The Land Report

A publication of
The Land Institute
Number 58
Summer 1997

Prairie Festival 1997

Saving Red-Cockaded Woodpeckers

Revolutionizing Howard County Schools

Bison on the Konza Prairie

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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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On the Front Cover: Interns (L to R) Caroline Brock, Andrea Leach, and Jon Jensen pick mulberries on the Sunshine Farm.

Thoughts on the Natural History of Eden

Wes Jackson

In the late 60s, when I was teaching at Kansas Wesleyan, I would drive around in the Saline County countryside from time to time looking at rural property as a place to build a house, have a small homestead to round out what I considered then the perfect life of teaching in a small liberal arts college and coaching the track team. The three children my wife and I had planned on were all born.

On several occasions I found myself parked at the end of an old iron bridge which spanned the Smoky Hill River south of town a few miles. On the east side of the river there was a high bank which overlooked the Smoky Hill below and a beautiful flood plain opposite. It was the strip along the high bank to which I was most attracted, for it was a strip that had been broken, farmed and returned long enough ago that native grassland had been re-established. Two ravines, one major and one minor, had cut their way toward the river, and spreading from these cuts were featured such trees as burr oak, green ash, black walnut, hackberry, and box elder. There were the usual accompanying poison ivy and grape vines. The gray dogwood and sumac were spreading into the prairie.

It was an idyllic spot, and my most favorite of all places was a high point where I could look down on the ripple created by the outcropping of the Wellington shale. It was more than an exquisite experience to sit there. I am tempted to say that I meditated on the wonders of nature, but I doubt that. For some reason I was always alone. I never felt like having anyone with me. At this time I was not interested in hunting the game the place featured, be it pheasant, quail, cottontail or squirrel. Nor had I any desire to fish the stream. The place was Eden.

Somehow I learned that an older childless couple, by the names of Bessie and Loyd Wauhob, owned this little strip. They lived across the river and across the road. I went to see them and expressed my interest in purchasing a small piece nearest the road, three acres maybe. Bessie and Loyd had never sold any land to anyone. Bessie's dad had always told her to never sell any of her farmland and she had stuck to it. But there was an entry point, it seemed to me, for the land I had in mind to buy was so erodable it had been abandoned as farmland. While both Bessie and Loyd agreed with my assessment of the land's quality, they remained reluctant to sell. They were not the kind of people one should push, but I did return to visit with them a few times and even offered to pay as much as $1,000 an acre for three acres. They finally agreed to sell, but protested that $1,000 an acre was too much and that I need only pay $500. A deal was struck. Frank Norton became my lawyer, the papers were drawn up and payments on the land were made to Bessie and Loyd on a monthly basis.

Of course, I wanted to start building a house right away and raise the children in the country. My wife agreed, and so I went to the proper government offices to obtain the permits for construction and the septic system. At the courthouse they asked to see my plans. Did I have any blueprints? I had none. But there was a tablet on the counter which I turned toward me and simply drew a square representing 36 feet by 36 feet, added a couple of doors and declared that, "Here are my plans." They were approved.

The county was more concerned about the septic system and sent a man out to obtain a "perc" test, from which was derived an estimate as to the number of feet of laterals I would need. Being conservative I doubled that length and, instead of using the regular limestone which would flake off and form a crust, spent extra money for much harder limestone.

For several months we did nothing to the place. We lacked the money to start. My family and I would frequently come out to The Land, as we called it, to picnic or walk around (and that is how The Land Institute got its name -- a mere extension). A decision was made as to where the house should go. It should more or less parallel a sloping bank down to the river just north of the ravine, which had once been a place from which poor quality coal had been harvested. I built a small construction shack out of hollow veneer dormitory doors that had one

or more holes kicked in on one side by not yet civilized college boys at Kansas Wesleyan. I added a $25 lab bench out of Wesleyan's old science building. I had power and water run to the shack. Water had to come from a well Nick Fent dug north of the road. Power and water lines went in the same trench.

The International harvester dealer rented to me at five dollars per tractor hour an industrial tractor with a back hoe and a front end loader. I went to work digging the basement, which was to be a walk-out affair, filled at the back but mostly open on three sides. After more or less mastering the controls on the backhoe, I was able to dig the ditch for the lateral field and the hole for the septic tank. I dug the footing making it two to three feet wide and about that deep. Miscellaneous pieces of iron, including old bicycles and tricycles, served as supplemental reinforcement for the concrete walls. Using mostly self-built forms, I intended for the walls to be 10 inches thick. (I measured one recently, it is closer to 11 inches.) Construction was unconventional and included the use of local trees for beams and inside paneling.

As I participated in the Creation, as a technological creature, I destroyed something whole, which is to say, Holy.

When I needed to rest, I often ambled over to the river, to the same spot where I had stood before construction began, and looked down and out and around. Nothing had changed beneath where I stood or sat. The Wellington shale was still there generating the ripple. The rustic iron bridge – which should never have been a part of Eden but somehow was – still hung over the river. The fields on the opposite side were the same. The large woody ravine was still to my left. But Eden was gone. I tried to bring it back by opening and shutting my eyes, trying to image what it was, but it never returned or even came close. I finally realized that Eden was gone for good. Apparently, the very exercise of what makes us human, in that place, had driven what some would call "the spirit" away. I could now understand the biblical meaning of the angel with the flaming sword which denies access to Eden.

Art Zajonc in his book *Catching the Light* has helped me understand that the nature of cognition involved in the design of an experiment to determine whether light is a wave or particle *determines* whether one will perceive a wave or a particle. We've all seen drawings which flip-flop – sometimes one sees a beautiful young woman and at others an old woman. You can't see both at once. In the case of wave vs. particle, or beautiful maiden or old woman, it goes back and forth. For me, a cognitive switch had been thrown that has never been thrown back.

One interpretation of the Genesis myth may be that our fallen condition is the consequence of insisting that we be participants in the creation by partaking of the Tree of Knowledge rather than the Tree of Life. As I participated in the Creation, as a technological creature, I destroyed something whole, which is to say, Holy. My family and I, like all others, wanted a home. Had I met the shelter need in a minimal sort of way would Eden have remained? We'll never know. I do know that my perceived need at the time was probably not a real need, so my perceived need was mostly culturally determined. But I did say mostly, not entirely.

Bess and Loyd continued to sell us acreage as we could afford it until we eventually owned 28 acres. Our design on the place expanded from the original three acres to now include 28 acres. Back from the river now grow various fruit trees, including organic apple trees which bear wormy fruit in a habitat still safe for deer, wild turkey, bobcats, quail, pheasant and non-verbal serpents not at all tempting us and indeed less onerous and certainly less poisonous than the ivy along the big ravine. Three decades since I first experienced Eden and nearly three decades since I lost it, there is now a sand box and a playhouse for grandchildren tucked under the river bluff trees less than 50 feet from the Edenic spot. A sweat-of-the-brow sponsored flower and vegetable garden grows profusely over the lateral field, and the shade and pleasing form of native and exotic trees planted as saplings early on – all watered from the Nick Fent-drilled well – bring delight to this participant in the Creation who sometimes thinks the loss of Eden was a bargain.

Reflections on Twelve Years at The Land Institute

Jon Piper

I arrived fresh from the university in August of 1985, with my wife Beth and son Joshua (age 1½) in tow, to assume my new position at The Land Institute. I was excited about exploring a diverse agriculture based on polycultures of perennial grains. After becoming aware of big-scale agriculture's harmful effects on the soil in the Palouse region of Washington State, I was intrigued by the idea of an agroecosystem that behaved like a natural grassland, featuring diverse arrays of perennial grain crops to protect the soil from erosion and contamination. What appealed to me was the application of ecological principles, gained from studying natural plant communities, to sustain our means of feeding ourselves from the soil. The work was, and continues to be, unique. In the subsequent twelve years at The Land, I have seen a lot of changes take place. Many people have come and gone, we have acquired new land and buildings, and started bold new projects. Yet, the overall vision and long-term goals of the organization have remained remarkably constant.

"The place has a different quality now than when I arrived."

Although The Land's vision has remained steady, the place has a different quality now than when I arrived. Much of The Land Institute's daily ambiance then flowed from the personality and devotion of Dana Jackson, who oversaw the intern program. For Dana, The Land Institute was like an extension of the home, and its staff and students were like extended family. The garden, household animals, and orchard were her domain, and she invited us to participate with her in their livelihood. There was a great deal of playfulness about the daily routine. Some days, the community of staff and interns felt like a summer camp.

We have not entirely lost the sense of playfulness, but now the Land exhibits a higher level of professionalism. Staff relationships, although still warm, are more collegial rather than familial. The work certainly carries a more serious tone. There is more of a sense of urgency about the work. We always joked about changing the world. Now, I think, we expect to.

Probably the most visibly dramatic changes have occurred in the physical place. Twelve years ago, the classroom building was the center of all activity. In the fall, classes and warm-up discussions were held five mornings a week upstairs; seed cleaning, weighing, and data analysis took place downstairs in the afternoon. The classroom building was a lot more rustic and funky then. There were nooks and crannies everywhere filled with dusty old treasures. Old, old (back to the seventies) environmental literature had accumulated on shelves along the walls. A sloping south wall was fitted with a bank of semi-functional solar heat collectors (car radiators painted black). There was also a big column in the middle of the room that housed rock for thermal mass. Then, as now, both up- and downstairs were heated with wood stoves.

The classroom building was renovated in summer 1987 following a violent windstorm that damaged the roof. New carpet, bookcases, and paint were added, floor ducts and the rockpile core were removed, and the south wall was extended and made vertical with additional windows for more light. Then, later, an east extension was added to provide an entryway mudroom and bathroom, and the basement was renovated to make more livable room for interns. The classroom remains a terrific space for class discussions as well as an intimate setting for public lectures.

In terms of facilities expansion, 1986 was a watershed year. We purchased and occupied both the Krehbiel House office building and the 72 acres on Ohio Street and Water Well Road. Within the Krehbiel House, we created desperately needed

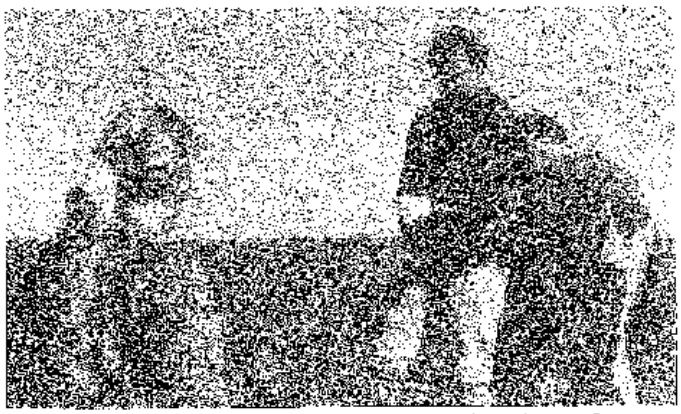
offices for research and administrative staff, housed the ecology & agriculture research library, and organized the seed room, the repository for our precious plant breeding stock. Construction of our 1400 square-foot research greenhouse south of the office commenced in early 1987.

The interns are a central fixture of The Land Institute. Oftentimes, a visitor will remark on how much he or she enjoyed the conversation with the intern who conducted a tour. Interns are fresh and idealistic; they help keep the place youthful. We joke sometimes about the "generic intern." In fact, the profile of a typical Land Institute intern has remained remarkably similar over the years. They are intelligent, idealistic, environmentally and socially aware, and committed to more ecologically-appropriate life styles. In the seasonal cycle, interns continue to attend class, conduct field research, and contribute to construction and maintenance. At the end of each term, the intern research presentations at Kansas State or the University of Kansas always make me proud.

There have been a few changes among the interns, probably reflecting changes at The Land Institute, as well as in the culture at large. In 1985, students accepted into our program were coming out of such traditional scientific disciplines as biology or soils. Now, they are just as likely to be the product of a multi-disciplinary environmental studies program designed in the 1980s. Sometimes this means that an incoming intern is not as well trained in basic biology, genetics, or botany as his or her predecessors. When I first arrived, ten interns and several research staff were devoted to perennial polyculture research: plant breeding and polyculture studies. Presently, we fund eight interns, five of whom are busy with various aspects of the Sunshine Farm project.

