

The Land Report

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Civilization's weedy roots



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Cover: Durum wheat, descended from an annual wild plant that caught farmers' eyes long ago. To learn why all of our major grain crops are annuals—though it needn't be so—see page 8.

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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.

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Natural systems living

Carl N. McDaniel

I first met Wes Jackson when I was putting together Rensselaer Polytechnic Institute's environmental science program in 1992. I wanted to learn about The Land Institute and to see what Jackson had to say about our new program. He heard me out and then asked, "Is the administration behind you? Are they committed to environmental education?" I described the support being provided—several committed colleagues, a grant of about \$200,000 for course and faculty development, and the keen interest of the dean of the School of Science. Jackson's assessment was to the point: "You will fail."

After about four years of 70-hour work weeks, a few colleagues and I had created a dynamic, holistic, interdisciplinary program that built on the classic wisdom of Rachel Carson, Aldo Leopold and E.F. Schumacher, and on the more recent perceptions of Jackson, Thomas Berry, Wendell Berry, David Orr and E.O. Wilson. The next few years, however, revealed that Rensselaer lacked what Jackson said we needed. The administration did not believe environmental education was important. Neither did the faculty, except for a few outliers like me. The president apparently thought environmentalism was a fad, and that things like population and consumption were not relevant to the school. Our already modest resources and support dwindled. I resigned in 2000, and the environmental science program we assembled is now defunct.

But the program did not fail. Rensselaer failed, as our culture is failing.

The eight years I devoted to environmental education, however, were personally transformative. Soon after I became director of environmental science, my path crossed that of an economist, John Gowdy. We wrote a paper on how the self-organizing principles of markets that have emerged in human cultures over the past 10,000 years inherently conflict with the self-organizing principles of ecosystems that have evolved over the past 3.5 billion years. The dynamics of ecosystems, within which all human activity takes place, follow the laws of biology, not those of human-created economic systems. The conflict between these systems is apparent: During the past century economic indicators have grown vigorously while environmental indicators have been negative. Ultimately, the growth of human economies faces the constraints that limit all biological systems.

This paper was a consensus statement that summarized the work of myriad others. It is their work and writings that have enabled me to grasp just how fragile

our accomplishments, "the good life" and civilization are.

My first book, *Paradise for Sale: A Parable of Nature*, co-authored with Gowdy, describes what happened on the central Pacific island of Nauru. In 1900 a rock from Nauru proved the richest phosphate ore ever assayed. Essentially the whole island was a phosphate mine. Over the next 100 years, the Australians and then the Nauruans extracted and exported the ore.

The Nauruans mimicked our market economics, and provide a microcosm of what is happening on a global scale: overpopulation, overconsumption, loss of biodiversity and the life support it provides, confused and dysfunctional society, reliance on fossil fuels, poor health and financial collapse. If isolated from the outside, most of the population will have to leave Nauru or there will be a massive die-off. What I came to understand from writing *Paradise for Sale* can be summed up simply: Global civilization is in very treacherous waters and, on its current path, unlikely to survive into the 22nd century.

My second book was *Wisdom for a Livable Planet: The Visionary Work of Terri Swearingen, Dave Foreman, Wes Jackson, Helena Norberg-Hodge, Werner Fornos, Herman Daly, Stephen Schneider, and David Orr*. Writing it solidified and brought into sharp focus for me the following.

Evolution can only select for those behaviors that are successful in the present. The hominid brain evolved over several million years to give us a human nature fitted to hunter-gatherer societies. This behavioral repertoire is that of a small-group, place-based, social animal that is territorial and hierarchical. Morphologically modern *Homo sapiens* migrated out of Africa some 200,000 years ago. These hunter-gatherer ancestors walked into the vast ecosystems of Earth that appeared never ending, without limit. Our species' behaviors evolved in compliance with a boundless frontier.

But our hunter-gatherer ancestors could know only what their evolved senses permitted them to know. They knew vanishingly little of how and why the biological-physical world works as it does. With only your senses and the unaided power of your brain—without resorting to the scientific insights of the past several hundred years—venture an explanation, or a dozen explanations, of how a plant's fundamental elements make stems, leaves and then flowers. You will realize that you just can't figure it out. And any answer will always be wrong, because the microworld of cells, genes and chemical

signaling is hidden from us. Our native abilities are inadequate to discern a world so removed from experience.

As a substitute for this lack of knowledge about how the biological-physical world works, our ancestors made up stories and believed them so strongly that they would die for those beliefs. At times, perhaps often, this world of imagined relationships proved to be adaptive and successful—it gave sufficient selective advantage to be fixed in the human gene pool and became part of human nature. Believing so strongly is a fundamental capacity of our evolved brains and a dominant element of humanity's nature.

Myriad hunter-gatherer cultures gave rise to a handful of agricultural societies beginning some 10,000 years ago. Over the past 2,000 years Middle Eastern agriculture birthed European culture, which in the past 200 years, boosted by fossil fuels, became global. This Western political-economic system combined the in-the-present perspective of human nature with our evolved capacity to transfigure “accepted reality” into beliefs deeply held without credible evidence. Thus emerged a culture that denied limits. Inherent in this no-limits perspective is a belief in growth that ignores biological and physical reality. This core belief of Western culture makes resolution of our multitude of environmental challenges essentially impossible. This is the mega-understanding I gained in writing *Paradise* and *Wisdom*.

A few months ago, my wife, Mary, handed me a *Cathy* cartoon and said, “This is your problem.”

Panel 1: A few people gather around as one woman says, “I quit dieting and lost 25 pounds!”

Panel 2: More women gather as another woman says, “I quit dieting and lost 35 pounds!”

Panel 3: Then Cathy says, “I quit dieting, gained 15 pounds and went up three jean sizes.”

Panel 4: Cathy stands alone and says, “Hope attracts a crowd. Truth makes it disappear.”

