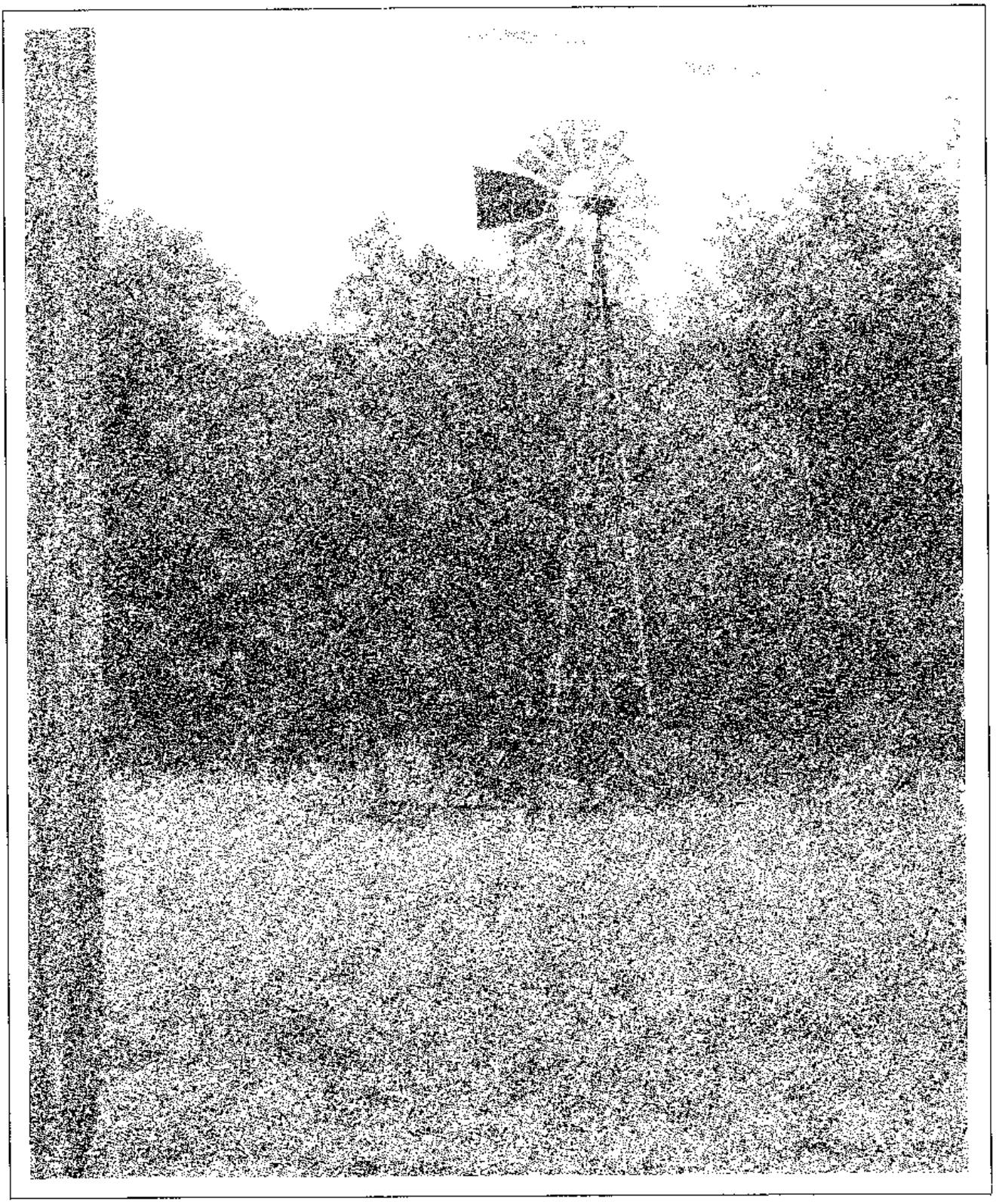

THE LAND REPORT

Summer 1991

Number 41

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Photographs and darkroom work for this issue by Ray Epp, Dana Jackson, Teresa Jones, Laura Sayre, Jake Vail, and Volker Wittig. Photo on p. 44 courtesy of *The Wichita Eagle*/Kim Johnson.

On the Cover

Between The Land's Big Barn and the Smoky Hill River stands this old Aermotor windmill. Windmills dot the Plains, symbols of an extractive approach to settlement. Some of our visions of a less extractive culture and agriculture, necessary for any long-term settlement, are explored herein.

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In This Issue

"The Value of Nature" was the theme of the 1991 Prairie Festival. Teresa Jones reviews our 13th celebration of the prairie ecosystem and prairie folk, and, in a separate article, reviews the history of the The Land Institute's Prairie Festivals.

Staff ecologist Jon Piper, with the help of several generations of interns, studies the prairie -- the basis of our research in perennial polycultures. In this *Land Report* Jon has written a detailed introduction to the 1991 polyculture experiment. Read this piece as you might read the prairie itself, and you'll come away with a new understanding of what an agriculture that uses nature as its model might mean.

As we near our 15th anniversary we find more and more connections between agriculture and culture, and our assumption that a truly sustainable agriculture will only evolve within a sustainable society seems more valid than ever. Articles on big corn and small bakeries, fish farming and sod busting, and newspapers with cows and *Dances with Wolves* expand on this premise.

This is the first *Land Report* to be published by hands other than Dana Jackson's. Hers are in Boston, working toward a degree in public policy. But much of her spirit is here, and anticipates your comments.

--JV

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Interns and friends lead a sing-along: (l-r) Charlie Pedersen, Teresa Jones, Tim Coppinger, Volker Wittig, Ruby Tilton, Adam Davis, Sarah Williamson, Jean-Luc Jannink, Michelle Mack.

Prairie Festival 1991: The Value of Nature

Teresa Jones

The music floated on a gentle Kansas evening breeze, around the glowing embers of the bonfire to the early campers settling down in tents behind the big barn. Many good people had organized, painted, cleaned, travelled, and gathered at the thirteenth Prairie Festival to contemplate "The Value of Nature." It was a theme that spoke to both The Land's research, which uses nature as its standard, and to the infinite social and aesthetic relationships between nature, value, and human beings. Friday evening united old Land interns, staff, friends, and newcomers with musicians of all ages and talents to set the celebrational mood for a weekend of exploration and learning.

