benefits accrued from installing prairie strips are 8.60 USD for every dollar invested; if part of the CRP program (with the financial benefits listed above), then the return is 61 USD for every dollar spent.[254] This makes prairie strips "among the least-costly structural best management practices designed to retain sediments and nutrients."[255]

Schulte et al.'s 2017 survey of Iowa farmers found that Iowan farm and nonfarm populations in the state prioritize the benefits that prairie strips provide, particularly valuing improving drinking water quality.[256] Therefore, despite the upfront and management costs for prairie strips, the environmental benefits are valuable enough (at least amongst Iowa farmers) for a favorable view of this restoration measure – even before the CLEAR Initiative was established to offset implementation costs. This is encouraging, particularly when considering that Schulte et. al estimate that 40 percent of row croplands in Iowa are suitable for prairie strips; in addition, 3.9 million hectares (out of 9.8 million total hectares) of row crops in Iowa could benefit from prairie strips' erosion control. So, if prairie strips are effective at doing what they claim to do –

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[252] Tyndall, J. C., Schulte, L. A., Liebman, M. & Helmers, M. (2013). Field-level financial assessment of contour prairie strips for enhancement of environmental quality. *Environmental Management, 52,* 737.
[253] Tyndall, et al. (2013). Field-level financial assessment, 740.
[254] Tyndall, et al., 743.
[255] Tyndall, et. al, 741.
[256] Schulte, L. A. *et al.* (2017, December 12). Prairie strips improve biodiversity and the delivery of multiple ecosystem services from corn-bean croplands. *PNAS, 114*(50), 11249.

increasing biodiversity, water retention, and improving soil health – they appear to be a potent opportunity for prairie restoration, even within the agricultural industry of the Midwest.

Fortunately, recent studies have found that prairie strips are effective measures for restoring the ecosystem services of prairies to agricultural fields. Schulte et al.'s study found that in catchments with prairie strips, native perennial plant cover was 13x higher, and species richness was 7.8x higher, compared to monocrop fields.[257] Compared to the fields without prairie strips, sediment loss was 20x less, phosphorous loss was quartered, and nitrogen content in surface water 3.3x less. And while water runoff was not significantly reduced compared to the row crop fields, insect taxa increased by 2.6x, and pollinator abundance by 3.5x. Birds were also positively impacted, with doubling of species richness (and although conservation-concern birds were positively impacted, bird species that are dependent on large tracts of grassland were not increased by prairie strip implementation).[258]

These successes are resounding; however, there are some areas where prairie strips are less successful. For example, even when different mixes of perennial seeds are planted, restored prairies (in strip form, or otherwise) trend towards C4 grasses within 3 years of restoration, when a balance between C3 and C4 plants is a characteristic of remnant prairies.[259] In Illinois, restored prairies' species richness declined by 50 percent after 15 years (even with fire disturbance). Cahill et al. hypothesizes that this decline in species richness could be due to nitrogen limitation and mycorrhizal facilitation favoring C4 grasses, and the absence of grazers not limiting grass species. Additionally, while active pools of carbon and nitrogen in the soil increase immediately after restoration, the total amounts of carbon and nitrogen (including both active and reserve

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[257] Schulte, L. A. *et al.* (2017, December 12). Prairie strips improve biodiversity and the delivery of multiple ecosystem services from corn-bean croplands. *PNAS, 114*(50), 11248.
[258] Schulte, L. A. *et al.* (2017, December 12). Prairie strips improve biodiversity, 11248.
[259] Camill, P. et al. (2004). Community- and ecosystem-level changes in a species-rich tallgrass prairie restoration. *Ecological Applications, 14*(6), 6189.

pools) in the soil are slow to increase even 10 years after restoration.[260] Both species richness and low total carbon and nitrogen indicate that soil health is not adequately restored by simply reseeding agricultural land with prairie vegetation.

One of the primary challenges of prairie strips is that they are fragmented landscapes. Collinge defines a fragmented landscape as "a particular spatial process of land conversion" which "refers to breaking a whole into smaller pieces."[261] This makes prairie strips vulnerable to disturbances that could harm the ecosystem. Prairie strips are often narrow and long, maximizing exposed. Much of the habitat is on the edge of restored prairie and row crops. This means that the edge effect – shifts in ecological and biophysical patterns on the border between two adjacent ecosystems – is very prevalent for prairie strips.[262] This phenomenon will be explored further in the second part of my thesis; for now, the excessive edge and isolation of prairie fragments leaves them vulnerable to "invasive species, sedimentation, reduced genetic vigor, herbicide drift, nutrient overload, air pollutants… and human disturbances" that cannot be mediated by migration of species from other prairie fragments, because they are so few and far between.[263]

Another element that impacts the efficacy of prairie restoration projects is time. Sampson & Knopf found that prairie restoration takes place on the scale of centuries due to the excessive degradation of many prairie ecosystems.[264] Wide-sweeping effects are unlikely to take place on isolated fragments in small spatial and short temporal scales, such as with prairie strips. In addition, many prairie-restoration programs (including the CRP) do not include stipulations for