Interns are now likely to come from multidisciplinary environmental studies programs of the 1980s.

Perhaps more interestingly, I have also perceived a change in interns' personality profiles. Initially, there was a fair amount of mutual derision and judgment of one another's life style. Although The Land Institute has never discriminated on the basis of dietary orientation, interns who consumed meat, coffee, and sugar often did so "in the closet." Interns now are much more relaxed about eating and transportation preferences. They are much less judgmental (or at least less vocally so).



Jon Piper helps 1997 interns Caroline Brock and Douglas Haynes identify prairie plants.

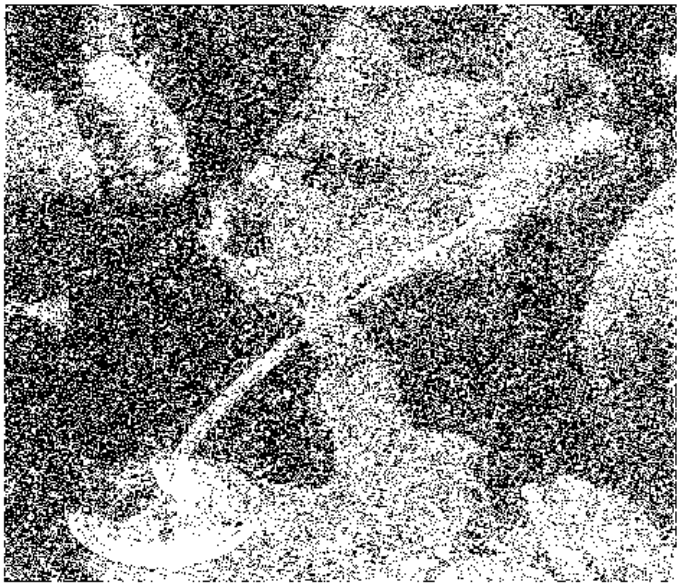
Finally, during my tenure, the research has changed, too. There has been a marked shift away from many diverse research projects toward a stronger focus on fewer, more extensive studies. Although research in perennial grain polycultures had primacy when I came, many of the projects were small, unlinked to one another, and rarely carried over from one year to the next. Some of the experiments were designed in ways that made them difficult to interpret. Now larger-scale, longer-term, potentially-publishable research is the norm. What I have been most happy about is more publishable research; it contributes to long-term credibility for the institution. Some of our supporters may accuse us of caving in to the scientific establishment. The fact is, research publication is the coin of the scientific realm. Research. That's where we'll leave our mark when all is said and done.

The dozen years I spent at The Land Institute were a gift to me. I only wish that every person could have the opportunity to interact with the quality of staff, students, and visitors, engage in the high level of discourse, and experience the humble excellence that characterizes this place. I thank the organization and its Friends for their generous support and wish all the best success for the future.

News from The Land Institute

At The Sunshine Farm

Farmer's Field Day, August 2nd. The Land Institute's Sunshine Farm hosted its second annual field day for farmers and agricultural researchers. Visitors toured the 150-acre research and demonstration farm with Marty Bender, project ecologist, and Jack Worman, farm manager and local Percheron draft-horse breeder. Projects included the biodiesel tractor, oilseed press, portable broiler-chicken pen, free-range egg production, draft horses, a photovoltaic array for producing electricity, 50 acres of narrow strip-cropping, rotational grazing of Texas Longhorns, and soil quality testing.



Sunshine Farm soil quality testing

In Matfield Green

"Learning in Place" Summer Teacher Workshops, June 16-20. In June, staff from The Land Institute and Emporia State University taught a five-day workshop to 27 educators from the Flint Hills of Kansas and three from Howard, South Dakota. The workshop taught teachers methods to help students understand and value their home communities (see article, page 13). Workshop attendees went on field trips led by a botanist, a rancher, an historian, and a photographer, all specialists who view the landscape with "different eyes."

Natural Systems Agriculture Program

"Natural Systems Agriculture: Multiple Challenges to an Existing Paradigm," Ecological Society of America Meeting, August 10-14, Albuquerque, New Mexico. In a symposium organized by Land Institute ecologist Jon Piper, nine scientists will present papers on natural systems agriculture research at the 82nd annual meeting of the Ecological Society of America (ESA). This is the first natural systems agriculture symposium to take place at the ESA annual meeting.

New Perennial Polyculture Plots. The Land Institute established two new perennial polyculture research plots this spring, one in the area known as the "quarter section" and the other in the "72 acres." The new plots were planted with rows of The Land Institute's four "star" prairie perennials: eastern gamagrass *(Tripsacum dactyloides),* Illinois bundleflower *(Desmanthus illinoensis),* mammoth wild rye *(Leymus racemosus),* and Maximilian sunflower *(Helianthus maximilianii).*

Ongoing projects. Perennial polyculture and gamagrass breeding projects, begun in 1996, continue into their second year. The community assembly project, designed to discover whether more diverse mixtures of perennial prairie plants form more stable, weed-free communities than less diverse mixes, continues into its fourth year.

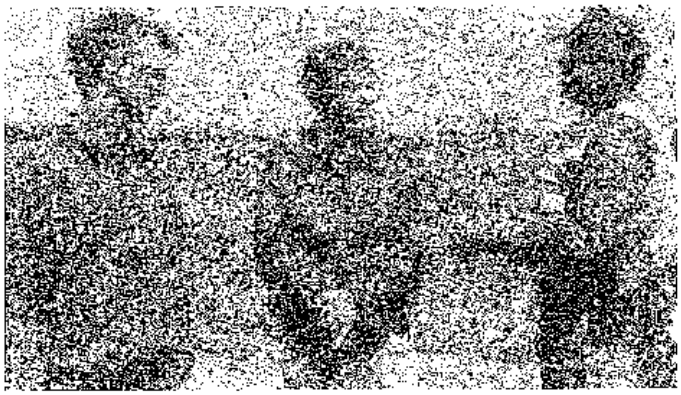
Intern Program

New Natural Systems Agriculture Curriculum. Rob Peters (education director), interns and other research staff are developing a new interdisciplinary curriculum in Natural Systems Agriculture to be used in the fall term.

Guest lecturers. Ten academics from the Midwest, West Coast, and Sweden lectured to Land Institute interns this year:

- Karl Zimmerer, Geography, University of Wisconsin, Madison
- Charlie Sing, Human Genetics, University of Michigan Medical School, Ann Arbor

- Angus Wright, Environmental Studies, California State University, Sacramento
- Ray Dean, Electrical Engineering and Computer Sciences, University of Kansas, Lawrence
- Buz Brock, Economics, University of Wisconsin, Madison
- John Doran, Soil Science, USDA and University of Nebraska, Lincoln
- Lennart Salomonsson, Torbjörn Rydberg, Johanna Björkland and Lennart Karlsson, Swedish University of Agricultural Science, Uppsala, Sweden.



(L to R) Intern Alex Crockford and staff member Marty Bender listen to John Doran, visiting scientist from the University of Nebraska

Miscellaneous News

Wauhob Prairie Acquired. The Land Institute acquired the neighboring 10.3 acre Wauhob Prairie, which it had been leasing from the owners since 1986. The Wauhob Prairie has one of the highest concentrations of plant species diversity in Kansas.

"Grasslands" Narration. Wes Jackson narrated Eugene Friesen's "Grasslands," a musical celebration of the prairie by The Paul Winter Consort and a 140-member orchestra and chorus. Performances were held June 7th in Arkansas City and in Salina at the Smoky Hill River Festival on June 14th.

Prairie Festival 1997: "Feeding Our World and Having It Too"

Douglas Haynes

The 1997 Prairie Festival of tours, talks, and art kicked-off with a bonfire party on Friday evening, May 23rd. For the first time in several years, we had little rain, and folks were not trying to salvage their cars from a sea of mud in The Land Institute woodlot.

The 1997 Prairie Festival's theme, "Feeding Our World and Having It Too," expressed the hope that sustainable agriculture can feed the world's people while helping protect wildlife and natural ecosystems.

After The Land Institute's Managing Director Ken Warren officially opened the Prairie Festival on Saturday morning, Bill Kurtis presented the keynote talk in the Big Barn. Bill is a journalist for CBS News and public television, who has traveled on assignment from the Brazilian Amazon to Africa's Sahel, reporting on science, nature, and native cultures. In his talk, he described the people he has seen in developing countries and their efforts to survive environmental destruction. Bill told stories of his visits to remote areas of the world, including the Nepalese mountain valley of Shangri-La, now a national park.

(L to R) Prairie Fest speakers Don Duvick, Dan Luten, Wes Jackson, and staff member Joan Olsen.

Saturday morning's other talks focused on how to keep rural communities economically and culturally vital, while preserving the natural

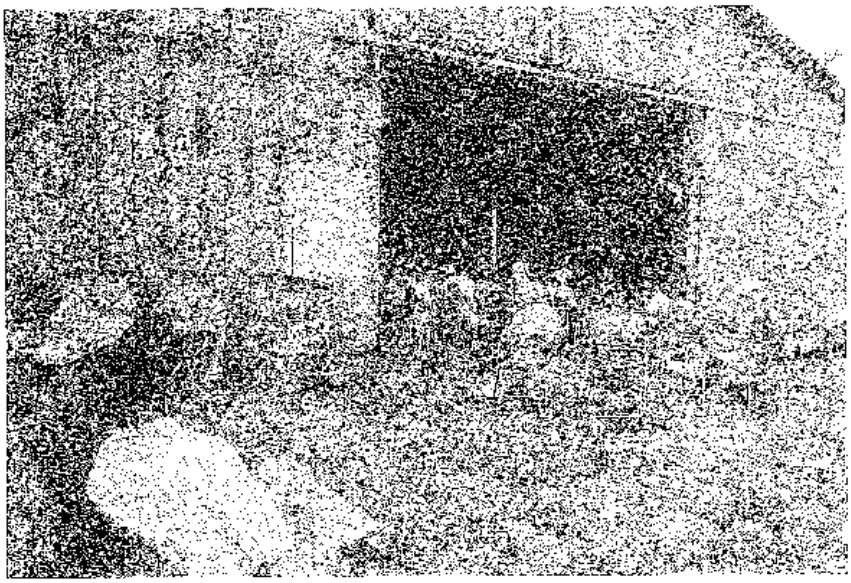
landscape on which these places depend. Jim Lentz, whose talk is featured on page 13, told of educational reforms in his hometown of Howard, South Dakota that are prompting young people to remain in the community. Joyce Wolf of the Kansas Land Trust explained how she helps rural landowners preserve their land for agriculture and conservation when it is threatened by development and high taxes. Finally, Brian Donahue, former director of education at The Land Institute, discussed his ideas for preserving forested land in suburban areas in a talk entitled "New Roots for Silviculture: Reclaiming the Common Forest."

Four scientists spoke on Saturday afternoon and Sunday morning. Bill Leighty gave an extensive slide show presenting evidence that global oil reserves are rapidly declining. He argued for alternative energy research by groups like his company, Alaska Applied Sciences Inc. Rob Peters, Director of Education at The Land Institute, followed Leighty with a presentation entitled "Red Cockaded Woodpeckers, Landowners, and the Illusion of Certainty." An adapted version of Rob's talk appears in this issue of the *Land Report*. Agronomist and retired Pioneer Seed Company executive Don Duvick shared his insights on how agribusiness and biotechnology are changing the nature of food production, and University of California-Berkeley Emeritus Professor of Geography Dan Luten presented "A Categorical Castigation of Carrying Capacity Plus some Sequels."