The Prairie Festival has always been a forum for experiential learning—cerebral, manual, sensory. Saturday morning encouraged participants to investigate aesthetic and scientific aspects of prairie life. Tom Mulhern led new visitors through a detailed slide show of The Land Institute, while Jon Piper, Kelly Kindscher, Doug Romig, and Laura Sayre led the traditional prairie walk—an experience very similar to early prairie explorations by Land interns in the spring. Discovery of the prairie as an intricate, diverse ecosystem and magnificent, varied landscape fundamentally changes a walker's perspective of the Midwest, its agriculture, and its people. It seemed appropriate to begin our understanding of "The Value of Nature" with visual re-evaluation.

The beginning re-evaluation included a closer look at the tallgrass ecosystem of the Konza Prairie through a slide show offered by Konza's associate coordinator, Gary Merrill. Terry Evans, Land Institute Arts Associate and long-time aesthetic inspiration, led a slide show with friend and colleague Greg Conniff of Madison, Wisconsin. They are both involved in The Water in the West Project, a photographic history of water use in the western United States (see *Land Report* #40). Concurrently, Steve Burr of Salina explained the practical advantages of using

hedgerows along agricultural fields, in the interest of soil conservation and providing wildlife habitat. Interested horticulturalists could then join Dana Jackson and Sarah Williamson for informal tours of The Land Institute's extensive organic garden. Laura Jackson, plant ecologist and native of The Land Institute, drew a large crowd for her discussion on "The Value of Biodiversity."

Land Institute horticulturalist Berni Jilka and Kansas State University landscape architect Richard Hansen addressed the topic of local biodiversity in their workshop on landscaping with prairie plants. Use of native plants provides a unique way to incorporate a need for human interference with a larger concern for integrity of place. The significance of the Prairie Festival, and the mission of The Land Institute, flows from such a sense of place. It requires an understanding of native plant and animal species and of native ways of existing on the land. In the late morning most of the Festival's 500 people gathered in the big barn to hear Stephanie Mills consider the meaning of place in her opening talk, "In Praise of Nature."

Stephanie Mills described herself as an "amateur ecologist," a person deeply curious and genuinely interested in a particular place and ways of being that are specific to that place. Stephanie's place is Maple City, Michigan, but she also considered more universal human relationships with Nature. Human beings are caught in a tension between subject and object. We are inevitably part of any "Nature" that we study or strive to understand, but we study it as an object separate from ourselves. She explained that "Nature is not what you think," and meant it literally: whatever it is, it is not inside of a human skull. Although this revelation did not alleviate the contradiction of studying nature, it offered a different perspective and even humility to our contemplations: perhaps not everything is accessible to the human mind. Stephanie prefaced her thought-provoking questions with a reassurance that, "The way my mind tricks me into growing is to forget that good and easy aren't the same thing." With those words, we launched into a weekend of conversation, teaching, dancing, and fun.

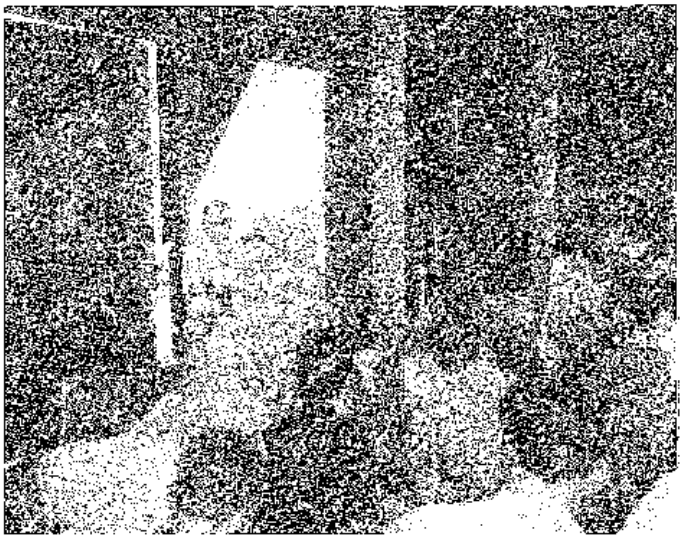
Stephanie Mills and a friend

Some traditions seem as old as the Prairie Festival itself. Ann Zimmerman worked as an intern at The Land in 1984, and has shared her musical talent with Festival-goers ever since. Although piano trouble attempted to thwart her efforts on Saturday, back-up instruments allowed her to sing images of home-grown tomatoes, hot summers, and trips across Kansas. Bryan Norton, philosophy professor at The Georgia Institute of Technology, followed Ann's creativity with a discussion of Nature's. Bryan explained that in the history of Western thought, there are no good models for how human beings should exist in nature. He traced this to the Cartesian/Newtonian philosophy that views the world as a great mechanical clock-like object. In this world order, matter itself cannot be creative; all phenomena are explicable on an atomic level, and can be predicted by scientific laws.

With a promise to utter no formula or multi-syllabic terminology, Bryan theorized that new developments in science, specifically thermodynamics, held great potential for creating a new world-view metaphor. The study of thermodynamics emphasizes process, change in a system, not objects. The New Physicists, proponents of the thermodynamic metaphor, use the flame as their central symbol. It demonstrates a process that regulates itself by giving off energy. The flame can serve, therefore, as a metaphor for creative nature---self-perpetuating and self-regulating—of which human beings are one part. Within such a metaphor, the deterministic world view dependent upon separation of subject from object, human from nature, would be impossible. Instead, human beings would observe a system in which every measurement and action had some effect, continually changing that which was being studied. Bryan offered a five-tiered model for understanding the proper human place in nature, which distilled down to a principle shared by The Land: Ecological thinking is local thinking. A holistic understanding of nature begins with a sense of place.

