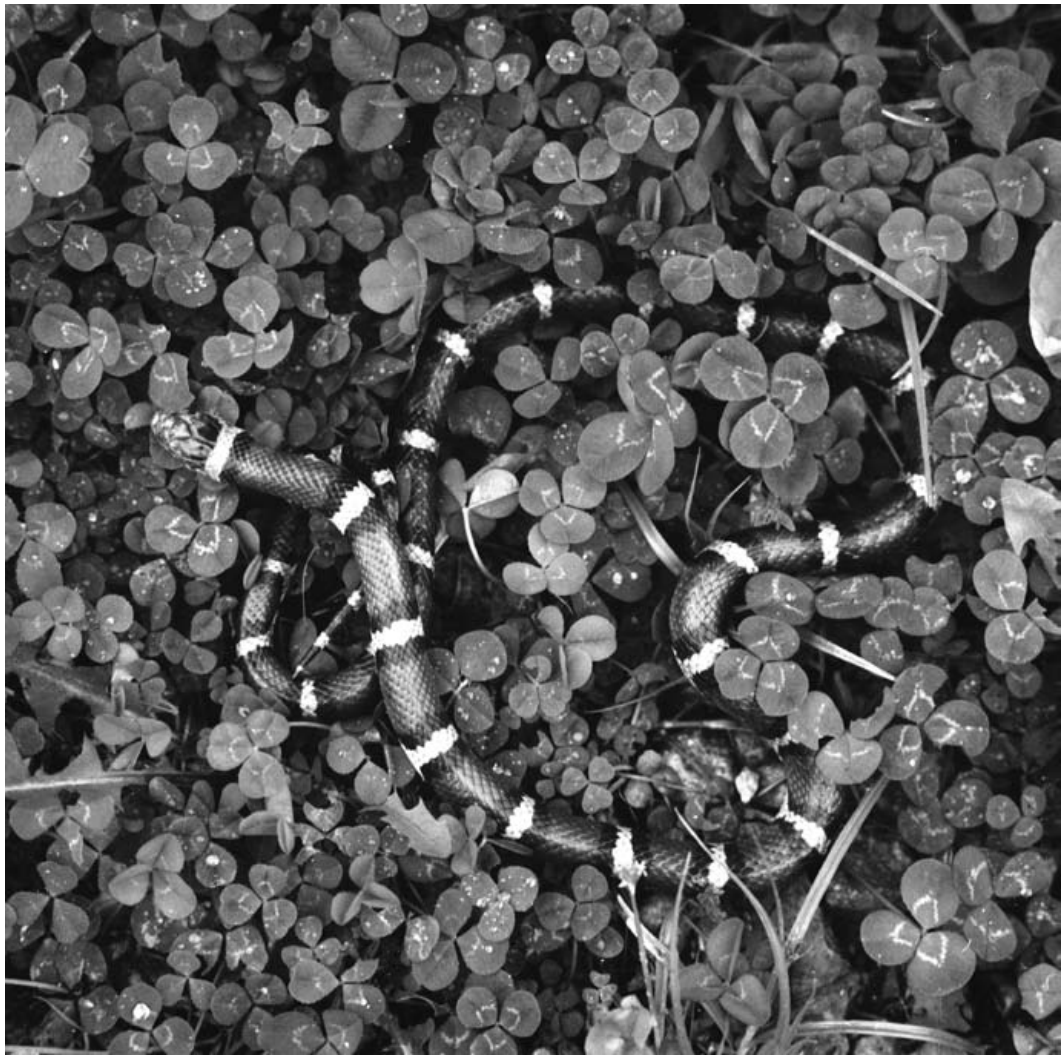
Land Report

Number 103, *Summer* 2012 · *The Land Institute*



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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ELECTRONIC MEDIA

To receive Scoop, e-mail news about The Land Institute, write to Carrie Carpenter at carpenter@landinstitute.org, or call. Our Web site is landinstitute.org.

SUPPORT

To help The Land Institute, see the contribution form on the back cover, or contribute online at landinstitute.org. Funders receive the Land Report.

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Cover: Milk snake, Lawrence, Kansas, 1982, by Terry Evans.

Contents photo: Perennial wheat hybrids at The Land Institute, by Scott Bontz.

David Van Tassel walks behind to check deposit of sunflower seedlings by a planter. Sheila Cox, left, and Lee DeHaan send the seedlings down the planter's chutes. Van Tassel started 28,000 seedlings, double last year. The machine is fast, but imperfect, requiring occasional touch-ups by hand. Scott Bontz photo.

$2 million for ecology research

Two million dollars from media magnate John Malone will fund Land Institute ecology research – how to make farms work more like natural ecosystems. Ecologist Tim Crews will lead the work as the institute's research director beginning in September. The money will come over five years.

Most of The Land Institute's scientists have focused on developing perennial grains individually. The new money covers how best to grow them for grain production, and together, as in prairie, which far surpasses annual grain crops at conserving soil and using water and nutrient, and can match or best them for green growth without artificial fertilizer.

Crews has long collaborated with Land Institute scientists, and numerous times has brought for visits his students at Prescott College in Arizona. There he studied nutrient cycles and nutrient inputs from weathering on farms and in natural systems. Running the school's farm, he worked toward agriculture with minimum resource imports. He taught about world energy availability and climate change, and local soil erosion, water-efficient cropping, nitrogen-fixing crop rotations, and natural systems agriculture.

For 24 years Malone was chief executive officer of cable TV giant Tele-Communications Inc. Now he is chairman of Liberty Media, which in addition to cable holdings owns much of the stock of Sirius XM satellite radio and the bookstore chain Barnes & Noble. He is the largest individual land owner in the US, with more than 2 million acres, almost half of it in Maine. He spends much time there, but makes his home in the Denver area. He was on the board of the Nature Conservancy, and has earned a reputation as a conservation-minded land buyer.

All in moderation, including N

Nitrogen is crucial for plant growth, and farmers use it, whether as synthetic fertilizer, manure, or in legume rotations, to boost grain yields. But growing the perennial intermediate wheatgrass in a hot and often dry climate like that of central Kansas might require careful and frugal balance of the nutrient and water. Wheatgrass researcher Lee DeHaan and his assistant, Marty Christians, measured chlorophyll and leaf temperature in plots receiving various amounts of nitrogen. Nitrogen clearly increases chlorophyll content, which last year increased yield. But this year nitrogen increased canopy temperature. That means plants lacked enough water to transpire and stay cool. Winter and spring brought too little precipitation to recharge the soil. Plots with plenty of nitrogen saw leaves whither and die. Plants failed to develop properly before building seed heads. The parching affected all plots, but the richer ones looked worse. The same

problem appeared in annual wheat. The most fertile portions of fields made the most tillers – side shoots, with their transpiring leaves. They used the most water, ran out of water, and had lower yields than what are usually the poorer sections.

