

The Land Report

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Above: *Scott Bontz*. Ice and leaves from a ginko tree—it rained all of them down in one fall day at The Land Institute. This east Asian tree is the sole surviving species of a group of gymnosperms that flourished with the dinosaurs 65 million years ago. No other gymnosperm—which include the pines, firs and spruces—shed their leaves during the fall.



Our 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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Beating Plowshares and a Different Drum

Charlie Melander

Adapted from a talk at our 2003 Prairie Festival.

The people who have gathered here this weekend are an inspiration to me. You are a part of the great American conscience that brings dignity and decency to this country. There is a question that many of you appear to share: Is there anything we can do on the farm to improve our environmental track record?

You're damn right there are things we can do. We can make positive changes to the environmental equation before The Land Institute's Natural Systems Agriculture is achieved, and without more tax dollars—if we choose to do so. As Pogo said, "We have met the enemy, and he is us." The change will require a shift in public, farm and government attitudes.

I fear that my explanations might offend neighbors and friends. Farmers tend to personalize comments made about farming. If you suggest to Farmer Jones that he might be using too much fertilizer, he will respond: "What did you say about my sister?" My remarks do not imply criticism of individual farmers. These people are caught in a system. They are doing what they believe is necessary to be successful. And I do not know it all. My strategies sometimes fail.

That said, let's take a peek at the Melander farm and our farming philosophy's difficult evolution.

We farm here in central Kansas, which is traditionally wheat country. This year about half of our land is in wheat and the other half is in milo, grain sorghum.

Most operations in the area can be classified as conventional, with crops grown in a tillage system, or as no-till, with herbicides replacing cultivation. No-till is increasingly popular. In our operation, we combine the systems. Each has pros and cons. We have a line of conventional farm equipment, but we are not conventional farmers. Our only planting gear is a no-till drill, but you can't call us no-till farmers either. I guess we could best be called hit-and-miss minimum till farmers.

There is a world of information on conventional farming and tillage. There are stacks of magazines that talk about the benefits of no-till. There isn't much said about mixing the two. In fact, you are either a diehard fan of one and criticize the devil out of the other, or you are a fan of the other and criticize the first.

I was born on the farm, and like most farm kids was introduced to farm labor at an early age. I learned from my father that the rules for success on the farm were direct and uncomplicated:

1. Work hard. All the energies of the family were focused on the farm.

2. Plow deep. Tear up the earth. Then frantically try to undo it—all that loose, lumpy ground left by the plow had to be leveled and coaxed back into a firm seedbed.

3. Eliminate residue. Burn it or bury it.

4. Do it all on time. Weddings and funerals could take second place to wheat harvest.

When we went to town on Saturdays, which most farm families did then, it was easy for a kid to look out the car window and pick out the most successful farmer. He was the poor devil who was working the hardest because he plowed the deepest and now was trying to undo it. He did this all on time.

Add some fertilizer, some pesticide, a bit more residue, and we have the ground rules for farming today.

With these rules firmly in mind, my wife, Kathy, and I rented some land in 1976 and began our own traditional farm operation. In 1983, more or less on a whim, we bought one of Great Plains Manufacturing's prototype no-till drills. This eventually would turn our farming ideas upside down.

Understand that there's a difference between a drill and a planter. A planter drops seed at fairly precise intervals in rows 36 to 40 inches apart. A drill places seed more haphazardly in rows 8 to 10 inches apart.

You are supposed to use a planter for some crops and a drill for others. When God made corn, He said, "You boys take this seed corn and put it in a planter with 40-inch rows." And when He created wheat, He said, "Why don't you use a grain drill with a 10-inch center." Strong opinions remain on row spacing.

About the time we purchased the drill, close friends Sam and Sally Siegrist bought a nearby farm. Sam bought a tractor and disc to work his land, but he did not have the machinery to make a manicured, finely textured, farmer-approved seedbed. That spring he called and asked if we would plant his milo. We didn't have a planter. Sam voted that we use this no-till drill with 8-inch spacing. Everybody else knew this wouldn't work.

I sent Dutch Goering, a close friend who worked for us, to drill Sam's milo. He came back an agitated Dutchman. The ground was so uneven he hadn't been able to travel at a good speed. He said no milo would come up. He said it was so bad we had to go look.

We did. It was ugly. You couldn't go in that field without stepping on a clod or a piece of crop residue or trash. Dutch and I shared the same traditional ideas on farming and pronounced the same verdict: disaster. The conditions were so bad we decided it would be pointless to use herbicide.

Scott Bontz. The usual erosion control on sloping fields is earth terraces made with heavy equipment. They slow runoff. Charlie Melander instead uses grass strips, which slow, filter and use the water. They also attract wildlife. Here amid strips Sam Siegrist cuts Melander's wheat.



I didn't see the field again that summer. That fall, Sam called and asked if I would drive the combine to his place and cut the milo.

I didn't want to do it. There would be weeds everywhere. The combine would choke and stall. There wouldn't be any milo. I'd be wasting my time. I hated the thought of it.

Dutch and company took the combine to Sam's. They found a pretty field of milo. After harvest, Dutch and I met in executive session, and with our vast knowledge of traditional agriculture, arrived at one conclusion: It was a miracle.

Milo was planted at Sam's the next year and we went through the identical routine. Here was success when we knew there should have been failure. What was happening? We began an active campaign to try to understand the dynamics.

It hasn't been easy. Our farm vision is limited by our farm culture. I have since concluded that all of us wear blinders. These blinders can be so limiting, you can't see the most obvious thing. Some of the discoveries I'm going to be talking about will make you say, "My God, any idiot could see it." Well, we were idiots who couldn't.

But by trial and error, we began to approach farm-

ing from a slightly different angle. Let's examine some of our simple discoveries.

We were amazed to find that no-till worked in Kansas. It was in sharp contrast to everything we knew to be true. How could you possibly grow any crop without intense tillage and multiple field operations? It seemed that no-till would be impractical and of no serious consequence.

Dutch and I weren't the only ones who thought so. Great Plains, trying to promote no-till, offered to donate a no-till drill to Iowa State University. It was rejected. The college could not see no-till becoming an important part of farming methodology. So, idiots had company.

Though skeptics remain, no-till acres are increasing. No-till succeeds by using herbicides for weed control. There is no tillage before planting, and no rebuilding for a firm seedbed.

Great things result. Most importantly, it nearly eliminates soil erosion. Our fragile lands, if not protected by plants and residue, lie naked before the wind and rain. No-till leaves plant cover in place through the year. A heavy blanket of residue can be difficult to manage, but it is the key to erosion control.

Furthermore, no-till can be productive. This year, the best wheat we have ever grown was planted no-till



into milo stubs last fall. We used no herbicides, and labor and fuel costs were low.

No-till protects our soils and is profitable. We need more no-till.

If this is true, you may ask, “Why isn’t the Melander farm 100 percent no-till?”

The answer can be found in the same thing that makes no-till succeed: herbicides. It’s exciting to use no-till when herbicides aren’t required, like the wheat in milo stubs that I just mentioned. Unfortunately, most no-till requires herbicides—gallons and gallons of it.

Kansas State University reports that in 2002 the average Kansas farmer spent \$28 an acre on pesticides for no-till corn. He spent \$29 an acre on no-till milo. The conventional farmer buys truckloads of the stuff too—\$20 for corn, \$18 for milo. He also will pay big bucks attempting to make his farmland look like the sanitized fields we see in chemical advertisements.

Enthusiastic pesticide use is leading to a rapidly developing farm dilemma. Pests are developing chemical resistance. Where will no-till be when weed IQ is greater than that of the chemical applicator? Also, there is growing evidence that farm chemicals pose a serious threat to public health.

I look at pesticides in much the same way I look at

laxatives. It is disgusting stuff. It is not to be taken every night because you think there might be a slight chance there will be a problem in the morning. Wait until you are reasonably certain a problem exists. Most farmers can’t wait. But 10 weeds in the soybean patch do not point to poor farming. We need to relax and accept some weeds.

In the past ten years of our operations, on average we have applied herbicide on probably less than 20 percent of spring crop acres and less than 10 percent of wheat acres. This year we put none on our wheat acres, but I went over our average on the milo ground to fight bindweed.