In addition to these talks on the Prairie Festival's theme, the weekend included artistic presentations and entertainment. Ann Zimmerman, a regular performer at past Prairie Festivals, sang folk songs, including a tune inspired by her time as a Land Institute intern. Dancer Joan Stone returned after ten years to perform a solo piece entitled "The Space Between Grasses and Trees, Grief and Memories," and Denise Ulrich of Chase County High School and photographer Terry Evans presented a photo exhibit created by Chase County students called "Seeing Homeland." Writer Janisse Ray from rural Georgia represented the literary arts at this year's Prairie Fest, reading from her chapbook *Naming the Unseen*, a collection of nature poetry inspired by the landscape of the Southeast. One of Janisse's poems appears in this issue of the *Land Report* on page 22. As every year, there was a barn dance on Saturday evening.

Wes Jackson opened the Sunday afternoon session by presenting the 1997 Land Institute Recognition Awards to Jon Piper, Land Institute ecologist, and Sam and Terry Evans, both present or past board members and longtime Friends of the Land. Wes honored Jon Piper for his twelve years of distinguished service, presenting him with a framed Terry Evans photograph of The Land Institute. Wes recalled Sam Evans's instrumental role in founding The Land Institute in 1976 and praised his continuing commitment to its cause. Sam's wife Terry Evans was honored for her enduring efforts as a board member and arts associate. Terry's work continues to spread the mission of The Land Institute far beyond Kansas. Both Sam and Terry were given framed prints of Wendell Berry poems in appreciation of their contributions.

The 1997 Prairie Festival concluded with two local voices. Native Kansan Angus Wright alerted the audience to the environmental movement's self-destructive tendency for millenarianism and doomsday predictions. Wes Jackson followed Angus' remarks with a prophecy of his own. He warned that unregulated biotechnology would reduce crop diversity and threaten sustainable food production.



Prairie Fest: an overflow crowd at the Big Barn.

As in other years, tapes of all the Prairie Festival talks are available for purchase from Perpetual Motion Unlimited of Boulder, Colorado.

Audio Tape Order Form

Selected Recordings From

Prairie Festival 1997

Feeding Our World and Having It Too:

How Can We Combine Sustainable Farming and Forestry with Protecting Biodiversity

Presented by the Land Institute • Salina, Kansas • May 24-25, 1997

Quantity		Session Title	Speaker(s)
		Saturday, May 24	
___	S1	Feeding the World and Having it Too: How Can We Combine Sustainable Agriculture and Forestry While Maintaining Biodiversity	Bill Kurtis
___	S2	Educational Food for a Starving Rural America	Jim Lentz
___	S3	Saving the Family Farm and Other Special Landscape Features	Joyce Wolf
___	S4	New Roots for Silviculture: Reclaiming the Common Forest	Brian Donahue
___	S5	Food Circles: Connecting Producers and Consumers	Panel with Doug Walton moderating
___	S6	Red-Cockaded Woodpeckers, Landowners, and the Illusion of Certainty	Rob Peters
___	S7	Global Energy, Global Climate Change	Bill Leighty
		Sunday, May 25	
___	SU1	Biology, Society and Food Production: New Concepts – Old Realities	Don Duvick
___	SU2	A Categorical Castigation of Carrying Capacity Plus Some Sequels	Dan Luten
___	SU4	Naming the Unseen	Janisse Ray
___	SU5	The Affluent Society: Can We Have It? Do We Want It?	Angus Wright
___	SU6	Clearcutting the Last Wilderness: Compromising the Genomes of our Major Crops	Wes Jackson

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Plant Breeders Develop Perennial Crops

David Van Tassel

As part of The Land Institute's efforts to develop Natural Systems Agriculture, we are developing ties with other researchers who breed perennial crops. This article reports on work by two researchers: Stephen Jones is developing lines of perennial wheat, at present an annual crop. Chester Dewald is improving the yield of eastern gamagrass, a wild perennial plant, so that it will be a more suitable crop plant. Eastern gamagrass is one of the four "star" perennial crop plants also being developed by The Land Institute.

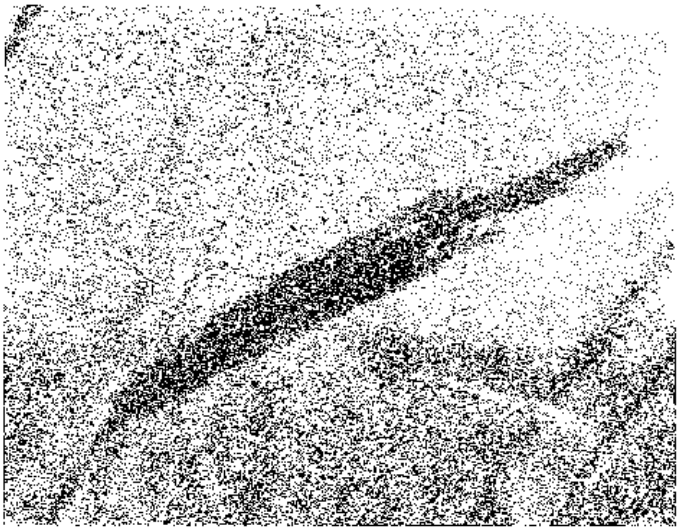
Dr. Stephen Jones and his colleagues at Washington State University are optimistic about developing lines of **perennial wheat** for use in the Pacific Northwest. In a May, 1997 article in *Wheat Life,* published by the Washington Association of Wheat Growers, they described the advantages of perennial wheat. One is drought-hardiness – because perennial wheat has a well-established root system that survives from year to year, it tolerates drought better than annual wheat. Growing perennial wheat also causes less soil erosion than annual wheat because perennial roots hold the soil better and because farmers do not have to cultivate every year. Jones envisions perennial wheat bringing into production highly erodible land presently set aside in the Conservation Reserve Program (CRP). In addition to conserving soil, perennial wheat would save farmers money because they would not have to plant every year.

With current strains of perennial wheat, grain yields are about 70 percent of annual wheat yields. In the past, these low yields caused researchers to abandon development of perennial wheat. Today, however, perennial wheat looks more attractive because of lower planting costs, erosion control, and the possibility of using CRP land. Also, farmers can make extra money by selling straw from perennial wheat as a by-product used in making paper or fiber board. Farmers growing annual wheat often cannot sell straw because they must keep it on their fields to reduce soil erosion after cultivation.

Perennial wheat was developed from hybrids between high-yielding annual wheat, genus *Triticum,* and species of naturally perennial wheatgrass, genus *Agropyron.* Although these hybrids were back-crossed with wheat to maximize wheat-like characteristics, they still contain several wheatgrass chromosomes with genes for perennialism. Wheatgrass itself has been investigated by the Rodale Research Center, Cutztown Pennsylvania, for development as a grain crop.

Eastern gamagrass is a wild perennial relative of domestic corn, native to North America, but differing from other native grasses in having large seeds. Chester Dewald at the USDA Southern Plains Range Research Station, Woodward, Oklahoma, has been breeding gamagrass for over 20 years, working to increase seed yield. In its current form, gamagrass produces too few seeds to be a successful grain crop, and its primary use is as a high-quality forage plant for cattle.

A breakthrough in gamagrass breeding came with the discovery in the wild of a single mutant gamagrass plant called a gynomonoecious sex form (GSF). Normal gamagrass plants carry seed stalks that bear both female and male flowers, with only female flowers producing seed. In GSF mutants, seed stalks bear mostly female flowers – few males – so GSF mutant plants can produce much more seed than normal. Having few male flowers, they are dependent on pollen from non-GSF plants to

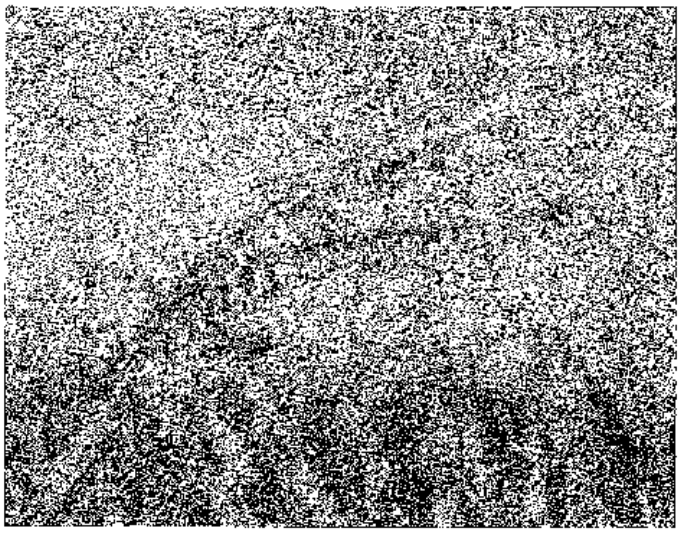


Stalk of gynomonoecious sex form (GSF) of eastern gamagrass showing predominately female flowers. The GSF strain will produce much more seed per stalk than normal gamagrass.

fertilize the female flowers and produce seed. Compared to normal gamagrass, the first GSF plants were weak and susceptible to disease.

Woodward and his colleagues were able to develop more vigorous, disease resistant lines of GSF plants by selectively crossing them with vigorous, normal plants. But how could they develop GSF plants that bred true, given that every generation would need pollen from non-GSF plants in order to set fertile seed? The answer was to develop a strain of GSF plants that produce seed asexually, with no fertilization by pollen needed. Because the seeds contain no male genetic material, the seedlings they produce are genetically identical to each other and the female parent – all grow up to be identical GSF plants with heavy seed production. Nonetheless, the asexual reproduction does not work perfectly. Although the asexual GSF plants do not require male genetic material to set seed, they do still require presence of pollen as a biochemical trigger to begin seed development. To satisfy this need for pollen, Dewald and his colleagues have developed populations of plants that consist mainly of highyielding GSF types with just enough normal types to produce the necessary amount of pollen.

The breeding project is also working to increase the number of gamagrass flowers per head by increasing the number of branches on each flower stalk and increasing the number of rows of flowers per branch. (The many rows of kernels on domestic corn are the result of past breeding to increase the number of flower rows per branch.) Other goals are to synchronize the time at which plants flower to make harvesting easier, increase leaf width to capture more sunlight, breed for stronger, thicker stalks to support extra seeds, and reduce the tendency for seeds to shatter (fall off the heads before harvesting).



Normal eastern gamagrass stalk showing both male and female flowers.

ARTICLE

Jim Lentz Serves "Educational Food for a Starving Rural America"

Douglas Haynes

Based on a talk by Jim Lentz at Prairie Festival 1997

As principal of Howard High School in Howard, South Dakota, Jim Lentz has made curriculum changes that affect not just his school, but his entire community, a town of 1,000 people. Lentz's 1997 Prairie Festival speech, entitled "Educational Food for a Starving Rural America," told how Howard students use their own community as a classroom, with field projects on Howard's history, environment, and economic and social issues. "The most logical reference point for students is something they are intimately familiar with – the community," he said.

Students learn history and physics lessons in the community

The Howard schools have two goals for their educational reforms. The first is to help Howard provide adequate jobs, food, shelter and clothing for all its residents. The rationale for this goal, according to Jim Lentz, is that "the community is only as well off as its most destitute citizen." The second goal is to ensure that Howard lives and grows within its ecological limits. The schools teach students to consider the town's long-term environmental and economic health. Reaching these goals is "workable in today's world," said Lentz. He emphasized that the Howard curriculum is not meant to create a utopia, but to keep young people in the community and help them sustain the town for future generations.

Jim Lentz described four beliefs that are the cornerstones of the Howard school system's curriculum.The first is that students must learn to value their community and appreciate its history. Lentz contends that once students know more about their community, their affection for it will increase, and they will be less likely to move away. In Howard social studies classes, students interview citizens, weaving personal stories and old photographs into oral and pictoral histories. They learn how their town was part of the American history presented in textbooks.

Even physics lessons can be taught in the community. A physics teacher at Howard High School took students to the local grain elevator during harvest season. At the elevator, the students calculated the number of soybeans in a pile one block long, half a block wide, and forty feet high. They also found that if the beans were laid end to end they would stretch around the world 3.5 times. When the students were finished calculating, the teacher told them to "realize how connected your small piece of the world is with the rest of the planet. The soybeans that grow here are literally stretched around the world to feed people."