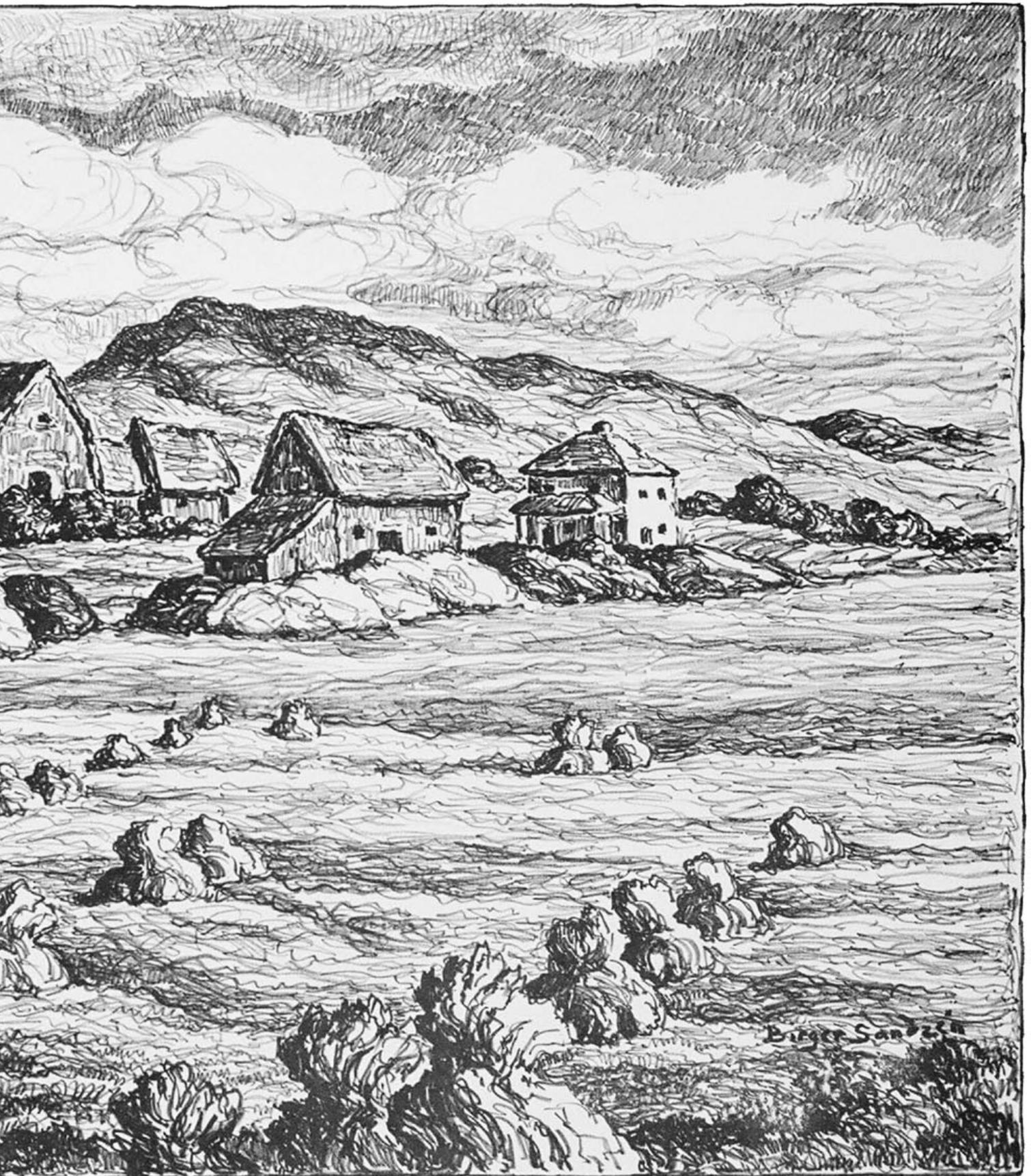
We certainly do have a problem keeping people's attention. The solution to staying focused on our fundamental environmental problems is far from clear. And the earth is replete with groups undone by hope for the essentially impossible. To make the impossible possible, we need true hopefulness.

True hopefulness is first recognizing the odds are heavily against us, believing those odds, and then doing everything possible to beat them.

What we are up against is that the important environmental trends are almost entirely negative. Human population size and consumption are beyond what Earth can durably support. Human industry has forced climate change—which has undone many local cultures that had impoverished their surroundings. Ninety percent of top ocean predators are gone. Half of the world's forests have been cut down. If current rates of erosion and fertility loss persist, most arable land will be gone in several



Kansas Wheatfarm, by Birger Sandzen. Lithograph, 20 by 15 inches,



Birger Sandzen

from The Birger Sandzen Memorial Gallery.

centuries. And biodiversity loss is reaching the level of past mass extinctions.

To assess the meaning and then to act on the distant consequences of these data is extremely hard for an animal that evolved to act in the present.

I believe it comes down to this question: Is it possible to change an economically centered culture into an ecologically centered one on a worldwide scale and in a way that accommodates human nature and behavior? Maybe, if a substantial fraction of us express true hopefulness.

Let's not kid ourselves. The shift to an ecologically centered pattern of living requires monumental changes in cultural beliefs. And fundamental cultural beliefs usually change glacially slow, if at all.

Consider this: Darwin published *The Origin of Species by Means of Natural Selection* in 1859. By 1900 we had scientific consensus on evolution being the major process that produced the diversity of life on Earth. Pope John Paul II endorsed evolution in 1996; however, the church hierarchy is now questioning his decree. In 2005 most of the people in the United States did not consider evolution a valid explanation for biodiversity, and a mere 26 percent of adults accept evolution occurs by the process of natural selection. Time is not on our side.

Wisdom for a Livable Planet is about people who express true hopefulness. Each of the eight people I wrote about is dedicated to a major environmental issue that appears impossible to resolve. I will tell two stories from the book.

If we are honest, each of us must acknowledge that most of our assessments and beliefs are based on incomplete knowledge. In fact, too often we take positions with minimal or no relevant data.

In one of his [University of] North Carolina courses, Orr [director of environmental studies at Oberlin College] had the students read E.F. Schumacher and Herman Daly. The scholarship of these economists is based on holistic analyses that establish the pervasive flaws in contemporary economic theory and practice and recommend in their place a human-scale and natural science-based economics. The faculty in the economics department at Chapel Hill openly dismissed this scholarship but did not explicitly criticize it. Orr recalled, "Standing on the sidelines of the soccer field while the kids were playing soccer, I turned to the chairman of the economics department, whose kid was out there, and I said, 'Jim, I know you don't like the work of Herman Daly and E.F. Schumacher, so how about coming into my class and giving a critique?'"

" 'No, I'm too busy, can't do it.' "

" 'Well, could we change the time?' "

" 'No, I'm too busy.' "

" 'Could we come to your office?' "

" 'Too busy.' "

" 'Could you just record some things for us and I'll play it in class?' "

" 'No. No time for it.' "

"So I said, 'Well, Jim,'—I took out a piece of paper and pencil—'could you just write out something you think is wrong with Daly and Schumacher?'"

" 'Oh, God damn it, David. I haven't even read those people!' "

If we are going to make the impossible possible, each of us must strive to be honest and base our beliefs on reality, as best as we can verifiably know it. In addition, the challenges before us require systems thinking. For a long time, Wes Jackson has advocated this.

I attended my first Prairie Festival in 1998. On an excursion around The Land Institute with Jackson, we drove by an alfalfa field heavily infested with weevils. He pulled into the shade of a grove of trees next to the field, turned off the engine, and said, "Alfalfa looks pretty bad. We allowed a local farmer to use this field. Part of the deal was no insecticides. Now that he's got a bad weevil problem, he wants to spray. Look, that's the problem. Say we let him spray. It seeps into the groundwater, travels to our neighbor's well, and nine years from now she has breast cancer." Jackson drew a circle in the thick dust on the dashboard and continued: "This is the boundary of consideration." He then drew a second circle around the first: "This is the boundary of consequences. As it stands now, that breast cancer is here"—he pointed to the space between the two circles—"outside the boundary of consideration. So, where do you draw the boundaries? We told him he couldn't spray."

Jackson wants people to think hard about the boundary of consequences that we have accepted with industrial agriculture. His institute has taken on the daunting task of expanding boundaries of consideration in agriculture beyond mere efficiency and short-term profit, to include and respect ecological and evolutionary principles.

Unfortunately, our economics-based culture finds it exceedingly difficult to set boundaries that accommodate such principles. Taking a long sweep of history, Jackson sums it up this way: "[W]e of Western civilization have moved from the church, to the nation-state, to economics as the primary organizing structure for our lives. We have been through the hypocrisy of the church, the atrocity of the nation-state that peaked with Hitler, and now we are devotees of economics, the encoded language

of human behavior that directs us toward ecological bankruptcy. It is time to move more aggressively on to the fourth phase, already under way, ecology.”

Thinking ecologically is not a passing fad or the venue of a special interest group. It is an emerging pattern of thought leading to a durable way of living that all may share and that benefits everyone. This belief in the correctness of an ecologically grounded way of living, held by other peoples under different circumstances, places us in appropriate relation with the rest of life. It is the next big idea in Western culture and has been in the making for more than a century. Religious, political and economic freedom were the big ideas that liberated Western culture, propelling it to become the dominant civilizing force of the past several centuries, but the successes of these big ideas have met the limits imposed by biological principles on a finite planet.