There are many creative ways to share observations and appreciation of nature. Lewis Hyde,

writer, teacher, and storyteller, told tales of "Coyote and the Fish Trap." Coyote, the Trickster, is a common mythological figure, forever causing trouble but also bringing new invention and change to human culture. Out on the prairie, younger Prairie Festival participants also explored change in nature during Lewis's tales. With Michelle Mack and Adam Davis, children looked at the land to observe and name plants themselves, to understand the cycles of water and nutrients through the soil, and to discover a natural world accessible to their young eyes and minds.



C. Dean Freudenberger

Some traditions of Prairie Festival extend back to the second celebration in 1980. Wes Jackson once led short tours of early research work: a walk through the collections of potential perennial polyculture plants, or an explanation of eastern gamagrass plots. With the advent of interns, Wes shortened his input to the philosophy of The Land Institute and an overview of our four central research questions. This year after Wes's preamble, Laura Sayre addressed the group amassed on the Wauhob Prairie, explaining the role of prairie research in The Land's work. As the sky deepened from threatening grey to eerie green, the group moved to the research plots on the 72 acres to hear presentations from the rest of the interns. Spectacular forked lightning against billowing cumulonimbus clouds may have stolen intern thunder, but the research tour fulfilled its central mission in the Prairie Festival: it served to make our scientific work accessible to Friends of The Land, and to offer a dynamic avenue for participant questions and concerns about Land research. The clouds and lightning won in the end, but even scientific research must be mindful of place.

Participants who decided not to brave the elements out on the prairie may have been surprised by a last-minute change of schedule. Chuck Francis, board member and long-time Friend of The Land, filled in for Rita Napier and William Baldridge. Chuck spoke on recent agricultural extension work in Nebraska, sharing some of his own efforts at the University of Nebraska. Mike Hamm, a Rutgers professor who was finishing up a sixth-month sabbatical at The Land, entertained a red-barn-full of children during the research tour. Inspired by his love of and skill in pottery, Mike led a clay mask workshop.

After a potluck in the big barn, Prairie Festival goers settled in for tales of another place, the wetter, cooler climes of the Northeast. With the humor and insight of a native, Mac Parker, Vermonter and storyteller, brought rural New England life to the prairie landscape of Kansas. Few of us will hear peepers in quite the same way again. Ann Zimmerman began the music fest, then dance caller Mike Rundle and Kansas City area band Calliope took the floor. Although most were too tired to comment after the barn dance, an anonymous evaluation seemed succinct: "It was a saw-dust-kickin' good time."

The experiential spirit of Prairie Festival got an early start on Sunday morning with a 6:30 a.m. bird walk. At 9:00 the more mainstream early risers gathered to hear C. Dean Freudenberger, professor of Pastoral Theology and Ministry, share his insights on Liberty Hyde Bailey. Bailey, author of *The Holy Earth* and an instrumental actor in agricultural history, grappled with questions of spirituality and human manipulation of nature through agriculture. Bailey defined the "divine" as all that humans did not make, such as the soil, the water, the cycles of growth, and the earth. He reinterpreted the Biblical directive that gave humankind dominion over all species; "dominion," he claimed, called for responsible stewardship, not domination. His contemplations focussed on a central question: "Is our conduct with the earth kindly?" Bailey believed that to a society belonged the fertility of the land, and that the ultimate good in the use of the land was the development of people. Dean summoned Wes Jackson's recipe for saving rural lands and their inhabitants—needing a higher ratio of eyes to acres—and called for an agricultural economy that serves producers as well as consumers.

In the realm of environmental ethics, many Land Institute Friends are familiar with the writings of Aldo Leopold. The 1991 Prairie Festival brought the leading contemporary exponent of Leopold's land ethic to the big barn to share his thoughts on "The Aesthetic Value of Nature." J. Baird Callicott, Professor of Philosophy and Natural Resources at the University of Wisconsin, offered a different understanding of American conservation history. He

argued that aesthetic appreciation of certain natural places has inspired conservation efforts more than functional or experiential considerations. Some National Park historians theorize that many areas made into parks had no other obvious human use, and were secondarily deemed worthwhile geological or biological places. Baird outlined the history of how landscape painting shaped perception of natural places, and subsequently, how people who never directly experienced a place could ascribe great value to it. This value then became the impetus behind park conservation.

Some of the crowd stayed on in the big barn, while others dispersed around The Land for the late morning presentations. Lewis Hyde led a compelling discussion addressing "When Nature Isn't the Measure." His skillful facilitation engaged most of the audience in an examination of how human culture profoundly influences our understanding of nature, and thus influences how we use nature as a standard. Kelly Kindscher delved into an important offshoot of Baird's earlier theme with a presentation concerning the preservation of natural areas. Aesthetics continued to be a unifying theme of the Festival, as Terry Evans and Greg Conniff explored the relationship between function and beauty. Throughout the Festival, they discussed their cooperative exhibit "Haystacks" with visitors to The Land Institute's art gallery. In the realm of integrating science and aesthetics, Margaret Ewing of Oklahoma State University led a discussion of surrealist painter Remedios Varo. Margaret showed Varo's work, characterized by obscured boundaries between people and landscape. Margaret, a zoologist, was interested in Varo's painting as a way to explore the unresolved scientific question of what constitutes the boundaries of life, on both cellular and organismic levels.

The small-group forum continued into the afternoon, encouraging participants to interact directly with Festival speakers. Baird Callicott and Bryan Norton bantered intellectually with the crowd about "The Instrinsic Value of Nature," each offering their perspective on aesthetics and thermodynamic process as the driving forces behind environmental ethics. Fred and Annie Kirschenmann of Windsor, North Dakota, led a father-daughter dialogue about the myths underpinning culture and nature. They identified myths, such as "The Fall," that are deeply embedded in Western culture and that need drastic reinterpretation to be meaningful in a sustainable society. Any George Lucas fan would have enjoyed their new analysis of the *Star Wars* story. Dana Jackson, Virginia Rasmussen, and Sally Merrill shared another reinterpretation essential to creating a sustainable society. Virginia, from The New Alchemy Institute, and Sally, from Kansas State University, joined Dana in providing a new feminist perspective of the environmental movement, particularly in sustainable agriculture.