When no-till demands herbicide, we favor a minimum-till program. Minimum till is not conventional till. Conventional, high horsepower tillage exposes our lands to devastating soil losses. It is a waste of time and resources. No-till success proves that frequent, aggressive tillage is unnecessary. With minimum till we can maintain yields, improve soil structure, reduce pesticide use, and protect the land and wildlife.

How can this be? Part of the answer lies with the development of modern farm equipment. It is big and heavy, designed for serious tillage. But with hydraulic depth control it can be adjusted to kill weeds and mix

residue by scarcely breaking the soil's crust.

This has important implications:

1. Shallow tillage leaves crop residues at or near the soil surface. This surface residue dramatically reduces soil erosion.

2. In one tillage operation more field preparation can be done than in three or four trips 40 years ago.

You might think that farmers would be excited about that. Think again. Tillage is a tough habit to break. Clean fields become an obsession. They appear to prove we're working hard to succeed. This results in unnecessary or even recreational tillage, though each additional pass hurts soil structure and density. Our soils are fragile. Every farm operation that cuts, pushes, mangles or smashes is destructive. Whenever possible put the tractor in the shed. Get a hobby.

3. With less tillage, farm timelines are not as critical. Relax and go fishing. That wheat stubble can wait until next week. Milo and corn stalks can stand and meet the winter snows. Everyone wins: Farmer Jones, the wildlife, and our environment.

4. Reduced tillage means reduced fuel costs. In 2002, ours was more than \$2 an acre less—about two gallons of diesel fuel—than on the average Kansas farm. Multiply that by the approximately 20 million Kansas acres in our four major grain crops and consider the effect.

5. Reduced tillage lowers herbicide costs because fields are left rougher. These minimum-till fields will make the ag school graduate shudder, and at first we thought they appeared examples of neglect and poor farming. Then we started to see this poor farming as good farming, and suspicion grew that good farming might be poor farming. Weeds love ground with nice, smooth, even textures. Do weeds follow your rotor tiller in the garden? It doesn't matter how deep you till, weeds love that pulverized soil on top. In chaotic field conditions, weed seed is put to the test. It's tough to germinate under a stack of clods and trash.

I want to make a final point in regard to rough fields. A seedbed is a small thing. This is a concept no-till people can accept. Conventional folks are mostly blind to it. When planting with no-till equipment, dirt clumps and crop debris can be pushed aside and the seed dropped into a micro-climate that encourages germination. It doesn't matter what the total field looks like. The milo seed or the corn seed, in its tiny, little bed, could not care less. So we don't spend countless machine hours trying to make the entire field a seedbed.

When weeding is needed in minimum-till and narrow rows, we use the rotary hoe. This is not a macho tool, it doesn't throw dirt. It's like Rodney Dangerfield: It gets no respect. But we need more tools like the rotary hoe.

I think I can give you an idea what a rotary hoe is.

In your mind's eye, bring up a bicycle wheel. Throw out the tire. Take off the rim. Now you see this thing with spokes sticking out of the hub. On the end of each spoke, put on a teaspoon. Now line up wheels like these 8 inches apart. Light wheels aren't going to do a hell of a lot of tillage, but when we pull them across the field, they'll break the crust—and pick up every damn beer can on the farm.

Now let's back up. Almost any crop seed is planted about an inch deep. As that seed begins its life underground, soil crust is forming. And tiny weed seeds are sprouting in or near the crust. Turn your garden soil crust over 10 days after planting and you'll see white, hairlike plant growth. That you picked that crust up or even shifted it a quarter of an inch will kill those infant plants.

On the farm, about two weeks after planting, we race over the field with a rotary hoe. You might say, "Oh my gosh, that's going to kill the milo." But we wait until the afternoon when it's hot and the plants are wilted. If you get up in the morning and walk out into a corn field when it's cool and kick a plant with your foot, it'll break right off. Do that again later in the afternoon and it's like a rag. This is stuff we learned the hard way. So we race over the field with a rotary hoe. The spoons barely break the crust and give it a little flick. The milo, planted an inch deep, isn't hurt. The wilted plants bend over and come right back up. The tractor tracks won't even show in a couple of days.

This light tillage gives the milo time to develop a canopy. With the canopy over a clean field, there is no need for herbicide.

Our hoe will cover over 30 acres an hour and costs me about 10 to 15 cents an acre in fuel. Remember, I told to you that the average conventional farmer is spending almost \$20 an acre on herbicide.

The hoe is an important tool, but its design hasn't really changed in years. In this age of hydraulics and electrical controls, a much more effective and versatile tool could be built. It is frustrating that no company is interested in doing that—they want to build crop sprayers. Can you imagine ag colleges, which have sold out to the chemical interests, designing a new hoe that will curtail herbicide use? So much for the hoe.

Crop rotation should be encouraged. Each crop attracts disease, insects and plant competitors that have similar lifecycles. Switching to a different crop with a different lifecycle helps control the pests affecting the previous crop. So pesticide use can be sharply reduced.

Narrow crop rows are important. It is critical that we use narrow rows in all our cropping. There are no golden rules for wide row spacing. We plant about 4 pounds of milo seed per acre. In 7-inch rows, the plants are spaced almost an equal distance from one another. In 36-inch rows the same amount of seed is jammed in



distantly spaced lines. Weeds love that space.

To someone like me, from the old school, it is always surprising to see the power that the narrow-row crop has to eliminate its competitors. We had 60 acres of milo this summer that needed no herbicide or rotary hoeing. The canopy also hides baby pheasants and softens the impact of smashing Kansas raindrops.

The next time you drive by a corn field, pause and consider how much soil and herbicide could be saved if that crop was planted in narrow rows. Don't let people tell you we can't do it.

There is another exciting conservation tool that is nearly hidden among the farm programs: the narrow grass strip. The Department of Agriculture should do more to promote these along our waterways and in our cropland, flat or sloping. Strips are excellent erosion control and outstanding air and water filters.

In the field interior where you would expect earth terraces made with heavy equipment, substitute grass strips 30 to 60 feet wide, depending on the slope. Following the land's contour are alternating bands of crop and grass, contrasting color and texture. Wildlife love it. I like to boast that every raindrop that falls on

Scott Bontz. Charlie Melander cuts milo that was grown without herbicides. Weeds do make inroads, but Melander plants narrow rows to better fight them. And he feels that a few weeds aren't worth worrying about, while reducing weed killers helps land and pocketbook.

these fields is filtered at least once by a grass strip before it can leave the farm. This is a cropping system good for the eye and the soul.

The farsighted programs that promote this and other conservation are examples of American government at its best. But they are undermined by the major farm subsidy programs. These narrow-mindedly tie payments to production. Additional bushels equal additional subsidy dollars.

At first glance this appears sensible. But what naturally follows is destructive. Farmer Jones plays crop lottery: Double up on fertilizer and pesticide tickets, pray for extra rain, and wait to hit the crop jackpot covered with subsidy dollars. Bulldoze the tree line on the south 80. New acres coming into production equal more potential bushels, which equals more subsidy dollars. Put down an irrigation well. More potential bushels equal more subsidy dollars.

What does the taxpayer get for those billions of subsidy dollars? Cheap farm products in the supermarket, falling water tables, fewer farms, atrazine and nitrates in the drinking glass, and a dead zone in the Gulf of Mexico.

We don't have to worry about production. Farmer Jones is going to do his damndest for that anyway. But our subsidy system encourages him to go overboard. This frenzied maximum input, maximum production is insanity.

More of these crop dollars chasing crop production must be used instead to stimulate resource conservation.

We know what the average farmer spends on inputs. We could have a simple program. Government could target these inputs and reward conservation based on consumption standards. Imagine this: Melander, your itemized Internal Revenue Service statement shows that you used \$2 less fuel than our consumption standard. That's important. We're going to write you a check for \$2 multiplied by your crop acres. Your fertilizer and pesticide costs were \$12 an acre less than our consumption standard. Reducing these has become so critical to health, we're going to award you \$25 an acre.

It makes as much sense to put subsidy dollars on this side of the road as the other side. To do so would radically alter the thinking of everyone in agriculture.

Such policies would excite creativity on the farm and do more to protect land and water than pages and pages of detailed regulation and red tape. With American farm ingenuity running wild in a new direction, there would be an explosion in responsible farm strategies.