What to do? In regions with higher rainfall or lower loss of water to heat, there is probably no worry. DeHaan's colleagues in Michigan report wheatgrass yields double of those at The Land Institute. But in central Kansas and other warm areas at the edge of the semiarid world, the system will need modification to sustain yield. DeHaan suggested these possibilities: Limit nitrogen availability to reduce plant growth and therefore water use. Keep plants widely spaced to limit water use. Reduce plant height and leaf area through breeding so less water is transpired. Breed and manage plants so they develop faster, reducing the time for maximum water consumption. Mow to cut moisture loss. Breed to reduce "luxury consumption" of water during periods of abundant soil moisture, as has been suggested by Australian scientists. Breed for reduced tillering to limit plant population density.

"My personal preference is of course to tackle this through the breeding approaches," DeHaan said. "If those prove inadequate, farmers will be likely to implement the management strategies." He's already seen great gains on faster development, and without trying: the big-seeded plants he selects for tend to mature sooner. A decade ago wheatgrass harvest came in August. Now it starts in July.

One might say that in natural systems agriculture the solution shouldn't involve applying nitrogen. But to get to that system first requires understanding its plants and how they grow among other plants. Getting nitrogen from manures or legumes is complex, and knowing how much of the nutrient is available makes experiments complex.

DeHaan began to collaborate with Steve Larson, a USDA geneticist at Utah State University. With Land Institute plants, Larson will create a genetic map of wheatgrass. This is like numbering the pages of a book. Researchers can use "markers" like bookmarks to help identify whether plants have desired traits. The markers identify particular DNA sequences. These random sequences aren't for genes that control the traits – finding genes is formidable. But scientists can, through study of proximity, link those genetic directions to the markers. So with map and markers they get fairly clear pictures of whether a particular plant has genes for traits such as larger seeds or easier threshing. This will allow breeders to skip raising every plant to maturity before being able to see its traits. And so DeHaan and others hope to greatly speed selection of the best plants and achievement of a useable perennial grain crop.

A storm knocked over wheatgrass varieties developed for pasture and hay. This "lodging" came because though the plants were relatively short, their stems thin. Forage breeders aim for low fiber, which means low stem strength. Livestock graze before plants are tall enough to lodge, or the plants can be baled. The population that DeHaan started with from the Rodale Institute a decade ago also lodged. But after a couple of selection cycles for seed size and yield, though plants grew taller, lodging was vastly reduced. "I have generally observed that plants with good seed yield also have thick, stiff stalks," DeHaan said. "Plants with flimsy stalks often set almost no seed."

Bypassing demands of winter

Wild Maximilian sunflowers must pass dormant through the cold and dark of winter

before they sprout. At least the vast majority do. This is a problem for making the perennial into a crop plant. Farmers sow in spring for their plants to sprout fast and beat weeds. And they don't need the trouble of giving hundreds of pounds of seed special treatment. But Land Institute sunflower researchers David Van Tassel and Sheila Cox have found some Maximilian plants that appear to not have genes requiring winter dormancy. The scientists can try to spread this trait through their sunflower breeding populations.

They made their finding by moistening thousands of seeds in the dark at about 80 degrees Fahrenheit. Some families had not one of 500 seeds germinate. This showed that the researchers had eliminated environmental signals that break dormancy. It strongly suggested that seeds that did germinate were different. The rate of germination among families varied greatly. In response to the very low frequency in some populations, Cox and Van Tassel provided one week of cold. Some families jumped in germination. Others appeared to need a much longer chill. Van Tassel said that relenting with one cold week lowered selection pressure so he could find seeds with at least reduced dormancy. Crossing plants with reduced dormancy might fully rid the next seed of the dormancy demand.

Van Tassel, Cox, and other workers transplanted from greenhouse to Land Institute fields about 28,000 perennial sunflower seedlings, double last year's effort. They also planted a couple thousand more near Hays, Kansas, about 100 miles west of the institute, and Hiawatha, about 150 miles northeast. Fort Hays State University and Highland Community College wanted to collaborate with The Land Institute. The institute will see how its plants perform in soils and rainfall different from home.

Changes on the board

The Land Institute said goodbye to two longtime board members and welcomed four new ones. Leaving after 32 years on the board is photographer Terry Evans, and after 19 years, land foundation leader Victoria Ranney. Joining the board are a scientist from the West Coast, Eric Gimon, one from the East, Michelle Mack, environmental educator Brian Donahue, and farmer and organizer Leigh Merinoff.

"It was definitely one of the important things of my life," Evans said of being a board member, "but I felt it was time to give someone else a chance." She said, "I intend to stay closely involved with The Land Institute." For more about Evans' history with the organization, see page 24.

Ranney is president of Liberty Prairie Foundation, which aims to build local food systems while enhancing the natural landscape. It is responsible for Prairie Crossing, a 669-acre Chicago suburb that is 70 percent open space, including 100 acres for food production, and allows prairie landscaping instead of lawn.

Michelle Mack is an associate professor at the University of Florida Biology Department. She's interested in what controls ecosystem structure and function, studies feedback between ecosystems and warming climate. She has worked from Costa Rican rainforest to Siberian tundra. While a Land Institute intern in 1991, she helped establish the organization's first large-scale perennial polyculture. She stayed on for 1992 as a research fellow. Her university Web page says, "If she were a plant, she would be a larch tree (*Larix sp.*). If she were an element, she would be something with a really conservative cycle, like neobidium."

Eric Gimon is a San Francisco Bay Area physicist and philanthropist working on energy, climate, and technology policy. He

is particularly interested in the long-term approach to societal problems: coupling ideas that may take decades to blossom with the sustained vision and drive to see them developed. He said he "has given up thinking about the mysteries of quantum black holes in order to dedicate himself to the evolution of a sustainable electricity grid built on a 100 percent renewable energy that is cheaper, cleaner, more resilient and more equitable than the one we live with today." A grandson of William R. Hewlitt, co-founder of Hewlett-Packard, Gimon helps direct the Flora Family Foundation founded by Hewlitt and Hewlitt's wife, Flora, and he has served on the board of the William and Flora Hewlitt Foundation. He also serves on the board of the Pacific Institute, which conducts research to advance environmental protection and social equity along with economic development, and he advises The Vote Solar Initiative, which works for cheaper solar energy.

Brian Donahue teaches courses on environmental issues, environmental history, and sustainable farming and forestry at Brandeis University in Waltham, Massachusetts. Before that he was The Land Institute's education director. His primary interest is the history and prospect of human engagement with the land. He co-founded and for 12 years directed Land's Sake, a nonprofit community farm in Weston, Massachusetts. He describes that in "Reclaiming the Commons: Community Farms and Forests in a New England Town." He also wrote "The Great Meadow: Farmers and the Land in Colonial Concord" and co-edited "American Georgics: Writings on Farming, Culture, and the Land." At the Prairie Festival he will lead a conversation with writer Wendell Berry and Berry's daughter, farmer Mary Berry Smith.

