

WHEN THE WATERS CAME

By

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Submitted to the Program in Comparative Media Studies/Writing in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN SCIENCE WRITING  
at the  
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

September 2022

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## ABSTRACT

In March 2019, record-breaking floods swept through the Midwest, leaving cities and farmland razed, broken, and drowned. Hundreds of people were displaced, and millions of acres of agricultural land were submerged. Thousands of livestock died; people reported carcasses floating in the currents. Silos were crushed and stored grains were contaminated, losing seasons of labor in a matter of days. But even when the water receded and returned to the confines of its banks, there was no relief for farmers like Jeremy Mahon and his family. Ranchers and farmers are still struggling, three years and hundreds of thousands of lost dollars later.

As climate change exacerbates weather variability and storm severity, areas like the Midwest are expected to see more, and worse, floods and other disasters. Agriculture is crucial to the region's economic success and residents' livelihoods, so it will be increasingly important to prioritize conservation and adaptation-focused farming practices to ensure the industry's safe continuity. But there's a challenge: for social, cultural, and financial reasons, various people and communities simply don't want to adapt. As disasters intensify, this resistance may be one of our biggest obstacles to successfully preparing for climate change impacts — the worst of which are still to come.

This thesis explores the long-term impacts of the March 2019 floods on agricultural production, specifically in northeast Nebraska. Though the state at large has mostly recovered, small rural towns and farming communities are still dealing with the repercussions. The thesis goes on to explore the question of what holds people back from taking on adaptive farming practices, which is an important question given that climate risk is increasing, that consequences of disasters are long-lasting and severe, as well as immediately damaging, and that farming is as vital as it is to this area.

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## ACKNOWLEDGEMENTS

To the farmers, ranchers, and producers in Nebraska — especially the Ruzicka, Uhlir, and Mahon families — who shared their valuable time with me: I am forever grateful for your patience, stories, and insights. I've learned so much, and I will not soon forget what this experience has meant to me.

To Alan Lightman, who kept me honest to my word count and who made the intimidating task of writing a thesis a thoroughly enjoyable, enlightening, and expansive process. It was a joy to work with you.

To my classmates: Emma, James, Iris, Shel, Grace, Shafaq, Leah — I'm so happy to have been side-by-side with you throughout this year. You have been my favorite part of this program.

To my parents, Jasmin, Tita Meds, Tita Arlene, and Grandpa, for believing in me. To Alison, Tabea, Heather, and Simona, for encouraging me. To Coleman, for loving me. I love you all, with all my heart.

Thank you to Patrick Doyle, Catherine Komp, and Kirsten Menking, for the support in getting me to this program. Your work as journalists and educators has shaped my approach to stories, reporting, and research, and I know that I am better for it.

Thank you to Seth Mnookin, Chris Couch, Shannon Larkin, and the rest of the GPSW teaching team — you have all played a crucial role in helping me stay sane, trust in my abilities, and get closer to fulfilling my dreams. I consider myself unbelievably lucky to have had educators like yourselves in my life.

Thank you to the Kelly-Douglas Fund and the MIT Graduate Program in Science Writing for funding this work.

Thank you to Filipina journalists everywhere, especially in the Philippines. Your pursuit of truth is what inspires me to hold power to account.

This thesis is for my Lola, who passed away two days before Valentine's Day this year. Thank you for teaching me to listen to and care for people's stories. I am here because of you. *Mabal kita.*

## WHEN THE WATERS CAME

Jeremy Mahon has been avoiding his pasture down by the Ponca Creek for three years.

This past September was the first time he set cattle on that small, grassy corner of Verdel, Nebraska — population of 26 — since March 2019. During his last few visits that year, he was collecting and burying the remains of his drowned herd.

He had 55 calf-cow pairs in the field that spring. But one morning, a flood ripped through the valley. All the calves and half the cows were washed away, their bodies crushed beneath and between the chunks of ice. He lost even more of his herd in another pasture.

“It’s amazing what your mind sees going in. It replays the whole visualization of that ice and water,” Jeremy said on a recent winter evening. His memories from that day haunt him.

“I really didn’t want to relive it. Just the amount of life lost — you wish you did stuff different to protect them.”

The rains came on the second Monday in March, but the conditions that would make the 2019 flood so unforgiving had been building all winter. Early that morning, Jeremy watched the Ponca Creek rise out of its banks and spill across the low-lying farmland surrounding his home. The small tributary, which feeds into the Missouri River along the northeastern border of Nebraska, typically winds around the family farms by the water. It had flooded before. But that spring, fed by stormwater and snow melt, the creek would soon swell into rapids much wilder and leave historic damage in its wake.