Jackson, The Land Institute, and many other people and organizations have embraced this ecological revolution. The institute’s objective is to abandon dead-end, industrial agriculture and replace it with a natural systems agriculture. The larger vision is to create a natural systems *living*, grounded in and abiding by the principles of ecology and evolution. Making global culture consilient with the principles of biology would be to make the impossible possible—what Thomas Berry calls “The Great Work.” The visionaries in *Wisdom* have challenged us to roll up our sleeves and get to it.

I’ll close with an illustration of the success possible by what I call true hopefulness.

On the afternoon of May 27, 1942, the aircraft carrier Yorktown returned to Pearl Harbor with severe damage from the Battle of Coral Sea. One of the admirals estimated that repairs would take three months. A second figured that a herculean effort could make absolutely necessary repairs in two weeks.

The Yorktown went into dry dock at dawn the next morning. Adm. Chester Nimitz, commander in chief U.S. Pacific Fleet, knew the Japanese planned to attack Midway Atoll in eight days. He inspected the Yorktown, then calmly said, “We must have this ship back in three days.” No one spoke. Finally hull-repair specialist Lt. Cmdr. Herbert Pflugstad responded, “Yes, sir.” Established procedure went out the window. Every electrician, carpenter, welder, fitter, machinist and mechanic that could be found went to work on Yorktown.

At 11 a.m. May 29 the Yorktown was floated and towed into the harbor with workers still swarming on her like hornets at a molested nest. Early the next afternoon, some 55 hours after Pflugstad had said, “Yes, sir,” the Yorktown steamed out of Pearl Harbor to join other ships at a position northeast of Midway hopefully designated Point Luck. She was by no means like new, but could launch and land aircraft. The ship was sunk in the battle,

but played a critical role in turning back the Japanese fleet and in sinking all four of the Japanese attack carriers.

In fixing the Yorktown, the impossible was made possible by true hopefulness. The story is a metaphor for our task. We must metamorphose our economically centered culture into an ecologically centered one on a worldwide scale and in a way that accommodates human nature and behavior, if we are to achieve a humane and durable future for humanity within Earth’s glorious diversity of life.

Ambiance

Dana Wildsmith

an open letter to the residents of Arden Meadows

We hate the lights you bring; we don’t hate you.
We feared you might be loud, but you’re not.
We wondered if you’d care to sit and watch
our deer graze past your decks at dusk. You do.
You could extend your fences half a foot
into our woods and we’d not notice it—
you haven’t. On the whole, we’d tell you that
as neighbors go, we’ve no objections to you.

But once our woods and fields held nights as black
as any depths you’ve known, such deep sea dark
we slept in endlessness defined by stars,

until your street lamps came and hung their sacks
of hazy light to spill into our dark
and herald the extinction of our stars.

Civilization's weedy roots

Stan Cox

When The Land Institute talks about our 21st-century research on the domestication and breeding of perennial grain crops, we are often asked, “If perennial grains are such a great idea, why did people domesticate only annual grains?” It’s a very good question. Prehistoric people gathered and ate foods from a huge range of plant species, but once they began domesticating, it was annual plants like wheat, barley and rice that they transformed. Among the world’s top 20 staple food crops, the banana is the lone nonwoody perennial. Herbaceous, grain-producing, perennial species are not to be found at all among the world’s crop plants.

Civilizations rose on annual cropping, then fell not to the sword but to the plow—its soil degradation. That haunts agriculture to this day. So we lament that the original domesticators didn’t pick erosion-resistant perennial species. But as The Land Institute has gone through the mechanics of perennial grain breeding over the past five years, it has become clearer to us why they didn’t.

Last year, The Land Institute’s Lee DeHaan was lead author of a paper arguing that annuals and perennials tend to differ in seed production because natural selection pushed them in opposite directions during their evolutionary histories. In annuals, living where soil is frequently disturbed, high seed production in their first and only year was favored. Since perennials can live many years, natural selection favored persistence and more moderate seed yield spread over a longer time. Today, plant breeders can push species in a third direction, increasing seed yield while maintaining perennality, though only through well-conceived and executed research.

Of course, there were no such breeding programs 10,000 years ago. As far as they knew, people were simply gathering food, with no aim to change plant genetics.

Ancient gatherers apparently did eat the seed of some perennials. Anthropologists have observed traditional methods of harvesting seed from perennial grasses in Poland, Mongolia and North America. People living south of the Sahara harvested the seed of a wide range of perennial grasses. The Vikings probably cultivated perennial lymegrass before barley reached Scandinavia. Yet no domesticated perennial grain species were handed down to us by the first plant breeders.

Plants most likely to catch the eye of a Neolithic, would-be grain farmer would have had seeds that were

larger than average, abundant and easy to harvest. But the most common characteristic among crop ancestors is their weediness—their tendency to thrive in disturbed soils like those around human dwellings. The circumstances of domestication are different for every species, but variations on the so-called “rubbish heap” theme were probably at work in most cases. New, attractive plants sprouting in discarded food scraps could hardly have been ignored. Indeed, the British plant scientist J.G. Hawkes wrote that for the people of that time, “It must have seemed little short of miraculous to find that plants needed for food sprang up by their very huts and paths.”

The perennials that represented the best prospects for grain production lacked that key trait—weediness—that triggered domestication. Perennials didn’t normally follow people back to the fertile, churned soil around their dwellings. The few that did and managed to escape being trampled by children and dogs likely would have been overwhelmed by the weedy annuals that specialize in colonizing such unfriendly territory by growing quickly and scattering their seed before dying.

Meanwhile, out in their only lightly disturbed natural stands, perennial plants regrowing from established, winter-hardy roots and underground stems would have been much more vigorous than new seedlings of the same species emerging from dropped seeds. People would have felt little incentive to sow a new generation of perennials as long as plants from previous years continued to produce well.

Some of the crop species domesticated later—for example, oats and rye—began their agricultural careers as annual weeds in farmers’ fields. Bread wheat was also domesticated by an observant farmer, from a lone natural hybrid between a primitive wheat called emmer and an annual weed. These later routes of domestication were also closed to perennials, which would not have become established in annually cultivated plots.

The genetic mechanisms of domestication are well known. As soon as people started sowing harvested seed, they automatically favored “nonshattering” plants—plants that refrained from dropping their seeds until harvested. So with each successive growing season, a population of intentionally sown but still-wild annual grasses like wheat or barley would have contained a higher proportion of plants with genes that prevented shattering. That process shifted many other traits as well that came to differentiate crops from their wild annual ancestors.

But if people harvested seed year after year from the same perennial plants, with no incentive to resow, they would have had little or no genetic effect on the population. As Charles Darwin would demonstrate, the kinds of changes one sees in plant traits during domestication and breeding, as in natural evolution, occur through cycles of sexual hybridization and selection that allow some individuals to contribute more than others to the next generation. Through that process, Neolithic people domesticated annual plants without, at least initially, even realizing that they were doing so. But perennials, whose reproductive cycle under human influence depended much less on sex and selection, were not domesticated.

Woody perennials of the Mediterranean region, including olive, grape, fig and date, were domesticated in the same environment where people first tamed cereals, but several millennia after agriculture had been well established, plant evolutionist Daniel Zohary found. Fruit-producing trees and vines did not have to compete with annual counterparts for human attention. They were raised from roots and cuttings rather than sex-derived seeds, and even today, Zohary wrote, most seed-derived progeny from them are “not only economically worthless, but often regress towards the mean found in spontaneous populations, showing striking resemblance to the wild form.” He also saw as evidence of little genetic changes in these crops their failure to spread far from original climate. Annual domesticates have.