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[260] Camill, P. et al. (2004). Community- and ecosystem-level changes in a species-rich tallgrass prairie restoration. *Ecological Applications, 14*(6), 6191.
[261] Collinge, S. K. (2009). *Ecology of fragmented landscapes*. The Johns Hopkins University Press, 3-5.
[262] Fonesca, C. R. & Joner, F. (2007). Two-sided edge effect studies and the restoration of endangered ecosystems. *Restoration Ecology, 15*(4), 613.
[263] Smith, D. (2010). Prairie management. In Smith, D., Williams, D., Houseal, G. & Henderson, K. (Eds.), *The Tallgrass Prairie Center guide to prairie restoration in the upper Midwest* (134). University of Iowa Press.
[264] Sampson, F. & Knopf, F. (1994). Prairie conservation in North America. *Bioscience, 44*(6), 418.

managing restored prairies once they are implemented. The main goal of prairie management is to "maintain a diverse prairie community capable of responding to environmental changes."[265] Prescribed burns, haying, grazing, selective mowing, woody species removal, and herbicide application are all methods that prairie managers can use to mimic the reciprocal balance between disturbance and vegetation that would be present in a healthy and sweeping prairie ecosystem.[266] Barriers to management include funding, personnel, and lack of knowledge about prairie ecosystems.[267]

Prairie strips are a solution to the loss of the prairie ecosystem, but require careful management decisions to maximize their benefit and resilience. They are the result of a nearly century-long negotiation between colonization, extractive agriculture, livelihoods, the national economy, ecosystem services, and the health of the prairie ecosystem. Such a meld of history, politics, and national identity is unlikely to have a clean answer. While this is frustrating, it is not an excuse to give up; the limited prairie restoration that is already in progress is a starting point for greater systemic changes to come.

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[265] Smith, D. (2010). Prairie management. In Smith, D., Williams, D., Houseal, G. & Henderson, K. (Eds.), *The Tallgrass Prairie Center guide to prairie restoration in the upper Midwest* (134). University of Iowa Press, 135.
[266] Smith, D. (2010). Prairie management, in *Tallgrass Prairie Center guide*, 136.
[267] Smith, 135.

A restoration case study: The Liberty Prairie Reserve

I conducted the field work for my thesis on the Liberty Prairie Reserve, a 5,000-acre reserve located in Lake County, Illinois that contains the Casey family farm. The stated goals of the Reserve are to

> create a model Reserve of exceptional land, water, and biodiversity health where public and private landowners manage their land in ways that sustain people, plants, and wildlife. We envision people restoring, enhancing, and enjoying the Reserve's rich array of natural areas. Additionally, the Reserve's agricultural values and heritage will be celebrated and continued in ways that support clean water, healthy soils, and diverse agricultural products and food.[268]

Liberty Prairie has been managed to meet these goals since 1991, and encompasses 3400 acres of protected land, as well as residential neighborhoods and 800 acres of farms (Figure 4.1).[269] This project was funded by 100 million USD of public and private money and is managed by several agencies including the Libertyville Township Open Space Commission, Lake County Forest

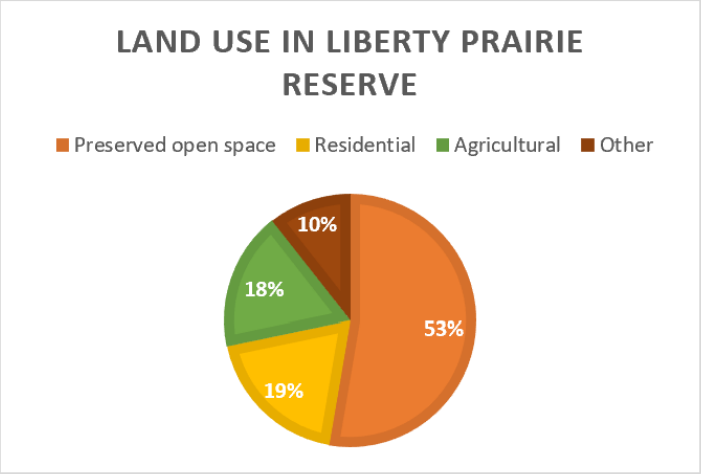

Figure 4.1. The distribution of land uses in the Liberty Prairie Reserve. Data is from Conserve Lake County's Liberty Prairie Reserve Master Plan.

[268] Conserve Lake County (2013). *Liberty Prairie Reserve master plan*. Chicago Metropolitan Agency for Planning, 8.

Preserve, and the Illinois Department of Natural Resources.[270] Within the Liberty Prairie Reserve there are rare sedge meadow and fen ecosystems, as well as wet prairies that have been carefully restored and managed over a period of 15 years.[271] The main challenges of ecological management of the prairie include genetic isolation, invasive species, and stream erosion; these are similar to the challenges to prairie strips that are described in the previous section.

Figure 4.2. (Upper left). Corn fields, prairies and infrastructure interact in the Liberty Prairie Reserve.

Figure 4.3.(Lower left). A bike path traverses prairie strips, tree stands, and corn fields.