When Jeremy recounts his experience of what would become known as ‘Great Flood of 2019’ he gets more animated, his typically brusque, even tone rising in pitch and speed. It’s three years post-flood on a safe and dry January night, and he’s wearing a dark sweater with an American flag splayed across the front in camo detail. He scrolls through his phone for photos to illustrate the story — there are many. The pictures convey the chaos while the timestamps track the creek’s rise, but they don’t express the roar of rushing water as it pours past.

“We went from ‘well, it’s gonna be bad’, to ‘oh my God, it’s gonna be really bad’, to it turning into a nightmare,” Jeremy said of the disaster’s unexpected escalation.

Jeremy, his wife Audry Wieman, and their two young kids, Cooper and Nora, live on high ground. Their house straddles the ridgeline between the Ponca Creek to the north and the Niobrara River to the south. But their farmland is spread out, with some pastures and crops on hilltops and some by the water.

The Ponca rose before sunrise. By nine a.m., Jeremy and his brother, Bradley, had moved some of their cattle to higher pastureland. Then, Jeremy decided, they’d help the neighbors move their livestock out of the floodplains, too. He drove his tractor down to Verdel, where water and large ice floes were streaming across the lower, flatter parts of town. A young woman’s house was filling with water, and he was going to help her evacuate. The current got stronger as he approached; at one

point, it lifted his tractor — all 20,000 lbs — and spun him around. After catching his breath, they escaped.

By late afternoon, emergency responders finally arrived. But the water had washed roads away, and responders, new to the area, were disoriented. Jeremy drove his tractor down backroads, leading the EMS teams to their rescue missions. Meanwhile, Bradley found a canoe to help move an elderly woman, her paraplegic daughter, and his own nine-month-old daughter. As they prepared, an ice floe struck the boat and sent it hurtling through the water. They retrieved it and got everyone out, dodging debris.

All of Nebraska and much of the Midwest was flooded that day, leaving cities and farmland razed, broken, and drowned. And it wasn't just the water. The ice atop the Niobrara River measured two feet thick and broke into Ford F-150 sized chunks, careening downriver. When the chunks hit the Spencer Dam, upriver and west of Knox County, it burst open, adding to the swollen rivers. Anything the ice and debris touched was dragged into the river.

The damage was immediate and complete.

Hundreds of people were displaced — some 400 families sought refuge outside of Nebraska — and millions of acres of agricultural land were submerged. Thousands of livestock died; people reported carcasses floating in the currents. Silos were crushed and stored grains were contaminated, losing seasons of labor in a matter of days.

More than 300 Nebraska National Guard members took to helicopters, rescuing people stranded on rooftops as they fought to stay above the waterline. Houses, farms, and bridges collapsed. And by March 14, nearly 350 miles of levees were damaged and nearly 3,300 miles of Nebraskan roads were closed or simply washed away.

In Nebraska alone, the Federal Emergency Management Agency (FEMA) approved \$485 million for public assistance. By comparison, the second most expensive state disaster was the 2011 flood, with FEMA providing \$62 million. But the latest state flood hazard mitigation plan reports that the total cost of the 2019 flood in Nebraska, including damage to infrastructure, crop losses, and cattle losses, was closer to \$1.3 billion.

In an interview with the New York Times, Bryan Tuma, assistant director of Nebraska's Emergency Management Agency (NEMA), said of the damage, "I would describe it as biblical."

But even when the water receded and returned to the confines of its banks, there was no relief for Jeremy and other producers in the area. Ranchers and farmers are still struggling, three years and hundreds of thousands of lost dollars later.

**T**he 2019 floods in the Midwest were record-breaking on all accounts. And though they stand apart as an exceptionally devastating event in that area, they aren't alone in the recent natural disasters that have, with increasing frequency and severity, struck the country. Just the past year holds notable examples: in early February, winter storms froze Texas out of power and caused food, water, and heat shortages. Over the span of two August days, 17 inches of rain fell on Tennessee; the deluge led to deadly flash flooding. And in December, tornadoes tore through the

Midwest and the South — outside the normal bounds of Tornado Alley — and claimed over 100 lives.

Floods are the most frequent and expensive disasters in the country, already accounting for 90% of all US natural disasters. Now, new research shows that they're becoming more common. By 2050, the flooding losses in the US will spike 26%, costing the country \$40.6 billion, up from \$32.1 billion, according to a study from the University of Bristol. These figures usually call to mind images of coastal hurricanes and storm surges, and for good reason. More studies show that severe hurricanes are on the rise; Florida counties can expect a 62% higher flood risk over the next 30 years.