The second belief underlying Howard's school reform is that the curriculum should help make the community economically resilient. If students are taught to recognize local economic problems, they can help reverse economic decline. Howard High School students, cooperating with local merchants, conducted a community cash-flow survey which revealed that Howard residents spend much of their income outside the community. The students concluded that, if ten percent more money were spent in Howard and turned over three times within the community, there would be an increase of over $7 million in local revenue. They published these findings in the local newspaper, which apparently convinced people to alter their behavior – spending in Howard increased 27 percent. In addition to benefiting the community, this project taught students lessons in economics, journalism, math, and data management.

Students grow organic fruits and vegetables to keep benefits of food production in the community

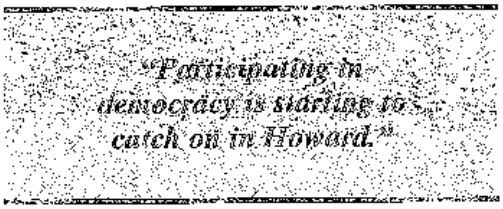
Howard High School students are also working to make Howard's food supply safer, more dependable and locally profitable. After finding out that only one cent of every ten cents spent on food in the United States is returned to the producer – most money goes to processors and distributors outside

the community – students looked for ways to keep money spent on food from leaving the community. They decided to grow fruits and vegetables organically and sell them through the local grocer, who would share in the profits. The students drew up a business plan and are selling company stock. Profits will be distributed through dividends, summer employment and scholarships. The Howard High School market-garden project exemplifies how educational reform can build what Jim Lentz calls "a country where people truly have choices." By growing fruits and vegetables, students give Howard citizens a chance to buy locally-grown food while keeping money in the community.

The Howard school system's third value is to advocate social justice, including the equitable distribution of wealth. Recently, the Howard High School chapter of Future Business Leaders of America used some of their funds to prepare and serve a meal to homeless people in Sioux Falls, South Dakota. Howard students have also organized food and clothing drives in their community.

Howard students learned something few public schools discuss, that one percent of the people in America own as much as the bottom 95 percent of the people. By reading books like *Broken Heartland,* a chronicle of the farm crisis in Iowa by Osha Gray Davidson, students discovered that agricultural conglomerates dominate the economies of many rural areas like Howard. According to Jim Lentz, four corporations – Cargill, Con-Agra, Archer Daniels Midland, and Pioneer – own 88 percent of the market in food and materiel used to produce food, from breakfast cereal to tractor parts.

One student used information in *Broken Heartland* to question Senate Minority Leader Tom Daschle, who visited Howard High School. "In . . . *Broken Heartland,*" she told him, "there is a partial list of Cargill products. This partial list includes aluminum, iron, rubber, and electronic parts, all used to build tractors. It also includes gasoline, hybrid seeds, and fertilizers. Knowing that farmers pay retail for all of the above mentioned items to put in their crops, then sell their crops on a market dominated by only three to four major corporations, for wholesale prices, then turn around and buy breakfast cereal at retail prices, please consider the following questions: Can you suggest a monopoly does not exist . . . ? If a monopoly does exist, why isn't something being done?"



The Howard curriculum also increases student involvement in local and state decision-making, the fourth belief underlying the new curriculum. Jim Lentz thinks that too few people vote and attend government hearings in America's small towns. However, "participating in democracy is starting to catch on" in Howard, Lentz said, and his "students are refusing to be led blindly by politicians." As students learn about issues that affect Howard, they become more confident about communicating with politicians. One student has testified twice about an educational appropriations bill before the South Dakota state legislature, and several others plan to testify about corporate hog confinement facilities. Lentz hopes that Howard will be an example for other schools. "Hopefully, this can lead to a national revisitation of democracy," he said, "as many states shake hands with this educational movement."

Jim Lentz did not conceive of his rural education reforms overnight. He taught and administrated small-town schools for fifteen years. Working in education, he said, opened his eyes to what had been happening his entire life: "These little places that I knew, these rural communities that I lived in and loved so much, were ceasing to exist." He made it his personal quest to determine how an educator could help improve the welfare of rural places.

Lentz has been inspired by educators and writers whose ideas stimulated the growing rural education reform movement. In his Prairie Festival speech, he quoted from "What We Teach Rural Children" by Minnesotan Paul Gruchow, who describes how conventional rural schools contribute to the decline of rural communities. "These are the lessons we teach rural children today," Gruchow writes, "that their parents were expendable and that their duty is to abandon their dreams and become cogs in the industrial machine . . and . . . if they expect to amount to anything, they had better leave home." Lentz named contemporary activists whose concerns echo Gruchow, including Paul Nachtigal, Wendell Berry, David Orr, Toni Hass, and Paul Theobald.

The Howard schools have received funding and program guidance from the Program for Rural School and Community Renewal, South Dakota State University, and Annenberg Rural Challenge, which supports similar programs in rural areas throughout the United States.

Annenberg Rural Challenge also provided a grant to Emporia State University and The Land Institute in Matfield Green to coordinate conferences and planning for community-based curriculums in six to eight school districts in Kansas' Flint Hills. At a Matfield Green conference last March, Jim Lentz spoke about the Howard school experience with Flint Hills' teachers, administrators, and community leaders. In June, community teams formed at the March conference convened again in Matfield Green for a week-long workshop entitled "Learning in Place."

The Land Institute's Matfield Green project helps Kansas educators with place-based curriculums.

Using the town of Matfield Green as an example, Sue Kidd of the Blue Valley school district, Suzy Achleitner of Emporia State University, and staff of The Land Institute showed Flint Hills' educators how to develop a curriculum to teach rural students their communities are "deserving of affection and care." The workshop included field trips with a botanist, a rancher, a historian, and a photographer, as well as ideas for art, writing, and community projects designed to create what Jim Lentz called "a deep-seated understanding of place."

ARTICLE

Hope for the Red-Cockaded?

Rob Peters

Adapted from Rob's talk at Prairie Festival 1997

A proposed plan to lessen impacts of the Endangered Species Act on private landowners could be a mixed blessing for an endangered woodpecker

Adult red-cockaded woodpecker feeding young.

The red-cockaded woodpecker, named for usually hidden red patches on the sides of the adult male's head, was once a common bird of the Atlantic coastal pine forests. Its range stretched from east Texas to Florida and north to Virginia, Tennessee, Kentucky, Missouri, Oklahoma and even beyond. In the last hundred years, logging of ancient pine forests and suppression of natural fires needed to keep those forests healthy have caused its range to shrink, and red-cockadeds have plummeted from perhaps half a million family groups to some 5,000 such groups. Although the red-cockaded has been federally listed for protection as endangered since 1970, its numbers have continued to drop, with a decrease of at least 23 percent just during the 1980s.

This highly specialized bird requires large pines, preferably longleaf, to nest and forage. The trees must be old enough – roughly 100 years – to develop red-heart fungus, which softens the heartwood so that red-cockadeds can excavate nesting and roosting holes. Even in a decayed tree, it can take months or years to construct a cavity and, once dug, the birds and their descendants may occupy the same holes for years. If nesting and foraging trees are destroyed, a colony usually cannot just move to a new site and so dies out.

To survive, a red-cockaded family group needs from 100 to 1,000 acres of pine forest, depending on the forest's age, the food supply and other characteristics of the habitat. The forest must burn every three years or so to remove brush and kill hardwoods that compete with the pines. Historically, big lightning-started fires regularly burned through the Southeast's forests, but they were not intense enough to hurt the naturally fire-resistant pines. The resulting open, parklike tree stands were perfect for foraging woodpeckers, sunning gopher tortoises and other indigenous species. Land managers, if they wish to, can create similar conditions by suppressing hardwood growth with prescribed burning, cutting or even herbicides.

In 1988 the Fish and Wildlife Service adopted a recovery plan whose goal is to bring the woodpecker back up to at least 15 populations, each containing 400 to 500 family groups. Most sizable remaining populations and all 15 designated recovery areas are on public lands – chiefly national forests, national wildlife refuges and military reservations. But these lands alone can't save the hard-pressed species even if they are administered with more consideration for the red-cockaded than in the past, according to biologists. For example, to grow to its target size of 400 groups, the recovery population centered at Fort Bragg in North Carolina's Sandhills will need habitat on adjoining private lands. Although some federal populations show signs of modest recovery because of changes in forest management, most private land populations continue to decline. Halting this trend will be difficult because the ability of the Endangered Species Act (ESA) to restrain landowner behavior is more limited than most people realize.

Typical red-cockaded habitat of longleaf pines with open understory.

The ESA expressly prohibits "taking" endangered species, meaning that you can't shoot an endangered species with a shotgun or drive over it on purpose with your sports utility vehicle. The courts have also interpreted the law to prohibit "incidental take," which is killing an endangered species as a side effect of logging, development or other legal activities. In the case of red-cockaded woodpeckers, incidental take would include destroying the woodpeckers' nesting or foraging trees, depriving them of habitat they need to survive. Because landowners complained that complete prohibition of incidental take unfairly restricted use of their property, in 1982 Congress passed an amendment to the ESA which authorizes landowners who participate in a habitat conservation plan (HCP) approved by the U.S. Fish and Wildlife Service (FWS) to obtain an "incidental take" permit.

A habitat conservation plan is a legal agreement between the landowner and the Fish and Wildlife Service that lets development, logging or other activities go forward under specified conditions. The Fish and Wildlife Service issues an incidental take permit that allows the owner to cut trees, for example, provided he takes mitigation steps to make up for harm done to an endangered species. Any deaths or harassment cannot "appreciably reduce the likelihood of the survival and recovery of the species in the wild." Mitigation can include purchasing replacement habitat elsewhere, improving habitat elsewhere, as by building nest boxes for red-cockadeds, or providing funding for recovery programs. In practice, FWS routinely gives such permits, as it did to North Carolina landowner Ben Cone in 1996. Cone's permit allows him to take the habitat of 12 family groups of red-cockadeds on his property, provided that he pays to build nest boxes and do other things to establish replacement groups elsewhere. "One problem with these permits," says ornithologist Jerome Jackson, a leading expert who teaches at Mississippi State University and headed the government's first red-cockaded recovery team, "is that FWS routinely grants them one-by-one and overlooks their cumulative impact."

The Endangered Species Act prohibits intentional or incidental taking of endangered species, but habitat conservation plans provide a loophole

The ESA also cannot obligate landowners to manage habitat to sustain the birds. "Because natural fires are no longer frequent, many private-land populations are disappearing because they need prescribed burning or other active management to keep the hardwood trees out of woodpecker habitat," says Ralph Costa, red-cockaded coordinator for the Fish and Wildlife Service. "And the ESA can't force a landowner to do this."

An artificial nest box prior to being inserted in a tree trunk.

Red-cockaded specialist cutting hole to insert artificial nest box.

Despite the HCP amendment, many landowners are angered by the ESA because it forces them to avoid logging in the vicinity of nesting and foraging trees unless they go through the HCP process, which they see as unnecessarily restrictive and cumbersome. Bumper stickers in woodpecker country proclaim, "When you run out of toilet paper, try a woodpecker." Barring complete removal of restrictions, landowners want the Fish and Wildlife Service to speed up, simplify and standardize the approval process for HCPs. They want to know exactly what their future obligations will be under the ESA so that they can make long-term business decisions about how to use their land.

Landowners demand regulatory certainty in a biologically uncertain world

Pushed by landowners, the number of habitat conservation plans for endangered species is growing rapidly. In August, 1996, Secretary of the Interior Bruce Babbitt said, "When I took office, only 15 habitat conservation plans had been agreed to during the twenty year history of the Endangered Species Act of 1972. Today there are nearly 150 in effect and more than 300 in the works." This rush to embrace HCPs has many environmentalists worried.

One issue is that HCPs are getting bigger, some now encompassing hundreds of thousands of acres. Many include multiple landowners who sign on to one pre-written master plan, covering an entire species or geographic region. The individual landowner saves time and money because he doesn't have to develop his own plan. Some plans lump multiple species together, allowing the landowner to do habitat restoration or other mitigation that provides for many species at once.