There are no stand alone solutions to complex environmental problems. No-till, minimum till, narrow rows, grass strips and numerous other concepts are parts of the puzzle. When put together, they can be a powerful force in maintaining the beauty and productivity of this great

land.



Scott Bontz. Wheat that was sown into milo stubble. Instead of spending many more hours of tillage to make the entire field a planting bed, dirt clumps and crop debris can be pushed aside and the seed dropped into all the space it needs.

The Golden Earth

Wolf Leslau

The people say that once two European explorers came to Ethiopia. They were seen going north to south, visiting every corner of the vast country. Everywhere they went they made maps of its mountains, roads and rivers.

Word came to the negus, or emperor. After hearing about the men who were making maps, the emperor sent a guide to help them. When, after several years, the Europeans were through with their task, the guide went back to Addis Ababa and reported to the emperor what he had seen.

“Everything they have seen, they have written down,” the guide said. “They have looked at the beginnings of the Nile at Lake Tana and followed the river down from the mountains. They have surveyed the rocks for gold and silver. They have charted the roads and trails.”

The emperor reflected on the work the Europeans were doing. At last he sent for them so that he might see them before their departure from the country. When they came he greeted them, fed them, and gave them valuable gifts. And when they went to the seashore to board their ship, he sent an escort with them.

As the explorers were about to leave, the emperor’s servants stopped them and removed their shoes. They scrubbed the shoes carefully and returned them to the Europeans.

The Europeans were perplexed, thinking it was a strange Ethiopian custom.

“Why do you do this?” they asked.

And the emperor’s messengers replied: “Our Emperor has told us to wish you a safe voyage homeward, and to say this to you:

“You came from a far-off and powerful country. You have seen with your own eyes that Ethiopia is the most beautiful of all lands. Its earth is dear to us. In it we plant our seed and bury our dead. We lie on it to rest when we are weary, and graze our cattle on its fields. The trails you have seen from the valleys to the mountains, and from the plains to the forests, they have been made by the feet of our ancestors, our own feet, and the feet of our children. The earth of Ethiopia is our father, our mother and our brother. We have given you hospitality and valuable gifts. But the earth of Ethiopia is the most precious thing we own, and therefore we cannot spare even a single grain of it.”

The Golden Earth was recorded by Wolf Leslau in Tigrai, northern Ethiopia. This tale is well known throughout the country, and is supposed to have taken place during the reign of the Emperor Theodoros in the 19th century. It appeared in The Fire on the Mountain and Other Ethiopian Stories, by Leslau and Harold Courlander.

Small Town Vernacular

Vaughn Wascovich

I'm originally from northeastern Ohio, a land of old hills and valleys. Several years ago I took a drive across South Dakota. I was amazed at the expanse of space, was disoriented by the sheer vastness and distance of the horizon. I felt as though I could see the curvature of the Earth, feel the speed of its rotation as it hurled itself through space. It was all I could do to hold on. I felt out of place, away from the protective bowl of close horizon that I was used to. I began wondering how our landscape informs us, how we are indelibly etched by our particular view and place in the world.

When people ask me why I photograph, the short answer is simply that I photograph to find out where I am. The long answer makes important additions: I also photograph to find out where I am from and who I am.

For the short term, I photograph for extraordinary light, for ordinary light, for the truth of things. For the long term I photograph the buildings that I will revisit to find forever gone. I'm interested in the history of a place, of what came before.

The pictures here, mostly from Illinois, Indiana, Iowa and South Dakota, are primarily of vernacular buildings of small towns, the grain elevators, churches and storefronts in which I try to see the story of a people. I try to see in these buildings how the land informed them.

Space is important to me too—the space between things, the space between myself and my subject, the space of a landscape. What can I learn from this structure?—not just the structure in front of me, but the structure of my composition. What questions can be raised?





Why We Should Pay More for Gas

William E. Rees

North Americans enjoy one of the most energy-intensive economies on Earth. Much of the continent depends, directly or indirectly, on fossil fuel for heat in winter and for air conditioning in summer. The way of life feeds on fossil-fuel transportation that moves everything people need over vast distances within the United States and Canada, and connects them materially to the rest of the world. With production agriculture and industrial food processing, it takes more fossil energy than solar energy to make our daily bread.

For all the paper wealth being generated by the so-called knowledge-based economy, the entire post-industrial economy still floats on an old economy pool of oil and gas. No wonder that in recent years people have been taken aback by wild swings in the market supply and pricing of gasoline, diesel fuel, heating oil and natural gas.

The Canadian and U.S. governments have generally responded to this instability with interventions designed to restore stable low prices for conventional fossil fuels. Even while ratifying the Kyoto accord, which is designed to reduce carbon dioxide emissions, Ottawa is doing everything it can, including ruling out a carbon tax and exempting the auto industry, to ensure that the oil and gas and automotive industries are minimally affected. Washington wouldn't even sign on to the accord.

While this might be good short-term politics, it is bad economics and lousy environmental policy. And it won't prevent even steeper price increases in the near future.

To avoid a serious energy crisis in coming decades, citizens of industrial countries should actually be urging their governments to come to international agreement on a persistent, orderly, predictable and steepening series of oil and natural gas price hikes over the next two decades. The present world energy market obscures the true price of hydrocarbon fuels and inhibits the development of alternatives.

This argument comes in two parts. The first is neatly summarized in a 1998 report by the Washington-based International Center for Technology Assessment. The report is called *The Real Price of Gas*, and it quantifies the numerous costs involved in running automobiles but not reflected in U.S. consumer prices. Such hidden costs include publicly funded infrastructure, tax and direct subsidies to the oil industry, and the health and environmental effects of burning fossil fuels, such as "second-hand exhaust." All these seriously distort energy markets, burden the economy with rampant inefficiencies,

and in the process are helping to destabilize the world's climate.

Depending on the range of subsidies included and the quality of available data, the total unaccounted cost of fossil fuel use in the United States was found to lie between \$559 billion and \$1.7 trillion dollars annually. This fuller social cost accounting would result in a gasoline price between \$5.60 and \$15.14 per gallon. In other words, even with the burden of existing taxes, prevailing energy prices do not tell the truth about the costs of using fossil energy. North Americans pay a fraction of what they would in a perfectly functioning market.

In fact, U.S. consumers enjoy the most under-priced fuel available in any major industrialized country, with Canadians not far behind. And as every economist knows, the invariable consequence of under-pricing is overuse. Wealthy and middle-class North Americans live in ever-larger energy-inefficient houses, drive ever-bigger and less fuel-efficient vehicles, and so are squandering in a few decades a non-renewable resource that took tens of millions of years to accumulate.

Even if there were no other issues at hand, it would be economically rational and ecologically beneficial for our governments to intervene in today's energy market to correct at least the best-documented and uncontroversial market imperfections. We should be paying significantly greater taxes and prices at the pump.

But there is indeed another issue at hand. The world is running out of cheap oil, and North America is looking at dwindling reserves of gas. Recent price hikes may be mere tremors heralding the real price shock to come. Surely this is not the time to be discouraging the development of alternative energy sources and deepening our dependence on fossil fuel.

The evidence? Oil "production"—really *extraction*—peaked in the United States about 1970 and in North America as a whole in 1984. More than 50 other oil extracting countries have already gone through this cycle of discovery, peak production and decline. Several recent studies project global conventional oil output to peak as early as 2010. Harry J. Longwell, executive vice president of Exxon Mobil, made an unprecedented admission recently: "To put a number on it, we expect that by 2010 about half the daily volume needed to meet projected demand is not on production today—and that's the challenge facing producers." The necessarily conservative International Energy Agency, in its *World Energy Outlook, 1998*, concurred for the first time that output could peak between 2009 and 2012 and decline rapidly thereafter. It projected a nearly 20



Vaughn Wascovich



Vaughn Wascovich

percent shortfall of supply relative to demand by 2020. Other studies show that by 2040 total oil and natural gas liquid output from all sources may fall to 60 percent of today's supply.

Oil is the means by which industrial society obtains—and overexploits—all other resources. The world's fishing fleets, its forest sector, its mines and its agriculture all are powered by liquid portable fossil fuels. Seventeen percent of the U.S. energy budget, most of it oil, is used just to grow, process and transport food. University of Colorado physicist Albert Bartlett has called modern agriculture “the use of land to convert oil into food.”