But this threat is also increasing in the country's heartland — and inland flooding costs more than any other severe weather event. Though perhaps best known for tornadoes or the Dust Bowl of the thirties, regions in the Midwest should expect more floods and other disasters.

This progressively unpredictable climate is difficult to anticipate and respond to, for anyone. But for farmers — barely 2% of the country's population, but 25% of Nebraska's workforce — the increasingly variable weather has much more dire consequences for their livelihood and for US food production at large.

Tying any one disaster event to climate change is tricky, though it's known that warmer temperatures create more suitable conditions for storms. The recent, marked increase in the number of disasters makes that connection clearer. And, some climatologists point out, it can be even more telling to ask how climate change is making these events worse.

Even with efforts to reduce carbon emissions, a certain amount of damage from climate change is guaranteed, though it's not yet clear what the exact scope of that damage will be. Knowing this, some scientists and policymakers argue that we should prioritize adaptation-focused actions and strengthen our social and environmental infrastructures against impending changes, not just the problems we see today. But according to the fourth National Climate Assessment, the advent of escalating climate threats has far outpaced our ability to enact meaningful mitigations. In short, adaptive planning is too underutilized and long overdue.

There's another challenge: for social, cultural, and financial reasons, various people and communities across the country simply don't want to adapt. As disasters intensify, this resistance may be one of our biggest obstacles to successfully preparing for climate change impacts — the worst of which are still to come.

Verdigre, Nebraska, over the hill and across the Niobrara River from where Jeremy lives, has a long stretch of a Main Street that runs parallel to the Verdigre River. On a sunny January day, three years out from the flood, Scott Ruzicka is crawling down this street in his pick-up at a cool five miles per hour — for safety, while sending texts on his phone. No other cars are driving, despite it being 9am on a Monday.

“You know how I have that radio show?” Scott asks, holding the phone up to his ear. “We're going to record it right now.”

Every Tuesday morning, Scott records ‘the Happy Herd Moment’, a segment for the local radio. His credentials include a 27-year long history as a feed nutritionist and his phone’s contact list — which has about 2,000 people on it, mostly farmers and producers he advises about nutrition. He makes sure that livestock get all the vitamins they need to stay healthy. It’s a specialized position; an animal’s diet changes throughout its life and farmers need to adjust with them.

It’s nearly calving season, so Scott talks about the nutrition that cows need in their third trimester.

“Guys and gals, like I always say, it starts off as crude protein, then energy, then microbes, then macros, and then our additives,” he says, finishing a spiel that involved a lot of mental math on crude protein to dry matter ratios.

A typical day sees Scott driving around South Dakota and Nebraska, visiting farmers, delivering products, and answering nutrition questions. Today, he’s on the South Dakota side of the river, dropping off salt licks and vitamin supplements. On the way, he describes what the area looked like after the flood: the golf course that was strewn with propane tanks, mattresses, dog beds; a restaurant that was bulldozed by ice; raw edges of riverbanks that used to extend out twenty feet before the water came.

Scott’s not a farmer, but he was impacted all the same. His family has a few animals, and the floodwaters and ice ruined a fence around one of their pastures. It may seem inconsequential, but pastureland is unusable if animals can’t be contained and it’s not good for much besides grazing. Scott fixed their fence at the tail end of 2021 — posts and wiring have been expensive and difficult to find with so much regional demand.

“There were customers that morning I called to ask, ‘are you alive?’ and I didn’t hear back from them for a while,” he says. “I can’t think of anyone who wasn’t affected.”

Nearly all of Nebraska’s 93 counties received presidential disaster declarations, but according to a 2020 NEMA report, the state’s Northeast region and specifically Knox County, where Verdigre is located, was the hardest hit.

Many rural communities were isolated for months, with key access routes shut or washed out. Half hour drives for basic errands became three-hour treks. Going to work or school, getting groceries, buying equipment, checking on farmland — everyone had trouble getting around. And aside from day-to-day tasks, emergencies were more of an emergency.

“You’re 80 miles out from a hospital out here when all these roads are damaged,” Scott says. “It’s scary.”

Scott knows this land. He knows whose cropland has been restored and which places are still struggling. One hayfield he passes just got the trees and debris cleared off this past summer. Others aren’t so lucky.