Early farmers also practiced selection in vegetatively propagated herbaceous species. As with woody species, they selected cuttings, roots or tubers from plants with desirable characteristics—often the results of unusual mutations—and distributed them far and wide. Occasional hybridization fueled some continuing selection. Yam clones selected as cultivars by farmers in Benin today are often hybrids between cultivated varieties and wild yams of the same species. But with only rare sexual recombination, there was little opportunity for the degree of domestication seen in grain crops.

Although the first farmers domesticated their crops through largely unintentional breeding, they undoubtedly recognized at some point their own power to change the character of their crops from generation to generation. Then genetic changes spread in ever-widening ripples through the plant species that people had adopted. Sowing spurred unconscious selection for traits like nonshattering; changes caused by unconscious selection prompted observant farmers to practice intentional selection; and intentional selection for one trait often affected other traits as well.

Maize, which evolved in Central America, is often recognized as a crop that underwent some of the most remarkable changes during domestication. As botanist Hugh Iltis said, without seeing the plants’ ears it

Yields of wild annuals and perennials

Some of the annual ancestors of grain crops had unusually high seed production as wild plants go, but others had yields comparable to those of the wild perennials used in perennial grain breeding at The Land Institute. The numbers here are from small plots, in grams per square meter. For a rough extrapolation to pounds per acre, multiply by 10.

Annuals

Emmer, a primitive wheat.....	210
Barley.....	186
Oat.....	148
Sorghum.....	71
Millet.....	47

Perennials

Illinois bundleflower*.....	89
Alfalfa.....	82
Intermediate wheatgrass*.....	60
Mean for 25 forage grasses.....	49
Maximilian sunflower*.....	41

*Plants we work with at The Land Institute.

sometimes takes a specialist to tell maize from its wild ancestor, teosinte, “But compare a many-rowed, 1000-grained ear of maize to a two-rowed, five-to-12-grained ear of teosinte—and be perplexed! How could such a massive, useful monster be derived from such a tiny, fragile, inedible, useless mouse?” Perhaps just as surprising is that those stark differences are under relatively simple genetic control.

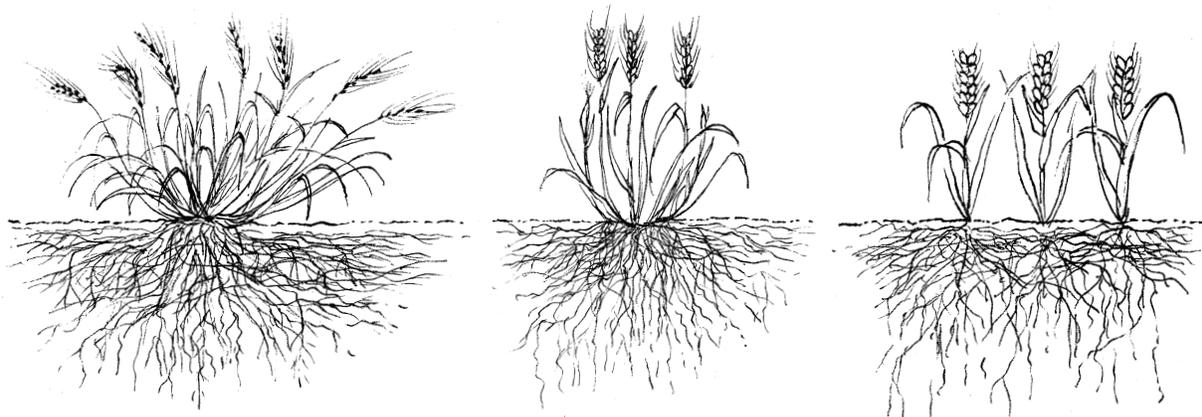
Maize is not the only species whose seed-bearing structures evolved into biological marvels under the guiding hand of early breeders. For example, pearl millet’s wild ancestor has seed heads measuring no more than 4 inches, but from it early African breeders selected millet varieties with heads up to 6½ feet long. Domesticated by Native American farmers, the common dry bean plant saw a reduction in the number of its side branches—to avoid excessive tangling in fields where it climbed corn plants—an increased robustness of leaves and stems, greatly increased pod and seed size, and an amazing proliferation of seed colors and patterns. Meanwhile, to the north, other Native American groups brought about the dramatic domestication of the sunflower by selecting for the fusion of many smaller heads into fewer, larger ones.

Perennials were left behind. Perennial species be-

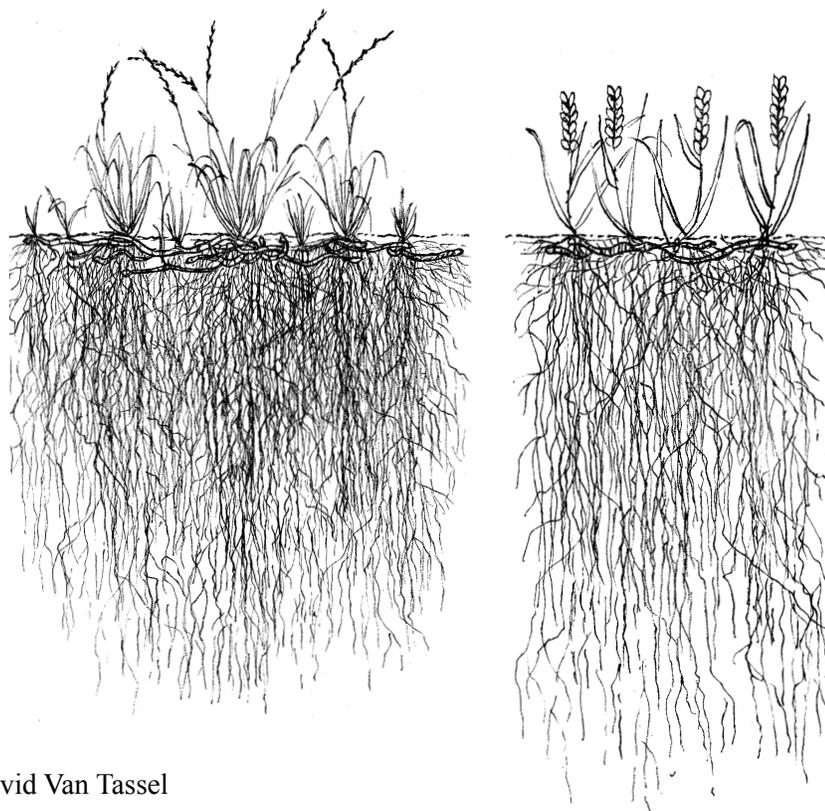
longing to the same families as maize, beans and sunflower did not undergo genetic transformations at the hands of humans, because they never cleared that initial, almost accidental hurdle of domestication.

But now, by design rather than accident, scientists at The Land Institute and other research organizations are domesticating and hybridizing perennial species. That will open the door to the kinds of dramatic changes in seed production and other traits that plant breeders have achieved in annuals.

Here's how it looked as wild annuals evolved under the guiding hand of humans into early grain crops and then modern ones, with shorter stems and more seed.



Given the same attention by plant breeders, perennials can change similarly, but with the great advantage of deep, long-lived roots.



Illustrations by David Van Tassel

At the Land

Perennial grain breeding

From hundreds of wild, perennial sunflowers grown in field plots, we picked 20 of the best for domestication.

Current crop sunflowers are annuals, replanted each year and leaving soil bare to erosion much of the time. Perennials overwinter underground and regrow come spring, holding soil and making better use of water and nutrients. This is part of The Land Institute's aim for farming to feed people more sustainably.

