Land Report

Number 127, Summer 2020 · The Land Institute

About The Land Institute

MISSION STATEMENT
When people, land and community are as one, all three members prosper; when they relate not as members but as competing interests, all three are exploited. By consulting nature as the source and measure of that membership, The Land Institute seeks to develop an agriculture that will save soil from being lost or poisoned, while promoting a community life at once prosperous and enduring.

OUR WORK
Thousands of new perennial grain plants live year-round at The Land Institute, prototypes we developed in pursuit of a new agriculture that mimics natural ecosystems. Grown in polycultures, perennial crops require less fertilizer, herbicide and pesticide. Their root systems are massive. They manage water better, exchange nutrients more efficiently and hold soil against the erosion of water and wind. This strengthens the plants' resilience to weather extremes, and restores the soil's capacity to hold carbon. Our aim is to make conservation a consequence, not a casualty, of agricultural production.

LAND REPORT
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TO REACH US
The Land Institute
2440 E. Water Well Road,
Salina, KS 67401
phone 785-823-5376
fax 785-823-8728
info@landinstitute.org

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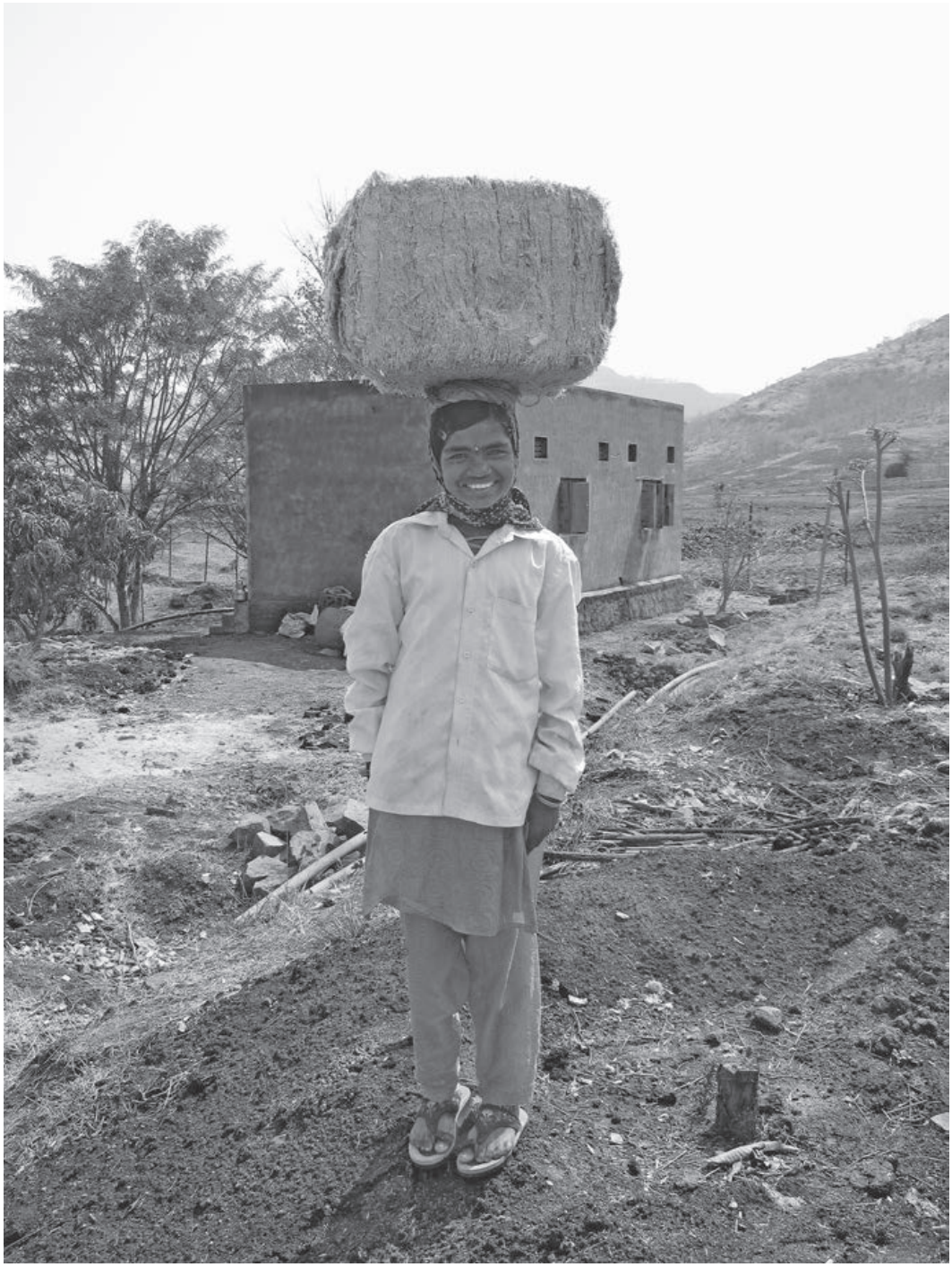
Cover

Edy Chérémond prepares heads of silphium plants for caterpillars of a pest called fall armyworm. Caterpillars were weighed before they went on the blossoms, and again after four days of eating. In another test they were fed silphium leaves. Caterpillar weight gain varied among the plant varieties, maybe depending on plant defenses, maybe on plant nutrients, maybe both. We're trying to sort this out. Ebony Murrell, lead crop protection ecologist, said we're already "one very large step closer" to being able to identify resistant varieties for the silphium breeding program. For more, see page 14.

It looks like a desert, but this field is a mile and a half east of The Land Institute, in central Kansas, during a season of normal precipitation, and five days after rain. Winds up to 45 miles per hour blew soil from land that in mid-May was not yet sown with its annual crops. Drought could've made the loss much worse – but note in foreground the toll of rain. Most wind erosion is by saltation: blown particles bounce along, knocking up other bits and damaging plants. Lighter grains can fly suspended for miles. They might add to soil somewhere

else, but this is far outweighed by the loss to the parent soil: it's left drier, poorer in structure, poorer in nutrients. And the dust pollutes the air, infiltrates buildings, and settles in streams and lakes. The National Soil Erosion Research Laboratory includes these ways to manage wind erosion: leave crop residue on the surface, time tillage well, and plant windbreaks. The first two concern annuals. The last uses perennials, but they are trees, and grown on the margins. What about covering the fields year-round with perennial grains? Scott Bontz photo.



Fossil fuels and contemporary economics have undermined subsistence economies and devalued physical labor. In India's Maharashtra state recently, teen-agers carried bales of sugarcane residue to mulch an orchard of organic mango and custard apple trees. Visiting Westerners had the job of pruning. Scott Bontz photos.