Environmentalists are concerned that HCPs are binding for too long, many limiting landowner responsibility under the ESA for periods of 99 years, with no provision for changing the agreement in light of new information or new threats to the species' survival. In many cases, long-term agreements are being made for species when little is known about their biology or requirements for survival. A group of top scientists meeting at Stanford University in 1996 questioned this practice, saying "...it must be possible to amend HCPs based on new information and it should not require 'extraordinary circumstances' to do so." Also worrying is the speed at which the hundreds of plans are being finalized, often before adequate biological analyses can be done.

One plan is a state-wide, red-cockaded woodpecker HCP being developed by the U.S. Fish and Wildlife Service and Georgia's Department of Natural Resources with the aim of both relieving landowners of ESA restrictions and helping woodpeckers. This plan has been attacked by some scientists and environmentalists as allowing too much logging for too little mitigation, based on inadequate biological knowledge. Jerome Jackson declares: "The plan merely provides exemptions from the ESA for the timber industry and developers so they can continue business as usual. It will ensure permanent removal of woodpeckers from many private lands where they are now found, leaving most responsibility for woodpecker survival to the public lands." Speaking in favor of the plan, Secretary of the Interior Babbit declared, "This plan responds to the needs both of the birds and the landowners, a win-win for everyone."

The Georgia plan is unique because it is the first statewide plan that, like a group health insurance plan, will cover all eligible landowners in the state who want to sign up and who meet certain criteria. Ultimately, hundreds of landowners could be covered by the plan's provisions, allowing them to take red-cockadeds under specified conditions. As the first state-wide plan, it is being looked at as a model for other states and other species.

The plan is also unusual because it would be administered by the Georgia Department of Natural Resources (DNR) instead of the U.S. Fish and Wildlife Service. FWS would give the Georgia DNR blanket authority to issue incidental-take permits to landowners, provided they meet the plan's conditions. The process would be streamlined, with landowners needing only submit two-page applications for approval. Critics have questioned whether it is appropriate for the FWS to delegate its authority, asking whether state DNRs are likely to have the knowledge and the will to deny applications if necessary to safeguard the birds.

Safe harbor agreements shelter landowners from the ESA in exchange for helping some birds.

The Georgia HCP offers landowners two main options, the first being the "safe harbor" program offering long-term shelter from most demands of the ESA. Participating land-owners would agree to manage enough habitat to support red-cockaded groups – "baseline" groups – resident at the time of signing. This management might consist of regularly burning hardwoods or allowing government

biologists to install artificial nesting cavities. In return for managing so as to protect existing groups, the landowner would be given a "safe harbor" for 99 years on all his land currently without woodpeckers, meaning he would not be obligated to protect any additional red-cockaded groups settling in during that period. If one of his current groups were to have offspring who set up a new territory on his land, the offspring's nesting trees would not be protected. The landowner also would be allowed to log a baseline group's habitat if the group dies out from natural causes, like a hurricane or predation. Surprisingly, even landowners who today have no red-cockadeds on their property could apply for safe-harbor protection to ensure they can harvest timber freely if woodpeckers later become established.

Safe harbor agreements benefit the landowner but at first glance seem to offer little to the birds. But many environmentalists favor them because, although not ideal, safe harbor agreements seem better than the status quo. "Without active management the habitat would soon be unsuitable because of hardwood growth, the primary reason the birds are disappearing right now," says Ralph Costa, primary author of the Georgia plan. He argues that signing away ESA protection for future groups is worth it, if doing so persuades landowners to manage habitat so as to keep today's groups from disappearing.

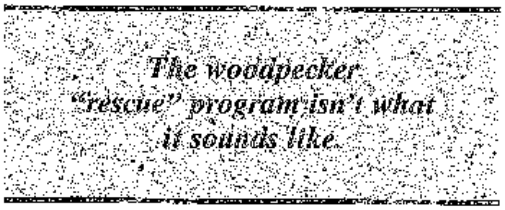
Another argument for safe harbor agreements is that they remove a powerful incentive for landowners to log old pines to prevent woodpeckers from colonizing them – what has been called "preemptive logging." It is common knowledge among woodpecker scientists and activists that during the 1980s and early 1990s many forests of old pines were logged in fear that woodpeckers might someday move in. Proponents of safe harbors hope that, if landowners are free to cut trees even if woodpeckers become established, preemptive logging might be less common. Of course, safe harbors doesn't provide an incentive for landowners to let their trees grow old; it only removes an incentive for cutting trees earlier than they otherwise would be.

The safe-harbor idea already is being tried in North Carolina's Sandhills. "Landowners in the region were afraid of the ESA," says Michael Bean, chairman of the wildlife program of the Environmental Defense Fund (EDF), which helped launch the Sandhills project. "Now that the safe-harbor agreements have been implemented, fear is largely gone and landowners are even willing to enhance woodpecker habitat."

One argument against these agreements is that they make it difficult for the species to increase its population or expand its range on private lands in the long-term, given that birds colonizing new territory would not be protected. Also, as the Stanford scientists pointed out, inflexible 99-year agreements are not good for woodpeckers, who may find their territory changed overnight by a hurricane or in the longer-term by climate change. To survive such changes, red-cockadeds may need to move to a new area where they would not be protected.

Experts also argue about the details. For example, there is a question as to whether safe-harbor agreements would protect enough habitat for long-term perpetuation of the baseline groups. Private landowners under the Georgia plan would only have to protect 60 acres around existing groups, substantially less than the 125 acres required on federal lands or the 1,000 acres Jackson maintains are needed by groups in poor habitat.

The safe harbors portion of the plan is less controversial than the second part, called the "woodpecker rescue" program by Ralph Costa. The key concept of the rescue program is that certain populations will be certified by the Fish and Wildlife Service as "demographically isolated," meaning that a population is so small and isolated from other populations that there is a high probability it will die out over a 30-year period. To take an extreme example, a population composed of a single male has little chance of successful reproduction. The Georgia plan assumes that demographically isolated populations are doomed and would let landowners petition to have the birds removed so the nest and foraging trees can be cut. In theory, the birds would be moved to safe habitat elsewhere – apparently a win-win proposition.



The "rescue" terminology used by the Fish and Wildlife Service suggests that teams of muscular biologists in bush hats will capture the birds and rescue them in the nick of time, moving them to comfortable homes elsewhere. But reality is different. In the few attempts to relocate adult pairs, the birds usually have abandoned the site without establishing new territories. Often they have returned home to the original cavity. Jackson reports this happened in the case of a male captured last year on Red Oak Timber Company land in Louisiana and released in the Kisatchie National Forest, home of one of the designated recovery populations. "Most adults just

disappear, probably falling to predators as they wander through unfamiliar territory," Jackson says.

Because moving birds is difficult, in most cases the "rescue" program will not actually rescue the landowner's isolated birds. Instead, it will establish replacement groups, primarily on public land, while leaving the original birds temporarily in place. Once a replacement group has been established, the landowner can harvest the trees on the territory of the original birds. A replacement group will be considered "established" if the male and female remain together for one year, even if they haven't successfully reproduced. Some question whether this standard is rigorous enough, including Jeff Walters, a professor at Virginia Polytechnic Institute who chairs a red-cockaded committee of the American Ornithologists' Union. Walters points out that "whenever you try to establish a new group, there's a risk of failure. Even if the birds seem to be doing fine a year or two later, you can't be sure the habitat will be suitable in the long run." Another concern is that, under the proposed guidelines, if the Georgia DNR does not succeed in replacing the original pair within 4 years, then the landowner can cut his trees anyway. Costa assures those concerned that available techniques can establish new groups in under four years.

Replacement groups may be formed by making artificial nest holes next to an existing colony, so that offspring of existing pairs move in, creating a new group. Or juvenile females, which can be moved more successfully than adults, may be captured from the landowner's site and translocated to the territory of an established single male.

Jerry Jackson and other woodpecker experts have questioned the plan's guidelines for demographic isolation. Should a small group be 5, 20, or 100 miles from other woodpeckers to qualify? According to the proposed FWS guidelines, a population of fewer than six family groups that is more than five miles from other woodpeckers would be considered isolated and a candidate for removal. Costa defends this standard by pointing out that, in data he analyzed, the average dispersal distance for banded birds is five miles. But the same data set shows that some birds travel 10, 20 miles, or more. Frances James, a red-cockaded specialist at Florida State University says: "Five miles is within the normal dispersal distance of woodpeckers and two groups five miles apart should not be considered separate populations." Critics contend that a five-mile standard would improperly designate populations as isolated – and slate them for removal – when they aren't.

Determining a reasonable isolation standard depends on understanding the bird's dispersal behavior, about which little is known. Ralph Costa believes dispersing birds travel near the ground in a straight line, which would make it unlikely that a dispersing bird could find a small population unless it ran right into it. If so, then isolation likely occurs when populations are separated by relatively small distances. But some researchers think dispersing birds may sometimes travel at high altitudes from which they could easily see potential patches of habitat far away, altering direction to investigate. In this case, dispersing birds may find other woodpeckers easily and isolation would only occur when populations are relatively further apart.

Aside from the issue of dispersal distance, Jackson and James question whether the Fish and Wildlife Service, Georgia's DNR or anyone else knows enough to map red-cockadeds' ranges accurately, a requirement for knowing whether populations are isolated. Researchers are not allowed on many private lands, they point out, because some owners are secretive about their birds and exclude government biologists. Given uncertainty as to where the birds live and what constitutes demographic isolation, critics of the Georgia plan ask whether it makes sense to sign 99-year agreements locking landowners and the woodpeckers into a five-mile standard. "Rather than give up a big portion of the woodpecker range by moving these birds from private lands," EDF's Bean asks, "why not use safe-harbor agreements and other incentives to improve habitat so the private-land populations expand?" Bean also sees a danger that the removal program could undermine incentive efforts. "If a landowner can just have the birds removed, what incentive does he have to sign up for safe harbor and protect existing habitat?" he asks.

These criticisms frustrate Costa, who says: "The bottom line is that these small populations will mostly be lost within ten years unless we do something different. Telling us to leave the birds alone won't save them."

The Georgia plan is one of hundreds of HCPs being approved for property owners covering many species in many parts of the nation. Are they based on adequate consideration of the biological needs of the affected wildlife, including unlisted species? The public will soon be invited by FWS to express its views on the Georgia red-cockaded plan.

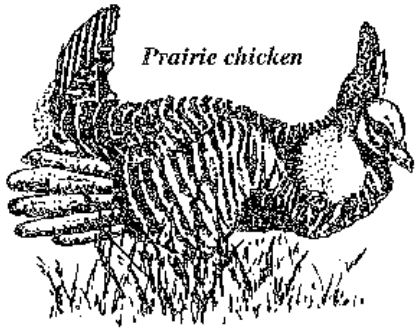
The Konza Prairie: Our Tallgrass Neighbors

Rob Peters

The Land Institute owns nearly 100 acres of never-plowed native prairie containing big and little bluestem grasses and uncommon forbs like blue funnel lily. To see a larger prairie expanse with bison, Land Institute interns visit the Konza Prairie Research Natural Area every year. Parts of the Konza are open to visitors year-round, and tours of the bison research area or prairie-chicken viewing areas can be arranged for educational or family groups by making arrangements in advance with the Konza Prairie office at 913 587-0441.

The Konza Prairie Research Natural Area is located in the Flint Hills of Kansas, one-and-a-half hours west of the Land Institute near Manhattan in Riley county. Konza's tallgrass, steep slopes and gullies are more reminiscent of the Old West than the flat wheat fields most people associate with Kansas. Much of the soil covering the flint-bearing limestone and shales is too shallow or rocky to plow, so the Flint Hills have been cattle country since bison were displaced in the 1850s.