Land Institute interns called participants together for a final gathering in the big barn. Through singing, they shared some of the thoughts and experiences that had filled their first five months in Kansas. Their songs included a gentle memorial for friend and 1990 intern, Todd Francis. Mac Parker spun a few more Vermont tales before Jake Vail took the floor to ask all to thank and wish a temporary good-bye to the organizer of twelve Prairie Festivals. Dana accepted the brilliant prairie bouquet and a hug from intern Tim Coppinger; she would leave for Harvard's Kennedy School of Government at the end of June.

Stephanie closed, appropriately, with a free-associative reflection on the many people that had touched her life and influenced her experience in the environmental movement. It is through these people that she truly began to understand the "loops" of environmental impact: her carefully sequestered hazardous wastes were dumped in the neighborhood of a poor Chicago friend. She confessed, "I've got to get off Hazel's back," and called the audience to reflect on the activities of daily life that might have great effect on human and non-human beings. Although her talk, like her book, was entitled "Whatever Happened to Ecology?" Stephanie spoke about ways of thinking and being in the world. Ecology is "the study of the household," the study of the homes of all species. An understanding of "home" breaks down the boundaries of inside and outside, subject and object, human and nature. When we can be as attentive to these larger homes as we are to the built dwellings in which we live, perhaps then we will figure out what happened to ecology.

Piper Eugene Lamm

1992 Prairie Festival

Mark May 30-31 on your calendars as the dates for the 1992 Prairie Festival.

Gleanings

On May third and sixth theologian John Cobb and his wife Joan visited The Land Institute from the School of Theology in Claremont, California. Dr. Cobb was invited to Salina by Paul Bube, professor of religious studies at Kansas Wesleyan University, to speak on "Moral Dilemmas in Economics and Ecology." The Land Institute co-sponsored his talk, and the morning before his address to a packed auditorium, Dr. Cobb came out to talk to Land interns and staff. Dr. Cobb is a professor emeritus of philosophy and theology, and co-author, with World Bank economist Herman Daly, of *For The Common Good: Redirecting the Economy Toward Community, the Environment, and a Sustainable Future.*

Rex Enoch, a sociologist at Memphis State University, paid his second visit to The Land and stayed for the last week of May. Rex is researching "the sustainability movement" and first visited in 1990. He returned to use our library and talk more with staff and interns.

In June John Craft took on new duties. John was a student at The Land in 1977 and has been operations manager since 1989. A wind energy enthusiast and president of the Kansas Natural Resource Council, John will be working with Marty Bender on the Sunshine Farm feasibility study (see p. 8).

John was replaced by Stan Amick. Stan is a farmer and beekeeper from Independence, Kansas, who brings not only knowledge of farming, greenhouses, food cooperatives, and sociology to The Land, but easy smiles and a generous sense of humor.

Stan came to The Land with about 500 friends; he arrived during Prairie Festival. The 1991 Prairie Festival, on "The Value of Nature," was attended by more people than any other, many of whom camped here from Friday until Sunday.

A few weeks later Rob Myers came to The Land with five students and co-workers from the University of Missouri, Columbia. Rob is an assistant professor of agronomy and heads the university's Alternative Crops Project. Interns and research staff enjoyed a potluck supper with the group, which was followed by informal presentations about plant reproduction and new and old alternative crops.

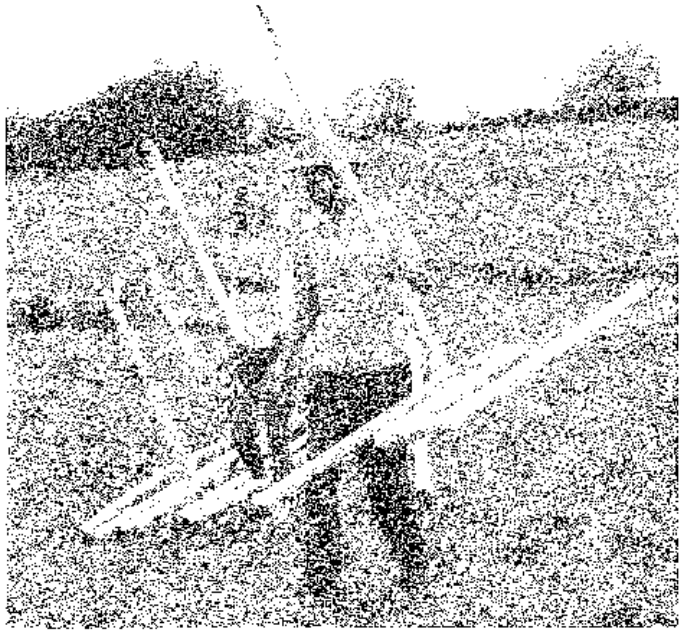
The next day the 1991 Salina Farmers Market opened, and Berni Jilka was there with organic beets, potatoes, onions, herbs, flowers, and raspberries. Berni, an '89 intern, is our part-time horticulturist and runs The Land's Harvest market garden. Thom Leonard was also at the market, selling fresh loaves of naturally-leavened bread from the Great Plain Bread Company (see p. 25).

On the morning of July 1, Dana Jackson headed east to attend the Kennedy School of Government at Harvard. Dana, co-founder of The Land Institute, director of education, and editor of *The Land Report*, will be taking classes to receive a master's degree in public policy next June.

Mike Hamm has been at The Land on sabbatical from Rutgers University since February. He has helped lead class discussions, put up fence, hoe, and rate disease in eastern gamagrass. He left July 16th, and says he'll be back.

July 11 was a volunteer work evening. We took the afternoon off, watched the eclipse, then were joined by about a dozen local volunteers and Friends of The Land for a few hours of twilight hoeing. Socializing over ice cream, lemonade, and cookies capped off the evening. One volunteer came all the way from California: Zack Lynch. Zack is a student at UCLA studying evolutionary ecology, and donated three weeks of his time and energy to help us with summer fieldwork.