The grading of our top 20 wild sunflowers was by a combination of highest seed production, biggest seed and resistance to shattering, the loss of seed before harvest. The selected plants were dug up and are growing in our greenhouse. We hope to see them flower and cross-pollinate soon to produce seed for spring planting, fitting an extra life cycle into the year.

Annual sunflowers grown for food and seed oil have been bred over years to have one or a few large heads with big seeds. The perennial maximilian sunflower tends to grow many smaller heads with smaller seeds. We are breeding it to be as productive as a crop plant.

We have added help to our development of perennial grains by examining plant chromosomes with special microscopes. Before, we could only judge by naked eye in field and greenhouse the results of breeding different plants. Now we can look inside their cells at chromosome makeup and connect that with whether a plant is perennial, is compatible for breeding with another plant, and is genetically stable to pass along other desired traits. The insight is crucial for efficiency in the years-long work of breeding new crop types.

In addition to continuing development of a hybrid from annual

bread wheat and the perennial intermediate wheatgrass, with a vigorous and healthy population in the greenhouse, we have begun crossing wheat with *Thinopyrum junceum*. This perennial closely related to intermediate wheatgrass has seeds almost twice as big. We're also crossing another relative, *Thinopyrum junceiforme*, with durum wheat, the type used for pasta.

Agroecology

We're arranging collaboration with several graduate students to learn how native prairie's efficient productivity can be brought to grain fields. The students will take three tacks: how soil microbes help make that prairie rich, the effect of fertilizer use over the past century, and what kind of plant communities it takes for production with little to no fertilizer. The studies will be at five native prairie sites on rich bottomland in four counties around The Land Institute.

New board member

Anne Simpson Byrne works for PricewaterhouseCoopers Financial Services Advisory Practice in Seattle, advising large banks and financial service companies on performance improvements. She grew up in Salina, and from Duke University earned a bachelor's degree in economics and a master's in business administration.

Exposure

Smithsonian magazine profiled Land Institute President Wes Jackson among "35 Who Made a Difference" in the November issue marking the magazine's 35th anniversary. Other honorees included Microsoft founder Bill Gates, DNA discoverer James Watson, and farmer and writer Wendell Berry.

Soil scientist Jerry Glover pre-

sented Land Institute research in Baton Rouge, Louisiana, for a meeting of Green Lands Blue Waters, which aims to move Mississippi River basin farming toward more perennial plants and continuous living ground cover. Jackson spoke at the University of Chicago. Then Glover and Jackson participated in a science symposium in St. Louis. Glover also spoke in Duluth, Minnesota, at a design retreat for architects.

Short course

Our weekend Natural Systems Agriculture course for undergraduate students will be May 26-28 in Salina. Call, write or see www.landinstitute.org for attendance qualifications and applications, due April 15.

Presentations scheduled

April 19, Manhattan, Kansas.
April 21, Lawrence, Kansas.
April 25, Ottawa, Kansas.
April 26, Wooster, Ohio.
May 7-8, Olathe, Kansas.
May 10, Armonk, New York.
Jun 24, St. Louis.

For details, call 785-823-5376 or see www.landinstitute.com.

Prairie Writers Circle

We send op-ed essays to newspapers around the country. Recent topics: meat eating ethics, suburban sprawl, small-town life, light pollution and immigration (see page 19). All of the essays are at www.landinstitute.org under Publications. They are free for use with credit to us.

Tours

We would enjoy meeting you, telling our story and hearing yours. Please call ahead. We give guided tours only with advance arrangement, from 8 a.m. to 5 p.m. weekdays. See Visit at www.landinstitute.org or call 785-823-5376.





Leland

Wes Jackson

“We are vastly superior to any other species in stretching our world into the shape we want; that also makes us infinitely more capable of creating unforeseen difficulties. As a general rule, the greater the changes we think into being, the more problems we have to face. Environmental history is, among other things, a lengthy account of human beings over and over imagining their way into a serious pickle.”

—Elliott West, *The Contested Plains*

July 4, 1976, the 200th anniversary of the Declaration of Independence, I had joined several anti-nuclear weapons activists on a march south of Salina. Leland Lorenzen’s daughter Lelain was among them. As we walked along we talked. She told me about her parents. And she told Leland about me. A few days later, Leland arrived at The Land Institute to meet what he called “this dropout professor.” We quickly became friends.

Leland Lorenzen died September 6, 2005, not far from his 79th birthday. He had lived on less than \$500 a year for nearly all of his last 29 years in a shack 6 by 16 feet. A small wood burning stove provided heat. He ate mostly soaked wheat, greens from his yard and, from time to time, milk from his goat. He died as he had lived: A day or two before he died he turned to his son, Jule, and said, “Time to open a hole.” The family buried him in his sleeping bag on his one-acre plot, his grave dug with a backhoe by a neighbor who refused to accept pay for the digging. His burial did not cost the family one cent.

People most mindful of the earth’s limits who come the closest to “walking the talk” don’t talk about it. Leland was the best example I know of a “walker,” but he too was dependent on the extractive economy, even for his burial. Leland, like the rest of us, was never “off the grid.” He acknowledged that when a merchant seaman, he was grid dependent, especially at sea. He shortened a rusted-out Volkswagen Karmann Ghia convertible and drove it to conserve fuel. It looked like Donald Duck’s car. During his life in the shack, depending on his goat for milk, he figured he spent \$350 a year on gasoline and tobacco and \$150 on food.

As a merchant seaman for seven years, he had been in various ports around the world, an experience that contributed to his radical views on economies. In ports near and far he noticed the difference between the economy of the street and the economy of the official culture. But it was while he was working at the local oil refinery that he read what was for him the decisive book: Thoreau’s *Walden*. What

Terry Evans. Land Institute President Wes Jackson visits his friend Leland Lorenzen in 1990.



Terry Evans. Leland's home.

he had been turning over in his mind came together. He threw a copy of the book on the kitchen table and told Bernice, his wife, she had better read it because it was going to change the life of their family, which included three children, ages 4, 11 and 13.

During this period he was quite apocalyptic, certain that nuclear war was inevitable. It seems likely that without Harvard or Emerson, Henry David Thoreau would have been a small town eccentric. I once reminded Leland that when he was reading *Walden*, he was a beneficiary of Harvard and Emerson.

Beyond *Walden*, a major insight of his own was that we start doing violence to people and the environment when we seek pleasure. He insisted that there is nothing wrong with the experience of pleasure, but when we *seek* it we start manipulating the world, people included. That is when conflict begins. The conflict between individuals or nations comes from the same source, he often said. Here is how it works. In our heads we have an imagined environment that will bring us pleasure, and through the pursuit of pleasure we begin to move that imagined environment out of our heads and try to duplicate it in



the world in which others live in their own imagined environments. This leads to conflict. In such a manner we destroy the world's fabric, damage the mysterious life-filled skin of our planet and create pain for others. Leland carried avoidance of this to what most people would consider an extreme. When I first knew him, he had a beautiful garden and in the winter a hotbed of sorts to extend the growing season of various vegetables. One year he quit gardening, reckoning that this too was a form of pleasure seeking.

Leland lived 30 miles south of The Land Institute, relatively isolated in the country. Late one winter when I was on my way to the Wichita airport to catch a plane, I

left enough time to stop by his shack to see how he was and to visit. I noticed that he had been poking seeds into a flat of dirt. I asked Leland, "What's going on here? You're going to have a garden again? You're back into pleasure seeking."