Keep in mind, too, that petroleum is not just a fuel. Oil and natural gas are the raw material for thousands of products, including medicines, paints, plastics, fertilizers and pesticides. Since oil is directly or indirectly a part of everything else, its coming scarcity and the attendant price shock might mean higher prices for everything else as well.

Many analysts will agree with energy economist M.A. Adelman that rising prices will stimulate exploration and addition to reserves. But though higher prices have brought more drilling, they have not added to proved reserves in net terms since the early 1980s.

Adelman also ignores that oil exploration is subject to diminishing material returns. A few decades ago, oil extractors in the United States would discover 50 barrels of oil for every barrel consumed in drilling and pumping. In the mid-1990s the ratio fell as low as 5 to 1. Eventually there will be no point in extracting oil with oil at any price even though there will still be plenty left in the ground.

What about substitutes? Concerns over climate change have already stimulated a growing interest in alternative energy sources. However, there are problems on the supply side. A recent summary article on energy engineering in *Science* cautioned that most renewable alternative sources of energy produce relatively little energy compared with that concentrated in fossil fuel. A recent issue of *The Energy Advocate* argued rather bleakly: “The renewable sources of energy—direct sunlight, wind, hydropower, biomass—are all solar in origin and are *in toto* inadequate for running anything that passes for civilization. [They have] no chance whatsoever of sustaining the present world's population.” While not all analysts agree with that grim prognosis, it has yet to be confidently refuted.

And there are still other problems. We sometimes forget that qualitative differences among energy types make substitution difficult. Wind-generated and photovoltaic electricity might be able to supply most of the electricity currently generated by fossil fuels. (Nuclear fission is still in disrepute and commercial fusion reactors are decades in the future.) However, electricity can-

not match petroleum derivatives for energy storage. While there may be promise in fuel cells—if we can discover a way to produce hydrogen efficiently—there is not yet a suitable substitute for the fossil fuels used in heavy farm machinery, construction and mining equipment, diesel trains and trucks, and ocean-going freighters. Jet aircraft cannot be powered by electricity, whatever its source.

The human population has grown six-fold in less than 200 years. The global economy has quintupled in less than 50. No factor has played a greater role in this recent explosive growth of the human enterprise than abundant, cheap fossil fuel. No other resource has changed the structure of economies, the nature of technologies, the balance of geopolitics and the quality of human life as much as petroleum has. Little wonder that some scientists believe that passing the peak of oil production will be a shock to the human enterprise like no other event in history. Population and consumption are still on a steep trajectory, but the rocket is running out of fuel.

The problem is solvable, but not without positive action and wide-ranging policy innovation. Certainly universities should be leading the way, with the research required to make alternative energy work, and with energy conservation demonstration projects.

Meanwhile, informed citizens and public service organizations in Canada and the United States should be urging governments to get real about energy policy, including pricing. All direct and indirect subsidies to conventional oil and gas producers must be eliminated. Subsidies keep fossil fuel prices artificially low, encouraging excess consumption and inhibiting the development of alternatives. We must move closer to full social cost pricing of fossil energy through carbon taxes or resource depletion taxes.

More realistic prices for traditional fuels are needed to induce conservation of our remaining fossil fuel reserves, to encourage the private sector to develop more energy-efficient technologies, and to make inherently more expensive but necessary alternatives more competitive. More realistic pricing would help make the entire economy more efficient as the world energy market tightens up.

It could be argued that higher energy costs would impose an unfair burden on low-income families. Certainly any such inequity must be avoided, but without abandoning the overall energy policy objective. Failure to act now might mean an even greater future burden on the poor.

On the positive side, note that this potential problem might be relatively short-lived if the policy changes are phased in according to a predictable schedule. Both producers and consumers respond to higher prices. People would not object too much about gasoline costing twice



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as much if their cars were twice as fuel-efficient—which they would be if their manufacturers hope to stay in business.

In any event, changes to energy pricing policy would be part of a broader program of ecological fiscal reform. Even income taxes rates could be adjusted to compensate for any residual inequity resulting from rising energy and material costs—dare we discuss a negative income tax?

Finally, keep in mind that many advanced European countries already have much higher energy costs than Canada and the United States. They have already made many efficiency adjustments with no appreciable harm.

Energy trends are no secret. Governments have known about the nearing supply dilemma for years, yet tend to sacrifice the public interest to that of the oil and gas and automotive industries, which lobby for the status quo. Or they remain in the thrall of conventional economists who still argue, against the evidence of recent decades, that rising prices will automatically lead to adequate new fossil fuel reserve discoveries.

Higher energy prices are needed now to signal the real scarcity to come. Without higher prices we will not invest in the technologies needed for a smooth transition to the post-petroleum age. Without higher prices, the remaining life expectancy of industrial society, as energy analyst Richard Duncan has frequently argued, may well be less than 40 years.

Walking Behind the Cinnamon Bear

William H. MacLeish

It was Ernest Hemingway who introduced me to my first bear. In the twenties, Ernest and my father, Archibald MacLeish, had met in Paris, where each was teaching himself to write. In 1928, shortly before I was born, my parents left France for a place in western Massachusetts that had once been a farm.

I never met Ernest, but Archie was full of stories about him. When I was old enough to marvel—say, five or six—he told me how Ernest had killed two grouse, in the first thunder of their flight, with two shots. He had flushed them from a bend in the path between our ponds, and I knew from family games of Scout just how thick that cover was. I also knew about the skins, from a zebra and a black bear, that Ernest had sent Archie when I was a baby. They were placed, neatly taxidermed as rugs, in the big room my mother, Ada, used to maintain her skills as a concert singer and to entertain friends who came for many of the summer weekends. Sometimes she'd let me join the company after dinner. I would lie on the black rug and listen. She might sing "O Western Wind" or a song from the Auvergne, but the effect on me was always the same: after a while, my mind would turn her voice into night wind, and then I would dig my fingers into the deep softness of undercoat, and breathe bear and be bear.

In a few years, I went on to another bonding. Archie had somehow acquired a four-volume set of ancient Gaelic stories, bound in blue leather with gold lettering. It was called *Popular Tales of the West Highlands*, and my favorite one was "The Brown Bear of the Green Glen." Archie read it to me often—sang it to me, since it is almost impossible to read a good English translation of Gaelic without slipping into the music of the original.

The human hero is John, a youngest child, as I am. He is the son of the ailing king of Erin and, like many last-born, is regarded by his siblings as something of a fool. But he is smart enough to see through the schemes of his two blaggardly elder brothers to take over the kingdom, and to develop a plan to thwart them by bringing his father curative water from the Green Isle, far away "about the heaps of the deep."

Early in his journey to the Isle, John gets lost at dusk in a forest. As the story has it, he climbs a tree and, from the top, sees a bear coming

with a fiery cinder in his mouth. "Come down,

son of the king of Erin,” says he. “Indeed I won’t come. I am thinking I am safer where I am.” “But if thou wilt not come down, I will go up,” said the bear. “Art thou, too, taking me for a fool?” says John. “A shaggy, shambling creature like thee climbing a tree!” “But if thou wilt not come down, I will go up,” says the bear, and he fell out of hand to climb the tree. “Lord! Thou canst do that same,” said John. “Keep back from the root of the tree, then, and I will go down to talk to thee.” And when the son of Erin’s king drew down, they came to chatting. The bear asked him if he was hungry. “Weel by your leave, I am a little at this very same time.” The bear took that wonderful watchful turn and he catches a roebuck.

The *mathon*, the bear, carries John on his back to visit giants who test the boy and then, satisfied, say things like, “Yes, yes, son of Erin’s king, now I know thy matter better than thou dost thyself.” John travels by more magic over the deeps to the Green Isle, fills his bottles, and returns to Erin. He puts his father on the mend, sees that his brothers are punished, and marries the daughter of—who else—the king of the Green Isle.

John’s bear was and is my bear, but I forgot about him for a while after my elder brother taught me to hunt. I started killing just about everything that moved. I still don’t know why. Perhaps I was trying to get to Archie, who hated hunting, by showing him I was set to follow Ernest down the blood trail. It has been said that the world is full of people who have stopped listening to themselves. I was one of them right through my young manhood. Then one day I wounded and lost a doe and put my guns away. Whenever I was tempted to take them out, I thought about the deer, and about a kit fox I had shot, lying at my feet and whimpering himself to death.