Leigh Merinoff, who raises herbs and fruit at her suburban New Jersey home and livestock, food, and herbs at a Vermont farm, organizes communities for living more sustainably through self-sufficiency. She founded two groups, Moving Toward Sustainability, and AgroLiving. (See agroliving.com.), and is beginning a rural food hub. The former sculptor and teacher serves as an ambassador for Heifer International, a nonprofit organization dedicated to alleviating poverty via education and gifts of livestock.

Protecting, getting at the gear

The Land Institute will build a 2,400-square-foot metal building at its farm, to protect and ease access to tractors and other equipment that pack an original structure to overflowing. The $60,000 building, funded from the general capital budget, will start going up in early August and should be ready by month's end.

Presentations

The cover story of the July issue of Harper's magazine, "Broken Heartland," includes The Land Institute and "buffalo commons" scholars and promoters Deborah and Frank Popper, and photos by departing institute board member Terry Evans. Land Institute staff members spoke in California, Illinois, and Arkansas. Upcoming appearances: August 8 in Winnipeg, Manitoba. September 13 in Lisle, Illinois. October 17 in Overland Park. The Land Institute will present its Prairie Festival this year September 28-30 – see page 10. For more information about presentations elswhere, call 785-823-5376 or see Calendar at landinstitute.org.

Prairie Festival recordings

September 23-25, 2011, The Land Institute

NUMBER	TITLE	SPEAKER
_____	Report from Land Institute scientists	
_____	Wildlands, Woodlands & Farmlands: A Conservation Vision for New England and Beyond	Brian Donahue
_____	Appreciating Local Governance	Kamyar Enshayan
_____	Soil: Our Most Strategic Resource	David Montgomery
_____	The (Re)Evolutionary Potential of Climate Change	Naomi Klein
_____	The End of Growth: Peak Oil and the Economy of the Future	Richard Heinberg
_____	The Next Synthesis	Wes Jackson

Total individual CDs _____ × $15 = _____

Sets (one of each) _____ × $90 = _____

Total _____

We accept checks and money orders for US funds, and Mastercard, Visa and Discover. Card purchases can be by mail, fax or phone. Place orders to The Land Institute, 2440 E. Water Well Road, Salina, KS 67401. Phone 785-823-5376. Fax 785-823-8728.

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It is dangerous to judge ability by short-term results. – Leonard Mlodinow, "The Drunkard's Walk"

"Generation 4," by Gesine Janzen. Woodcut, 60 by 43 inches. Janzen will show at The Land Institute's Prairie Festival.

Prairie Festival 2012

Writer Wendell Berry will return to speak at this year's Prairie Festival, this time in conversation with his daughter, vintner Mary Berry Smith, and "Reclaiming the Commons" author Brian Donahue. The festival will be held September 28-30 at The Land Institute, Salina, Kansas. Other scheduled speakers are David W. Orr, environment scholar and author of "Down to the Wire: Confronting Climate Collapse"; P. Sainath, a journalist who writes about India's rural poor, including in the book "Everybody Loves a Good Drought"; Michelle Mack, a University of Florida ecosystem scientist now studying feedback between ecosystems and warming climate; physicist Eric Gimon, who plans to discuss the parallels between moving society to a more sustainable agriculture and moving it to more a sustainable, carbon-free energy system; and Land Institute President Wes Jackson. Gesine Janzen, a native Kansan now teaching at Montana State University, will show prints (see facing page). Architect Bill McBride will erect a sculpture in wood ringing the festival's traditional bonfire. Singer-songwriter Eliza Gilkyson will entertain on Saturday night, Ann Zimmerman on Sunday morning. The festival features a barn dance Friday night. Primitive camping is available – no campers, trailers, or RVs. Directions, transportation, and lodging information can be found under the Visit tab at landinstitute.org, or by calling 785-823-5376 weekdays. Schedule and updates appear on the Web site Calendar.

	Students	_____ x $10 = _____
Early registration	Friends of the Land	_____ x $16 = _____
	Others	_____ x $26 = _____
Registration after September 9	Friends of the Land	_____ x $20 = _____
	Others	_____ x $30 = _____
	Saturday night supper (vegetarian, not vegan, meal: ☐ Yes ☐ No)	_____ x $14 = _____

Friend of the Land gift, $50 minimum. You're already a friend if you have given since September 27. $ _____