"Come on in, Wes," he said. "I'll tell you all about it. I'm all screwed up." His wife, who lived in a house like a bomb shelter some 70 feet away, felt she needed \$300 a month to meet expenses. Her Social Security would only allow her \$200, but because Leland had worked at regular jobs before reading Thoreau, he was eligible for \$400 a month. So Leland took out Social Security, was giving Bernice \$100 per month, and the other \$300, as

he put it, was “piling up in the bank.” The knowledge of his growing bank account was causing him to “have creative thoughts,” and he had started various projects in his shop and around the place. These thoughts had led him into pleasure seeking again, and so to the desire to have a garden. His brain was “on fire with imagination.” He began to imagine pleasure foods he knew he could do without.

I couldn't help him out of his dilemma, and besides, I had to get to the airport and contribute more atmospheric carbon. This was March. Leland continued to draw his Social Security until around Christmas. My daughter Laura had come home for the holidays. On a cold Christmas Day Laura and I drove toward Leland's with the idea we would visit the Maxwell Game Preserve to check on the herd of bison and prairie elk, have a winter prairie picnic and see Leland. We parked our car at the preserve and walked a couple of miles through pasture, fields and snow to Leland's. He was in his shack, and once again he began to complain about the money piling up in the bank, forcing him into creative thinking. Laura said, “Well, Leland, why don't you just quit taking that Social Security, since it is bringing you so many problems?” A month or so later, Leland drove up to tell me, “Laura's words kept ringing in my ears, and I'm going to scratch my name off the Social Security list.”

He told me later it wasn't as easy as he had thought. He did try, but the official told him that he would have to give back all that he had received. Well, of course Bernice had spent her allotment, and Leland had spent some of his on his “creative efforts.” Leland said he couldn't give it back. The official told him to give further payments to a worthy cause. “There are no worthy causes,” he said. “Give it to your children” the official suggested. “They aren't worthy either,” he replied. (I think he feared it would be a source of problems for them; I know he loved them dearly.) Anyway, he was stuck. This money had become a curse.

This idea of money as a curse reminds me of another incident involving Leland more than a decade earlier. I was putting a roof on what became the new classroom at The Land Institute after the other had burned down. Leland stopped by, crawled up the ladder and began to help. It was inexpensive roll roofing. He helped me immensely that day. I had both a twenty-dollar bill and a five in my billfold and I tried to give Leland the twenty. He refused. I then tried to give him the five. He said no. I insisted, saying that I could afford it and that he was to take it. The conversation ended when he said, “Don't give me your problems.”

Many people have asked me what he did with his time. I do know that he had an intellectual life. He would go to the public library, check out six books, read them in the shack, return them and get six more. He had read

a lot of Krishnamurti and knew the Bible pretty well. Though he had serious doubts about an afterlife, he liked a lot of what Jesus had to say. His particular fascination was for the old Jews in the Hebrew Scriptures. He once said to me, “When you have Jews come around The Land Institute, I want to meet them if they take their religion seriously, especially the Orthodox Jews.”

A major effort for Leland was to stop the internal dialog. “We are always either building or protecting an image,” he told me. He also thought it nearly impossible in the presence of another to stop the mind's desire to do so. This was a source of worry. He said that he found himself doing it when in company. The only way out was to be alone. When he was alone, after a while his image of himself would fade, and then he would have the “awareness of a squirrel.” With squirrellike awareness, only the “effective” environment surrounds us. One is out of the “perceived” environment where the buds of violence grow.

He once took me a couple of miles from his shack to an abandoned pasture, with prairie and trees all around, where there were some large protruding rocks. Using those rocks and a minimum of building materials, Leland had recently built a small shelter just large enough to sleep in. It was really spare. The pillow case was stuffed with prairie grasses. Here the deer and other wild animals, undisturbed by his presence, would come to lie down outside within a few feet of where he was sitting or sleeping. As I surveyed the surroundings and inspected his handiwork, he explained, “Here is where Leland goes to get away from Leland.” I didn't ask what he meant, and still think it would have been improper to do so, but I have wondered. My first question was, “Why isn't life back at his shack enough?” I thought of Francis of Assisi, some of the mystics, some monks, Elijah and other examples. I still don't know what he meant, but I am still glad I never asked.

Once when I brought a “certifiable intellectual” to visit with Leland, Certifiable Intellectual was disappointed. He said I had given Leland too much credit; he thought that Leland had nothing to offer. I didn't argue. It was good enough for me that Leland had become one of my indispensable friends.

He once told me that the wheat he ate daily cost him about 3 cents, and that when he had the goat which produced his milk, the wheat that went into that goat cost 9 cents. The value of the wheat came to less than \$33 per year. Now and then he would mix honey into his soaked wheat. He called honey a pleasure food that he could do without. Every day he would measure out the wheat that he would consume the next day. He would soak it in water and cook it with a 40-watt light bulb a few hours. The cover for his container was a hubcap.

Once we took a driving trip in a pickup truck to Long Island, New York, to pick up tools and equipment

that had been donated to The Land Institute by a friend whose husband had died. On this trip Leland declared that he wasn't going to let me eat him "under the table." But I did. He got so sick we had to stop at a grocery store and buy him some peanut butter and crackers. Back to a simpler diet, he was fine.

On another trip, one January, he took me around to visit some dropout communities in the Missouri Ozarks. Most of the dropouts had been anti-war protesters, civil rights activists and the like who had thrown themselves out on the land with their advanced degrees from places like University of California-Berkeley. It was near subsistence living. This was a good trip, and I enjoyed the conversation. Leland and I talked about that trip many times, noting how difficult it is to try to become a satellite of sustainability while orbiting the extractive economy. Over the years, most of these idealistic, strong individuals found themselves increasingly pulled into the orbit of the dominant culture.

Never self-promotional, group discussion was not Leland's thing. Once when Wendell Berry was here for a visit, Leland came by. I had told Wendell that Leland had the ability to slip into a small gathering, totally de-vibe himself and slip away with scarcely anyone noticing. There was a small circle of discussion under way when Leland appeared. Wendell commented later that I had been right. Leland had come and gone without a word.

Once Leland told me that his times of depression, which sometimes lasted a few days, came as gifts of a sort. He said that depression was like a "great cleansing," that it would be followed by great clarity and insight.

Like Thoreau, he had many visitors who were attracted by his philosophies.

There are, of course, many lessons to learn from Leland, as we stand perched on the pinnacle of the oil epoch, knowing our history as a species that has gone from one energy-rich carbon pool to another, from the early stages of agriculture till now. His example forces us to ponder what is perhaps our fatal flaw: our ability to "perceive" and thereby plunder the "effective" environment of all other life.

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Soil out of Africa

Lee DeHaan

Lake Victoria and its surrounding landscape is a dramatic example of the inevitable connection between land use, wildlife and human health.

This large east African lake was once a place of beauty, a refuge for biodiversity, and an abundant source for human sustenance.

Deforestation of the hills nearby in decades past resulted in soil loss from the uplands. Although most of the hilltops are no longer being used for row crops, the soils are now too thin to quickly regenerate trees that could keep the water from running off. Rain falling on the hills rushes down the slopes into the valleys, carving out massive gullies in the thick, loose, river valley soils.

Scientists realize that the only hope for stabilizing the soil is to restore plant communities resembling those prior to deforestation. On hilltops where nearly all soil has been lost, this is too costly, and will take centuries to achieve through natural processes. In valleys, farmers have been able to stabilize a few of the gullies by planting trees and other perennial plants. Replacing annual crops like corn and cotton with carefully managed grasslands or tree crops holds promise. Some scientists hope that erosion could be sharply reduced by extensive tree planting in targeted regions.