I began to walk the land just to be on it, to sense and be quiet. People around me were beginning to talk about the “environment,” as if we were not a part of nature but surrounded by it. Wiser friends got me started reading: Thoreau, then Aldo Leopold, Edward O. Wilson, Thomas Berry.

From mythologists like Mircea Eliade and Joseph Campbell I learned that our effort to separate ourselves from the rest of life is something new to the species. For more than 95 percent of our time on earth, all of us, to use Eliade’s phrase, “were less aware of belonging to the human species than of a cosmic-biologic participation in the life of [our] landscape.” During those thousands of millennia, people studied everything that lay about them and remembered what they learned. They could not have done anything else, given their limited powers and resources. They were so close to all living

beings, including those they killed in order to live, that they might as well have been speaking the same language. Their rituals and myths helped them in the competition to survive.

Some of the strongest myths were those that developed in the northern lands, the core habitats of the bear. He, like us, was an omnivore. He ranked a bit higher than we in survival skills, knowing as he did how to be at the right place and time for salmon or blueberries and how to sleep through the hardest months of the year. He was a teacher of our teachers. His power was so great we dared not call him by his name. We called him Grandfather, the Old Man with the Fur Coat, the Dog of God. We placed him at the celestial axis of the earth’s rotation, in a constellation we called the Great Bear. (Learning the last startled me: I had had a recurring dream about entering a room and seeing a bear walking erect through the door opposite. I backed out and fell in long grass. The bear stood over me, looking straight into my eyes. In an instant, he was in the night sky, wheeling around a bright star like a gibbon on a branch.)

I live now above the Deerfield River, on what used to be a farm, less than twenty miles from where I grew up. My wife, Elizabeth Libbey, is a poet and teacher of poetry, and she is one of the few people I have met who know that they are animals before they are anything else. Elizabeth says that she believes some part of her is a wolf. I have heard her conversing with the coyotes who occasionally sing on our hillside of a warm evening, and I have no doubts on the matter. People hunt black bears in these hills, but so far the bears are winning. They bend the poles of our bird feeders and take their sweet time shuffling off when we bang pots at them. Mostly they stay in the woods and we in the fields.

Every summer for years, Elizabeth has taken me with her to visit her home country in and around the Tetons in Wyoming. We usually stay in a village of old cabins brought in from the range and fixed up for modern residency. From there, we can hike or drive to old-growth conifer forests or to sage meadows along the Snake River or to the sage flats that stretch for miles below the mountains. If I’m on foot, I’m eager to see animals that pose minimal threat—elk, antelope, sand-hill cranes, white pelicans. I fear encounters with moose guarding calves or with any mature bison. And more than once, I have stood still as stone while a black bear ambled across the trail far away, gently mouthing the shrubbery, taking only the best leaves.

The park is full of signs telling visitors what to do if a bear takes special interest in them. The park rangers warn us not to get too close: grizzlies are apt to be more dangerous, but black can and do maul. I usually buy a pressurized can of pepper spray for defense, though the rangers have told me that the stinking mist does not



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always do the trick. Among their less gory tales is one concerning a grizzly cub and a picnic lunch in a tourist's station wagon. The tourist sprayed. The cub sat down and threw up. His eyes swelled shut, but his nostrils remained open. In a second, he was in the car and at the sandwiches.

I grew to like the feel of the spray can, holstered and swinging low on my hip like a trusty Colt. But two summers ago, when I might well have needed it, it was back in my suitcase. I had walked the half-mile from our cabin down to the community pay phone. I had just left the booth and was heading for the road back when a bear stepped out of the scrub onto the pavement. He (I

remember him as a male) was golden red; he was brighter than life. The brilliance made him huge in my eyes, though he probably was under two hundred pounds, not yet fully grown. He looked at first like a grizzly, but he had no hump. I remembered reading that the western black bear comes in assorted colors. This one was what they call a cinnamon bear. He was standing there in glory, looking at me out of the corner of his right eye. Nothing moved. We were alone together on what should have been a fairly busy afternoon. Then the bear took my road, padding along on what a student of the species has called “the palms of his feet.”

The thing is that I followed him, about fifty yards back, close enough so that, if he had wanted to rearrange me, he could have taken that wonderful watchful turn before I could have done anything but bleat. Thought, though, was not part of my process. I do know that I hadn't the faintest shiver of fear. I wanted to be where I was. The bear didn't seem to mind. He swung his head as he walked, and I knew he was keeping tabs.

I heard a humming noise behind me. At first I thought it was my hearing aids whining, but when I turned I saw an electric golf cart bearing down on us, driven by the supervisor of the cabin-clearing crews. She was a small woman with a large voice. When she saw the cinnamon bear, she spun the cart around and grabbed her cell phone. “BEAR!” she shouted to her people. “INSIDE! LOCK THE DOORS!”

The golf cart hummed off. The bear kept his pace, and I mine. He watched me, and I watched him. For the first time in my life I was trading awareness with the animal from whom I had tried, through touch of fur, through Gaelic myth, through a dream of the North Star, to draw strength.

A car came abreast of me. It was park security. The golf-cart lady must have phoned him. I looked over at the driver, the only occupant. He stared at the bear. Even in my altered state I could see that he was the spit and image of Dick Tracy, from slab jaw to unfinished eye. He honked, the bear disappeared. So, in a minute, did Tracy.

The bear and I had walked together for five minutes at most. It took me a lot longer to return to my wits, and when I did I found them in a mess. It dawned on me that I had done something fairly foolish. It was also obvious that I wanted to tell everyone about the elation that foolishness had produced. But who would listen? I thought of the large numbers of my countrymen who hold strongly that the Almighty has elevated man a mile or two above all other creatures. Very few of them would want to spend time hearing about a short walk behind a mere animal, whatever the color.

Over time some things have sorted themselves out. The embarrassment over my incaution has subsided.

The desire to address myself to its transcendent effects has increased. I remain appalled by what is now a global urge to convert the natural to the bankable. If the trend continues for a few more generations, a human population roughly twice its present size might have to get along on half the world's present resources. Yet I have come to believe that we carry within ourselves something of a counter to such disaster.

When I was born, some forty of every hundred Americans took their living from the land, and fewer than four do so now. But I think that, under the right circumstances, most of us still respond to nature, or to symbols of it on our screens and pages—sometimes in ways our ancestors would recognize. Our bodies and minds have not forgotten hunting and gathering. I don't believe that my dream of the bear wheeling in the sky was a fluke. Like everyone else, I carry memories too distant to be called memories, but they flicker when I smell heavy rain coming or look up through the plumage of an old white pine, or hear geese in their high formations talking over the particulars of their trip.

It turns out I needn't have felt so isolated after my walk in the Tetons. Now that I'm looking for listeners, I find them everywhere. I have only to mention the cinnamon bear to complete strangers to spark an hour of just-so stories, all suffused with a familiar excitement. I have only to look to find experiences similar to mine in painting, in music, in literature. One, described in “The Heron,” a poem by Hayden Carruth, is eerily close. A man and a blue heron stand twenty feet apart on the banks of a trout pond. “Communication occurred. I felt it. Not just simple / wonder and apprehension, but curiosity and concern.” The heron nods and flies off, and the man walks back into his life—but not quite. The poem ends:

If goodness exists in the world—and it does—
then / this moment / was the paradigm of it, a
recognition, a life in conjunction with / a life. /
But why am I compelled to tell you about it? It
was / wordless. / And why, over and over again,
must I write this poem?

I think now that almost all of us can understand why. For, hard as it may be for us chosen souls to admit it, all life shares a common origin somewhere among the single cells of the young earth. That makes the bacterium my ancestor. That makes the bear my grandfather. Once in the know, how could we possibly keep this stuff to ourselves? And if we did, who can say how goodness would grow in the world?

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Mother's Milk: Natural, Healthful, But Not Honored

Kristin Van Tassel

The benefits of breastfeeding are widely acknowledged, but few people see this as relevant to anyone but the parents of babies. In fact, there are advantages directly related to larger concerns, particularly food and the environment. Human breast milk is one of our most valuable natural resources.