Total $ _____

☐ Visa ☐ MasterCard ☐ Discover Expires _____ / _____ Card number _____

Signature _____

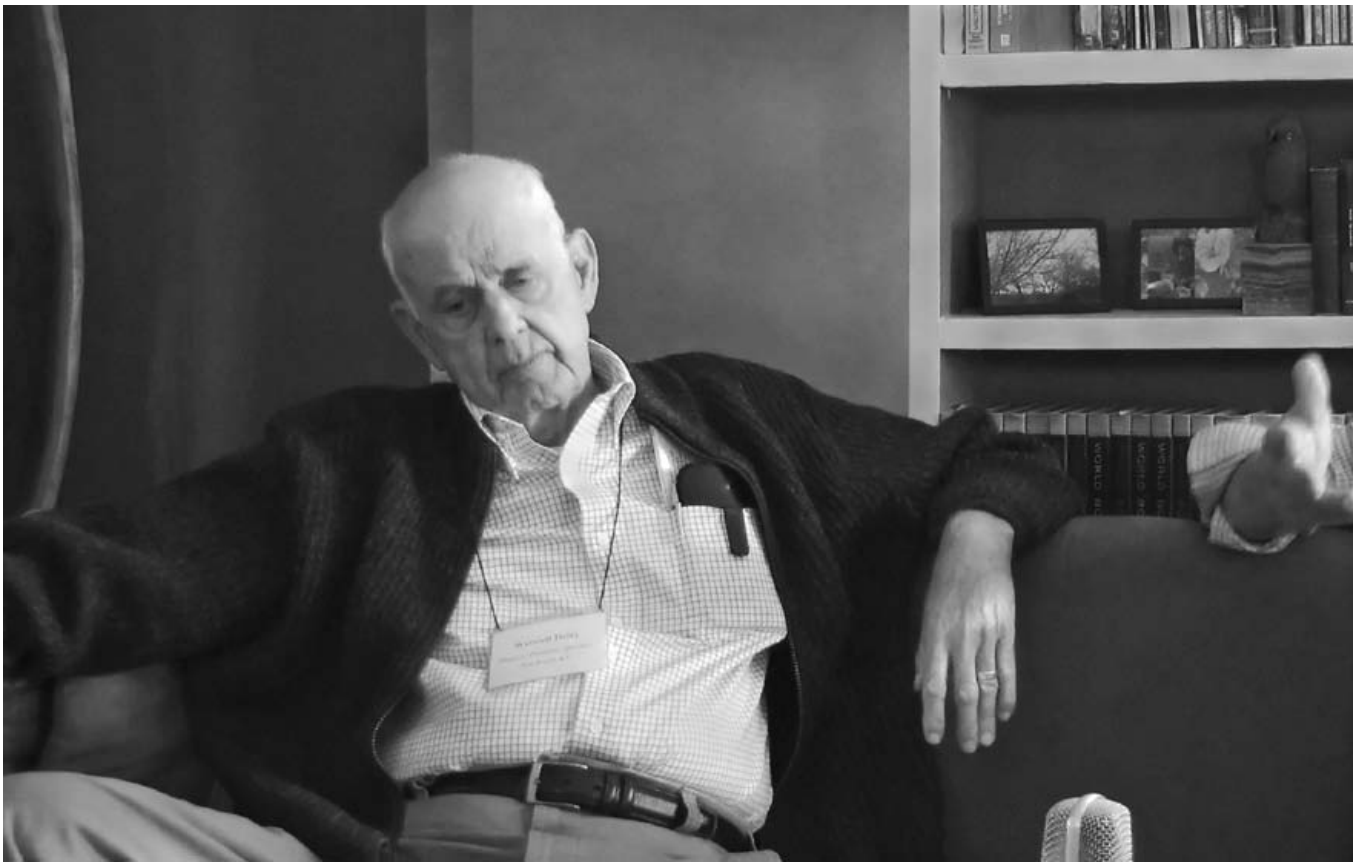
Attendee names _____

_____

Address _____

Phone _____ E-mail _____

To register by phone, call 785-823-5376 weekdays. We won't confirm your reservation. Collect programs and meal tickets at the registration desk. No refunds. ☐ Send map



When Wendell Berry and Wes Jackson first met, Berry said, "The spirit was immediately conversational." Scott Bontz photo.

Our common ground

An interview with Wendell Berry and Wes Jackson

Over the course of three decades, Wendell Berry, a fiction writer and poet in Kentucky, and Wes Jackson, a scientist in Kansas, have influenced, challenged, and entertained each other. Despite their very different training and approaches to exploring the world, their friendship has been a vital source of mutual creative inspiration. Through the frequent exchange of letters and phone calls, they have developed new ideas and revised old ones, collaborating on a number of projects, including "A 50-Year Farm Bill" for The New York Times opinion pages. And Berry will speak at the Prairie Festival to be held September 28-30 at Jackson's Land Institute. In an era of increasing abstraction and specialization, where personal connections are understood in terms of digital "networks," Berry and Jackson have forged a lasting friendship based upon their mutual respect for the earth. Here they talk about it with Kristin Van Tassel and Aubrey Streit Krug.

Van Tassel: You've written a lot about male friendship in your fiction, Wendell. But you've also mentioned in interviews that there are restraints on how men can show love and affection for one another, especially in public. So I wondered if you could talk about why this is the case for male friendship, but also why male friendship is important. Do you see your friendship with Wes as extending beyond the boundaries of what's typical for male friendship in intellectual circles or rural places?

Berry: I never thought to classify and label it as "male friendship." My friendships have had their significance in being distinct, not in being alike. I don't have much of anything to compare with this friendship. Wes is the only scientist with whom I have really talked over a long time. In some ways, I don't think of him as a scientist but as a partner or co-worker, and also as a friend.

Jackson: Wendell's ideas greatly influenced my thinking and therefore The Land Institute for three decades. Wendell's education in the humanities having influenced the scientific discussion here shows what is possible for the universities; knowledge can be forced out of its categories.

Berry: I'm enabled, too, in the opposite way because as a critic of agriculture, which I guess I am in a way, I'm necessarily a critic of science. I know most agricultural scientists are not going to respond to me because I can be safely ignored. Nevertheless, if I can get an idea past Wes, then I have a certain boldness to speak that I wouldn't have otherwise.

Jackson: Wendell has said to me many times, "all adaptation is local." This informs my idea of the ecological, and my ideas of the ecological have informed his idea of the local. This is the way it ought to be.

Berry: When I say all adaptation is local, I'm talking about what I think is science. But if I didn't have a scientist to say it to – who would either stop me or let me say it – I would not know. Maybe you could say we've given each other a kind of completeness neither of us would have had alone. There's a kind of confidence that comes with this sort of alliance. You can think of it as a friendship from an internal point of view, but as it faces the world, it's an alliance because we've got opponents out there. So we need each other for help.

Jackson: Exactly. Wendell has said that in a conversation you have to respect the otherness of the other, and you don't always get back the answer you want. But what you get back informs the next. If you have a friendship, you automatically have respect for the other. Now you can have a conversation. Think about how many conversations are unnecessarily combative. It becomes a competition rather than a mutual search. And that's what it should be – a search.

Van Tassel: How do you maintain your relationship? How often do you call one another or write? Is it something you just find yourself doing? Is it something you've committed to do?

Berry: Well, I call Wes to see if he'll let me say something. I think of something with a scientific aspect to it, and I know I've got to call him up. I'll say, "I'm going to say this – is that all right?" And he'll say, "Yeah, go ahead and say that." Or he'll say, "Wait a minute."

Jackson: We used to write more. Now we talk more on the phone. I find – just as Wendell said – that we don't have to explain things. We've got common interests. But what's interesting about those common interests is that while mine are informed by science, Wendell's are informed by literature – which I've found absolutely indispensable and use all the time. For example, I recently talked about Milton and Blake in one of my public lectures. Shoot, I'd never have come to Milton and Blake on my own, ever. Or the title of my last book, "Consulting the Genius of the Place," came from Wendell. Wendell's literary engagement has enriched my whole way of thinking about the world. Early on in my friendship with Wendell, I found that if you have an abstraction without a particularity, you better pack your bags. But I came out of family that was like that. You know,

rural people. They spoke plainly. That's one thing I really liked about our relationship from the beginning – it's quite all right to speak plainly.

Berry: When we talk, we don't sound like the Biology Department talking to the English Department.

Jackson: Or biologists talking to biologists. In some respects, because we come from different disciplines, there's a forced plainness in our talk that is just as communicative. Our common ground is *ground*.