Konza vegetation is a patchwork, with tallgrass growing more than eight feet in good soils and short and midgrasses where the soil is dry, shallow or rocky. The grasses support rare prairie chickens, collared lizards and skinks, a host of grasshoppers in summer, and a large bison herd. During a field trip in May, Land Institute interns saw the bones of a cow bison that had died three years before in childbirth. An oval of taller, greener grass showed where her decomposing body had released fertilizing nitrogen.



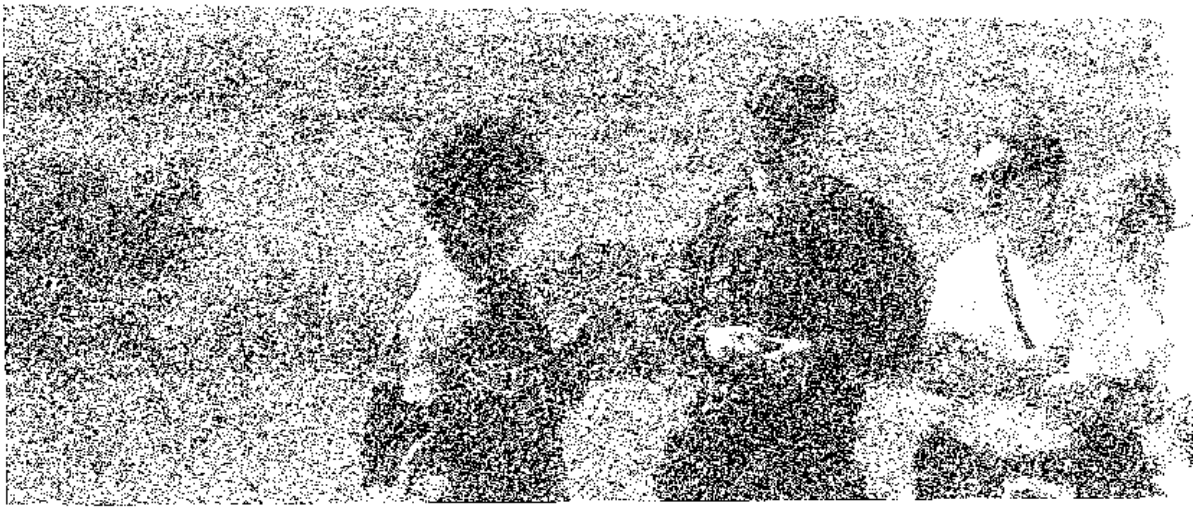
Prairie chicken

Bison disappeared from Konza in the last century as European settlers arrived, but returned in 1987, when 30 animals were donated by Fort Riley army base. The herd now numbers approximately 250 head on some 2,400 acres. Between 50 and 60 calves are born each spring, but excess animals are sold so herd size remains the same.

A bison eats 900 pounds of forage monthly, grazing at "bison lawns," where the grass is cropped frequently and grows back tender and green. At present stocking levels, bison consume 25 to 30 percent of the annual above-ground plant growth, about the same consumed by Flint Hills cattle stocked at moderate densities. "Grasshoppers are the other big natural herbivore," said Valerie Wright, Konza's environmental educator. "Most people who aren't farmers don't realize it, but in some years we've got so many grasshoppers they eat more than bison."

As one of the nation's largest tracts of native tallgrass prairie, the Konza Prairie is primarily a research station, with ongoing studies by Konza staff, Kansas State University scientists, the Long Term Ecological Research program, and numerous other visiting scientists from around the U.S. Researchers collect detailed information on weather, soils, vegetation, and animal populations. A key question is how bison and cattle affect the composition and health of the prairie. From May to October, KSU researchers keep cattle in four pastures and bison in another four, observing which plants they eat. Both cattle and bison increase plant diversity by eating dominant grasses, like big bluestem and Indian grass, that otherwise would choke out less competitive forbs. "Bison increase diversity somewhat more than cattle," said David Hartnett, Konza's director, "because they eat proportionately more of the dominant grasses. The bison's wallowing behavior also increases diversity by creating bare depressions that favor certain plants."

Under historic conditions, fire swept frequently across the prairie, burning old grass stems and allowing light to penetrate to ground level, benefitting



Konza Prairie's environmental educator, Valerie Wright explains prairie ecology to Land Institute interns.

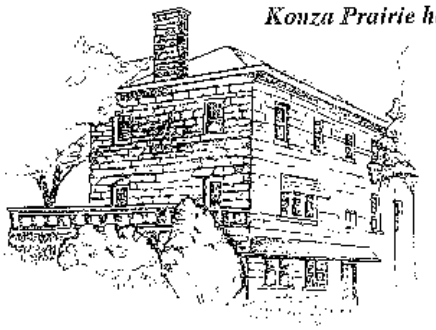
new growth. Fires also killed the shrubs and trees that otherwise would invade the grasslands. At Konza, researchers study the effects of fire frequency by burning different watersheds at 1, 2, 4, 10, and 20-year intervals. "Natural fires have threatened to burn our experimental sites off schedule," said Wright, "but so far, we've been lucky. In February, 1996, a wildfire burned 3300 acres, but 3200 of those were scheduled to be burned."

If the time between fires is too long, then shrubs and trees invade. If fires are too frequent, plant diversity drops. "This is an example of how our research benefits ranchers," said Hartnett. "We found that burning every year, which some ranchers do, decreases plant diversity compared to burning every three years. And the areas that are burned too often don't produce as much forage for cattle during dry years. Our results suggest that ranchers who manage for botanical diversity may add long-term stability to their pastures."

Research on the Konza Prairie helps ranchers with information on how often they should burn for maximum production of forage.

The Nature Conservancy (TNC) and Kansas State University (KSU) own different parts of the Konza Prairie Research Natural Area, but the whole area is managed by KSU. The largest section is the 7220 acre Dewey Ranch, an active cattle ranch since the late 1800s, purchased by TNC in 1975. The ranch's original limestone barn and house, built between 1915 and 1920, serve as Konza Prairie headquarters. The old bunkhouse was renovated in 1997 as an educational center to hold botanical and zoological collections, where students may observe eating habits of small reptiles, mount collected insects, and examine fossils.

Students and other visitors can visit three public hiking trails, open from dawn to dusk, located near the main entrance. Although casual visitors are not allowed in the bison research areas, visitors can arrange in advance for tours led by staff or docents, trained by Konza's new environmental education program. Docents are recruited from the general public and are "people who love the prairie and enjoy teaching others about it," says docent Nancy McClanathan, social studies teacher at Eisenhower Middle School. "I'm learning too," she says. "My favorite time is out among the bison, listening to their sounds and watching calves, and I even catch grasshoppers to feed the skinks and glass lizards."



Konza Prairie house

Poem from Janisse's reading at Prairie Festival 1997

Drouth

Janisse Ray

For six weeks without measurable rain
the crops were irrigated with water
from a pond formed by a dam, set
across an intermittent, unnamed creek
that drained a thousand acres
of the farm. In six weeks the pond fell
eight feet. What was hidden
was brought to light: curvature
of bank, black trunks of dead trees, new
snags. Bluestem germinated
where it could not grow. In Fitzgerald
confused clouds watered womens' flowers, and
even in Osierfield, a half mile
away, rain spattered one side
of the highway and spared nothing for
the other, where the farm lay.

One morning, crossing the dam,
we counted fifty wood storks shook
with five or six great egrets, fishing
in the drying shallows.
A wood stork will travel a hundred
miles to feed in fluctuation
because they don't stalk or dive
but blunder. They live by chance:
that of touching with their probing
bill minnow, crayfish, shiner.
A wood stork's life
is one long risk.

That summer we waited for rain, reading
more from the skies than could be
read. Corn and soybeans withered
in the fields. All we could count on
were the wood storks, flowering
in the shrinking pond: how the pliers
of their upturned beaks gnawed
at the sky: the fish glinted like money
going down. In some way it was payment.

Janisse Ray at Prairie Fest '97.

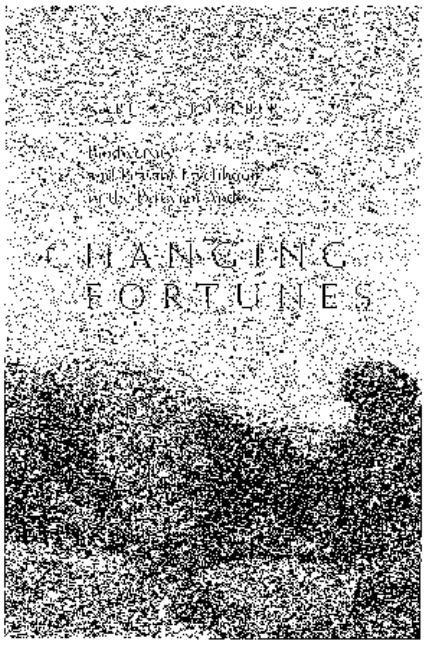
Poet Janisse Ray, a native of southern Georgia's coastal plains, read to an audience that filled the big barn at the 1997 Prairie Festival. Janisse recently finished a Master of Fine Arts degree at the University of Montana in Missoula, where she was awarded the 1996 Merriam-Frontier Award for her poetry chapbook *Naming the Unseen.* An endangered species activist, Janisse also writes non-fiction for conservation magazines such as *Orion, Florida Wildlife,* and *Georgia Wildlife.* Her first non-fiction book, a memoir about growing up in the longleaf pine ecosystem of the Southeast, entitled *Where the Cutting Ends: Ecology of a Cracker Childhood,* is due out next year.

Changing Fortunes: Biodiversity and Peasant Livelihood in the Peruvian Andes

by Karl S. Zimmerer
Berkeley: University of California Press, 1996. 308 pp.

Reviewed by Jon Jensen

Perhaps no area of the world is more closely associated with diversity in agricultural crops than the Andes mountains of Peru, where the people grow over 5,000 different landraces of potatoes and over 7,000 varieties of maize. Writers from Carl Sauer to Wendell Berry have marveled at and studied this diversity, the subject of a new book by geographer Karl S. Zimmerer. In *Changing Fortunes: Biodiversity and Peasant Livelihood in the Peruvian Andes,* Zimmerer provides an in-depth study of agricultural practices of the Quechua peasants in the Paucartambo region of the Peruvian Andes. He asks: How has this diversity fared during Peru's political and social changes of the last 600 years? What have been the effects of modernization on crop biodiversity and peasant lifestyles? What can we say about future prospects for the diverse crops of the region and the peasants who farm there? *Changing Fortunes* offers "a definitive assessment of a worsening extinction problem and the prospect for uniting biological conservation with agriculture that is economically sound and socially just."



Karl Zimmerer can trace some of his own diverse roots back to The Land Institute. He was an intern here in 1979 when he focused more on wind generators than on South American peasant agriculture. It was here that Zimmerer was first exposed to the work of Carl Sauer and environmental geography. This field, which has guided his work since, combines scientific and cultural analysis. Zimmerer is still pursuing his "unslaked interest in transdisciplinary investigation" as an Associate Professor of Geography and Environmental Studies at the University of Wisconsin, Madison.

In researching this book, Zimmerer spent six years in the late 1980s in the Andes of rural Peru, mainly in the region know as Paucartambo. Most of us would imagine that this rugged, mountainous landscape, with its elevations in excess of 13,000 feet, is hostile to agriculture. Yet the Quechua peasants of the region have been farming it for centuries. One of the book's highlights is the way Zimmerer brings Paucartambo's people to life with stories. He tells us, for example, that the *chimpu* shawl, traditionally used by Quechua farmers to carry crops, evolved into a standard unit of volume used to measure crops, also called the *chimpu.*

In addition to describing the rich cultural, political and biological history of the region, Zimmerer outlines three main conclusions about agricultural diversity in the Andes, which he describes as both "ironic and instructive." First, he argues that those who claim there is a "wipeout" of genetic diversity in traditional Andean crops are mistaken, given that tremendous diversity still exists. Before we are allowed to celebrate this good news, however, we are given a closer look. Slow, but steady loss of genetic diversity has been taking place, and Zimmerer warns that our "misplaced belief in the 'genetic wipeout' has deflected attention from the real process and perils of genetic erosion." Those of us familiar with the problems of soil loss in the U.S. know how slow, incremental losses are often more dangerous than large and sudden ones. Much of *Changing Fortunes* chronicles and explains this erosion of crop diversity in Paucartambo.