Angus Wright came for his second visit this year, and spent an afternoon talking about development and conservation issues in Brazil and environmental education in the U.S. Angus, a Salinan who is a professor of environmental studies at California State University, Sacramento, is the author of *The Death of Ramón González: The Modern Agricultural Dilemma.*



Judy Logback and Stan Amick

The Sunshine Farm

John Craft

If the first lazy but clever gatherer-turned farmer had spent more energy planting, harvesting, and preparing the seeds of the first crop than the energy nourishment provided by that harvested food, starvation would have been the result. The industrialization of agriculture, with its massive inputs of cheap fossil energy, has allowed this fundamental currency of nature—energy—to be ignored.

A new project to discover what an agriculture based on a true energy economy might look like began at The Land Institute in July. Dubbed The Sunshine Farm, this post-fossil fuel farm will have to account rigorously for all of the energy entering or leaving its borders. Thus, fertilizers, fuel, machinery, and eroded soil will have to be "purchased" with harvested energy—energy that is either directly or indirectly renewable solar energy.

With energy as the new yardstick, striving for maximum yield per acre will be replaced with striving for maximum net energy gain. A modern irrigated corn crop with its high inputs might become much less "valuable" than a crop giving a lower yield but requiring fewer inputs.

We will need to ask many questions in this effort to implement a sustainable agriculture: Can an adequate level of productivity be achieved? Do draft animals or tractors powered by liquid biofuels such as ethanol or soybean oil provide the best returns in this sunshine economy? (Remember that we will be "paying for" soil erosion and machinery.) What mix of old methods and new technology will best carry us into the post-oil future?

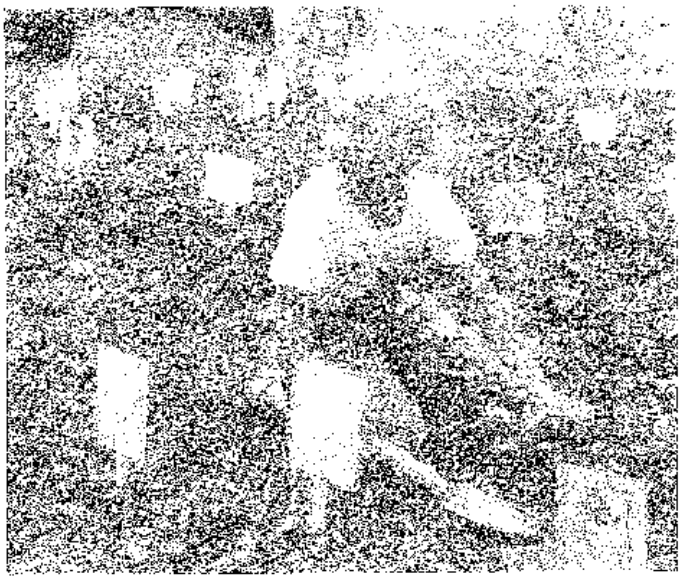
This first year of the project will be a feasibility study, to be undertaken by Marty Bender, Ray Dean, and myself. We hope that the most promising combinations of technologies and farming methods can then be put into practice and the Sunshine Farm study continued for approximately ten years.

A Prairie in the Park

Beth Gibans

While buffalo once roamed the Great Plains extensively, today they are a rare sight. However, if you were at the Smoky Hill River Festival June 7 you would have seen a small (plywood) herd wandering among the crowd in Salina's Oakdale Park. They weren't grazing or wallowing, though, they were leading the way to the "Prairie in the Park."

The Land Institute sponsored a one-day "Create a Prairie in the Park" for children as part of the regional day activites at the Smoky Hill River Festival. Recognizing that many people are ignorant of the plant and animal life indigenous to this region, we wanted to involve festival participants in an ecologically educational project. Intern Michelle Mack and I organized "Create a Prairie in the Park" to give children an opportunity to learn about native prairie and specific plants, and to help create a permanent natural area in the park. We were pleased to have the cooperation of Bob Ash, superintendent of the Salina Parks Department (and Friend of The Land), who agreed in advance to prepare an area for planting and to maintain this area as part of Oakdale Park.



A young Salinan learns about the prairie at the Smoky Hill River Festival.

Michelle and I started the children off with a general introduction to the prairie ecosystem. Each child selected a favorite plant from among many potted wildflowers and grasses provided by The Land's Harvest and EarthCare Services. The children studied illustrated descriptions of the plants, then each created a label with a colorful drawing of the mature plant, the plant's name, and their name. Adam Davis and Mike Hamm helped each child choose a spot to transplant his or her seedling and post the accompanying laminated label. By the end of the day we had an appealing patch of greens, yellows, oranges, purples, and whites on stakes and stems.

A prairie mural provided a creative backdrop to the newly planted prairie. Little artists crayoned in big bluestem and indian grasses, bison, fox, and butterflies — whatever large or small, warm-blooded or warm-seasoned critters that caught their imaginations.

The bison herd is gone, but the patch of prairie remains for park visitors to view. We plan to expand the prairie next year.

An Integrated Search for Sustainability: The Land Institute's Prairie Festival

Teresa Jones

Imagine an early bloom of butterfly milkweed, strikingly orange amidst clumps of big and little bluestem, wispy dropseed, and hair-fringed side-oats grama grasses, framed by a wooden one-quarter-meter square. It could be one of Terry Evans's photographs for The Land Institute's 1979 plant distribution studies, or it could be a sample plot about to be clipped by an intern. In the early years of The Land Institute, the biology of these prairie plants offered both aesthetic and scientific direction to a search for alternative agriculture. The prairie provided a brilliant metaphor for human communities: complex interdependence with room for rich diversity.[1] It also represented a community of soil-building plants, a perfect model for Wes Jackson's emerging ideas of perennial polyculture.

The prairie was the quintessential interdisciplinary model for a young environmental organization struggling to integrate the sciences and the humanities into its vision. Yet, The Land Institute, like the threatened prairie ecosystem, is embedded in a cultural system that values reductionist analysis more than humanistic understanding. In the name of scientific rigor and to gain scientific credibility, research must ask questions which—at least temporarily—neglect interdisciplinary concerns. The broader scientific search for sustainable alternatives has been largely unable to incorporate non-scientific elements—politics, aesthetics, psychology, and human idiosyncracy—into its methods. The danger in such reductionism surfaces with its own progress. Its results may return to a society where no feasible cultural context exists.