“That guy used to farm his property all the way to the trees, but now they’ve lost some of that ground,” he says, gesturing out the car window. Large sand piles stick out amongst browned, long-dead stalks. “It’s completely done, they’ll never farm that again.”

The 2019 floods deposited silt and sand everywhere, posing big problems for landowners by the water. Floods already wash away key nutrients in soil and the sand deposits make it even harder to produce anything. Healthy topsoil is precious; a heavy layer of sand reduces the quality and chokes the roots of anything growing. The sooner sand is off, the better the soil can recover.

Jeremy dealt with this on his farm by the Ponca. It's usually good land — fertile and sub-irrigated by the creek. But crop production was worthless in 2019, according to Jeremy, who had to forgo planting 70% of his land after the flood. That year was too muddy and wet, especially with the flooding that continued all summer.

And there was the sand. Jeremy cleared it off as soon as he could, so he's had viable regrowth compared to other producers who didn't. But otherwise, it can take anywhere from five to ten years — some agricultural experts guess twenty — to get back to a normal level of production. For some farmers, the cost ratio of clearing the sand to the potential crop yield simply isn't worth it. Knox County struggled with this; topsoil layers here are worryingly thin.

Jeremy estimates that the flood cost them about \$500,000. The lost livestock and crop revenue, sand removal payments, other repairs to the farm — it was an expensive event, even with the little government support they received. Many people couldn't bear the costs. A few older producers sold their farms and quit. Jeremy and Audry heard more conversations than usual about leaving: people said the flood caused too much financial strain. Scott thinks it wasn't the flood itself that made people leave, just that it was maybe the straw that broke the proverbial, already overworked cattle's back.

"Flooding is a concern just as serious as any other," Scott says, explaining many producers' mentalities towards the flood. Drought and politics can be equally problematic. Farmers work all year to sell their product in a single afternoon — and then budget the next year on a single paycheck. A fixed amount of money leaves little margin for error, much less disaster.

"Farming is hard because you have no idea if you're going to raise money," Scott says. "If you're paid twice a month and gas goes from \$3.30 to \$3.60, you might not be too bothered. You have something coming in. But if you're paid just once a year, then it matters more, because you're budgeting. Everything counts."

Heidi Ruzicka, Scott's wife, sees these problems up close. She's Verdigre's town clerk, which means she's in charge of checking electric meters, running the town's books, paying its bills, and anything else needed to fund a town of 550 people.

"I'm dealing with issues by the minute," she says. While walking into the town office, she asks if it's okay to eat a sandwich as she talks. It's been a busy morning.

Heidi's been overseeing a list of FEMA projects to fix flood damages in town for the past three years, and today she's finally checking off another task. This is the second project completed. There are 16 projects on her list.

The first project was removing a leftover pile of trash from the flood, kept in a parking lot down the street from town hall. Today, they're removing a sand pile near the baseball field. Heidi's had a rough time finding people willing to work this far out.



Just as she's mid-sandwich, the contractor managing the sand removal steps in to give Heidi a quick update. This kind of gig — getting rid of sand where it shouldn't be — is no longer unusual for him.

"I've been pushing sand out all over since the flood," he says. "On farms, on ditches... sometimes you have to go down 18 inches just to get back to the topsoil."

Verdigre has flooded before, but not to this extent. And though she's pushing through, Heidi hasn't trained for this scope of work. There's complex FEMA paperwork to figure out and she must navigate tough decisions around the town's needs. She gets "flustrated" — a word she uses, combining flustered and frustrated — that there's no time to work on bigger response plans when she's constantly putting out fires.

Nebraska has mostly recovered, but progress has been minimal for rural communities like Verdigre that have to fund expensive projects with small-town budgets. A year after the flood, FEMA allotted Nebraska a \$45.8 million grant to sponsor projects that reduce the risk of floods, fires, or other hazards. But the financial distribution process has taken so long that some already-approved projects dropped out or were reattributed to different programs. The state has essentially returned \$11 million in aid back to the federal government and has \$34 million left to spend.

Three years later, Nebraska has spent \$2.2 million on property acquisitions and hazard mitigation projects out of an initial \$45.8 million budget.

**E**mergency managers and disaster researchers say that, on average, it takes ten years for a community to recover after a natural disaster.

Disasters, however, are not beholden to this timeline, and the 2019 floods showed Nebraska the consequence of disasters piling up on each other. In 2018, severe windstorms hit the state hard. Farmers were still recovering from those storms when the floods came.