Zimmerer's second main finding is perhaps most surprising. It is the richest of the Quechua peasants who do the most to conserve a diversity of crop varieties, he tells us. This seems contrary to the conventional wisdom that indigenous people lose their traditional, environmentally sound agricultural practices when they become modernized. Zimmerer explains how the Quechua peasants are different.

Inverting the tenet that the traditional use

> of environmental resources is invariably immersed in mass society, the better-off Quechua in Paucartambo have been both socioeconomic modernizers and the keepers of crop diversity during recent decades. The well-off farmers replanted their diverse crops not for the sake of conservation per se but rather to enjoy their agronomic, culinary, cultural and ritual values.

As an example, of this we are introduced to Líbano, a well-off peasant who continues to seed a widely diverse mixture of potatoes. Líbano uses this diversity to his economic advantage by offering part of his crop of desirable potatoes to his workers as a way to recruit additional labor, the major limiting factor for most Quechua.

Finally, *Changing Fortunes* shows how the influence of modernization, while incrementally decreasing crop diversity, increases variability in other aspects of peasant agriculture. The Peruvian Land Reform of 1969, for example, widened the economic gap between rich farmers, who could afford to grow both "improved" and traditional crops, and poor farmers who "suffered input shortfalls that prompted them to disown the diverse crops." The Paucartambo landscape is now patchier, with some farm-holdings rich in traditional crops and others not. On a larger scale, uneven dispersal of regional markets for commercial crops causes a corresponding "uneven geography" of crops. Zimmerer describes how three places that are "hot spots" of diversity, know in English as Plain of Maize Stubble, Step of Silver, and Place of Snail Shells, "differ markedly in ... whether their farmers could sustain the trove of crop plants..."

Zimmerer's book critiques misconceptions about crop diversity in the Andes and elsewhere. "Critical reflection on the conventional wisdom," he tells us, "finds many of our current beliefs to be thinly supported assertions sorely in need of rigorous study." One example is the belief that traditional plants have been precisely tailored, with each landrace handpicked by farmers to fit a particular microenvironment. Zimmerer believes that, although Andean growing environments are very diverse, due mostly to differences in elevation, the Quechua have not bred their crops to match microenvironments. They use processes which are both more general and more subtle. Individual landraces are divided into broad use categories, such as "boiling potatoes," "soup potatoes" and "money potatoes," and planting decisions are made with these groupings. In addition, adequate diversity within these groups is not selected for by some "calculus of fine-tuned adaptation," but rather by a subtle process which relies upon "variation of colors and shapes in their tuber piles."

At first glance it may seem that peasant agriculture high in the Andes of South America is not important to The Land Institute. One doesn't have to look far, however, to see how wrong this initial impression would be, and it is worth noting ways that Zimmerer's book is important to the work of natural systems agriculture.

The most direct link is through the diversity of Andean genetic material. It is easy to imagine that one of the 7,000 landraces of maize may prove useful – if not critical – to developing a perennial sorghum or perennial corn. Or some of this genetic information could help domesticate eastern gama grass, one of the Land Institute's four "star" perennial grain candidates. Loss of this genetic information now could jeopardize future research possibilities.

The Quechua's traditional agriculture gives The Land Institute a rare example of "de facto conservation," as Zimmerer calls it, something we are also trying to accomplish with natural systems agriculture. The Quechua people are not members of environmental groups who have consciously preserved crop diversity for the good of humanity. On the contrary, they conserve diversity as a side effect of their farming and cultural practices. The Land Institute hopes that, likewise, if American farmers adopt perennial polyculture, then soil conservation and reduction in pesticides and fertilizers will be a de facto consequence.

With Zimmerer's book we glimpse conditions which foster or threaten de facto conservation of crop diversity in the Andes. We learn, for example, of the close link between crop diversity and diet, as the Quechua continue to plant diverse crops for their own use, not for distant markets. We see also that culture, including language, helps conserve diversity. The Quechua have no word for "crops" as a general category, but use specific and creative names for hundreds of individual landraces. Potato varieties include the rose-colored "Red Mother," the lumpy "Pig Manure" and even "That Which Makes the Daughter-in-Law Weep," whose "torturously convoluted skin tried the peeling talents of the most adept wife." Zimmerer argues that such names are not only culturally significant, but also a crucial component of the Quechua's de facto conservation.

Changing Fortunes is a scholarly work with two great strengths. One is that it is grounded in a specific place the author has studied for many years. The other is that Zimmerer's work transcends traditional disciplinary bounds to analyze multiple dimensions of a problem, in this case loss of crop diversity.

John Jilka Remembered

The Land Institute lost one of its most quietly colorful characters when John Jilka died at age 71 on April 10, 1997. John worked at The Land Institute from 1989 to 1996 doing everything from fixing fences to mowing the yards. In his last several years here, he was Jack Worman's assistant on the Sunshine

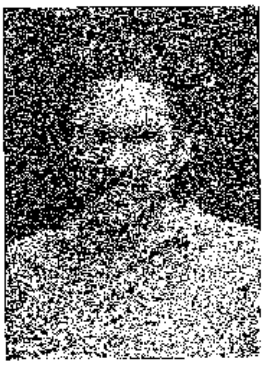
Farm. John is profiled in an article by Kathy Holm in the winter 1994 edition of *The Land Report.*

We remember him as a friend and colleague to us all. He was as caring to each of us as he was to his wife Evangeline and their seven daughters and two sons. We miss John's careful work and his eyes which twinkled as he told an occasional tall tale.

New Staff at the Land Institute

by Sarah Jack Hinners and Douglas Haynes

Rob Peters



The Land Institute's new director of education, Rob Peters, arrived at the Land Institute in February. After a first term teaching, Rob is using the summer to edit the *Land Report* and collaborate with staff and interns to refocus the intern curriculum on natural systems agriculture. "I'm having fun," he says, "because I'm teaching about things we see everyday – prairie, farms and soil."

Before coming here, Rob spent fifteen years as a conservation biologist in Washington, D.C., working for World Wildlife Fund and Defenders of Wildlife. He specialized in global warming and biodiversity, ecosystem management, and forest health. As a free-lance consultant, he wrote and edited books and reports for the Smithsonian Institution and Environmental Protection Agency. He is co-author and editor of *Global Warming and Biological Diversity* (Yale University Press) and wrote *Getting What You Came For: the Smart Student's Guide to Getting a Master's or Ph.D.* (Farrar, Straus and Giroux). Rob received his Ph.D. in biological sciences from Stanford University in 1982.

A native Californian, Rob is glad to be back in the West. "Salina's great for an ecologist," he says, "because it's right on the border between the tallgrass and mixed grass prairie communities." Rob purchased a Victorian house in Salina with his fiancée, Karen, which they are refurbishing with occasional weekend help from the interns.

Laura Underwood

If you've phoned The Land Institute since the end of April, you were probably greeted by Laura Underwood's mellow voice. Laura is The Land Institute's new secretary/receptionist. A native Kansan, Laura was born in Fort Scott and lived in Kingman and Olathe as a child before her

family settled in Salina. She graduated from South Salina High School and has a diploma in secretarial/word processing from Brown Mackie Business College. Past positions include sales and management, security guard, and telemarketer.

Laura has a passion for things of the past – she helps her family restore Victorian homes around Salina, owns restored cars, and hunts antiques. "Sunday mornings are devoted to Gibson's Flea Market," she says. She's a voracious reader and read Dostoevsky's *Crime and Punishment* in grade school because "it was a challenge."

David Van Tassel

David, our new plant scientist, joined us in April after finishing his Ph.D. in plant biology at the University of California, Davis. David's top priority at The Land Institute is to develop a program to breed perennial crop plants. He's contacting researchers and reviewing scientific literature to identify the best plant species and technologies to use in our breeding program. "Much more research is needed than The Land Institute can do alone," says David, "so a big part of my job is identifying potential collaborators at universities and other research centers. There are people working right now on perennializing wheat and sorghum" (see page 11).

"I'm also becoming familiar with the day-to-day operations of The Land Institute," says David. He is learning everything he can from ecologist Jon Piper before Jon leaves for a teaching position in the fall. David adds, "With twelve years experience in the fields, Jon's help is invaluable." David will be continuing some of Jon's long-term experiments, including eastern gamagrass breeding and the polyculture yield plots.

David spent most of his childhood in Hong Kong. He is now living with his wife Kristin on the Evans' farm in Ottawa County, where he is flock leader to guinea fowl and four Chinese goslings.

Kate Worster

After attending many Prairie Festivals since she was a child, Kate Worster is now Wes Jackson's administrative assistant, helping him with background research. Kate was born in Boston, Massachusetts and lived in Hawaii and California before her family moved to Lawrence, Kansas in 1988. She calls Kansas home now, as most of her family is here. "People in Kansas are honest, accepting and in touch with reality," she says. Kate graduated from Grinnell College in Iowa with a B.S. in biology and a concentration in environmental studies.

In 1996, Kate spent seven months studying and working in Zimbabwe, and this past winter examined the Narmada dam project in western India. These experiences have guided Kate toward a career in international environmental issues.

"I feel at home at the Land Institute," Kate says, "because I've been so involved in the past." She spent a summer working in Matfield Green two years ago and visited an intern class when she was in ninth grade. She says, "I've regarded Land Institute interns with a certain reverence ever since."

Departing Staff

by Sarah Jack Hinners

The presence and contributions of the following staff will be greatly missed at The Land Institute.

Heather Brummer

Heather Brummer first came to The Land Institute as an intern in 1995 and stayed on as research assistant in 1996 and early 1997. Heather was also our intern coordinator and helped in the office in 1997. In future, Heather may farm or study landscape ecology, but for now she plans a long summer vacation.

Emily Hunter

For almost two years, Emily Hunter has been The Land Institute's conference coordinator in Matfield Green. She is leaving that post, but will work with the Land Institute as an independent contractor. She will still live at the Lumberyard (the Land Institute residence in Matfield Green), providing bed and breakfast accommodations and hosting meetings for The Land Institute and local organizations. Emily hopes that this change will

allow her more time for gardening and finishing a Master's degree in writing from Antioch University.

Jon Piper

Jon Piper, research associate and ecologist, will leave The Land Institute in August for a teaching position at Bethel College in North Newton, Kansas. He began working at The Land Institute in summer of 1985, after finishing his Ph.D. in botany at Washington State University. John was drawn to the Land Institute because he felt that "here is a place that marries applied and pure plant science." (See Jon's retrospective, page 5.)

From 1986 to 1992, Jon studied native prairie ecology, an integral part of the "nature as measure" approach of natural systems agriculture. From the start, Jon has overseen our several perennial polyculture experiments and worked a bit on the perennial sorghum and western gamagrass breeding programs in later years. In addition to scientific articles published during these years, Jon co-authored the book *Farming In Nature's Image; An Ecological Approach to Agriculture* with Judith Soule, another former Land Institute ecologist. Jon taught interns prairie ecology through his classes and prairie walks, which have now become a Land Institute tradition.

Jon looks forward to teaching at Bethel this fall and hopes to provide his students with opportunities for local field studies. Though officially handing over his research projects to David Van Tassel, Jon hopes to remain an advocate of the The Land Institute's vision.

Alice Sutton

After two years as The Land Institute's secretary/receptionist, Alice Sutton left this spring, although she still drops by every now and then. When asked why she decided to leave, Alice said, "I live on forty-five acres. It seemed to me that instead of driving to The Land Institute every day, I should be doing something with my own land." As a first step, she's started a home herb garden and is considering options for future expansion of the business.