Over the past fifteen years, The Land Institute has struggled to integrate social questions and research through non-scientific discussions, field trips and projects, and by bringing interns together from a wide range of disciplinary backgrounds. Even the interns, however, carry a cultural burden of early specialization which often forces choices between scientific and humanistic training. On all levels, the struggle to conduct holistic research confronts deeper questions of cultural and institutional change. The Land Institute's Prairie Festivals, mutually created by scientist and humanist, encapsulate this story better than any other component of The Land's work. The Festivals created a formal opportunity to explore sustainability beyond the constraints of reductionism; they offered a forum where the sciences and the humanities could interact with equal standing. The story of the Prairie Festival both redefines and revalues the non-scientific work of sustainability, and recongizes the importance of the individuals who do it.

For Terry Evans, science inspired a profound change in an artistic career. She recalls that, "the biology of the prairie informed my sense of aesthetics more than any other single event in my life."[2] To The Land Institute, Terry offered her skills and strong conviction that life should be explored through visual art. Much of human experience cannot be felt or shared through language, even as understanding multi-faceted phenomena often exceeds the analytical capacity of reductionsm. Artistic media, such as Terry's photographs, offer non-verbal ways to examine and express human imagination. They offer human ingenuity a unique way to engage the challenge of sustainability.

In 1979, artistic and scientific minds intermeshed in the staff of a young environmental organization. Jim Peterson, research fellow at The Land Institute, was also a lover of history, poetry, and culture, and sought to teach an interdisciplinary appreciation of the prairie. Supported by a grant from the Kansas Committee for the Humanities, Jim and Terry created an evening program of "photography, poetry, and conversation." Friends of the Land gathered on Terry and Sam Evans's farm for a Prairie Festival, to explore a relationship between human

beings and a thirty-million-year-old ecosystem: to "look at the prairie as the ground of our culture and agriculture."[3] It was, Terry remembers, a "magical moment... a moment when a lot of those people who had been thinking in similar ways came together."[4] Those people included Congressman Keith Sibelius and the president of Friends of the Earth, David Brower. For an evening they considered how human beings have reshaped the prairie and how the prairie experience has shaped a special sense of place in the human imagination.[5] They shared a journey in holistic investigation, meeting to stretch the realm of imagination and the boundaries of culture.

In 1980, Dana Jackson became the primary generative force behind the Prairie Festival. The second year combined "wonder and knowledge" in musical celebration and manual and intellectual experience. Prairie slide shows, flower identification, an "open mike" for performers, and formal lectures and discussions continued the 1979 tradition of interdisciplinary learning. Speaker John Todd, then executive director of The New Alchemy Institute, confirmed The Land's commitment to scientific research underpinned by humanistic insight. Dana and Laura Jackson later summarized John's message in a 1980 *Land Report:*

John Todd, 1980

> He substantiated our convictions that the alternatives we seek are not to be found in the imagination of science fiction writers or the reductionist research of "Science" with a capital S, but in our holistic understanding of natural systems and the problems at hand.[6]

"Holistic understanding" implies the inclusion of all parts and assignment of comparable value to each of them. Such parts include people, and the importance of individual thought and work remains a central precept of the Prairie Festival. As Dana wrote, it was "... a time to celebrate the people who understand human dependence upon natural systems and work to develop lifestyle patterns and activities which are harmonious with the earth and sustainable."[7] In this spirit, Dana begins every Prairie Festival by reading a list of all of the organizations represented, publicly acknowledging the wide spectrum of people who do good work that has relevance to The Land's mission.

The biology of the prairie holds a wide spectrum of good metaphors for human existence. The ecosystem of the prairie can be understood as a process that allows for temporal and functional diversity of species. Wildflowers bloom in brilliant succession throughout the spring and summer, seldom competing with one another for resources. Dwight Platt explained in 1981 that "Nature," as we strive to use it as "a Standard," is fundamentally elusive. It is a continual process, an ebb and flow of life, not any final product or condition. Prairie process serves also, therefore, as a metaphor for human and environmental history. Human beings, like any species, have always interacted dynamically with their environment. Yet, unlike other species, humans have created social structures that intensify and accelerate environmental interaction on a global scale. Ecological limitations have influenced how people use resources for survival, but we have profoundly altered the environment by consequence of our individual and collective choices. Any pursuit of a sustainable future depends upon an understanding of this historical causality. The prairie provides scientific and humanistic thinkers with living proof of the importance of process.

The environmental history of the world could be written around the single theme of how human beings have filled their stomachs.[8] How we produce, distribute, store, prepare and consume food has shaped the face of the planet. The 1983 Prairie Festival on Food and Peace reminded participants that they engage daily in this monumental process. Before Frances Moore Lappé discussed the current food production system that fails to meet human needs, many Friends of the Land offered workshops on home food production. Cheese-making, bee-

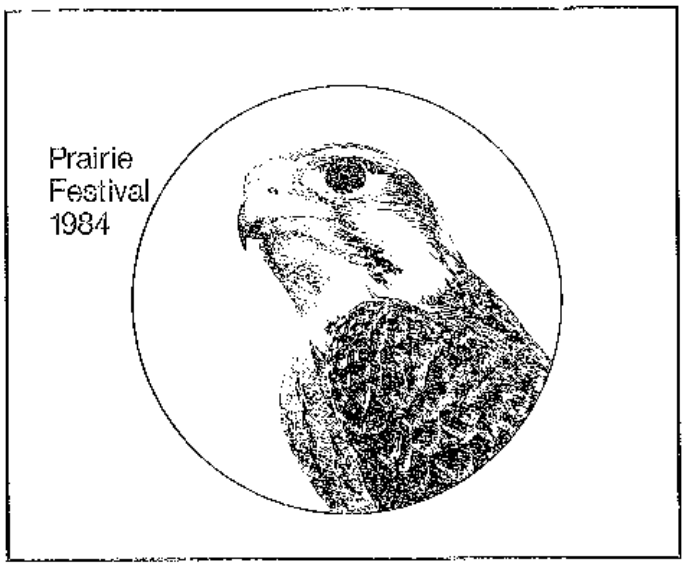
Gary Snyder, 1985

keeping, growing nuts and fruits, keeping dairy goats, making tofu, composting, and helping children to prepare healthy snacks are survival tasks similar to those performed by women in the "developing" world. It is far too easy to forget, or simply never to realize, the skills and time required to feed human beings. Yet, it is this apparently tangential work that has enabled the continued existence of the species. To move closer to sustainability, we must revalue food production on two critical levels: Respect farmers and workers of the land, and respect the work traditionally done by women.