Loss of soil, roads and fields to gullies gobbling up the landscape is devastating enough, but the effects on Lake Victoria, the world's second-largest freshwater lake, have been catastrophic. Soil and the nutrients in it wash into the lake and cause toxic algae blooms, massive fish die-offs, and the spread of water hyacinth, an invasive floating weed. The hyacinth cuts oxygen to other life and drives out desirable native plants. Water near shorelines stagnated by dense hyacinth mats becomes a breeding ground for mosquitoes and snails that spread deadly human diseases. Human activities in and around the lake have so far resulted in about 200 fish species endemic to Lake Victoria becoming extinct.

These disastrous conditions make the need for protecting the integrity of natural ecosystems throughout the planet abundantly clear.

Lee DeHaan. Scientists stand in a gully from erosion that followed cutting of forest near Lake Victoria in Kenya.



Free borders make good neighbors

Wylie Harris

Not long ago, half a dozen people calling themselves the “Lone Star Minutemen” descended on a corner in the college town near our farm to protest illegal immigration. Every day at this corner, undocumented Latino men gather in hope of landing a day’s work with passing contractors.

These Minutemen appropriated their name from the militia of the American Revolution, who had to be ready to swap plows for muskets in a minute to defend their new country. Those independent small farmers became a cornerstone of the United States’ civic mythology. Indeed, Thomas Jefferson believed them to be both source and guardian of democracy itself.

Today’s Minutemen want stricter limits on immigration. But that approach would shut out people who come as close as anyone to making reality of Jefferson’s vision. That’s certainly true of some Mexican neighbors of mine—hardworking folks who farm other people’s land, scraping and saving until they can afford a few acres of their own. Against all odds, some are making that dream come true.

My Mexican neighbors, and others like them all over the United States, are also one of the first rays of hope that farm country has seen in many a moon. Ever since the Dust Bowl days of the 1930s, many rural counties have been losing people. Between 1990 and 2000, Latino immigrants have kept more than 100 rural counties from suffering that fate, according to the Agriculture Department.

Latinos are also the fastest growing group among farmers, whose numbers have been declining for decades. Nationwide, the number of Hispanic farmers doubled between 1997 and 2002, even as the overall number of farmers continued to dwindle.

The United States has its own trade policies to thank for the rising number of farmers migrating here from Mexico. As heavy U.S. farm subsidies flood Mexican markets with cheap corn, farmers there earn less on the corn they grow. Many of them have no choice but to go looking for another job. In that search, many learn the hard way that “free trade” agreements open borders only to wealth—freeing it to go wherever it can multiply the



quickest—but not to the people impoverished by that process.

Combining an agricultural policy that ruins Mexico’s farmers with immigration laws that keep them from rescuing the United States’ own rural economies makes little sense and less justice. That lack is plain in the modern-day Minutemen’s un-neighborly attitudes, and in the draconian immigration bill currently before the Senate. The bill would put up a new

fence along the U.S.-Mexico border, use police and military troops to patrol it and make illegal immigration a felony.

Such schemes punish not only immigrants, but also the “natives” who still inhabit—and value—rural communities. Farming as a way of life is tough, rewarding and vanishing. I welcome people—any people—who will keep it going, and I want an immigration policy that doesn’t get in their way. The National Immigrant Farming Initiative (immigrantfarming.org) has an approach I like, investing in immigrant farmers’ contribution to U.S. agriculture with training, translation and the chance to network with other farmers.

My family has lived on the land that we farm for five generations and counting, but I try not to feel smug about that. For all I know, a like smugness may have inspired the earlier “natives” who scalped my great-great-grandfather. Wind the clock back far enough, and we are all newcomers—all with something to contribute, all in need of, and eager to return, a helping hand.

However different our origins, the same economic winds blew my neighbors and me into the little stretch of country that we share. Like it or not, we’re neighbors, and that fact carries certain obligations—of fairness and decency, of neighborliness. We ignore those obligations only at the peril of losing community, democracy and even freedom itself.

With the Prairie Writers Circle, The Land Institute invites and distributes essays to about 500 newspapers and a dozen Web services. All essays are at www.landinstitute.org, and free to use.

Ask Marty

Scott Bontz

Marty Bender could tell you a grass species by the hairs at the base of its stem, and how many calories make the world go round. And tell you he would. If you asked The Land Institute's energetics bulldog and largely self-made naturalist for help understanding this vast economy largely ignored by the world's economists—how much oil was burned to mine the coal to smelt the steel to make the tractor to drink the oil to grow the wheat to raise the loaf of bread to fuel your body—you likely wouldn't just get an answer off the top of his head. (Though he might indeed recall how many watts a chickadee flutters—and imitate its call, too.) No, you'd probably get a whole paper. It could be quickly copied from among thousands accumulated over years to pack more than 50 file cabinet drawers and boxes, which he navigated like a hawk in home forest. Or next day you'd find in your mailbox a sheet of his research and calculations, rendered in a hand seemingly aimed to burn lead through paper. Either way, it would be more than you asked for.



Author Wendell Berry wrote in an appreciation, “I learned for myself that a request to Marty for a little help would bring it forth abundantly, and even overwhelmingly.”

Historian and Land Institute board member Donald Worster said he once asked Bender for a few facts about energy consumption on a Kansas farm.

“Back in the mail came a response that must have taken him several hours to assemble—far more information than I needed, all given in a spirit of selfless generosity that characterized Marty to the core. Besides his family, he lived for The Land Institute and its research programs.”

Bender's answers were both blunt and exacting, what institute board Chairman Conn Nugent called a “tough theology”:

“Will biofuels one day power an expanding American economy? No way, says Marty: You could grow fuel crops on every square inch of North America, and still fall way short of the net energy provided by the contemporary supply of fossil fuels. Solar panels? Wind machines? Hybrid vehicles? Sure, Marty would say, those are good things. Just don't expect them to let you live in the style to which you've become accustomed.”

Bender, who taught himself calculus in junior high school, was naturally made for science. But as a self-described city boy from Dayton, Ohio, he was not a born or bred naturalist. He graduated, cum laude, with a degree

in physics and chemistry. Only after that did he develop the interest in biology that would take him to The Land Institute.

“I look back,” Bender said at the institute's Prairie Festival in 2004, when a nature trail was named for him, “and find it hard to believe that during the first 25 years of my life, the only things I could actually name were robins, blue jays, cardinals, pigeons and nighthawks.”

This even though as a Boy Scout he went camping every month.

But when he began leading scouts himself, their questions about bird and trees were a call to the wild. He went birding with an Audubon group. He took Peterson guides to the field. What he couldn't identify there he sketched for comparison at home with a three-volume plant manual. He amassed several hundred pages of notes, and kept lists of everything he identified in west-central Ohio: at least 200 birds, 200 insects, 70 butterflies and moths, 40 mushrooms.

He did this so he could refresh his mind with the new names.

“I am embarrassed to tell you,” he said, “but as I drove to work every day, I memorized the scientific names of plants over and over again. I had to do this in order to recognize the scientific names in professional botanical surveys that I looked up in various research journals.”

Land Institute President Wes Jackson said, “As it was said of Charles Darwin, he had an enlarged curiosity.”

That curiosity and dedication eventually took Bender from teaching high school to being a county park ranger. And that took him to meet Jackson, and then to the institute as an intern, in 1978, for the big-picture environmental bent he missed as an undergraduate.

“Here, the emphasis was not on environmental problems, but on how we got into this mess and how we might get out of it,” Bender said at the Prairie Festival.

He stayed on as a researcher and helped study prairie plants in preparing ground for the institute's mission, to make agriculture work more like natural ecosystems.

After five years, Bender left to earn his doctorate in plant biology. Then he returned to lead a project called the Sunshine Farm. For 10 years the institute would look as far as possible through the human and natural economies for how much energy, material and labor came into a farm and out of it, toward conversion of agriculture to renewable energy. Bender's expansive view fit.