The past and future of sustainability

Economics must be reincorporated with nature, and made beholden to our needs

KATHLEEN R. SMYTHE

We inhabit a planet blessed by lots of solar energy. All of our efforts to harness Earth's resources for our welfare depend on the process of photosynthesis. The unprecedented economic growth and economic policies associated with the last two centuries, the 20th century in particular, was made possible largely from abundant and cheap supplies of fossil fuels – what is essentially stored photosynthesis, available to us only once and not renewable.

With increased use of cheap hydrocarbon energy, economists stopped worrying about the limits of solar flow and of the biophysical world, essentially ignoring energy and turning to social explanations for economic questions. They focused almost exclusively on production and wealth generation. Oil and minerals remain the means by which modern societies add value through labor and capital to produce goods, and our daily lives depend on fossil fuels, either for direct energy use or as embedded energy in our machines and tools. When we write under electric lights, take a warm shower, or cook on a stovetop, we are harnessing energy in quantities that would not be available to us if we relied only on our own labor and photosynthesis.

After the Great Depression, the dominance of Keynesian economics foregrounded employment in economic policy, alongside promoting production. After the 1970s, economic theorists argued that the best possible way to improve the global economy was through policies that favored production, not full employment or fair wages. Wages became disconnected from corporate growth and success, except in the upper ranks of corporate leadership. Non-economic forms of human relationships were eclipsed by a stronger focus on the market, a faith that increased with the fall of communism in the late 1980s. Neoliberal economics asserted that if societies reduced government and encouraged free markets, more people would have more goods and live better lives. This obsession with markets pushed out people as a central concern, and furthered the disconnect of economics from both environment and society. This subordination affected both global North and South, but the past five decades have been marked by divergent paths for the industrialized countries as they accumulated wealth and capital, and the less-industrialized, usually previously colonized countries, as their labor and resources contribute to Northern wealth.

What concerns me most about this turn toward fossil fuels and contemporary economics is the undermining of subsistence economies and devaluing of physical labor, through the guise of reducing poverty. The global North began dividing the world into "rich" and "poor" after

World War 2. President Truman's inaugural address in 1948 – in which he identified the "ancient enemies" of "hunger, misery, and despair" as problems to be overcome – is an oft-cited early public statement of this now dominant belief.

Truman saw technology and international cooperation as means to eradicate global poverty. He invited other countries to pool technological resources to benefit people elsewhere, as "our commerce with other countries expands as they progress industrially and economically". Cheap fossil fuels led to agricultural production up to 1,000 times greater than those for the slash-and-burn agriculture of the tropics, suggesting that hunger could be eradicated. Many believed that economic growth and social welfare could be joined.

Plans for economic development sought to train specialist workers for an urban economy rather than encourage youths to develop multiple capacities necessary for subsistence living, such as building, gardening, sewing, and cooking. Economist Jeffrey Sachs, director of the Center for Sustainable Development at Columbia University and former director of the university's Earth Institute, argued that climbing the ladder of economic development requires increasing wealth per capita. Such development leads to a materially more complex lifestyle that comes with more vulnerability, and sometimes catastrophe, when individuals and societies must rely on the marketplace for most of their needs rather than satisfying them directly through their own labor and local relationships. The ability of individuals to meet some of their own needs is not part of general economic discussions.

The World Trade Organization promotes corporate agriculture, driving farmers off their land, while the World Bank seeks to eradicate poverty – a poverty that is most readily apparent in urban slums, to which failing subsistence farmers typically flee. The WTO's success is also its failure because while there is abundant food for sale, there are also a billion people in poverty. How, when, and if we use the term "poverty" is important if we wish to have a sustainable future.

So-called liberation from hard physical work has consequences that include disengagement and dissatisfaction, diminution of the human spirit, and reduction in employment and meaningful work. People do not necessarily want to be liberated from self-directed work. In fact, most want to be relatively free as they pursue their work – whether that is farming, craftwork, art, or service.

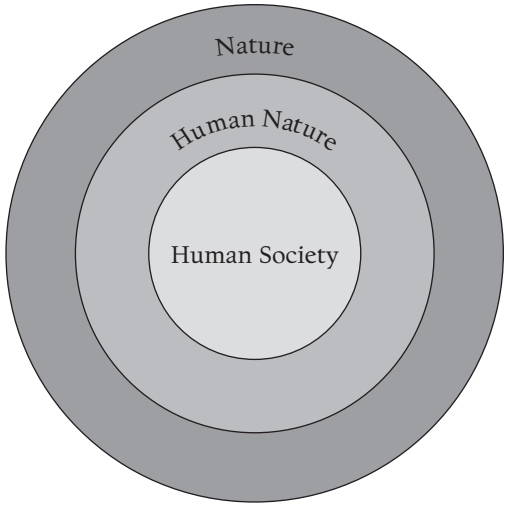
Amid this de-humanizing economics and idea of progress, in the 1980s the UN World Commission on Environment and Development wrote the seminal document for sustainability and sustainable development. The term sustainable development was already used by a number of international organizations, but this popularized it. The report of the Brundtland Commission – as it was commonly known, after its chairperson – recognized that human activities, particularly ones associated with development, were destroying the environment. But poorer people deserved more development, the report concluded. The commission wanted to reintegrate economics, human welfare, and environmental sustainability. But the dominant economic system was not flexible enough to accommodate the holistic thinking necessary. The Brundtland Commission report, later published as the book "Our Common Future", states: "Humanity has the ability to make development sustainable – to ensure that

it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development does imply limits – not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities. But technology and social organization can both be managed and improved to make way for a new era of economic growth. The commission believes that widespread poverty is no longer inevitable. Poverty is not only an evil, but sustainable development requires meeting the basic needs of all and extending to all the opportunity to fulfill their aspirations for a better life. A world in which poverty is endemic will always be prone to ecological and other catastrophes".

The report also calls for "policies that sustain and expand the environmental resource base". The message is that technology will overcome environmental limits for the sake of development. The report concludes that ending material poverty through economic development is the only way to ensure societal sustainability, ignoring that societal vulnerability is due as much, if not more, to investment in endless growth without concern for limits.

The triad of economics, human welfare, and environmental sustainability was created to end economics' longstanding isolation, but instead has reinforced its autonomy. And it is part of a global effort to end subsistence economies and physical labor that benefits people directly. A more successful sustainability model starts with human nature and what people need to thrive, to have meaningful work and meaningful lives.

The lessons from long-term history – rather than short-term fossil fuel history – point to a more sustainable path illustrated by sustainability circles. Here, nature is the holistic foundation of human welfare. Human societies grounded in nature – the hydrosphere, lithosphere, atmosphere, and biosphere – and then in human nature, can promote optimal welfare for all.