Chris Schroeder is the community outreach unit supervisor with NEMA and says that the state had never experienced "stresses like this before." The all-encompassing nature of the flood exposed weaknesses and exacerbated issues in Nebraska's preparedness plans. Part of the problem, Schroeder says, was that stakeholders across local, state, and federal levels weren't connected well enough to respond effectively.

"Some of it was simply because there had never been a need prior to that, which is not all together a bad thing," Schroeder said. The historic nature of the flood, after all, created unprecedented needs. "But because of that we're starting from square zero."

NEMA's official position for flood mitigation is that people should move out of the floodplain. It's the main message of various state departments, and John Gassmann, Nebraska's state hazard mitigation officer, sees it as the only permanent solution. Gassmann and his team prioritized FEMA grants to fund property acquisitions and buyouts to move people out of flood-prone areas.

Gassmann does recognize that other mitigation efforts are helpful, and he points to Verdigre as an example of a city that built levees and raised city infrastructure to deal with rising waters. However,

he notes that these changes only provide temporary relief — the increased frequency and high levels of flooding are negating the elevation changes they’ve built in the past.

“Now they’re seeing that it’s insufficient or it’s not a long-term solution,” Gassmann said.

Schroeder says changing systemic government operations can help mitigate disasters, too. Updating building codes ensures that homes are designed to prioritize weather resiliency. Supporting and expanding volunteer-based emergency response teams means more people can answer calls for help. Improving emergency alert systems, establishing relief shelters, and making aid resources more readily available strengthens all communities.

And, both Gassmann and Schroeder stress, it’s crucial that people understand their disaster risk exposure and the kinds of preventative action at their disposal. It clearly takes a long time to recover from extreme weather. If floods are happening more frequently, planning and mitigation measures are the most cost-effective and resiliency-building tools available. Indeed, the National Institute of Building Sciences reports that every \$1 the federal government spends on mitigation saves \$6 in response and recovery. The more disasters and their ensuing consequences pile up on each other, the harder it is to play catch up.

“Some folks may build based on the codes in place now, because they’re written for conditions now,” Gassmann said. “But data is telling us that the flows and annual floods are increasing. So, some of those folks not currently in danger may be in danger in ten or twenty years.”

**M**ost producers aren’t worried about flood risk. The 2019 flood was bad, but many say it was a ‘hundred-year-flood’ in the wake of a ‘perfect storm’.

It started with the snow. Months before the March bomb cyclone, the Nebraskan winter was unusually wet and cold. Record snowfalls covered the state — in some places, the levels were over four times higher than the average accumulation. February 2019 also happened to be one of the coldest Februarys in state history. The below-average temperatures permeated deep into the ground, freezing the soil more than two feet down; this became an impermeable layer with a thick snow cover sitting on top. Then, the temperature spiked. On March 3rd, the high was 8 degrees Fahrenheit — 38 degrees below normal. By March 13th, the high rose to 63 degrees — 12 degrees above normal. With so much rapid snowmelt unable to penetrate the frozen ground, Winter Storm Ulmer, the bomb cyclone that catalyzed the floods, was just the icing on top.

But though many think it’s unlikely this combination of events will strike twice, each of these conditions, for the most part, line up with what Nebraska state climatologist Martha Shulski sees as the impacts that climate change will have on Nebraska and the Midwest region. Climate variability and precipitation intensity will both increase.

“Chances are more likely that we experience flooding,” Shulski said. And the changing climate patterns indicate that flooding will be worse than the area has experienced.

A quick look at the state’s flooding history demonstrates changes are already happening: the destructive flood of 1993 was due to prolonged rainfall over several days. Now, flash floods like the

ones that plagued Nebraska the summer of 2019, are the norm. Even if a flood as big as 2019's might be rare, the cumulative impact of more small-scale flooding presents its own set of challenges.

Experts say that there is a strong link between climate change and heavy rain events in this area of the US. Because floods are influenced by nearby precipitation patterns, rains in Colorado, Wyoming, Montana, and South Dakota also contribute to Nebraska's flood risk.

Just within the state, precipitation is on track to rise between ten and fifteen percent over the winter months. Similarly, the number of heavy rain events is going up; there's been an above average and growing number of two-inch precipitation events since 2005. Nebraska's wettest multi-year period was 2015-2020. This heavy winter precipitation may bring more moisture for winter wheat, but it can also delay summer crop planting and exacerbate drought, since the rainwater doesn't absorb into the soil enough to replenish much needed moisture. Heavy precipitation also causes soil runoff, which reduces water quality and erodes valuable topsoil.