Berry: That's right. The common experience of growing up on the ground, doing the work of landed people: that's a connection. It doesn't require much explaining. I think you'd be mistaken, though, if you thought we always talk as if we are at a conference. There's a lot of what more serious people would consider waste in our conversations but that for us is utterly enjoyable. Sometimes I call Wes because I haven't heard from him for a long time, and I want to know how he is. I've begun to worry about him. I know he's been traveling a lot. So I try to get him on the phone, and I don't have any agenda at all. I just want to hear his voice and see what he's found out and catch up a little bit. Some of these conversations are favored in a more serious way, and something will come up – a rabbit will jump, and we'll chase it, and we'll both learn something, or I'll learn something from him. It's just being available to each other that makes these possibilities.

Jackson: When I put out "New Roots for Agriculture," I didn't see this coming. I'd read "The Unsettling of America." I was very taken with it. As I say in my book, "Consulting the Genius of the Place," when Wendell called, I turned to the family and said, "It's Wendell Berry." I had no idea we'd have the kind of symmetry we have. If you start with the idea we're all students trying to understand, then you forget about any game playing like you see in universities. In the university, you're forever seeing people who bring up a book or article or something else they've done, and you feel terrible about yourself, thinking, "Oh, I'll never do that." But if you start with the idea there's a deficiency that needs to be dealt with, as Wendell and I do, you get at it together. And that comes from friendship. Wendell has pulled that line out of E. M. Forester's "Howard's End": "It all turns on affection, don't you know." Once you have that reality – it all turns on affection – then you don't have a university. You've simply got a way of being with one another that's enriching.

Berry: Actually, this friendship didn't start with my phone call to you. Gary Snyder had heard Wes speak at a conference, and he told me, "You have to talk to this guy Wes Jackson." So somehow or another I got the book "New Roots for Agriculture." I heard about it, got it, read it, and wrote Wes, raising some issue about the horse/tractor issue. I didn't have any evidence; I just had memories, anecdotal stuff, so I wrote him that I thought he was off on the number of horses necessary for a certain number of acres. Something like that.

Jackson: You pleaded with me to keep horses on the agenda.

Berry: I flew out to Salina, and Wes met me at the airport in this old car. Wes was buying his cars by the pound back then. We did not meet in an adversarial spirit. The spirit was immediately conversational. Talking for pleasure, in a way. However serious or productive this conversation might be, it has always been a pleasure. I was working at that time for Rodale Press – before they fired me for being more interested

in the local than in organic. I called Wes and asked if I could write an article about The Land Institute. He invited me to visit, and of course I accepted. It wasn't long after that until Wes was at my house with a bunch of –

Jackson: Eastern gammagrass roots.

Berry: So it's just gone that way. We've stayed in touch. This is the way intellectual life is supposed to go.

Jackson: There was a time in which I know I was trying to impress Wendell. He had dropped out and left the university, and I had, too. Of course, I admired him, so the desire to impress him was sort of like courtship.

Berry: Jesus, I didn't know that. (laughter)

Jackson: Well, it's like courtship with a woman. There reaches a point in the courtship in which you can relax. (laughter) That faded pretty fast. I know it was there for a couple months, or weeks, or whatever – but it didn't last long.

Streit Krug: I wonder if you might want to talk some about your decision to share your private friendship – your "courtship" – with a more public audience. In many ways you've written about your friendship and talked about it. What led you to take this private relationship and share some aspects of it with the public? In what way might it be important for friendships to be known? What work might they be able to do in the world?

Jackson: With our friendship I don't worry about being on guard. No one reveals every thought, of course; indeed, much of anyone's thought would be uninteresting to others. Our friendship moves along in a fluid sort of way. If there is a rock that divides our stream of thought it never lasts.

Berry: I wrote about my friendship with Wes in "Life is a Miracle." The purpose there was to talk about the difference between a conversation – as a form of intellectual life – as opposed to the specialist departmentalism of the modern university. I had to show our friendship as an example because it was the only example I had. It is possible to talk across these disciplinary lines –

Jackson: Right.

Berry: – on certain conditions and to certain advantages.

Streit Krug: The gift you're able to give together, then, is this mutual search, showing other people how it might work. Do you reflect upon the legacy of your friendship? Has your friendship influenced what you understand to be a "good ancestor," or what you want to give to others?

Berry: We don't live our lives for posterity, though posterity has a certain claim on us, and I think we acknowledge and honor that. But when friends talk, they're speaking as themselves, for themselves, and the generosity is taken care of, not by some explicit sense of obligation to posterity, but to the basic principles of honesty, good faith, the effort to be clear. That's all.

Jackson: One of Wendell's most memorable sentences for me was his statement: "I just want to make sense." This is very different from, "I want to go down in history."

Berry: People ask me all the time how I think about my audience when I write. But readers can be a distraction. My obligation is to the subject. Posterity is not ever an audience – it's an inheritor. To try to please posterity is presumptuous. If I'm telling a story, my obligation is to the story. Or if I'm making an argument, my obligation is to the argument.

Van Tassel: What have you learned about your own homes, your own places, from one another? Like how has your understanding, Wendell, of Kentucky been shaped

or changed because of Wes? Or, Wes, how has your understanding of your home been changed by Wendell?

Berry: My metaphor for that would be binocular vision. I know Wes pretty well, and I know his mind pretty well, so when he comes to my place I can't help imagining it the way it must appear to him.

Jackson: You can't see back there; there are too many hills. (laughter)

Berry: You can see too far out here; it gives you a rather creepy feeling. (laughter)

Jackson: I don't think you can live anywhere you can't see the curvature of the earth. (laughter)

Berry: You don't know who may be looking. (laughter) I got Wes to come one time to travel with me and some friends in eastern Kentucky because I wanted him to see what's going on up there with the coal mines. And it would be hard to classify or catalog the benefits of that. That's something I don't have to explain anymore. He sees.

Jackson: Right.

Berry: So your conversation gains a step there. It's a step required by the laws of friendliness, of affection – of love, actually. To imagine what something that matters to you looks like to somebody else is a kind of discipline.

This first appeared in "Flight Patterns" of Flyway, an online journal of writing and environment.

The good work

KRISTIN VAN TASSEL

Some name the body
a sanctuary – sacred,
sound. But we know
better its pendulous slabs,
corrugated membranes
sloughing rust. Fibers held
together with mortar, crumbling
before sunburn, frostbite, wind.

We do our best, ratcheting
our parts across the sediment
of earth's gravity-cloaked
crust, heaving debris into
clusters of light and sound,
finding the leverage to do
what we call dance.

Eddy covariance equipment reads the flow of water vapor and carbon dioxide between the atmosphere and intermediate wheatgrass at The Land Institute. Lee DeHaan collects the data. Scott Bontz photo.