Instead of isolating economics from nature or society, the sustainability circles understand economics as part of human society, just like politics, religion, and other human constructs. These circles resemble ecological economics' nesting our economic system within our social systems, and nesting both within the ecosystem. But this one gives special attention to human nature.

First, humans have had, and still have, a spiritual relationship with the natural world. This perspective includes a sense of vulnerability in the face of natural forces, such as hurricanes and tsunamis, as well a sense of wonder and awe, and an inescapable connection to the larger scheme of things. Second, humans have had, and still have, a utilitarian relationship with the natural world because we need the earth's resources for our survival. Third, humans have had, and still have, an intellectual

Nature is the holistic foundation of our welfare. Human societies grounded in nature, and in human nature, can promote the optimal interests of all.

and cultural relationship with the natural world; for both utilitarian and less practical reasons, we seek to understand animal behavior, weather patterns, and countless other aspects of the larger living world. This perspective includes the meaning that people make of the natural world, like the stories we tell about our place within it. Humans live all three of these qualities all at one time.

Both science and philosophy lead us to a humble view of our relationship to nature. E. O. Wilson's term "biophilia" captures the innate emotional attraction between humans and other living organisms as a result of evolution. Henry Beston says in "The Outermost House": "Nature is a part of our humanity, and without some awareness and experience of that divine mystery man ceases to be man." We need nature to make us whole; we are made human by our profound interaction with weather, water, flora, and fauna. Our attraction to bodies of water, large trees, and grassland is likely due to the important role they played for our ancestors for millennia, serving as sources for water and food, protection, and the dominant ecosystem in which humans evolved.

An outward focus, or lack of self-consciousness, can produce positive emotions. Research in many fields indicates that people think better, heal more rapidly, and work more efficiently when connected to other living organisms, both plant and animal. Children with access to nature have more imaginative and social play than kids who play on built structures and asphalt. Humans respond physiologically to nature because we are creatures that evolved in nature. Humans are at their best in relation to others – both human and nonhuman.

Human communities have always been vulnerable, and still are. Devastation like that of the Bahamas by Hurricane Dorian in 2019 reminds us that some forces of nature are so strong that attempts to thwart them are futile; we can do nothing except evacuate beforehand and cope afterward.

We need to accept our human need for, and history of, bodily engagement with the world, including bodily risk. Philosopher David Abram believes technology is a fearful response to our vulnerable natures. He writes in "Becoming Animal": "Indeed, most of this era's transcendent technological visions remain motivated by a fright of the body and its myriad susceptibilities, by a fear of our carnal embedment in a world ultimately beyond our control – by our terror of the very wildness that nourishes and sustains us. We cannot abide our vulnerability, our utter dependence upon a world that can eat us."

Ancient scholars had a strong sense of how important the natural world was to our humanity. According to philosopher Alan Holland, the Stoics, Cynics, and Skeptics all believed life's goal should be ataraxia, or tranquility and freedom from disturbance, which was achieved by "aligning one's aspirations with nature, or with the way the world works". This is in stark contrast to the reigning market culture philosophy of aligning one's aspirations to the human-made world. For Holland, writing in the journal Ethics, Policy, and Environment, a worthwhile life requires us to be alive to the presence "of a sufficiency of meaning and meaningful relationships." He sees the burning question of human existence as: What are we doing here? Not: What is it all worth?

Humans have spent much energy trying to escape their vulnerability. See all the conferences, money, and research devoted to geoengineering our way out of climate change. I embrace my vulnerability to nature. I often choose to walk in the rain,

camp, and bike in it. I go out in all temperatures, including increasingly warm ones, and find most of them refreshing and not nearly as insufferable as the local weather forecasters have led me to believe. I also lead bicycle rides for a history class, encouraging students to be vulnerable. They almost universally embrace the experiences. Without some risk, some reminder amid the comforts of indoor climate control, I find I am less content.

Homo sapiens began as weak, vulnerable animals on a predator-heavy African savanna, and later lived in inhospitable climates in Europe, Asia, and the Americas. We evolved, like all organisms, to make the best use of the natural environment around us to ensure our survival. Millions of years ago, our ancestors' survival depended on their ability to respond quickly to threats. As a species, we still worry more about today's needs than tomorrow's, even as life for many has become more secure.

Humans created civilization from the nature around them. We still do. We eat plants and animals, we use the trees, sand, and rocks for building. We can catalogue and cross-reference information about food using all our senses. The well-preserved bones of early Iron Age humans reveal that they ate 60 plant species. "Multiply that number through the seasons and across the animal kingdom, and some appreciation for that human's catalogue of sensual clues begins to accrue", Richard Manning writes in "Against the Grain".

In our very existence are sown the seeds of environmental use and possible abuse, which has intensified dramatically over the past 300 years, as we alter the face of the earth. The utilitarian perspective alone will not to lead to a more sustainable existence.

Human response to natural forces has been largely technological. Yet there is much evidence, starting with the evolution of communication and writing, that cultural ideas and norms are inextricably bound with nature. The chief mechanism for meaning-making is human language, and this arose from the natural world. As Abram explains: "Oral language gusts through us – our sounded phrases borne by the same air that nourishes the cedars and swells the cumulus clouds. … Whether sounded on the tongue, printed on the page, or shimmering on the screen, language's primary gift is not to re-present the world around us, but to call ourselves into the vital presence of that world – and into deep and attentive presence with one another." As human communities moved toward writing, they moved away from the natural world that had served as the crucible of their communication. With writing, language came to be seen as a human creation, independent of earthly context.

Humans are storytelling creatures. In the journal Studies in the Literary Imagination, Jerry Hoeg says this evolved by natural selection to regulate how people relate to one another, and how society relates to environment, regulating its use. Children from the age of six on typically have this narrative capacity. Humans use all kinds of living organisms as sources of metaphor, myth, and modeling. How societies achieve a balance with other organisms includes hunting rituals and taboos against eating certain animals. East Africans have oral traditions about elephants as protectors that signal rain. Elephants provide a cultural template for human families in these communities because in stories the animals have grandparents with long memories and the capacity to weep and mourn.

Landscape is not just something to be

regulated. It can regulate us. In "Wisdom Sits in Places", anthropologist Keith Basso describes the culture of the Western Apache, where human beings needed history of experiences on the landscape to guide their personal growth and maintain the society. "[P]lace-making is a universal tool of the historical imagination" he writes. "And in some societies at least, if not in the great majority, it is surely among the most basic tools of all." He tells how elders use place names to help a distraught younger person recover emotionally and socially, often evoking a string of place names that conjure associated stories and morals. A single utterance can perform multiple tasks: heal a wounded spirit, display tactful attention to a particular behavior, and affirm traditional values. Basso observes that while "grandmothers and uncles must perish … the landscape endures, and for this the Apache people are grateful."