Runoff and sedimentation are some of the biggest problems northeast Nebraska faces, according to state senator Tim Graegert, who has previously worked with the Natural Resources Conservation Services. With more rains and few farmers using cover crops, tons of sediment, literally, stream downhill during storms. The Niobrara River is full of farm runoff, which Graegert says has made the riverbed shallower and more susceptible to dramatic flooding. A raised riverbed means water spills over banks faster and covers a wider expanse.

A study published by science news outlet Carbon Brief compiled data from over 400 studies, each analyzing human influence on extreme weather events. They found that 70% of the extreme weather events were made more likely or more severe due to human-caused climate change.

Climate change in Nebraska impacts more than precipitation. Droughts will start faster and get drier. Temperatures, which are already changing, will reach more dramatic extremes. February, specifically, is expected to get much cooler (it has cooled by about five degrees over the last thirty years).

Heat is where Shulski is really concerned. Regional temperatures are getting hotter overall, and nighttime temperatures are warming twice as fast as the daytime highs are. Right now, Nebraska's summer temperatures average 85 degrees Fahrenheit in July; if global policies are enacted soon, the state's average summer temperature will be 95 degrees by 2080. Without action, it goes to 102 degrees.

Shulski is sure that, by 2050, Nebraskans will be farming in a different climate. (In high-risk scenarios, the climate will more closely resemble southern Kansas.) That means producers can't grow the same crops or rely on the same agricultural practices. It will be harder to anticipate changing weather patterns by referencing historical data.

"You can't expect [current farming practices] to work, because the pace at which things are changing — it's just out of context with what has happened in the past," Shulski said. "That traditional knowledge is not going to apply."

It's a Tuesday evening and Jeremy, his brother Bradley, Audry, and the kids are huddled around a tractor. A belt for the water pump broke, and they need to fix it. Otherwise, the engine can't run. Cooper flits around the adults and alternates between shining a flashlight and passing tools. The temperature, unusually warm earlier, is plummeting quickly. They work fast, fingers stiff in the cold.

"Machinery costs so much," Jeremy said. "We have to fix everything we can."

To Jeremy, three main factors affect farming: machinery and other input costs, land costs (like property taxes), and Mother Nature.

"You've got control over the land and the machines, but Mother Nature — she'll throw you a curveball when you think you got it figured out," Jeremy says. "Mother Nature's the one that you can't control. You can manage it; you can't control it."

That's why Jeremy thinks adaptive practices, like irrigation, are so important. Other practices like rotational planting and cover crops also improve soil health, which reduces flood risk, increases drought resiliency, and helps crop production. Building small dams and terraces on hilly farmland and establishing sediment control basins help deal with erosion. Growing a wider variety of crops will protect farmers in changing climate environments. There are plenty more strategies, and Jeremy's excited to try what he can.

Irrigation mitigates against consequences of drought, which is a fear for many producers and why the Mahons use this practice. They're noticeably progressive for the area; no one else irrigates within a 30-mile radius. Graegert, the state senator from northeast Nebraska, estimates that in western Knox County, fewer than 10% of producers use irrigation.

Most folks out here don't irrigate because of financial costs and, historically, difficulty accessing water. But with modern technology, the Mahons identified the best spot to reach groundwater and dig a deeper well. Irrigation has worked pretty good so far: they're saving money in the long run and after the flood of 2019, the Mahons provided water to their neighbors for months after power outages shut down most people's waterlines.

Jeremy and Bradley, like most farmers, always try to cut unnecessary costs. Unlike most farmers, the brothers are young on the spectrum of who's farming in the US these days. Jeremy is 40 and Bradley is 43. Just 8% of all farmers are under age 35. Even more unusual, Jeremy had practice running the entire farm just a few years out of high school when his parents would travel to Texas during the winters.

The tradition of decision-making authority given only to the oldest members of a farming family plays a big role in the resistance to mitigation and adaptation efforts. Typically, at least here, a family's oldest male farmer is the one running the farm. Younger generations don't take the helm until they're much older. Sometimes, Jeremy says, that exclusion from decision-making is what provokes the exodus of kids leaving the farm. This generational loss affects how families might or might not incorporate mitigation: it's harder for older people to learn about and adapt to new farming practices that younger folks might be more open-minded to.

“[Older] people want control,” Audry says. “You’ll see the 80-year-old dad making all the decisions, the 60-year-old son has made very few decisions, the 40-year-old grandson does the leg work, and the 20-year-old great grandson is the grunt.”