Reading the land in the wind

SCOTT BONTZ

Walk from a parking lot to a grassy field in summer, and you might feel the temperature fall 10 to 15 degrees or more. The nerves in your skin won't tell you why. It's plants and soil of the field freeing water vapor to the air. Evaporation cools. The plants and soil life also breathe. In this exchange the field can take in more carbon dioxide than it gives up. So fields grow fertile. Plowed crop ground often runs in reverse. Hence fertilizer. Also flowing are methane and nitrous oxide. These currents shift from night to day and from season to season. Each landscape has its own gassy tale. Mostly they go untold.

But they can be spelled out by combining measure of what's in the air with how that air moves. The method is called eddy covariance. The idea was proposed more than a century ago. A technique has developed over the past several decades. An example stands at the end of a Land Institute field. White detectors at the ends of booms on tripod towers point south into the prevailing wind. While that wind plays the towers for harmonic resonance of varying pitches, the detectors sniff the air with molecular exactness 20 times per second. The air has rolled over about 8 acres of intermediate wheatgrass, a perennial being made into a grain crop.

Elsewhere eddy covariance towers sample the gases of forests, farms, and cities. This helps scientists understand how vegetation and our use of it affect air, soil, and water, and how that can affect crop yield. It can help the rest of us understand and improve our role in the story – in water use, farming, and climate change. How can you log a rainforest and not shift climate? How much does a parking lot affect evaporation from a neighbor corn field? What's a better way to irrigate the Great Plains from the falling Ogallala Aquifer?

Every three weeks Land Institute wheatgrass researcher Lee DeHaan walks out to the towers, pulls from a weather-tight box a 2-gigabite computer card full of data, inserts an empty card, and mails the collected numbers to the University of Kansas office of Nathaniel A. Brunsell. Brunsell is a biometeorologist. Biometeorology's standard definition, he said, is the interaction of life and weather. This means things such as how air moisture affects grasshopper populations, and the effect of hair type on mammalian body heat control. From biometeorology came the heat index, which combines actual temperature and relative humidity for

perceived temperature. Brunsell's concern is vegetation. Growing up in New Mexico, he was drawn to water issues. He earned a bachelor's degree in geology. He also worked for a professor to model paleoclimatology – the study of weather throughout Earth's history – measuring water transfer between surface and atmosphere. Thence his path to eddy covariance.

Part of his research reads from on high with satellites. Then there are the towers, standing 2 or 3 meters above the ground, in the eddying wind. Eddies don't speak through the skin, but for covariance they are key. Air movement is not just a straight line, such as the described average, predominate force in central Kansas, 12 miles per hour out of the south. And eddies aren't just occasional perpendicular spins revealed as dust devils. Brunsell said eddies swirl up and down, they make circles, they mix. He suggested picturing smoke in its turbulent path from fire. So eddy covariance detectors measure wind speed and direction in three dimensions. They also count carbon dioxide and water vapor molecules. Other instruments take soil readings at intervals of half an hour, and measure air temperature and humidity.

From all of this and a lot of math comes answer to the question of how much water vapor and carbon dioxide is coming up and off the landscape, and how much carbon dioxide is going down and in.

Land Institute workers also take soil samples and measure aboveground mass made by the wheatgrass.

Of course not all of the air reaching the sensors started in the subject field. Eddy covariance analysis allows a 10 percent margin of error, Brunsell said. But study has shown that at a meter above ground, about 90 percent of the air being measured has passed across the ground from 100 meters upwind. And the land changes the gas makeup. After sundown, plants and soil life still respire, giving off water vapor, but the plants no longer photosynthesize and take in carbon dioxide. So measurement differences from night to day give a net balance.

The more time data collects, the more confident Brunsell can be in the accuracy of the average. He hopes to monitor the wheatgrass field for at least a couple of years. He started with eddy covariance towers elsewhere in 2006. A forest at Harvard University has been monitored for 25 years. "The longer the record, the more interesting it is for me," Brunsell said.

Bolstering confidence even more comes with results from extremes. Brunsell wants to see how the wheatgrass field responds to years wet and dry. He's getting half of that wish this year. The thirsty plants won't even make seed. At Konza prairie 70 miles east of The Land Institute, in another dry year the air at a tower near woods carried more vapor than at a tower in more open grassland. Trees drew water from deeper in the earth.

Another difference for effects to compare between the Konza towers is how often managers burn the study prairie: one year vs. four. Brunsell also has a tower in an abandoned farm field outside Lawrence, home of his university. In June he visited Brazil, where he hopes to monitor the effects of growing sugar cane in savannah country. He wants to see if there are patterns of clearing land that don't alter the vapor and carbon dynamic to effect climate change.

"How do different types of vegetation respond to different precipitation?" Brunsell said. How do they use water, and how do they use carbon? It depends not just on the species but where there are – for example, where on the gradient from the humid east of Kansas to the arid west – and how the precipitation falls. He can compare data

from his four towers with that from about 10 other grassland sites run by other scientists.

About 1,500 eddy covariance towers stand scattered across the world, including on farms, tundra, and cityscapes. Probably best represented, Brunsell said, is deciduous forest. Trees are champs at sequestering carbon. They're considered important for carbon credits. But he said, laughing, "I think a lot of people who do this kind of work just like working in forests."

One thing that Brunsell likes is the chance to compare a field of a perennial grain crop plant with a prairie. He gravitates toward earth sciences, but also follows biology and ecology (and holds interest in astronomy and neuroscience). He likes the idea of an agriculture using perennial grains. He seeks to maintain scientific objectivity. But he says the study might "quantify increase in sustainability of these fields" over those of annual cropping. This could increase interest in the pursuit of perennial grains. And that, along with the eddy covariance findings themselves, could help sustain things like the Ogallala Aquifer and agriculture on the Plains. It could help balance climate change with food security.

Amino/Amnion

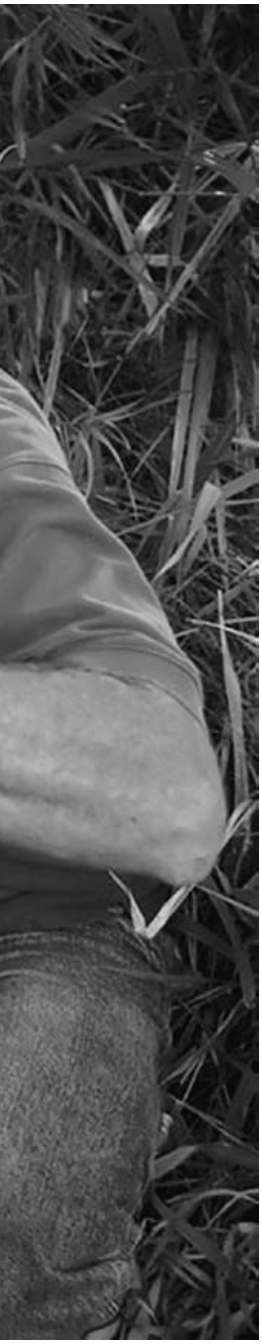
PATRICIA SCLATER

For M. B., K. N., and F. W.