It boosts infants' immune systems. It is designed to meet their specific volume and nutritional needs, with no additives or supplements. It eliminates the waste of formula's packaging and discarded leftovers.

While formula requires fossil fuel for its production and distribution, every nursing mother has a fresh, locally produced food ready to serve to her infant anytime, anywhere. Rather than relying on multinational companies, breastfeeding mothers empower themselves—and, thereby, their home communities also—to nourish their children.

Breastfed babies are also less likely to suffer from obesity later in life. And exclusive and frequent breastfeeding can work as birth control, limiting population growth.

Breastfeeding should be of interest to anyone concerned about landfill waste, global warming, agribusiness, multinational conglomerates, obesity and overpopulation.

But despite its large support in the medical community and positive coverage in the media, the culture of breastfeeding continues to face troubling challenges. Like a canary in a coal mine, it reveals systemic problems that bode ill for effectively addressing more complex and controversial food and environmental concerns.

The steady decline of breastfeeding during the first three quarters of the 20th century resulted directly from industrialization's move toward large-scale food production and the subsequent overproduction of cow's milk. The dairy industry's search for new markets led to development and promotion of infant formula, with devastating results for the culture of breastfeeding.

By 1972, only 25 percent of American women left the hospital nursing their newborns. And of these women, virtually unsupported in a society that had lost the experience and knowledge necessary to sustain the practice, very few continued nursing beyond the first two months of their children's lives.

The good news is that breastfeeding has made a remarkable comeback during the past 25 years, due in large part to the organization of breastfeeding support



groups, encouragement by progressive doctors and the perseverance of individual mothers. Now, 70 percent of women leave the hospital nursing their infants, a marked improvement in one generation.

Still, the culture of breastfeeding is undermined and compromised. It is sobering to realize that despite stacks of supporting scientific studies, universal endorsement (or at least lip service), and an army of local volunteers, consultants and support groups, only 16 percent of

American mothers nurse their babies for the full year recommended by the American Academy of Pediatrics and the surgeon general.

The formula industry is alive and well in both rich and poor countries. It is standard for companies to give mothers in U.S. hospitals gifts and free cans of formula. Now the manufacturers are fighting an Advertising Council public service announcement for breastfeeding.

Although the inability to breastfeed is extremely rare, too many women, faced with the large presence of formula in the maternity ward and supermarket, assume supplementing or replacing their breast milk is desirable, even necessary. This belief undermines confidence in their bodies, which hinders their breastfeeding success.

Additionally, social and economic forces in the United States discourage extended nursing. While no one objects to a baby being fed with a bottle in a restaurant, park or church, nursing remains taboo in many public places. And although it benefits employers to support breastfeeding since breastfed babies are sick less, which means their parents miss fewer work days, many businesses fail to give mothers the flexibility to realistically fit breastfeeding into their working lives.

We live in a society where our domestic lives are severed from our educational and economic activities, commercial agendas take precedence over the natural world, and profits are prioritized over health. These dichotomies come at the expense of women and babies.

We would do well to examine the economic, political and cultural forces hindering the complete success of something as straightforward and compelling as breastfeeding.

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Spread the Word

Friends of The Land are creating ways to tell our story to more people.

A real estate broker in Washington state read our card asking her to tell friends about us. She realized she had a way through her client newsletter. She asked if we would send her a short article about our work and reply envelopes to include in her mailing. In a region keen on environmental issues, she thinks her clients would like to know about The Land Institute.

This one person is helping us reach hundreds of people who might not ordinarily hear our message about connecting biodiversity and agriculture, and increasing ecological sustainability.

We'd like more ideas such as this.

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 Oliver A. and Eunice A. Stromberg
 Paulette Strong
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At the Land

Natural Systems Agriculture

A plant breeder's work is never done. It is winter, but the greenhouse has more plants than ever as we combine the characteristics of annual crops, such as ample food seeds, with a wild perennial's ability to live for years. This season saw that population expand with both new hybrids and promising descendants of earlier cross-species breeding. It also brought installation of a heating system to expand by a third and fill out the greenhouse's winter capacity.

Sorghum

Our work last year produced a large population from sorghum hybrids that had many of the traits needed for a perennial crop plant. But no plant has good levels of every trait, which includes rhizomes, the underground stems by which a perennial can spread; the ability to survive winter; shortness, so energy goes to seed production rather than wasteful competition for light; large seeds; and stiff stems. And consistently perennial sorghum plants have not had crop characteristics. Our aim now is to increase the number of plants with all or most of these traits.

Like all new crops, our perennial sorghum lacks the genetic variation for long-term breeding progress. But this year we will deepen that gene pool considerably. In field plots last year we found plants that had proven hardy over three winters, plus offspring that had survived two years. These we bred with newly released grain sorghums from researchers in Nebraska and Texas. Results in the greenhouse: more than 100 new hybrids, each with one consistently winter-hardy parent and one high-yielding parent. This year we will field test these hybrids' offspring. Considering that our best previous plants all trace to fewer than a dozen such hybrids, all with less strongly perennial parents than the new hybrids have, this will open up considerable new genetic territory.

Small grains

This effort is younger than the sorghum program, but in two years we have gone through three breeding cycles and produced hundreds of plants that have wheat in their lineage and appear perennial.

The first round of breeding wheat with wild perennial relatives, mostly intermediate wheatgrass, resulted in hybrids that could not make pollen. (For an illustration of the process, see Land Report No. 72.) These were pollinated with wheat, a "backcross." Some of the

resulting plants produced a few seeds unassisted. These seeds should make plants with heads that fill out better. And the continued backcrossing should bring a higher share of plants that are fertile.

To eventually combine with this branch of plant development, we also are breeding a new triticale. Triticale is most often a cross of wheat and annual grain rye. Our plant's rye parent is a wild perennial, *Secale montanum*. We are in our third generation of selecting offspring with the best traits. The new triticale will add to the breeding diversity, it is relatively easy to cross, it produces robust hybrids, and because its parentage includes a perennial, it might lead to a perennial grain faster than by working only with wheat and intermediate wheatgrass.

Sunflower

We are in the early development of hybrids from breeding crop sunflower, an annual, with three relatives that

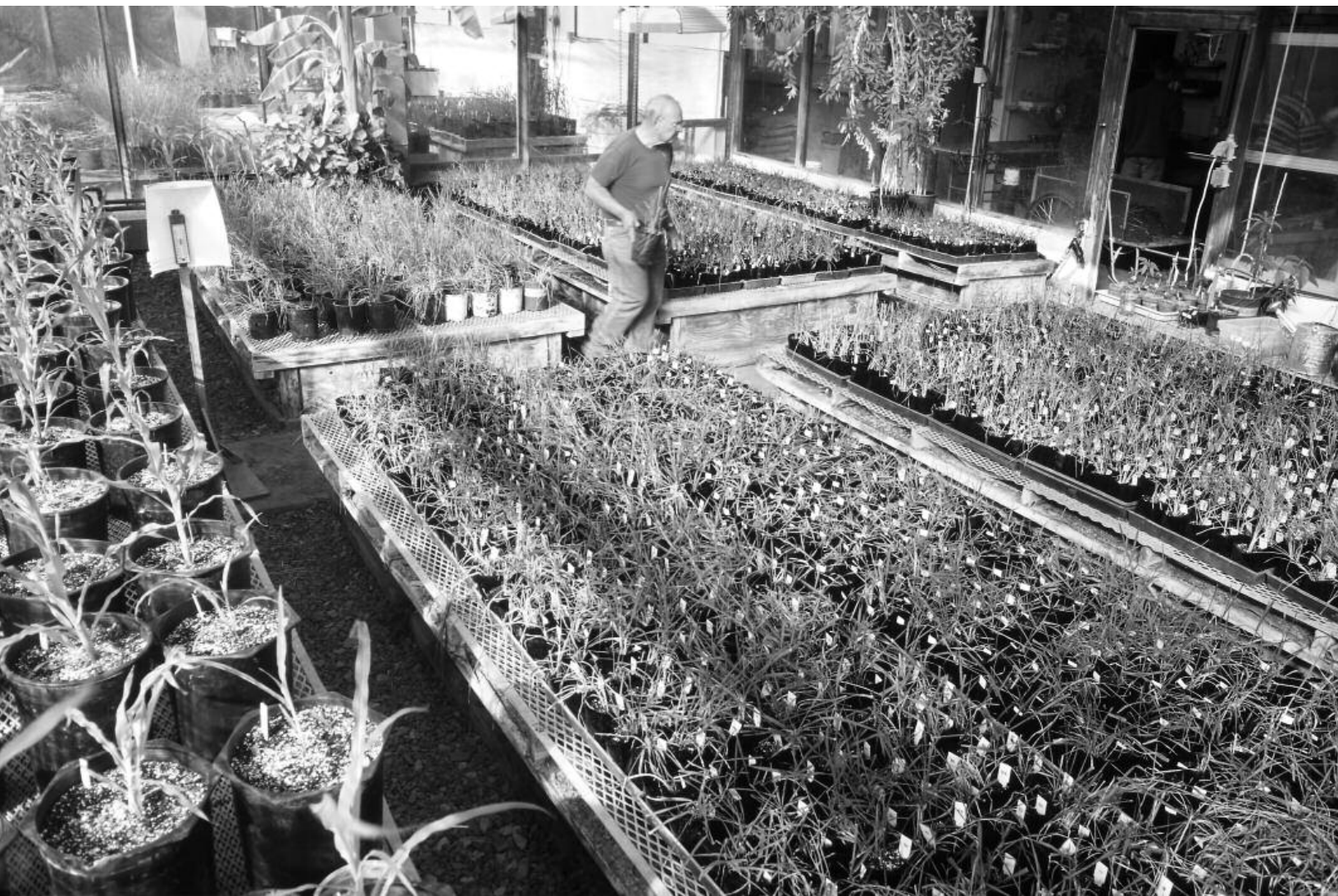
are perennials: Maximilian sunflower, sawtooth sunflower, and Jerusalem artichoke. We are experimenting with ways to improve the fertility of offspring.