Gary Snyder, in 1985, reflected further on the value of individual skills to a workable vision of sustainability. Music has always been a part of the Prairie Festivals, a way for people to express and appreciate the joyfulness of being together. Gary called on his audience to learn to play an instrument, "skills being more important than possessions."[9] Gary also offered a rarely-articulated list of what some of those important skills are, a list borrowed from an Inupiaq spirit revival. As they try to revive their culture and value old ways, they call for humor, humility, knowledge of the family tree, household skills, knowledge of their language, hunter success, generosity, knowledge of their land, respect for elders, spirituality, love of nature, and gratitude.[10] In many ways, The Land Institute's mission seems to summon values of the past, but Gary's words offered clearer insight into how we must see existing skills as essential to sustainability. The daily work of tending the garden, raising children, knowing the community and the land, building lasting relationships with people, and nurturing human and non-human life has been practiced and mastered for centuries. Only if we can recognize these activities as crucial and valuable skills can we reinhabit our rural and urban lands, and engage our own lives. It could well be this message that Gary Snyder intends in the closing directive of his poem, "For the Children:"

stay together
learn the flowers
go light.

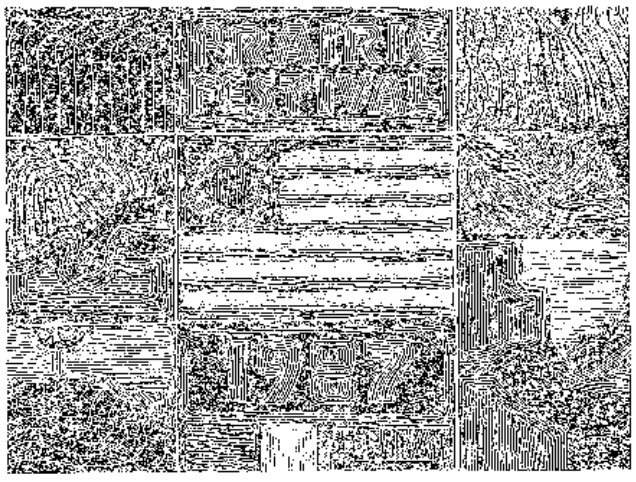
The infinite questions of value in the search for sustainability converged on the 1991 Prairie Festival—"The Value of Nature." It touched the very core of the research philosophy at The Land that holds "nature as standard." Lewis Hyde, writer, storyteller, and teacher, asserted that The Land Institute interprets its standard to serve a larger purpose. Interpretation is inevitable, but historic example

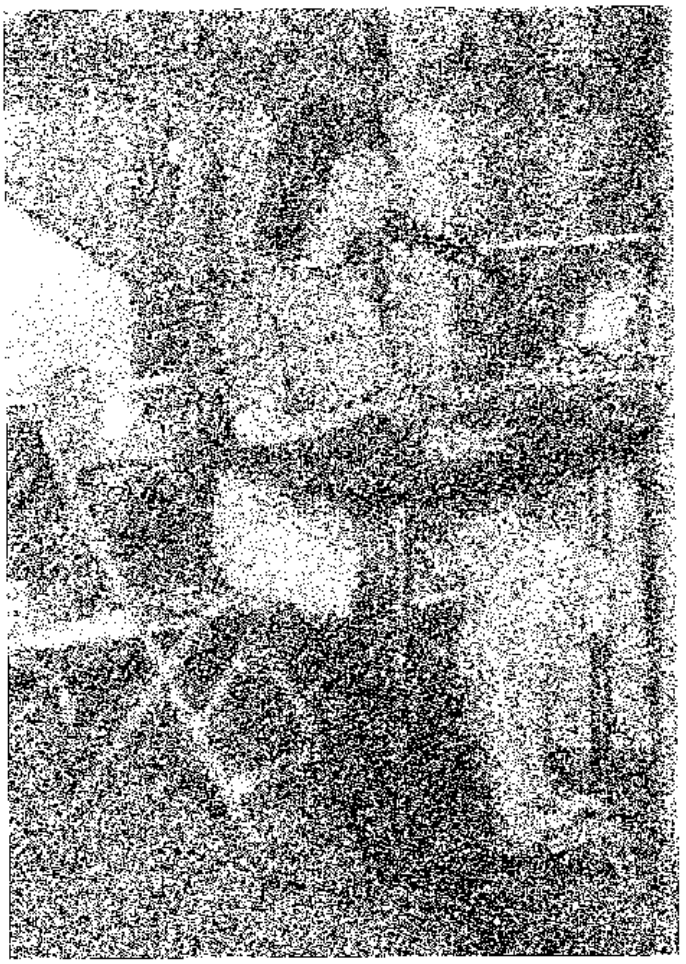


gives compelling reasons for careful integration of humanistic inquiry into research process and results. Many non-biological attributes have been ascribed to biological phenomena, such as skin color. Pernicious cultural artifices have been embedded within nature, and claimed as natural: the "fact" of biology then served to support cultural discrimination. Scientific method always exists in a cultural context. The risk of presenting research recommendations to a culture not ready seems slight beside the danger of forgetting the premises of research and the biases that accompany it.

Within ever-elusive "Nature" resides many clues to perennial polyculture research and to thoughts of what a sustainable world might look like. Nature also holds many secrets that we selectively avoid. Stephanie Mills, amateur ecologist and professional writer, revealed one of those unpleasant secrets. She spoke of fishing in the Alaskan wilderness, the thrill of making a catch, and her inability to deliver the killing blow. Death, often violent death, is a part of Nature's cycling web. In this civilized age and nation, the closest direct contact with such violence may be hunting, roadkill, or slaughter of animals for meat. There may be sustainability without violence, but not without some painful part of human nature or human culture. Although art has more often dealt with a nature that is beautiful and sacred, it has the capacity to portray that which is ugly and profane.[11] Aesthetic exploration may enable examination of a fearsome nature with the safety of foresight.