The Luo of Western Kenya along Lake Victoria strive for a life of indebtedness – even debts that they will never repay in their lifetimes. In "The Nature of Entrustment", anthropologist Parker Shipton says, "A life in which all debts were settled would be a frozen life of atomized individuals – no life at all." This is not overspending a credit card and then seeking bankruptcy through a legal process. It is cultivation of relationships of give and take that ensure connectedness for a lifetime and beyond – so that one's welfare is tied up in that of another. Shipton describes this kind of relationship: "Loans are the elastic in economic life, stretching labor and capital over land, stretching food over the season, stretching income over a lifetime." He calls these entrustments. "They are also about defining who we are, and about connecting to something bigger than ourselves."

In Western history, the land mortgage became increasingly common after the 16th century. Such loans imply that land is bounded and separate from the people on it. In most of rural Africa, land is bound to people and more than one person can claim interest in any given piece of land for reasons of social security. Commoditizing land is insanely risky for farmers in areas with unreliable rains and uncertain markets. Mortgaging might make sense in an industrial economy with sufficient wage employment. But Kenya has neither. Despite more than 60 years of exposure to land titling and mortgaging, most Luo are reluctant to mortgage their land. They see it as unnatural and unfair.

In the Luo approach to land, all three biophilic attributes are demonstrated – material, cultural, and spiritual. Land belongs to both ancestors and future family members. Lineages lay claims to land for both the dead and unborn. Burial sites are important spiritual resources. People are bound to the land.

The news, whether political, economic or ecological, can be depressing. Often this is because it is so narrowly conceived and delivered. Acting and living from our biophilia, our interdependence – or, as Aubrey Streit Krug has written here, our reciprocal healing relationship with the Earth – is broad and real. Such an approach has provided me with some capacity to resist poisonous dominant ways of being and, thus, find meaning. Collectively, it could promote optimal welfare of people and planet.

Adapted from Kathleen Smythe's upcoming book, "Whole Earth Living: Reconnecting Earth, History, Body and Mind". Smythe also wrote "Africa's Past, Our Future". She is chair of the History Department at Xavier University, in Cincinnati.

Pest de résistance

The fall armyworm, used for the experiment pictured on the magazine's cover, eats many plants and gets lots of attention from crop scientists. For research, they can buy a box of caterpillars through the mail. The moth called eucosma eats only silphium. This sunflower relative is new as a crop, and researchers don't know how long its specialist pest lives, how far it travels, or how many times its destructive larvae molt. And you can't buy its caterpillars. The Land Institute's crop ecology technician, Edy Chérémond, is building his own lab colony of eucsoma. Moths are trapped with the apparatus shown at left in a stand of blooming silphium. Atop a screened box the size of a phone booth is a solar panel and a fluorescent tube that emits blue and ultraviolet light. The UV light attracts all sorts of nocturnal insects, which hit aluminum panels surrounding the tube and fall into the box through a small hole. In the morning, Chérémond enters the trap and captures moths in little plastic condiment tubs. Research resident Blaze Johnson, above, does so in another trap a mile and a half to the west. First, they plug their ears to keep out insects, of which there can be hundreds, even thousands after a midge hatch. With the eucosma moths captured, they open the traps to free the other insects. Catching wild moths is just the start of the job. Chérémond must learn eucomsa's life stages, dietary needs, and what entices it to mate, such as ranges of temperature and light quality. But with a lab colony established, he will be able to run tests like that with the fall armyworm and find which silphium varieties better resist eucosma. Scott Bontz photos.

Seize a wrench and the day

Living resourcefully,
in good humor,
and not worried about badges

ROBERT JENSEN

Mentor, Kansas, a small community a couple of miles south of The Land Institute, hasn't had a post office since 1995 and these days is more a suburb of Salina than a town. Just off Mentor Road, its unassuming main street, are a handful of modest houses, Mentor United Methodist Church, and a Saline County fire station (RFD NO. 2).

And then there's Rex's Antique Car Museum.

The museum is housed in two large metal storage buildings that look equally unassuming and modest – until visitors step inside and survey the eclectic collection. There are lots of vehicles, mostly cars and a few trucks, several with celebrity backstories – including a 1937 Lincoln Brunn that once carried FDR and a 1919 Stanley Steamer that Jay Leno bid on, unsuccessfully – along with three fire trucks for good measure, one with a full tank that is available for local firefighting.

But visitors who stay long enough to talk with Rex Russell and Thelma Woerz

Rex Russell and Thelma Woerz keep a museum with 99 cars and trucks – along with automated musical instruments. Technology has made it so "now you can do almost everything by yourself", Russell said. When he was growing up, to run a corn cultivator demanded two people. That made for neighborliness. Scott Bontz photo.

will realize that just as intriguing as the collection are the two proprietors and their backstories.

First a little more about all the stuff.

In those buildings are not only the vehicles – a total of 99 cars and trucks, going back to the 19-teens, all of which run and are driven regularly – but vintage tools, cameras, furniture, and housewares. The main museum building also has some intriguing features built in. One beam is a section of a construction crane – more on cranes later. Look closely at the steps going up to the second floor and notice what looks like tire tread, because they are made of old tires. At the top of those stairs are rooms with 1930s furniture and quilts, a kerosene stove, a hand-crank phone – all arranged as they would have been in a home from that era. Downstairs are a 1920 nickelodeon and an 1895 player piano.

Along with the antiques are modern updates. A jukebox made from the back end of a 1958 Ford Thunderbird is digital. Want your picture taken behind the wheel of an old Ford truck? Type in your e-mail address, and a digital camera hooked up to a computer will send the photos to you.

In the back of the building is the dining area. Rex's is not only a museum but a party and wedding venue that folks rent for a variety of gatherings. Outside vendors cater the food, but Thelma and Rex are the museum's only staff and do all the setup and cleanup.

Because the main building is big enough to hold only a fraction of the cars, a full tour includes the overflow vehicle storage building, where the cars are stacked in racks. Some in the collection are real antiques, including a 1911 Ford Model T Roadster, while others are more curiosities, such as the 1974 Volkswagen Thing, which looks a bit like an Army jeep. There are two of those 1919 Stanley Steamers, which have 30 valves that have to be set – "It's kind of like a water heater", Thelma says. The 1981 DeLorean DMC, with the distinctive gull-wing doors, well, it's just plain cool.