From nearly 1,000 initial Maximilian sunflower plants collected from about 100 places in Kansas and elsewhere, we have two years of data on seed size and yield, height and other traits. Now we can begin picking from the collection those plants with most promise. We'll dig up pieces of their rhizomes and move them to a new plot, where the resulting plants will breed exclusively with each other.

Greenhouse

Early this year we added heating to the last of four 860-square-foot greenhouse rooms. This opens up more space for breeding perennial plants.

If it is sunny, even a cold day feels shirt-sleeve comfortable in the greenhouse. But at night the temperature can plummet well below what encourages plant



Scott Bontz. Bob Pinkall works in a greenhouse full of our breeding work.

growth. It also can hurt the tiny wasps we want to keep for controlling destructive aphids.

Aiming to maintain the greenhouse at no less than 50 degrees on a night when the mercury outside hits zero, we installed more than 1,800 feet of winding pipe to carry boiler water radiating heat under the potted plants.

Vanguard Piping Systems of McPherson, Kansas, donated the tubing, fittings and tools, and helped us engineer this latest variation and improvement on our greenhouse heating.

Agroecology

Study shows that hay cut from an unfertilized prairie for 75 years yielded as much nitrogen as nearby fertilized wheat. And the prairie's soil quality is much higher. Of course, humans can't eat hay. But they will be able to eat perennial grains grown as on the prairie, in diverse mixtures and with deep, always living roots for greater self-reliance in fertility and healthier soils.

A second phase of the study is measuring the effects on nutrients and water when prairie is converted to annual cropping without tillage, and when annuals and perennials are grown in mixtures, such as wheat seeded in prairie.

In our own fields we have finished the first of 20 years comparing soil, water, nutrient and productivity effects of restored prairie, rotational cropping of annuals, and intermediate wheatgrass, one of the perennials in our breeding program. It is being grown both in monoculture and mixed with another prospective perennial crop, the legume Illinois bundleflower. As our plant breeding makes them available, additional perennial crop species will be put in the research plots.

Sunshine Farm

Marty Bender continues to write a book on the 10-year Sunshine Farm experiment, a study of an organic operation's energy economy. Institute operations manager Steven Renich is completing some data analysis.

Staff

Early this year our scientists gained research assistant Chad Burns, who graduated with a psychology degree recently from Austin College in Sherman, Texas. There he also focused on environmental studies, and in pursuing that interest he came to us.

Last year, Sheila Cox, daughter of institute scientist Stan Cox, again helped with research between semesters as a biology major at the University of Kansas. Her brother, Paul, volunteered during a break from globe-

trotting study of literature and social science in the Friends' World Program of Long Island University.

With internships from their schools, we also were helped through the growing season by Tim Clark of Austin College in Sherman, Texas, and Jason Schulz of the University of California at Santa Cruz.

Katie Jensen, who had attended our weekend introductory course for undergraduates, returned during summer to help with research. She is studying biology at Luther College in Decorah, Iowa.

Taryn Kennedy volunteered as part of her senior project at Prescott College in Arizona, where she will receive a degree in environmental studies with an emphasis in agroecology.

George Taplin, a high school science teacher in nearby Solomon, Kansas, worked with us through the Tech Prep Summer Internship Program, which gives educators experience in fields related to their teaching areas.

Exposure

Publications

In a book published last year, *The Essential Agrarian Reader*, Wes Jackson has a chapter, "The Agrarian Mind, Mere Nostalgia or Practical Necessity?"

In the June issue of *American Journal of Alternative Agriculture*, Land Institute energy scientist Marty Bender documented the efficiency of intensive animal production on Amish farms. For the published papers of an international energy studies conference in Porto Venere, Italy, he described lessons from our Sunshine Farm project.

In the July-August issue of *Crop Science*, plant breeder Lee DeHaan co-authored a study of genetic diversity in Illinois bundleflower, a protein-rich perennial legume that we aim to domesticate.

An Associated Press feature about Jackson and the institute appeared in more than 50 newspapers from Sparks, Nevada, to Staten Island, New York.

Presentations

Four staff scientists and a graduate fellow explained The Land Institute's work for the annual American Society of Agronomy symposium in Denver. Staff members made presentations across the country, from the University of California at Santa Cruz to Boston University.

Following are scheduled appearances:

- March 22, Great Barrington, Massachusetts.
- March 23, New Haven, Connecticut.
- March 24, Amherst, Massachusetts.
- March 25, Northampton, Massachusetts.
- March 26-27, Chambersburg, Pennsylvania.
- March 29, West Lafayette, Indiana.

- April 1-4, White Earth Reservation, Minnesota.
- April 9, San Francisco.
- April 26, Pittsburgh, Pennsylvania.
- July 10, Topeka, Kansas.

For more details, see the calendar on our Web site, www.landinstitute.org, or call us at 785-823-5376.

NSA Graduate Fellows

The nationwide program of funding graduate students in our line of work enters its seventh year as we plan to bring on eight to 10 new fellows. They and continuing fellows will gather for an annual workshop June 6-12 in Salina and rural Matfield Green, Kansas.

Short Course

Staff scientists will lead undergraduates through an intensive weekend exploration of agriculture patterned after ecosystems May 28-30. There is no tuition, but students are responsible for their travel and accommodations. There is free camping on the grounds.

For more details of the course, including application information, see our Web site or call us. Send applications by April 26 to Liz Granberg at theland@landinstitute.org, or by mail to The Land Institute, NSA Short Course, 2440 E. Water Well Road, Salina, KS 67401.

Prairie Writers Circle

In a bit more than two years we have distributed more than 90 op-ed essays. These now reach more than 85 newspapers in Kansas, some 130 more print publications across North America, and nine Web sites.

We have 10 Kansas writers and 20 others from around the country. They pick their own topics. There is a small stipend for one essay per year from each, plus the potential attention of hundreds of thousands of readers.

Recent pieces have calculated the low-carbohydrate diet craze's potential ecological effects, argued for reclaiming a conservation ethic, and called for left and right to find common ground for environmental protection. For another example, see page 23.

All essays are posted on our Web site.

Prairie Festival

For our annual gathering around conversation, food and music, to be held October 1-3, we already have three speakers: William MacLeish, Judy Wicks and Michael Pollan. There will be more by the summer Land Report. Meanwhile, you can check our Web site for updates.