Figure 4.4. (Right). A sign entering the Reserve.

All photos by Anna Burns.

[270] Conserve Lake County (2013). Liberty Prairie Reserve master plan, 16.
[271] Conserve Lake County, 26.

The Liberty Prairie provides a restoration of the prairie that incorporates residential and agricultural land use into its stated goals. The Liberty Prairie Commission is not interested in building a prairie museum; instead, they are constructing a prairie landscape for people to interact with, as is exemplified by the 12 miles of trails that run through it (Figure 4.3).[272] Additionally, it takes care to incorporate the land's historical agriculture use into its strategy by addressing agricultural production goals and encouraging food production that complements the ecological initiatives in the protected areas, such as biologically based farming practices and sustainable food production (Table 4.1).

Ecological	Agricultural
Expand and connect core habitat areas (woodlands, wetlands, and prairie) within the Reserve	Increase soil organic matter and reduce erosion across all agricultural land within the Reserve
Collect baseline data and monitor the results of restoration activities	Explore arrangements with longer term leases that help to manage cost and risk for tenants
Encourage participation in the Conservation@Home program for sustainable landscaping on developed properties within the Reserve	Consider the conversion of agricultural land that has highly erodible or hydric soils to core natural areas
Control soil erosion	Investigate the use of performance standards and lease terms to encourage better land management practices
Develop a cooperative plan for controlled burning	Encourage farmers and farmland owners to convert operations to be more complementary to the Reserve natural areas, which may include biologically based farming practices, sustainable food production, pasturing livestock, and other products and production methods
Develop an integrated pest management program for invasive pests	
Using the suggestions below as a foundation, develop detailed, site specific management recommendations for land and water resources	

Table 4.1. The management goals of the Liberty Prairie Reserve. Ecological management goals are from Conserve Lake County's Liberty Prairie Reserve Master Plan, pp. 59-60; agricultural management goals are from Conserve Lake County, 65-68.

[272] Conserve Lake County (2013). *Liberty Prairie Reserve master plan*. Chicago Metropolitan Agency for Planning, 46.

Conserve Lake County's *Liberty Prairie Reserve master plan* also includes descriptions for involving the surrounding communities in the restored prairie. Their management goals are to expand the Conservation@Home program, which encourages nearby homeowners to incorporate prairie flora in their yards to increase the number of prairie patches in the surrounding area.[273] Its 12-mile trail system connects to the Des Plaines River Trail (which traverses from south of Chicago up to the Wisconsin border), and the Reserve is accessible both by major roads (IL Routes 45, 83, and 21) and regional rail systems (Metra Milwaukee District North).[274]

Some of the primary ecological management goals that the Reserve wants to improve include soil erosion control, burning and integrated pest management, and site-specific operations based on increased data collection.[275] I hope that the second part of my thesis, which concerns an evaluation of soil microbial abundance in prairie restorations within the Reserve, will contribute to the data collection and soil management recommendations that are identified as concerns within the twenty-year plan.

[273] Conserve Lake County (2013). *Liberty Prairie Reserve master plan*. Chicago Metropolitan Agency for Planning, 10.
[274] Conserve Lake County (2013). *Liberty Prairie Reserve master plan*, 49.
[275] Conserve Lake Count, 59-60.

Conclusion

These four thesis chapters are the product of my efforts in the Fall 2022 semester to understand what historical and ecological forces created the environment that I have observed for the past ten years in Libertyville, Illinois. From the micro-scale local Indigenous and settler histories that I begin with in the first chapter, to the broad-scale economic and political forces that created the Midwestern Corn Belt, my analysis of the land history around the Liberty Prairie will inform the soil conditions that I explore in the second half of my thesis. I follow these histories with a study of prairie ecology, loss, and renewal through the third and fourth chapters, setting the scene for my own soil restoration analysis.

While this thesis stands independently as a land history study, I wrote it to complement my ecological analysis from the Spring 2022 semester. To pursue my initial questions of how prairie restoration efforts in the Liberty Prairie influence soil microbial communities, I collected soil samples from the Reserve in July of 2022. I then extracted DNA from these samples, and sent them to a lab for 16S rDNA analysis, which informed me about the bacterial diversity present in the soil samples. Finally, I evaluate these results through the lens of the land histories that I develop through this thesis, drawing conclusions on the efficacy of soil microbial restoration in the Liberty Prairie. My second thesis is published under the title “Examining Soil Microbial Diversity in Transition Zones between Corn Fields and Restored Prairie in the Upper Midwest” as a companion piece to this work.

The goal of this thesis is to peel back the layers of narratives that created the landscapes that are familiar throughout much of the country, where sweeping fields of grain beg the question of what was present before cultivation. By balancing the ecologies of prairies and agriculture, I analyzed the contested histories that are the bedrock of the Midwestern United States – the

heartland, the Corn Belt, and the breadbasket. By understanding the Indigenous, colonial, economic and agricultural forces (which of course are not discrete, but blend together in vital ways as discussed in the previous four chapters), I hope that my thesis will forge a path for a prairie atonement, and eventually reconciliation, in Lake County, Illinois.

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