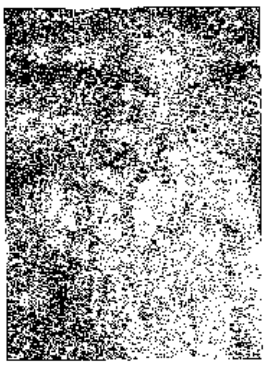
Personnel

The 1997 Land Institute Interns

By Douglas Haynes and Jon Jensen

Caroline Brock

Caroline is this year's perennial polyculture intern, managing our long-term experiment to see how well perennial crop candidates grow when planted together in adjacent strips. She is a 1996 biology graduate of Cornell College in Iowa and last summer was an ecology intern under Dr. David Tilman at the Cedar Creek Research Station, University of Minnesota. At Cedar Creek much of her summer was spent weeding big bluestem grass. "Compared to that," she says, "The Land Institute's bindweed is delightful."



Caroline organized much of this summer's Prairie Festival, managing travel and lodging arrangements for speakers, arranging the program and coordinating group meals. "I enjoyed getting a behind-scenes look at how non-profits operate," she said. She plans attending graduate school in ecology or agroecology next year.

Alex Crockford

Alex Crockford grew up in Michigan and studied biology at Michigan Technological University. Last year, he interned at Tillers International in Kalamazoo, where he learned blacksmithing, carpentry, and how to drive horses and oxen. In his spare time, he uses The Land Institute's forge to make chisels and axe-heads from old automobile springs and lawnmower blades, and he is crafting an ox yoke with traditional hand tools.

Alex's intern project is to assist David Van Tassel, our plant scientist, with The Land Institute's plant breeding program. Alex is researching soil and seed preparation, time of planting and other cultivation methods needed to successfully establish perennial crop plants in experimental plots. His long-range plans are to operate a grass-based, low-input farm where he can do natural systems agriculture research and put into practice the "homecoming" ideas Wes Jackson outlines in his book *Becoming Native to This Place.*

1997 Interns

Top row (L to R):
Sarah Jack Hinners, Alex Crockford, Andrea Leach, Laura Weingartner

Bottom row (L to R):
Jon Jensen, Caroline Brock, Douglas Haynes, John Guretzky

John Guretzky

"I love those cattle – they're gorgeous," says John Guretzky, who studies how Texas Longhorns affect plant composition on the Land Institute's 160 acre native prairie. "Big John," as he is known among the interns, spends most mornings managing cattle and observing daily changes in the prairie plants. He expects to have his own herd one day for enjoyment and research.

John grew up in the northeast Nebraska town of West Point and earned his undergraduate degree in natural resources from the University of Nebraska, Lincoln. As an undergrad, he researched how weevils and other plant-eating insects damage a native thistle species. His results have been accepted for publication by the journal *Ecological Applications*. John has also worked for Dr. David Tilman, University of Minnesota, assisting research on plant community ecology. Next year he will attend an ecology or agronomy graduate program to follow up on his interest in grasslands ecology.

Douglas Haynes

Douglas cares for the Sunshine Farm's layers and broilers as part of the Sunshine Farm's crop-animal integration project. He came to The Land Institute to learn farming and agricultural research skills after studying English and Environmental Studies at the University of Wisconsin, Madison. "To me, agriculture is the most important interaction between people and the non-human world," he says. "We all rely on manipulating nature to eat."

He's also interested in how natural environments shape human values and institutions. The Land Institute's work in Matfield Green, for example, tells us about how the environment of a particular place – climate, topography, and plants – determines how people live, and how they in turn change the environment.

Douglas plans to apprentice at an organic market garden or community-sponsored agriculture farm and to earn a Master of Fine Arts degree in poetry and nature writing.

Sarah Jack Hinners

Sarah Hinners grew up on a small farm in Nova Scotia, Canada and lived the past six years in Montreal. She graduated in 1996 from McGill University with a degree in geography and environmental studies. "I came to The Land Institute," she said, "for four reasons: I wanted to see where the field of sustainable agriculture is going, live in a new place, continue with classroom learning, and get my hands dirty doing farm and field work -- all at the same time."

Sarah's intern project is to test soils at the Sunshine Farm as part of a one-year monitoring program to determine, in part, whether letting cattle graze on cowpeas changes underlying soil quality. As this year's photography intern, Sarah is creating a historical record of Land Institute events and provides photographs for the *Land Report.*

She hopes to combine her artistic bent and love of the land in future studies and career. She plans graduate work in landscape ecology, which she calls "the integration of geography and ecology." Sarah hopes to one day return to live in rural Nova Scotia.

Jon Jensen

Jon Jensen came to The Land Institute for a break from his doctoral studies in environmental ethics at the University of Colorado, Boulder. Jon is an experienced carpenter and wilderness canoe guide, with an undergraduate degree in philosophy and political science from Luther College in Decorah, Iowa. He views the intern program, with its emphasis on head-and-hands learning, as the ideal place to combine his interests.

Jon was also attracted by The Land Institute's mission, which aims to address both the biological and cultural causes of agricultural problems. Jon believes that we must adopt what Wes Jackson calls the "ignorance-based worldview," an outlook that forces us to be humble in the face of nature and assume that technological solutions may not always be the best ones.

After finishing his Ph.D., Jon hopes to teach at a small liberal arts college. He also wants to live in the country, growing food for home-use and conducting small-scale forestry.

Andrea Leach

A strong interest in applied ecology attracted Andrea Leach to The Land Institute's intern program. Andrea hails from the "Republic of Texas" and grew up in the Fort Worth area. She attended the University of Texas, Austin and received a Bachelor of Science in ecology, evolution and conservation biology in 1996. Although she maintains close ties to her native Texas, Andrea has grown fond of what she calls the "unappreciated beauty" of Kansas.

Andrea is responsible for The Land Institute's community-assembly research project. In 32 plots planted with different numbers of native plant species, she studies how plant communities are created and change over time. While further work in biology is part of Andrea's future plans, she isn't certain what direction that interest will lead her.

Laura Weingartner

Laura Weingartner first became aware of the ecological problems caused by industrial agriculture during her undergraduate studies at the University of Missouri, Columbia, where she majored in agronomy. Her concern about pesticide use led her to conduct an independent research project which compared weed and crop growth with and without herbicide treatments. After finishing her degree, Laura went to West Africa for four months as a Peace Corps agricultural volunteer.

Laura came to The Land Institute wanting to learn more about how to conduct professional research in sustainable agriculture. She is responsible for the Sunshine Farm soil quality experiment at The Land Institute this year. "There's something about being close to individual soil particles that speaks to me," she says. Next year, Laura plans to continue her studies in agroecology so she can help developing countries farm and feed themselves sustainably. She would one day like to return to Africa and study how traditional agricultural practices can help maintain sustainable economies.

The Land Institute's Natural Systems Agriculture Advisory Board

The Land Institute's Natural Systems Agriculture Advisory Board consists of nearly 40 experts in fields of agronomy, ecology and other sciences relevant to our mission of advancing perennial polyculture. The committee advises us on overall scientific approach and individual experiments. Below we profile three members of the committee and list all current members.

Donald N. Duvick

Dr. Duvick is an expert in crop breeding and an affiliate professor at the Department of Agronomy, Iowa State University, Ames, Iowa. He recently retired as Senior Vice President for research at Pioneer Hi-Bred International, where he coordinated his company's worldwide plant breeding and biotechnology activities in corn, sorghum, pearl millet, wheat, soybeans, alfalfa, and sunflowers. He has researched maize endosperm, the genetics of cytoplasmic male sterility in maize, performance of maize hybrids, and how plant breeding affects genetic diversity within a crop.

Dr. Duvick was born in 1924 at Sandwich, Illinois and was reared with three brothers on a 90-acre farm raising dairy cows, chickens, pigs, and vegetables. He has witnessed changes in farm practice since the 1930s, which he recounts in one of his essays, "Responsible Agricultural Technology: Private Industry's Part." He describes how industry responded to farmers' and society's demand for increased farm production with innovations including hybrid corn and wheat, fertilizers and pesticides. In addition to increased yields, these changes caused unanticipated environmental problems, including epidemics of disease and insects, and environmental contamination by potentially carcinogenic chemicals. "Our problems are due in part, therefore, to our success in creating a highly popular and super-efficient production agriculture," he writes. "We must recognize that to plan and operate ecologically sound agricultural systems requires, by definition, a holistic approach... Best results, long term, will come when an informed public, the agricultural support industry, and our public agricultural institutions all work as equally responsible partners towards achievement of clearly enunciated, ecologically sound goals."

Dr. Duvick has published in numerous scientific journals and is a reviewer for genetic and plant breeding journals. He lectures at seminars and symposia in the US and abroad, and he has served on committees or in other capacities for the US National Resources Council, the Office of Technology Assessment, the American Association for the Advancement of Science, the American Society of Agronomy, and many other scientific organizations.

Stephen Jones

Stephen Jones began his career in wheat breeding in 1981 as a technician in the USDA wheat breeding program at Aberdeen, Idaho, later working for ARCO Seed in their *Triticale* and wheat breeding program in Salinas, California. In 1985 he entered the graduate program at the University of California, Davis, while working in the wheat-breeding program for Dr. Cal Qualset. Dr. Jones received his Masters degree in agronomy in 1986 and a Ph.D. in genetics

in 1991. His research while at U.C. Davis involved the identification and transfer of genes for end-use quality and resistance to rust from wild wheats into domestic wheat. In 1995 Dr. Jones was hired as the Washington State winter wheat breeder by Washington State University, the position he now holds. He is responsible for breeding all market classes of winter wheats. "Washington State has been the number-two state in the nation in total production for the last three years, while being ranked only number five in total acreage," he says.

Working with Dr. Jim Cook (USD), Dr. Jones identified new sources of resistance to take-all and *Rhizoctonia* diseases of wheat in wild wheats from Italy and former Yugoslavia. Working with Dr. Tim Murray (Department of Plant Pathology, WSU), he identified new sources of disease resistance to the diseases *Cephalosporium* stripe and straw breaker foot rot. There is no true resistance to *Cephalosporium* stripe in common wheat, but Jones and Murray were able to identify chromosomes of wheatgrass *(Agropyron),* a wheat relative, that confer true resistance when transferred to wheat. Working with their graduate students, they were also able to identify and transfer resistance to straw breaker from four different wild wheat species. There are over one million acres of wheat sprayed with fungicides for straw breaker in the Pacific Northwest and Dr. Jones believes these new sources of resistance should eventually reduce the sprayed average to zero.

In the process of wild-wheat gene transfer, Jones and Murray have produced several perennial wheats. They are presently testing these and perennial wheats from other sources in an all-out effort to make perennial wheat a viable crop that can stem soil erosion (see article, page 11).

Eugene Odum

Dr. Eugene Odum is Callaway Professor Emeritus of Ecology, Alumni Foundation Distinguished Professor Emeritus of Zoology, and Director Emeritus of the Institute of Ecology, University of Georgia, Athens. He is a member of the National Academy of Sciences, was named Georgia's Scientist of the Year in 1968, and Educator of the Year in 1982 by the National Wildlife Federation. He has received three major international awards: La Institute de la Vie prize in 1975, awarded by the French government; the Tyler Ecology Award in 1977, awarded by the Tyler Foundation; and the Crafoord Prize, an equivalent of the Nobel Prize (which is not awarded in the field of ecology), awarded by the Royal Swedish Academy of Science in 1987.

Dr. Odum is known for his broad view of man and the environment; he has pioneered ecosystem ecology as a new "integrative science." Other research interests include ecological energetics, estuarine and wetland ecology, agroecology, ornithology, and resource economics. Dr. Odum says he represents not only the academic community, but also the future generation, which he believes should have a say in how natural resources are used in today's marketplace.

At the University of Georgia, Dr. Odum was responsible for establishing the Marine Institute at Sapelo Island, the Institute of Ecology, and the Savannah River Ecology Laboratory, operated by the University on contract with the U.S. Department of Energy. He is author of three widely used textbooks, *Fundamentals of Ecology, Ecology,* and *Basic Ecology,* and over 200 papers published in scientific journals, plus numerous popular and semi-popular articles. His most recent book is *Ecology and our Endangered life-support Systems,* and another book – *Ecological Vignettes: The Ecological Approach to Dealing with Human Predicaments* – is in press.

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