The Mahons stand out here, and not just for their atypical family dynamics, with Jeremy running the farm at a young age. They’re new to the area. Their grandfather came in the 1940s, so the brothers are second generation while most people around here are fifth or sixth generation. In this country, these histories are the foundation of one’s identity, and the Mahons feel it. There’s tension around not being “from here.”

The ostracization is more overt when it comes to farming practices. Their choice to integrate adaptive agricultural techniques doesn’t always garner welcome. They get “ribbed”, Jeremy says, for their new tech and expansion of farmland. He mostly shakes it off, but it’s difficult to discern whether some jabs come from a place of comedy or contempt. Sometimes, he thinks their ‘outsider’ status makes other producers more resentful of the new techniques they try.

Audry says the flood was a momentous enough disaster that it forced people to reassess their operations. Some people saw it as a sign for change.

“They MacGuyver their way through problems,” she says. “They test the waters a little bit more, they try out new practices... They seek out new information and might not commit to everything, but they are trying.”

The other group, Audry says, clings to the tried-and-true practices established by earlier generations. It’s not bad, she says. People want to uphold family customs and figure out their own solutions. They use what they know works.

Jeff Uhlir is one of the Mahon’s neighbors, a few farms south, who has deep generational ties to and love for this land. The first Uhlir came to Knox County in 1870, he says, and this has been home ever since. He’s reluctant to change his farming practices — he wants to run the farm like his family before him.

“My life task is figuring out how to keep the farm and making it work,” he said. “I don’t know how to do anything else. This is where I feel that connection [to my family].”

Jeff thinks there will probably be another flood, but he’s more concerned about property taxes. Costs are rising quickly, and his budget is strapped. There’s no time or financial cushion to plan any longer than three years out. It’s stressful enough to think about buying seed, deciding which land to fertilize, and feeding the herd.

“It’s a hard sell to take land out of production [to try adaptive farming techniques] for the threat of a hundred-year-flood situation,” Jeff said. Maybe if money wasn’t such an issue, he’d have more capacity to prepare for floods, but for now, “it’s not something that happens very often and there’s no history of it.”

Jeremy is friends with Jeff and admires his political lobbying to restructure property taxes. But situations like Jeff’s frustrate him. Choosing to not fortify or improve a farm doesn’t make sense,

Jeremy says, especially if the up-front expenses can be made back quickly with the savings from more efficient operations.

“It’s like my dad said, if you don’t change your practices with the times, you don’t survive,” he says.

Audry agrees with him, but conversations around mitigation are complicated. They go back and forth when trying to understand their neighbors’ different points of view.

“A lot of the ranching and farming just does not want to change,” Jeremy says.

“I think when you feel like you're always managing for loss... you're just trying to control how much you lose. You're not looking to expand, not looking forward to what you can gain,” Audry says, speaking from the point of view of people who resist new practices. “It's tunnel vision. I think that's where the lack of risk-taking comes in.”

Jeremy sighs. “I think some of it is that they don't want to know, deep down,” he says. “They don't want to know or admit that they're wrong, because they've always done it this way. And they just want to complain at the end after the fact. Say it's the cattle's fault.”

Simply saying Nebraska sits in the country’s breadbasket does not convey the profundity of its agricultural history. The roots go deep. This is the top cattle and calf producing state in the country, and the third in corn production. Farmland is over 91% of the state’s land. Farming is 41% of the state’s economy. Farms employ 25% of the state’s working population.

The fourth National Climate Assessment (NCA) groups US states and territories into regions and breaks down the different impacts of climate change in each. Nebraska sits in the southeast corner of the Northern Great Plains and contains nearly a third of the farms in this five-state region.

Given the expected warmer and wetter conditions here, the NCA anticipates several ramifications for food production: more extreme temperature events will hinder pollination and reduce crop yields. Livestock will forage on lower quality grassland. There will be more, and stronger, weeds and invasive species. Crop pests will increase. Plants will bloom on abnormal schedules and disrupt growth cycles.

The US supplies a third of the world’s corn and soybeans and a fifth of the world’s beef and veal. The Northern Great Plains region is crucial to this production and maintaining US food security. The region holds 7% of the country’s farms — about 150,000 — but nearly a quarter of all the land. One out of every four beef cows come from this area. And the region contributes 12.7% of the market value from agricultural products sold in the US, despite containing 1.5% of the country’s population.

There will be serious implications for local and national economies and livelihood if the farming industry in this region falters. As the NCA reports, changing climate, increasing weather variability, and extreme conditions pose threats outside the bounds of what producers have faced in the past. Which is to say — old solutions aren’t enough for these new problems.