While not a formal part of the museum, the old farm machinery outside – mostly Caterpillar tractors and implements, most of them not in working order – is just as intriguing. "My dad farmed with Caterpillars, and I did a lot of dirt work (road building) with them", Rex says. "I always liked them".

Rex's museum does no advertising. There's no sign on Interstate 135, about a half mile to the east, and the sign out front is modest – although the size of the sign doesn't really matter since there's virtually no traffic in Mentor. Visitors arrive via word of mouth, or from an equally modest website and Facebook page.

How many people come through? There are visitors at least three or four days a week, and Rex estimates a thousand people a month. Thelma thinks it might be a bit more, but there are no tickets issued to keep track and no admission fee. They accept donations, albeit somewhat reluctantly. Two couples visited when I was there, and as they left one of them held out two twenty-dollar bills, Thelma says. "I told them one was enough".

What about finances? Rex says he only started keeping track of expenses and income last year, and wishes he hadn't. "Turns out that we lost $6,000", he chuckles.

How long have they been doing this? When did the museum open? "We never did open it", Rex says. "It's just here".

OK, but when did people first start coming to see the cars? "They always have, seems like. Ever since I've had cars, I've had people come to look at them".

It's hard to pin down a date the museum was created, but Thelma joined the enterprise in 2007, and it keeps growing, not to make money, but because the two of them are having fun. The pleasure they take wasn't hard to understand once I got to know a bit more about their lives. For me, Rex and Thelma – not the cars – are the real attraction.

Both started life within about 30 miles of Mentor: near Galva for Rex, born in 1932, and near McPherson for Thelma, born in 1948. Both learned to farm by working alongside parents. Rex was the fifth of six children in the Depression, while Thelma was an only child born in the beginning of the post-WWII boom. Their early experiences on the farm seem to have produced several common traits, including a willingness to strike out on new paths with gusto.

Let's start with Rex. He worked in his father's hardware store and then his father-in-law's Allis Chalmers tractor dealership while he also worked on other farms and road crews; took an entry-level job at Beech Aircraft, eventually moving into sheet metal work and then electronics; got interested in airplanes while at Beech, bought his first one for $400 – he had $150 and borrowed the rest – and learned to fly; bought a bulldozer and became a terracing contractor; was shop foreman for Reece Construction in Salina, where he also led a project to develop the large-scale manufacture of sulfur concrete, a specialty composite construction material; spent years as a pilot flying private clients and charters; and then started a construction crane rental business that, at its peak, was leasing up to 150 cranes. (Remember the construction crane serving as a beam in the museum?)

Thelma's path also has lots of unexpected turns. With a voice scholarship in hand, she headed to McPherson College and earned a teaching degree; taught home economics for 14 years, along the way picking up computer programming; earned a doctorate in childhood education from K-State; opened a computer store selling her own computer brand to customers such as Boeing; went to work for Raytheon as a computer analyst during the run-up to Y2K; and returned to do more teaching, this time in special education at Wichita State University. And through all that, she was racing dirt-track cars, good enough that she almost went on the road with Danica Patrick and the World of Outlaws Sprint Cars.

Along with the success, both have also dealt with setbacks. Thelma had to grow up fast after her father died when she was 15 and her mother a few years later. Rex is lucky to be alive; in the early 1970s, a bucket loader came down on him while he was working on a road crew. Doctors told him he would never walk again, one of the many proclamations from authorities in his life that he's ignored. Much later, one of his four children – Danny, his partner in collecting those old Caterpillar tractors – died in an industrial accident, "And just like that, I lost interest in them Caterpillars", Rex says.

In "retirement", both work harder than many people with full-time jobs. Both are happy to talk about their lives and their unorthodox career paths, though when I used that phrase, Thelma chuckled, as if she had never considered that there was anything unusual about her working life. Rex and Thelma talk about their lives as if there's nothing particularly special to note. But to me, three things stand out.

First, their early farm experience taught them how to get things done with whatever tools and resources were available. Most every farmer in those days was also a mechanic, Rex points out, to keep things running. If a mechanic from town

was available, you might not be able to afford the help. Thelma learned her way around engines in the same fashion, helping out her father with every aspect of farming. Such "tinkering" experience, common in the world in which they grew up, would be difficult to replicate today with vehicles and implements that have so many computerized components and can't be fixed without sophisticated tools and highly trained mechanics.

Second, both seized opportunities without giving much thought to whether they were qualified to take on a challenge. Thelma learned computer programming when the principal at Marquette's high school, where she was teaching, had no one to take on the class, and so she volunteered. Rex made his first solo flight after only an hour and 45 minutes of instruction on a Saturday, landing his plane on Sunday in his brother-in-law's alfalfa field to give rides to family members. On Monday, after telling a co-worker who ran the Marion airport about it, he learned he was supposed to have a minimum of eight hours in the air with an instructor before soloing. For both Rex and Thelma, that work experience on the farm no doubt helped foster that confidence – from an early age, both had demonstrated to themselves that they were competent to get things done.

Third, Rex and Thelma both have an understated sense of humor. I'm not a racing fan and am unfamiliar with dirt-track racing. "Could you explain it to me", I ask. Thelma's response: "You get on the track and go left". How did her racing career start? She was helping a guy build a car that his son was supposed to race. When the son didn't show up, "I put on the suit, and finished third". She only gave up the sport, she said, when she "was racing against the grandkids". Literally. She once raced against one of Rex's grandsons.

In the 1950s, Rex was wiring houses when an inspector came by and asked to see his license. "I said, 'Well, I've got a driver's license and a pilot's license. Which one do you want?'" Instead of shutting him down, the inspector looked at the quality of his work, left, and came back later that day and handed Rex an electrician's license. Where did Rex learn to wire a house? By paying attention. When rural electrification came to the area in the 1940s, "My dad wired houses and I helped", he says.

This reflection on rural history is of value not simply for the sake of nostalgia. Wes Jackson, Land Institute president emeritus, who himself grew up on a Depression-era farm, says all three of those traits will be necessary in the low-energy world that is coming at the end of the fossil-fuel epoch. "We're going to need people who can tinker and keep all this patched together, and who don't wait around for permission to do things", Wes says. "And it isn't going to always work, which means we are going to need a healthy sense of humor".

Rex isn't much for predictions, but he worries about the bills for the United States' expansive economic growth during his lifetime coming due. Take wind machines, he says, which "made us big money in the crane business, but may be the worst thing that we've done". Rex isn't against renewable energy, but warns that we've underestimated the long-term maintenance costs and are counting on more from that technology than is likely coming.

Rex doesn't resist change – there's a computer on his desk and a cell phone in his pocket. And he isn't nostalgic about the suffering during the Depression – he has enjoyed being able to travel and gets pleasure from all those vehicles and planes (he owns a dozen, all still flying).