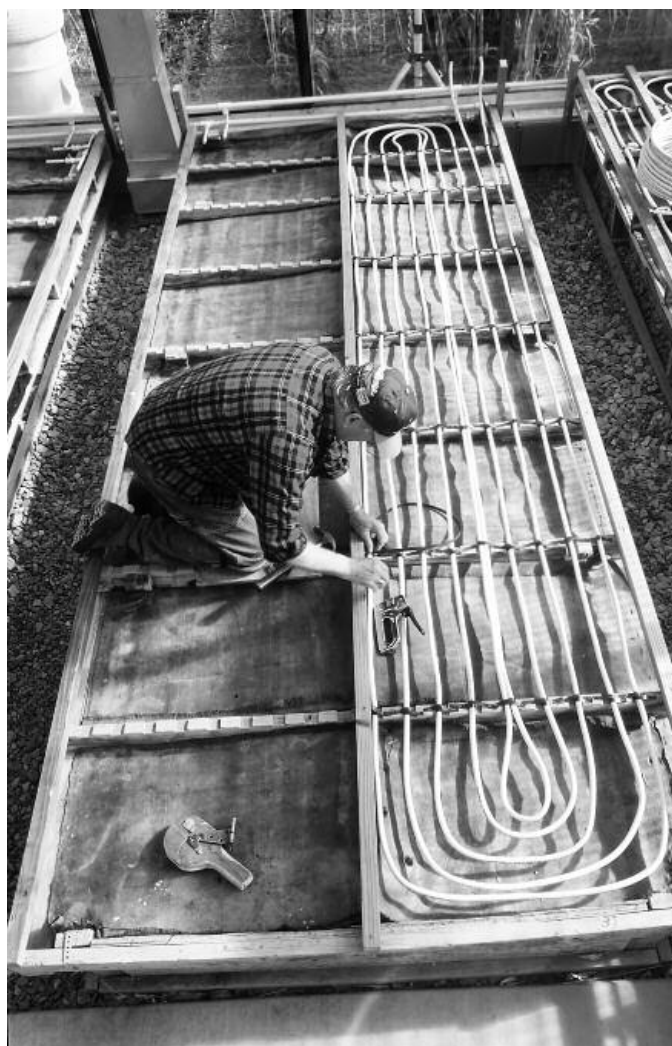
California chef Donna Prizgintas, who led prepara-

tion of the 2003 festival's Saturday supper, will return for the same this year.

Pollan has written about food production for the *New York Times Magazine* and is a member of our Prairie Writers Circle. His books include *The Botany of Desire: A Plant's-Eye View of the World* and *Second Nature*.

Wicks is the founder of Philadelphia's White Dog Cafe, which buys produce in season from local organic farms and supports a foundation for promoting the local economy. She co-founded and helps leads the national Business Alliance for Local Living Economies.

William H. MacLeish is the former editor of *Oceanus*, the magazine of the Woods Hole Oceanographic Institute. His books include *The Day Before America: Changing the Nature of the Continent*. An essay he wrote is on page 17 of this Land Report.



Scott Bontz. Harold Frazell installs heating pipe in the greenhouse to expand our capacity for breeding new plants through winter.

Time to Stop

E. F. Schumacher

Not very long ago, I visited a famous institution developing textile machinery. The impression is overwhelming. The latest and best machines, it seemed to me, can do everything I could possibly imagine—in fact, more than I could imagine before I saw them.

“You can now do everything,” I said to the professor who was taking me around; “Why don’t you stop, call it a day?”

My friendly guide did indeed stop in his tracks.

“My goodness!” he said, “What do you mean? You can’t stop progress. I have all these clever people around me who can still think of improvements. You don’t expect me to suppress good ideas? What’s wrong with progress?”

“Only that the price per machine, which is already around the 100,000 pound mark, will rise to 150 pounds.”

“But what’s wrong with that?” he demanded. “The machine will be 50 percent dearer but at least 60 percent better.”

“Maybe,” I replied, “but also that much more exclusive to the rich and powerful. Have you ever reflected on the political effect of what you are doing?”

Of course, he had never given it a thought. But he was much disturbed; he saw the point at once.

“I can’t stop,” he pleaded.

“Of course, you can’t stop. But you can do something all the same: You can strive to create a counterweight, a counterforce, namely efficient small-scale technology for the little people. What are you, in fact, doing for the little people?”

“Nothing.”

I talked to him about what I call the “Law of the Disappearing Middle.” In technological development, when it is drifting along, outside conscious control, all ambition and creative talent goes to the frontier, the only place considered prestigious and exciting.

Development proceeds from Stage 1 to Stage 2, and when it moves on to Stage 3, Stage 2 drops out; when it moves on to Stage 4, Stage 3 drops out, and so on.

It is not difficult to observe the process. The “better” is the enemy of the good and makes the good disappear even if most people cannot afford the better, for reasons of money, market, management or whatever it might be. Those who cannot afford to keep pace drop out and are left with nothing but Stage 1 technology. If, as a farmer, you cannot afford a tractor and a combine, where can you get efficient animal-driven equipment for these jobs—the kind of equipment I myself once used? Hardly anywhere. So you cannot stay in farming. The

hoe and the sickle remain readily available. The latest and the best—for those who can afford it—is also readily available. But the middle, the intermediate technology, disappears. Where it does not disappear altogether it suffers from total neglect—no improvements, no benefits from any new knowledge, antiquated, unattractive, etc.

The result of all this is a loss of freedom. The power of the rich and powerful becomes ever more all embracing and systematic. The free and independent “middle class,” capable of challenging the monopolistic power of the rich, disappears in step with the “disappearing middle” of technology. (There remains a middle class of managerial and professional servants of the rich organizations; they cannot challenge anything.)

Production and incomes become concentrated in fewer and fewer hands, or organizations, or bureaucracies—a tendency which redistributive taxation plus ever-increasing welfare payments frantically try to counteract—and the rest of humankind have to hawk themselves around to find a “slot” provided by the rich, into which they might fit. The First Commandment is: Thou shalt adapt thyself. To what? To the available slots. And if there are not enough of them available, you are left unemployed. Never previously having done your own thing, it is unlikely that you will have the ability to do it now, and in any case the technology that could help you to do your own thing efficiently cannot be found.

Reprinted from Resurgence magazine.

The Writers and Photographers

Charlie Melander works land that his family has farmed for a century. He advises The Land Institute and helps with its farm operations.

Wolf Leslau is professor emeritus of the Near Eastern Languages and Cultures Department at the University of California, Los Angeles.

Vaughn Wascovich is assistant professor of photography at the University of Missouri-Columbia. In addition to small town vernacular, he has a particular interest in environmental issues, and has for the past several years been photographing Superfund sites, most recently at Tar Creek in northeastern Oklahoma.

William E. Rees is an ecological economist and professor in the University of British Columbia's School of Community and Regional Planning.

William H. MacLeish is the former editor of *Oceanus*, the magazine of the Woods Hole Oceanographic Institute. His books include *The Gulf Stream: Encounters with the Blue God* and *The Day Before America: Changing the Nature of the Continent*. MacLeish lives in rural Massachusetts.

E.F. Schumacher (1911-1977) was a German-born economist in England who argued that "production from local resources for local needs is the most rational way of economic life." He wrote *Small is Beautiful*, as well as *Good Work* and *A Guide for the Perplexed*.

Kristin Van Tassel is a mother and teaches English at Bethany College in Lindsborg, Kan., and Kansas Wesleyan University in Salina. She also manages the Salina farmers market.

Scott Bontz edits The Land Report.

Prairie Festival Tapes

From September 27-28, 2003, at The Land Institute

Tape	Quantity
Natural Systems Agriculture round robin <i>Land Institute scientists</i>	_____
The End of Empire <i>David Korten</i>	_____
Reading from <i>Citizenship Papers</i> <i>Wendell Berry</i>	_____
An untitled talk <i>Winona LaDuke</i>	_____
Writers Corner with <i>Angus Wright, Amy Fleury, Bill Sheldon and Wendell Berry</i>	_____
Farming Well <i>Charlie Melander</i>	_____
The Memory Economy <i>Mas Masumoto</i>	_____
Life on the Farm: 100 Years Hence <i>Wes Jackson</i>	_____

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Scott Bontz. One of our results this winter of breeding annual wheat with a perennial called intermediate wheatgrass.

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