Adaptive conservation practices reduce the potency of climate change's impacts, but the price tags on these practices can intimidate producers. Fortunately, financial support exists. One example on the federal level is the Natural Resource Conservation Service. It runs the Environmental Quality Improvement Program (EQUIP), the Conservation Stewardship Program (CSP), and the Conservation Reserve Program (CRP), all of which provide subsidies and grants to farmers who adopt conservation practices. There are opportunities on state and local levels, too: Nebraska's Natural Resources Districts, for example, offer flexible incentive payments for farmers to incorporate sustainable farming techniques.

But even though these structures are designed to ease the cost that is often, some argue, the main limiting factor to change, they are severely underutilized. Some incentive programs for no-till farming or, in some places, irrigation, have become popular, but they are the exception. Tim Graegert, the state senator from northeast Nebraska, says it's partly because to use these funds, farmers must adhere to government-determined farming standards. And that doesn't sit well with folks who have been farming for generations.

"There's this resistance to change," Graegert said. "And a lot of people don't want to be told how to farm."

Chris Schroeder, the community outreach unit supervisor with NEMA, sees this resistance, too. He thinks it's partly fueled by a combination of pride, independence, and concern for how they're perceived socially.

"It goes back to an ingrained mentality of control," Schroeder said. "If things are changing, then everything we've known that has impacted this area for generations, is suddenly inaccurate, invalid, and just out the window. That's tough to reconcile for folks, so they think 'we handled it then, and we'll handle it again.'"

Disaster researcher Samantha Montano writes in her latest book:

**D** *Climate change requires global action, but much of climate adaptation must happen locally. Local knowledge of needs and solutions is essential, and often the authority to mitigate our risks resides at the local level. We need to leverage resources — more than what local communities can come up with on their own. Doing so requires a national movement.*

Graegert recently proposed a bill, now in the final stages of the Nebraskan legislature's approval process, that would empower producers who use adaptive practices successfully to share their results with their peers. It's hard for people like Graegert and Schroeder to recommend actions as government employees, even when they strive to understand individual needs, keep things local, and provide funding. Educating people about new hazards and their solutions, Graegert thinks, leads to more widespread acceptance of these practices. And because this information can be unfamiliar and complex, it's easier to learn about it from other farmers — folks like them.

"Producers trust other producers more than government workers," Graegert said.

Political will is a term often used when invoking the lack thereof, particularly around climate issues. However, it's clear that there are instances where systems already exist to facilitate change — they

may need improvement, to be sure, but they're there. Convincing people to use the system is another story.

It's a hard balance. In a democracy, the responsibility for change does not lie solely in governments deciding the right courses of action. Individual citizens — not just farmers — must also choose to be a part of the solution, not the problem.

But personal will, it would seem, can be just as stubborn a culprit.

**I**t's late at the Mahon household. Various pots and plates are balanced on other pots and plates on the stove burners. The countertop serves as the pantry. There's an avalanche of toys in the corner.

Cooper, the six-year-old, insists on showing a replica of the river system that he dug out behind the house. Audry thinks it's his way of processing the flood.

He bundles up in a puffy jacket and dashes outside, flashlight in hand. Audry yells after him to shut the door, and then he's out in the moonlit Nebraska night. The thin flashlight beam illuminates muddy channels and pools feeding into and out of each other.

He explains why he widened some channels and fortified some of the mini mud dams, crouching at the water's edge. The puddles are frozen over and he gingerly tests a step on a sheet of ice.

"I was just kind of building this to play in," Cooper says. "Then, I thought I'd make a dam out of this."

Cooper says he doesn't think much about the 2019 flood. Mostly, he's excited to start farming. He scampers from his river replica to the family's new side-by-side (a farm vehicle like a fortified golf cart), where he sits in the driver's seat and, teeth chattering, explains all the buttons. He's gotten to drive it nine times, he says proudly, before describing each half-mile-long venture in extreme detail.

It gets cold too soon, so he turns to head back inside. When Cooper pushes the door open, Tug, their golden retriever, leaps up on his chest as a hello. He joyfully chases his own wagging tail and then, suddenly, there's a crash — the Lincoln Log house that Cooper constructed earlier that day is now scattered across the floor. His face falls for the briefest moment and then, with a smile, he shrugs and pushes some of the pieces out of the way.

"It's okay," he says patiently and to no one in particular. "I can build it again. And I'll do it better."



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