But he sees how some "progress" has come with costs, such as community connection and neighborliness. Rex doesn't think that people have changed all that much, but, "It's just (technological) advancement more than anything else", he says. "We used to have to have help to do things, but now you can do almost everything by yourself". He gave the example of a corn cultivator that required two people, which meant he needed his neighbor's help. "You worked together because you had to. You didn't have a choice".

Rex points out what many sociologists have observed: In small communities with limited resources, people get things done through collective effort, which means spending lots of time together, which creates real bonds. Here's another example: When he was young, Rex's dad and brother were badly burned when the propane generator for a Delco battery system that they were repairing blew up. (Rex says he had been helping them but escaped the same fate because his mother made him go out to milk the cows.) His brother hadn't finished his plowing yet, and without anyone in his family asking, more than 20 neighbors came by and got the work done. "Neighbors still help", Rex says, "but not like that".

Wes, who had stopped by and joined the conversation, nodded in agreement, noting that this also meant a certain lack of privacy that people have come to expect today. "There was no such thing as 'your own business'", Wes says.

Rex agrees, and offers another observation that researchers have "proved" through scholarly studies: Our experience of wealth and poverty is relative to what our friends and neighbors have, which means it's easier to thrive in hard times when the struggles are shared.

"Everyone else was just like us, and we didn't think of ourselves as being rich or poor", he says. "At Christmas, I got one present, just like everyone else. Not a dozen presents, just one. I don't recall feeling deprived".

Rex hasn't felt deprived, and he also appears unfazed by his success in his various businesses or his impressive collection of cars, truck, and planes. He acknowledges that he enjoys working – "building, creating, fixing things" – but can offer no explanation when asked about the secret to his success.

"Well, I have no idea", Rex says. "I've just done what happened to come in front of me".

Robert Jensen is professor emeritus of journalism at the University of Texas in Austin, and a longtime collaborator with The Land Institute.

Prairie Shower

JOEL KURZ

Standing naked
on this black block
surrounded by blue tarps
which flap subtly in the breeze
and stop short of the horizon,
I revel in the cold
descending drops
of early morning
as the vast sky
and standing prairie
praise yet another day.

The writer lives in Warrensburg, Missouri.

Tilting with windmills

Green energy won't stop climate disaster. We must use far less energy, and soon.

STAN COX

For more than three decades, all serious proposals for America to tackle the climate emergency have been thwarted on the grounds that cutting greenhouse emissions would impede economic growth. But the idea of a Green New Deal, the vision that vaulted straight to the center of the climate discussion in 2018 and has stayed there, could break that losing streak.The Green New Deal, which so far exists only in the form of a joint congressional resolution – submitted in 2019 but never brought to a vote – has garnered wide support because it steers clear of regulatory limits, fines, carbon taxes, international obligations, and other approaches that are viewed by the corporate sector as threats to wealth accumulation and economic growth. And it holds out the prospect of millions of new jobs, which gives it extra luster at a time of sky-high unemployment due to the coronavirus pandemic.

This "New Deal" side of the Green New Deal can be relied upon to accomplish its goals of prosperity and economic justice. Keynesian stimulus has a long track record. In contrast, however, the plan's "Green" side is woefully inadequate. It would fail to do the one thing that any plan to head off climate catastrophe must do: drive greenhouse emissions down to zero on a crash schedule.

The Green New Deal's central assumption is that large investments in renewable electric capacity and green infrastructure will work their way through the market to drive fossil fuels out of the economy. History and research, however, tell a different story: that in a growing economy, new sources of energy do not displace existing sources but instead add to the total supply. As oil use expanded rapidly through the twentieth century, coal use did not fall; rather, it rose right alongside oil use. The burning of coal and oil continued its steep increase after World War 2, even as natural gas arose as a major energy source. And between 2009 and 2018, during a historically rapid buildup of US wind and solar capacity, only one-fourth of that new electric output displaced output from coal-fired power plants; the other three-fourths simply fed additional energy consumption, even as use of natural gas also rose sharply.

Our market economy is incapable of ridding itself of fossil fuels. We need a law mandating that fossil-fuel use be driven down to zero in time to prevent climatic catastrophe. The law must impose an impervious cap on the total barrels of oil, cubic feet of gas, and tons of coal allowed out of the ground and into the economy. The cap must ratchet down year by year until the quantities of all three fuels reach zero.

The authoritative 2019 United Nations' Emissions Gap Report calls for an annual greenhouse emissions reduction of 7 to 8 percent worldwide if we are to avoid catastrophic warming. Doing our part to achieve

those reductions must include reducing U.S. fossil fuel use by at least 7 percent of today's supply each year for the next 15 years. That would achieve zero emissions from fossil fuels well before 2040. Emissions from other sources would require similar reductions.

A Green New Deal of some kind will be needed to fill the gap that will be created in the energy supply; however, it will not be possible to bring wind, solar, and other non-fossil energy on line as fast as fossil fuels are going off line. (And there is extensive evidence that we will never get back to today's consumption using renewables.) We will be left with a smaller, less flexible energy supply. That will have far-reaching consequences that require a deep overhaul of our economy and society. Most importantly, it will no longer be possible to let the pursuit of wealth accumulation be our nation's chief goal.

How to achieve economic sufficiency and justice in an America that has a shrinking energy supply and smaller economy

The US War Production Board of the late 1940s ensured that the economy's resources went to production of essential goods. With a declining cap on fossil fuels, we'll need a Peace Production Board to steer the nation's energy supply to what we need, and not to luxuries. Illustration by Cedar Van Tassel.

includes planned allocation of resources and production, shorter working hours with full pay, universal, single-payer health care, and price controls with rationing of essential consumer goods. The economy will need to be reoriented toward producing essential goods and services and away from wasteful and needless production.

Efforts to slow the spread of the coronavirus have focused on curtailment of businesses that provide nonessential goods and services. I hope that discussion will plant the seeds of a broader national conversation about how to decide, collectively, which products and services are essential, which are useful to produce if we have the resources, and which are luxuries.

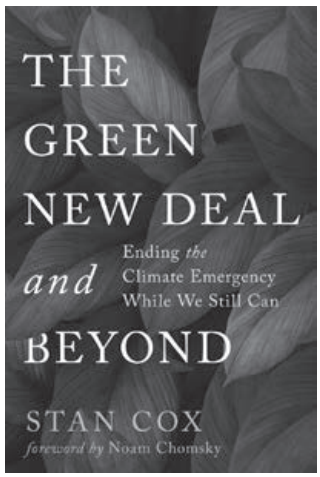
Having that conversation now will prepare us for the phase-out of fossil fuels. And there are historical precedents to consider. In the 1940s, the US War Production Board ensured that the civilian economy's diminished pool of resources went exclusively toward production of essential goods. If we have a declining cap on fossil fuels, we will need a Peace Production Board to steer the nation's energy supply toward providing necessary goods and services.