Some say that we are made of stars,
or of water,
perhaps even of flame.
But every scientist knows the simplest alphabet;
just a few letters, and we come into being,
wrought from ceaseless spirals,
bound by the world's chains,
climbing its ladders blindly.

Words redeem; they, too, are helixes of life,
embracing, preserving our ancient codes,
defying the artifices of maps and charts,
crossing even the shimmering vastness of the sea,
where stars watch over our beginnings.

Photo by Judy Olausen, Land Stewardship Project.



Purified by perennials

In the picture, Martin Jaus drinks from a pipe draining pasture at his Gibbon, Minnesota, organic dairy farm. His wife, Loretta, laughs. "If it's hot and he's out in the field, he routinely does that." Loretta won't quite go there. But she shares Martin's enthusiasm for the pasture's mixture of perennials.

"There had been three inches of rain in a couple hours time. Martin charged into the house and says, 'You gotta come see this!'" she told The Land Stewardship Letter. The drainage tile outlet of a neighbor row-cropped field spewed water brown and frothy. "There was the beginning of a river of thick chocolate-colored paste," Loretta said. "I wondered just how many of these tiles were emptying into this ditch system between here and the Minnesota River," and how much sediment, fertilizer, and toxic chemicals flowed to the Mississippi and the Gulf. The answer, for water and wind erosion in the Midwest, is more than 4 tons per acre per year, according to the Natural Resource Conservation Service. Using data from Iowa State scientists, The Environmental Working Group estimated rates 12 times higher.

Perennials replacing annual crops could cut that to a small fraction. That's the goal of The Land Institute, with the decades-long development of perennial grains grown in mixtures. Meanwhile, a group called Green Land Blue Waters aims to restore more land to perennial cover by additional means, including cover crops, forestry, and pasture.

The Jaus pasture of brome, timothy, fescue, white clover, alfalfa, and bird's-foot trefoil drains to tile, perforated pipes installed through much of the upper Midwest to make swampy land more farmable. The soil between dairy cows above and tile below makes about three feet of sponge and filter. Undisturbed community slurps up so much rain that Martin said the tile outlet runs only a short while. The neighbor row crop drains may leave the faucet on all summer. But when the pasture pipe puts forth amid the "black desert" of western Minnesota corn and soybean fields, there comes soothing testimony for the architecture of diverse perennials: cool, clear water.

For a Land Stewardship Letter story about how Loretta and Martin Jaus have made their farm fit with nature, see mepartnership.org/the-3-ps-of-farmland-conservation/.

Fent's prairie, August 18, 1978, 9 *to* 11 *am. Terry Evans photo.*

On board from the beginning

SCOTT BONTZ

On a summer evening in 1976, Wes Jackson went to the yard of John Simpson, a Salina, Kansas, lawyer and Kansas state senator, to enjoy a hot dog roast. Jackson was on a two-year leave from his professorship at California State University in Sacramento. He had a home and 30 acres on a bluff of the Smoky Hill River several miles upstream from Simpson's place in town, and was thinking of starting there a school called The Land Institute. He mentioned this to Simpson. The lawyer said, if you want my help, financial or legal, let me know. Shortly after that Jackson called. Simpson donated about $5,000 and completed the legal forms to incorporate the institute.

Jackson went with Simpson and another friend, Sam Evans, to solicit Sam's father, Dean. Dean Evans had been a partner with Simpson's father in a grain business, and then went on to head his own, with dozens of elevators across central Kansas. He became so respected in the area that his death years later topped the Salina Journal's front page. Evans sold fertilizer and farm chemicals. Jackson, whose "Man and the Environment" inspired Cal State to hire him away from Kansas Wesleyan University and start an environmental studies program, was already out to rid agriculture of these synthetic applications. Sam Evans asked Jackson why he should fund an organization opposed to parts of the grain business. Jackson, pointing to Dean, answered, "Because of his grandkids." Sam Evans said this and Jackson's willingness to abandon a tenured university position and start a nonprofit on a relative pittance impressed his father, a man of the Great Depression. He matched Simpson's donation.

Jackson was not without insecurity about the leap. But his daughter, Laura, reminded him of a line he used on his children: "We are not called to success, but to obedience to our vision."

Jackson wanted the vision of others, too, and for his organization he needed a board of directors. He invited Sam Evans and Simpson, and among others a couple of local physicians, who also helped raise money. "You round up some brains that you think are responsible," Jackson said. In the 36 years since then, the board has seen 71 members, including 17 honorary members. Other than Jackson, just one founding member remains, Simpson. Sam Evans, a believer in new blood, left after four years. But his wife, Terry, then joined the board and stayed for 32 years, until this summer. Following is a sketch of these original and longtime members.

John Simpson was born and raised in Salina. He earned an accounting degree at the University of Kansas, served in the Navy, worked as a certified public accountant and then for his father's grain business before it was sold and he returned to KU for a law degree. Back in Salina, he practiced tax, corporate, and estate law. He served in

the state Senate from 1971 to 1979, then left an increasingly conservative GOP and ran as a Democrat against Robert Dole for US Senate. A year after that loss he followed his secretary's advice – "You've had too much exposure to musty old wills" – and shifted his focus to environmental law and civil rights, in Fairway, Kansas, a suburb of Kansas City. Twenty years later, at an age when many are ready to retire, Simpson found new ground in criminal defense, mostly representing indigent defendants in trials, pleas, and appeals. He will turn 78 at the end of July.

In the late 1960's Simpson became interested in environmental matters. Jackson then taught at Kansas Wesleyan University in Salina and began to be known as an environmental advocate. He was controversial, but Simpson said, "I thought he was pretty much on the right track." He enjoyed what Jackson said, and how he said it. "I've always been attracted by the long-range focus of The Land Institute," he said in 1991. "A long-range focus is what it will take to solve our environmental problems, and there aren't many groups or individuals with that kind of a view."

At the institute's beginning, Jackson wasn't yet focused on polycultures of perennial grain to help solve the problem of man and the environment. The institute was broad, with gardens, wind turbines, and interns building shelter with adobe and newspapers. It was also small, with all this work essentially in Wes and Dana Jackson's back yard. In the 1980's the organization acquired a 160-acre pasture, its students expanded research, and Jackson traveled more to spread the word, said Simpson, who sometimes joined him. Simpson said the board makeup changed from a heavy emphasis on Salina and Kansas, to a balance of blood ranging from California to New York. This helped for funding, he said, and it addressed the environment in other parts of the country. Adding a Northwest connection was Simpson's daughter, Anne Simpson Byrne, a Seattle business consultant, who joined the board in 2006.