Doug Tompkins, co-founder of the Foundation for Deep Ecology and a primary benefactor of The Land In-

stitute, said Bender was crucial for the organization to do something like the Sunshine Farm:

“Marty was one of those people who had a particular fix on things, a particular slant that was important and critical to the big analysis; without it, without this slant and fix we would have fallen short in our collective thinking. Those who may have higher profiles and put the big picture together, some like Wes, have to have the Marty Benders around to put solid foundations under their broad macro arguments.”

Wendell Berry said, “I visited The Land Institute for the first time in 1980. I have known ever since that a crucial portion of the energy and intelligence of that place was Marty Bender’s. I have known this not only from my experience of Marty himself, but also from Wes Jackson’s frequent mentions of his perfect trust in Marty and his admiration and of course his gratitude for Marty’s great ability.”

“Marty was one of the most gifted people I have ever known,” Jackson said, and irreplaceable. “To say that he will be missed does not capture the sense of loss all of us feel here at The Land.”

The Sunshine Farm study itself ended in 2001. Bender set to analyzing it and writing a book, expected to take several years.

In November 2003, he was diagnosed with a terminal cancer. Jackson told him that he was free to leave the institute, with pay, to spend his time however he wished. Bender stayed, to write the book. For two years he worked full-time. In November 2005 his physical energy could no longer match his intellectual desire, and he finally stayed home. Shortly before his 54th birthday on Dec. 26, Bender’s wife, Mary, brought him to the institute for the last time. He spent the morning explaining the roughly three-fourths of the book he’d written, what was left, and how to finish. The Land Institute will do this.

Bender kept reading magazines brought to him, though shifting from science to current events. He listened, critically and analytically, to classical music. To the day before his death, he talked and joked with visitors at home. And the next day, from a hospital bed, he spoke to his three children. Even into his last week, Bender had still planned for a family reunion this summer. Though from diagnosis on he did not deny what was happening, he still worked and talked looking ahead.



Marty Bender in 1981 with sorghum, one of the annual grain plants The Land Institute is making a perennial.

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The writers and artists

Carl N. McDaniel is professor of biology at Rensselaer Polytechnic Institute in Troy, New York, and a member of The Land Institute's Natural Systems Agriculture Advisory Group. He is the author of two books: *Paradise for Sale*, with economist John M. Gowdy, and *Wisdom for a Livable Planet*.

Birger Sandzen, 1871-1954, was a Swede who came as a young man to Bethany College in Lindsborg, Kansas, intrigued by reading of America and Mexico. He taught painting, art history, languages and esthetics at Bethany, and promoted appreciation of art in the Midwest. A namesake gallery in Lindsborg shows his work and that of other artists. You can learn more at www.sandzen.org.

Dana Wildsmith is the author of four poetry books: *One Good Hand*, *Our Bodies Remember*, *Annie* and *Alchemy*. She lives in Bethlehem, Georgia, and works as an

English literacy instructor for Lanier Technical College. **Stan Cox** leads The Land Institute's plant breeding team.

David Van Tassel is a Land Institute plant breeder.

Wes Jackson is The Land Institute's president, and author of books including *Altars of Unhewn Stone*.

Terry Evans, a Land Institute board member, has several books of photographs, primarily about the nature of prairie, from native state to human use. Her latest work is *Revealing Chicago: An Aerial Portrait*.

Lee DeHaan is a Land Institute plant breeder. He visited Kenya to give a presentation at the International Ecoagriculture Conference and Practitioners' Fair.

Scott Bontz edits *The Land Report*.

Wylie Harris ranches with his family in Cooke County, Texas, north of Fort Worth. He was a Land Institute graduate student fellow.

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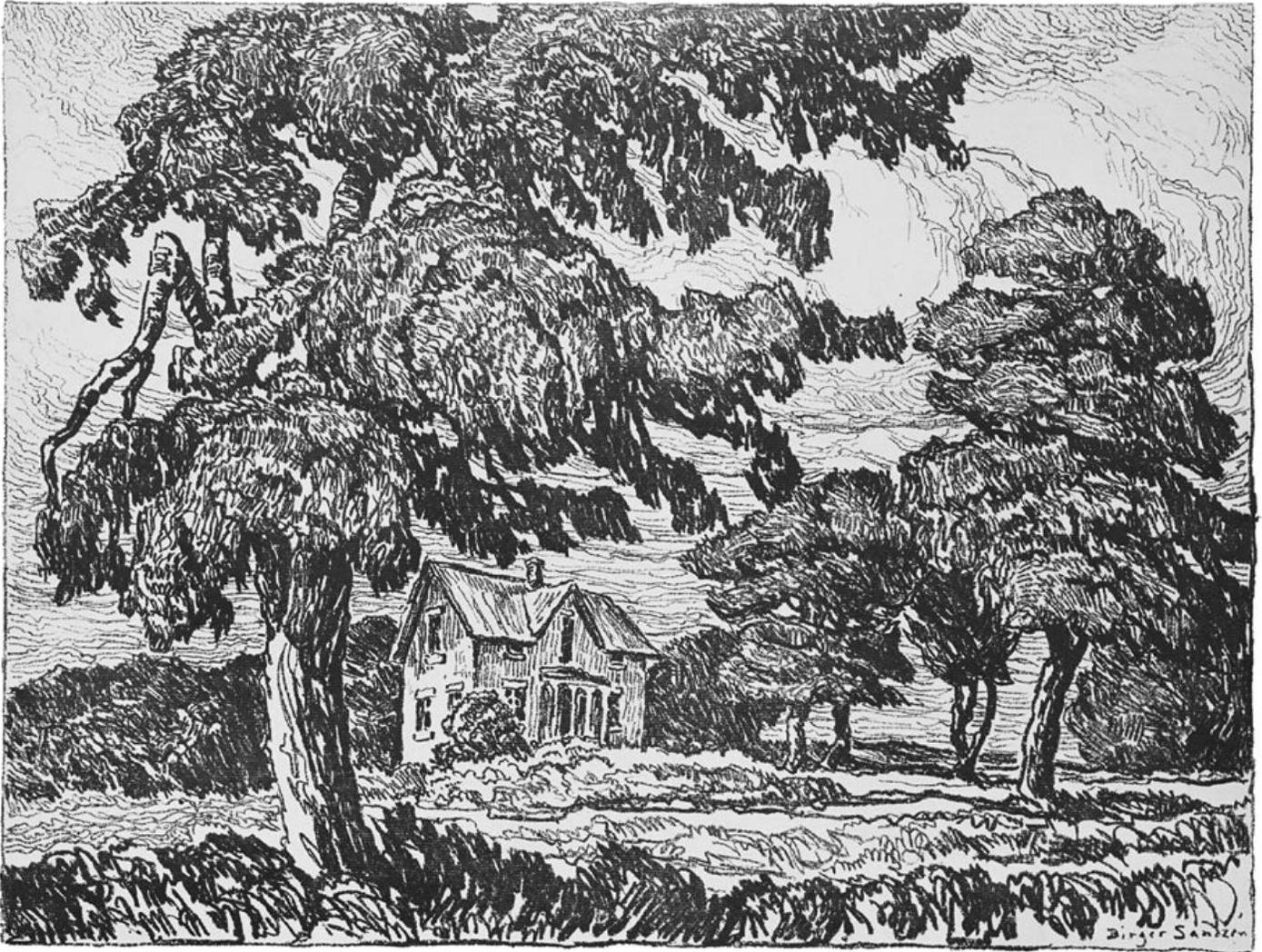
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Olof Olson's Homestead, by Birger Sandzen. Lithograph, 20 by 15 inches, from Birger Sandzen Memorial Gallery.



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