If shortages of staple foods and other essential goods develop, we will need to prevent the kind of panic-buying and hoarding we saw when the pandemic hit. The only remedy for that will be price controls and rationing.

The pandemic and the groundswell against systemic racism and police brutality are laying bare the economic, racial, and environmental injustices that were already endemic in the United States. Millions are now suffering even more severe deprivation. Too often there is an implicit assumption that solving these horrific problems requires a return to profligate resource consumption and continued greenhouse emissions.

In fact, restoring the exploitative economy that created such deep vulnerabilities in the first place would mean making economic misery permanent for much of America. The pandemic has shone a light on our dire need for a federal jobs guarantee, living wages, and assured access to essential goods and services regardless of income.

There has long been a debate in climate circles over which scale of action is most important: individual, collective, or governmental. If there is one lesson that people in the United States appear to be learning during the pandemic, it is that if we don't achieve deep, transformative action at all three scales – if instead we simply depend on market forces – we will face consequences that far surpass the devastation and suffering that we have seen so far. It seems entirely possible that a similar realization can now energize the climate struggle.



Stan Cox bred perennial sorghum for The Land Institute for two decades, and now researches and writes for us about ecosphere studies. His new book, from City Lights, is "The Green New Deal and Beyond: Ending the Climate Emergency While We Still Can".

Extracts

NATURE IS RANDOM, but it is wonderfully organized. – Jake Fiennes, proponent of ecological farming, in The New Yorker, issue of February 17 & 24

WE HUMANS ARE UNIQUE in nature, and this is a great gift, but it becomes our downfall. We tend to confuse the truth that we are different with the illusion of being separate. – David Steindl-Rast, "Words of Common Sense"

DEAR GUESTS, conserving energy is the most important virtue as we all know. – Joe, the manager, sign on door of Lazy K Motel in Ogallala, Nebraska

THE PRINCIPAL OBJECT of natural philosophy is not the material elements, but their composition, and the totality of the form, independently of which they have no existence. – Aristotle, "Parts of Animals"

ONLY A CEILING ON ENERGY USE can lead to social relations that are characterized by high levels of equity. … Participatory democracy postulates low energy technology. Only participatory democracy creates the conditions for rational technology. – Ivan Illich, "Energy and Equity"

THE WORLD was a lot bigger when you got around it by bicycle rather than by Boeing, and it was none the worse for it. – Michael Hutchinson, "Re-Cyclists"

AROUND THE WORLD, economic, social, and environmental conditions function as a diffuse, barely perceptible contraceptive. – Anna Louie Sussman, New York Times

WE CAN'T IMPOSE our will upon a system. We can listen to what the system tells us, and discover how its properties and our values can work together to bring forth something much better than could ever be produced by our will alone. – Donella Meadows, "Dancing with Systems"

IN A LOW MARGIN BUSINESS, reducing production costs pays much better than increasing production. – Darrell Emmick, "Managing Pasture as a Crop"

WE LOVE (and make intelligent use of) what we have learned to understand. – Aldo Leopold, "Wherefore Wildlife Ecology?"

WHEN YOU GET THE FEELING that the whole world can see you but no one is watching, you have come to the grasslands of North America. – Dan O'Brien, "In the Center of the Nation"

IT'S WHEN NOVICES move toward survival, embracing the deprivations of monastic life as a personal, inner necessity, that they begin to feel truly free. They also begin to understand the depths of joy, and how little it has to do with what the world calls happiness. – Kathleen Norris, "Dakota"

TO BE CONTENT with a little is difficult. To be content with a lot is impossible. – Marie von Ebner-Eschenbach

Land Report shorts

Iutzi resigns presidency

On July 1, Fred Iutzi stepped down after almost four years as The Land Institute's president. An announcement signed by Kenneth Levy-Church, new chairman of the institute's Board of Directors, said, "Under his leadership, we have become a global institute that stands on its own merits. Fred provided a steady hand during transitional times moving us beyond a founder's enterprise. He helped us integrate our emerging ecosphere studies work with our ongoing scientific research and collaborations, resulting in a powerful and coherent vision for a perennial future. He brought continuity and rigor to all our operations. He helped expand our international network to 50 collaborators, spanning six continents, preparing our work to grow to scale. We are forever grateful to Fred for his service and now look to the future for new leadership". The board named Chief Strategy Officer Rachel Stroer, a five-year veteran of the institute, to serve as acting president.

Iutzi

Stroer

Prairie Festival canceled

The Land Institute embraces the ecological facts of life, and the coronavirus pandemic has brought a hard one. With the disease bound to still be infecting people come fall, gathering hundreds together for a Prairie Festival would not be right. The forty-second of these festivals will have to wait at least until 2021.

In field, in lab, in masks

After the coronavirus pandemic shutdowns, The Land Institute was never entirely empty. Agriculture is essential, and researchers still could be found in the field and greenhouse. But anyone able to work at home did so. The parking lot that usually filled with three dozen cars often had as few as three. We delayed and then suspended bringing 15 interns from across the nation, and instead hired former interns and recent high school graduates, some from the families of Land Institute researchers, and so "within the bubble". The parking lot saw more cars in early June, after the Kansas health department eased restrictions – and as field work picked up with the season. But home work remains encouraged and masks on site still required, and we pared 2020 research to the core programs of breeding and ecology. In every work area are rolls of paper towels and bottles of alcohol for disinfecting anything one touches. A meeting of collaborators from around the world was conducted as a webinar. Through June 2021, staff meet-

ings are planned for the electronic meeting service Zoom.

Big grant for perennials

The USDA awarded almost $10 million to our collaborators at the University of Minnesota for a project called "Developing and deploying a perennial grain crop enterprise to improve environmental quality and rural prosperity". The grant will come over five years, and about $250,000 annually will be directed to The Land Institute. We'll study greenhouse gas emissions, nutrient retention, water infiltration, and other environmental benefits of perennial grains. Money will also go to initiate grower groups, for education curricula, and to improve supply chains and markets. And it will fund study of intermediate wheatgrass performance across a range of soil fertility, and to compare lines of the crop over a wide geographic range.