"I thoroughly enjoy the people on the board," Simpson said. He enjoys Jackson's reports, and how members get along. "Whatever it is," he said of the board's agenda, "it's always expeditious." He called the meetings a good lesson for how a board should function. "It's the best board I've ever been on."

For most of the board's existence Simpson has served as treasurer. Jackson said the lawyer's "strong fiduciary streak" and careful questions about the budget make others mindful of fiscal responsibility. "I did not want us ever to have debt," Jackson said, and The Land Institute has never taken on a loan.

Simpson no longer serves as the organization's legal counsel. He lacks the time, and decided that, though he'd never had a problem, the arrangement could pose a conflict of interest.

"Hopefully I've added something to the board over the years," Simpson said. "I haven't regretted staying, anyway." He said Wes told him, "I want somebody with that history."

Like Simpson, Sam Evans, 68, grew up in Salina and worked for his namesake's grain business. Simpson left grain for law, Evans for the YMCA, running its international operations from Chicago. He left the Y in 2007 to lead development for McCormick Theological Seminary, also in Chicago.

Evans said that in his twenties and thirties he was shaped by The Land Institute, the Y, and Ghost Ranch Presbyterian Adult Learning Center in New Mexico. Ghost Ranch impressed on him the

church's idea of being good steward to the land, with environmental projects including solar energy and community gardens. From the Y came involvement in and lessons from national leadership, and in seeing wealthy men and women serving community in ways outside their norm. The Land Institute brought leaders from around the world for environmental education of the leadership in Salina, and as a board member he played host. The institute's first Prairie Festival was held at the Evans farm. "These are all ways to set your values," he said.

"Terry and I were beginning to understand what it meant for the environment," Evans said of how Jackson attracted him and his wife to the institute. "And of course his personal passion for it." Evans continued: "What's always made him so special is his probing and his ability to think," challenging tradition. "He was always that way. That was his genius."

Evans remembers The Land Institute beginning with environmental change on a personal level. Now its approach is more with things like a 50-year farm bill.

Evans left the board well before this, in 1980. He'd become experienced in governance on various boards and with the Y, and said he told Jackson, "You've got to have new blood coming in. That's really, really important." Experienced board members tend to dominate, he said, and their helpfulness can wane. He said Wes values stability, and argued that finding new blood is hard. Evans volunteered to take the lead and leave, possibly for rotation. "So I did, and nobody followed me," he said, laughing.

They did in time. Two-thirds of the board's members have stayed no more than 12 years. Today, Jackson says the board needs both stability and new blood. It needs some members with money. It needs reflective, thoughtful intellectuals. "I call my board members and ask them questions," he said.

He also said, "I feel there's a need for artists on the board. In the long run, I think beauty is more important than knowledge."

Jackson filled Evans' seat with Terry Evans, who went on to national recognition with her photographs of prairie. (The Nelson-Atkins Museum of Art in Kansas City will present a 100-picture retrospective, including a book, October 20 through January 20.) She stayed with the board for 32 years, until the end of her term this June, and called it one of the most important things in her life.

Evans, 67, grew up in Kansas City, Missouri, where her parents ran a wedding portrait studio. She called it a "wonderful business," and the nearest she got to formal instruction in photography. "I had no intention of being a photographer," she said. "I just loved art." But in her last semester as an art major, when Bobby Kennedy came to speak at the University of Kansas, she borrowed her father's Nikon, the same camera used by photojournalists at the time, and got onto the floor of the field house with the pros. "I thought, Wow, this is amazing," she said. "It was such an experience – the interface of the camera and the world."

Her first photo project was an exploration of poverty in Kansas. She hadn't felt she could just knock on a door to explore her interest in such a subject. But she said, "When I had the camera, I could." To be able to communicate in image what she saw excited her. "Once I discovered photography, or it discovered me, I gave up painting."

Evans met Jackson at Simpson's house for dinner. She and Sam were good friends with Simpson and his wife. This was by 1970, well before planting of The Land Institute. She also heard Jackson speak at her Presbyterian church. "He was talking

mostly about all the issues that he's still talking about," she said.

When for a historical observance the city of Salina asked Evans to photograph old houses, Jackson said that what's more important than the houses is the ground they're built on. She said he asked her, "Have you ever seen native prairie?" No, she hadn't. He invited her to visit. She went, and was courteous, but she wasn't interested. "I was bored. Bored and hot."

She was courteous again a couple of years later when Jackson asked her to photograph students at The Land Institute throw meter-square frames on prairie and count the species within so they could better understand plants interaction. This would come to help set the institute's path toward developing mixtures of perennial grains. For Evans the lesson was immediate.

"I started seeing the ground, and seeing the tremendous diversity of what was going on on the ground. It just changed everything for me," she said. Seeing the structure of the prairie helped her sense structure in the universe. She went on to study structure in nature, in Native American culture, and in ancient art compared with Renaissance art and its shift away from the whole to the individual. The prairie and the earth seen at that moment at The Land Institute has since been a kind of guiding principle for her work, including aerial photographs of Chicago, which she sees as human ecosystem, and even studies of steel mills, as they draw from the earth. In an earlier Land Report story, she said that "the biology of the prairie informed my sense of aesthetics more than any other single event in my life."

Also of influence was the institute's culture. She said Jackson was the only person speaking so radically about things such as soil loss and the ecology of agriculture, and he continually drew interesting artists and scientists to speak. "It was just a fascinating place to be," she said. "It always was."

For long after the institute started it was hard on Evans to see how few outsiders took the research seriously. They were there, but, "Lots of people in Salina thought Wes was off on some strange tangent and there were these hippies out there." Simpson said, "Wes couldn't even get the land grant colleges to talk to us. They thought we were crazy." Now Evans talks of how "widespread his net has been cast." The place has respect and admiration; the ideas are coming to fruition. "The work is so solid," she said. "There's no way it's going to turn around, it's just going to keep going."

Jackson credits Evans with imbuing The Land Institute, crucially, with sense of the importance of beauty, and of the esthetic pursuits that "hardheaded realism" calls a waste of money. Evans finds the artists to show work at the Prairie Festival, her photos adorn the science building foyer, and she taught rural children to appreciate the difference between pasture weeds and wildflowers. "It is the art of putting on the dinner that carried it beyond mere calories or tastes," Jackson said. Land Institute supporters might not fully understand the science involved, he said, "But they'll know whether it's a place that's cared for, a place that's loved."

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Terry Evans is a Chicago-based photographer. The Nelson-Atkins Museum of Art in Kansas City will hold a retrospective of her work October 20 - January 20. Kristin Van Tassel teaches English at Bethany College in Lindsborg, Kansas. Aubrey Sreit Krug is a doctoral student in English and Great Plains studies at the University of Nebraska-Lincoln. Patricia Sclater is an editor in Kansas City.

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