New research residents

New interns were turned away because of the pandemic, but The Land Institute continued with its residency program, which brings back a handful of interns who showed strong interest in our research. Each focuses on one area for a year or more. We hope they'll go on to graduate school with what they learn here while advancing our work. The new residents and their fields are Blaze Johnson and Jarrod Fyie, crop protection ecology; Angela Brekalo, crop protection genetics; Siena Polk, ecosphere studies; and Sophia Skelly, commercialization, which will include supporting growers of our crops. Johnson is from Florida, Polk from Idaho, Fyie and Brekalo from Ohio, Skelly from Texas. Residents Abbi Haan, Alex Griffin, and Eric Cassetta, who inaugurated the program last year, will continue their research through the fall.

Skelly

Brekalo

Fyie

Johnson

Polk

Kernza for sale

You can buy Kernza® grain and flour from a Minnesota organization called Perennial Pantry, which wants to improve the supply of perennial grains. Kernza is the registered trademark for seed and food from intermediate wheatgrass developed as a grain crop. Perennial Pantry is an offshoot of Sprowt Labs, a five-year-old company that devel-

oped malting equipment for small brewers and wants to "accelerate the localization of brewing supply chains". A 14-ounce bag of Kernza flour is $9.75. Buyers receive recipes and may share their results with a civic science project of The Land Institute and the University of Minnesota. The website is perennial-pantry.com.

Kernza website

Our grain called Kernza® now enjoys its own website. Several beers and eateries have used Kernza. General Mills plans for a cereal when there is enough acreage devoted to intermediate wheatgrass. Growing interest from farmers, brewers, restaurants, manufacturers, and the public inspired creation of kernza.com. The site focuses on the crop's commercialization, and includes licensing, innovation by growers, and managing seed supply. We approve farmers to grow Kernza if they have the right equipment, acreage, and knowhow. There is a section labeled "research", but the main site for information about breeding remains our regular web address, landinstitute.org.

New director

The Land Institute Board of Directors added Jill Isenbarger, who this year became chief of staff for the UN Foundation. Before that, she was chief executive officer of Stone Barns Center for Food and Agriculture, which advances sustainable agriculture and a culture of eating that can support it. She brought it from an organization of New York focus to one of international reach. She has also been chief of staff for The Nature Conservancy, working on climate change initiatives and developing a radio series, "Stories from the Heart of the Land". She was among contributors to the book "Letters to a Young Farmer".

Isenbarger

Perennial Practice videos

On our own website, you can see six videos that introduce perenniality, diversity, and Land Institute research, and which provide prompts for learning through experience. The writer and presenter is our Ecosphere Studies director, Aubrey Streit Krug. Each video is about 6 minutes. Search for Perennial Practice at landinstitute.org.

Publications and presentations

Our researchers contributed to the Houston Chronicle and Yes! magazine, The Progressive, Resilience, The Hill, and Literary Hub, and to the journals Solutions, Restoration Ecology, Frontiers in Plant Science, Cereal Foods World, Journal of Plant Registrations, The Ecological Citizen, and American Journal of Economics and Sociology. They made webinar presentations for the UN's Food and Agriculture Organization. They visited collaborators in Denmark, Argentina, Palestine, and Israel, and spoke at the Carbon Drawdown Symposium in San Diego.

Bringing down carbon

In 2016, University of Kansas researchers Nathaniel A. Brunsell and Gabriel de Oliviera began measuring how much carbon

was going in and out of a field that had been restored to perennial grassland a decade earlier. They metered the gas carbon dioxide with what is called an eddy covariance tower. There's another such tower just downhill from our office. (See the summer 2012 Land Report for more about how they are used.) The 16 acres of restored grassland was at the Perennial Agriculture field station near KU. In fall 2017, the field was tilled and planted to the legume alfalfa and intermediate wheatgrass, a biculture we are studying to eliminate the need for synthetic nitrogen fertilizer on grain crops. The prairie vegetation and the soil organic matter pool it fed had been accumulating more than 800 kilograms of carbon per hectare per year, which means tons of climate-warming carbon dioxide removed from the atmosphere. The year after conversion, the field lost more than 1,200 kilograms per hectare. This was inevitable with tillage and why annual grains are such a huge carbon loser. But two years later, the perennial alfalfa and wheatgrass were well on the comeback, losing just 30 kilograms. Next year the field almost certainly will once again be a carbon sink, Research Director Tim Crews said, testimony to what perennial grains could do for stemming climate change.

Thanks to our contributors

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Every gift matters to us, thank you for being part of this journey. As we work toward best practices as a team, we are moving toward only publishing your name if you have given us permission to do so. If you see your name listed & wish for it not to be published in the future, please contact Amanda at 785-823-5376 or info@landinstitute.org. Thank you again for your generosity. This list is for contributions made from January 1 through May 31.

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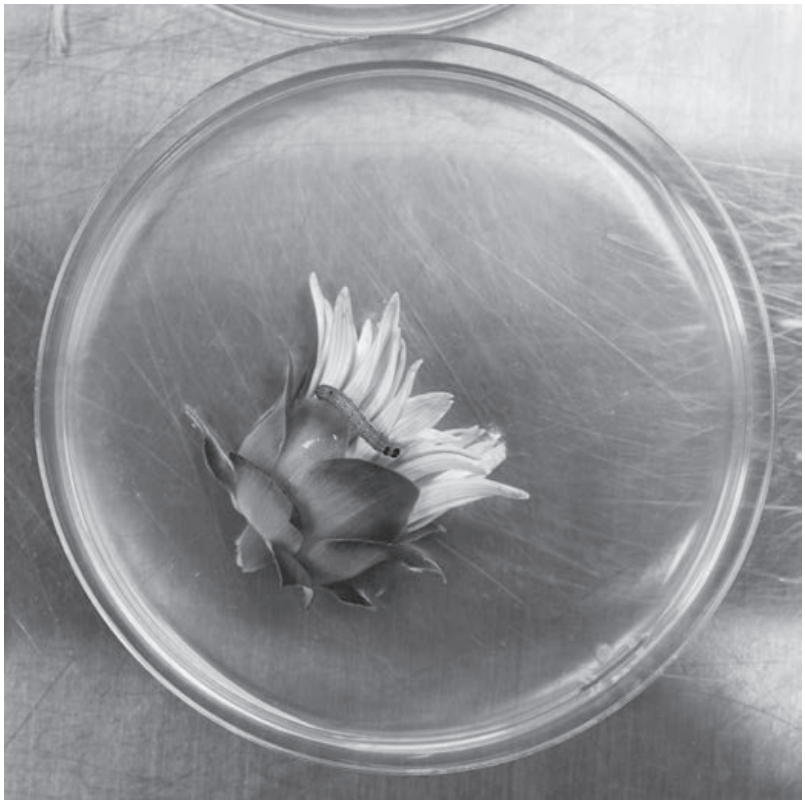

Fall armyworm caterpillar on silphium. *See Cover description on page 3.*