The Prairie Festivals have provided an essential forum for integrated study at The Land Institute. Through each different theme, Dana has shared our vision and struggles in artistic and literary ways. The Prairie Festival has made The Land's scientific directions largely accessible to all, and allowed friends to bring many insights and concerns to bear on both our scientific and non-scientific questions. It has given us a structured way to confront a deep cultural challenge to sustainability: Science has become a crutch for clarity, and has been truncated from the interfering complications of humanistic thought. There is no doubt that reductionism has provided important insight into natural processes and given critical momentum to the environmental movement. Yet, its process too often excludes non-reductionist thinking and people who are not scientists. At this year's Prairie Festival, Dean Freudenberger concluded his reflections on Liberty Hyde Bailey with relevant simplicity: "How can the human spirit continue to express itself if it is locked into the confines of reductionism?" The Land Institute continues its struggle to reconcile the cultural imperative of reductionism with a philosophical commitment to value the humanities.





Ann Zimmerman, 1988

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Thirteen Years of Celebrating the Prairie Ecosystem and Prairie Folk

1979 Prairie Roots/Human Roots
David Brower, Amory & Hunter Lovins, Terry Evans

1980 The Fairy Ring
John Todd, Bill Whitney, Wes Jackson

1981 Diversity
Joan & Alan Gussow, William Irwin Thompson, Gus Speth

1982 Resettling America
Wendell Berry, Donald Worster, David Orr

1983 Food and Peace
Frances Moore Lappé, David Ehrenfeld, Marty Strange

1984 Ecology and Economics
Herman Daly, Arnold Schultz, Peter Berg

1985 Patterns and Traditions for a Sustainable Society
Gary Snyder, Gene Logsdon, John Firor

1986 Soil and Seeds: The Sources of Culture
Francis Hole, Gary Nabhan, Orville Bidwell

1987 Citizenship and the Land Ethic
Nina and Charles Bradley, Donald Worster, Angus Wright

1988 Health, Beauty, and Permanence
Conn Nugent, David Orr, J. Stan Rowe

1989 The Global Environment: A Prairie Perspective
Rafe Pomerance, Donella Meadows, Paul Gruchow

1990 The Future of Prairie Communities
Frank & Deborah Popper, Marty Strange, Susan Witt

1991 The Value of Nature
Stephanie Mills, J. Baird Callicott, Bryan Norton

New Roots for Agriculture

The 1991 Perennial Polycultures: Cropping Systems Based on the Prairie Model

Jon K. Piper

The typical modern agricultural field is characterized by monocultures, single-crop plantings of annual crops. Annuals are plants that die after yielding their harvestable product. Most cereal, legume, and vegetable crops are annual plants.

In terms of return on labor, industrial agriculture is a highly productive form of seed, fruit, and fiber production. Over the last few decades, however, it has taken increasing amounts of fossil-fuel energy to produce a unit of grain in the U.S., with the ratio of energy expended to food energy consumed now about 10 to 1. Modern agricultural methods, while highly productive, are sustainable only as long as fossil fuel supplies are available and topsoil is intact.[1]

Additionally, there are environmental costs associated with this high productivity. Growing annual crops requires frequent plowing and cultivation. This leads to soil erosion, decomposition of soil organic matter, and weed problems. Field uniformity can lead to outbreaks of pests, and consequently crop losses. As a result, reliance on fossil fuel, synthetic fertilizer, and pesticides increases.

Marked changes occur when virgin soil is cultivated. Organic matter content rapidly decreases, large pores crucial for soil function are destroyed, changes in physical properties increase erosion, rates of nutrient leaching can increase, and populations of beneficial invertebrates decline. Prairie soils can lose 30 to 60% of their organic carbon, 30 to 40% of nitrogen, and up to 25% of phosphorus from the A horizon after only a few decades of cultivation.[2]

Soil erosion is a major problem on about 50% of U.S. cultivated cropland. On average, soil is being lost many times faster than it is being formed. Erosion rates alone may not be good indicators of soil degradation, and soil quality may decline faster than the soil erodes. Many of the consequences of soil degradation, such as effects on crop productivity, have been temporarily offset by improvements in fertilizer and irrigation technology and the development of higher-yielding crop varieties.[3]

In addition to serious effects on human health, the chemical fertilizers and biocides sprayed on agricultural fields directly affect many non-target soil organisms. Populations of beneficial organisms such as earthworms are particularly sensitive to chemical use, as well as to tillage.[4]

The problems of soil loss, fossil fuel dependence, and chemical contamination in agriculture suggest an acute need for a blending of ecological theory with agriculture. The introduction of characteristics of natural ecosystems will promote long-term sustainability of food and fiber production. Such alternative practices as conservation tillage are valuable in saving soil, and serve as logical intermediate steps in the merging of ecology and agriculture. Ultimate solutions to the problem of agriculture, however, must lie beyond modifications of standard agricultural practices. Cropping systems that involve annual plants may still result in soil erosion and loss of soil organic matter. Studies that recommend frequent cultivation to replace herbicide use to control weeds fail to address agriculture's high fossil fuel dependence. Solutions to the environmental problems arising from current methods of farming require new and innovative research approaches.

In contrast to annual monocultures, the prairie features perennial plants whose roots hold the soil and whose leafy canopy protects the surface from wind and water erosion. Most terrestrial ecosystems are dominated by perennial plants,

comprise a diversity of species, and show no net soil loss. Plant communities of the North American prairie are grass-dominated mixtures primarily of perennial grasses, legumes, and composites. They exhibit patterns that change spatially and over time, with proportions of different types of plants varying regionally and across soil type. The resilience of prairie communities derives from the tendency of herbaceous perennial plants to hold and build soil. The prairie's resilience is also due to a diversity of plants with complementary niches, the species composition of which changes in response to climatic fluctuation. Species diversity of prairie communities also ameliorates the effects of herbivorous insects, plant diseases, and weeds. Because virtually all nutrients are tied up in living tissues and soil organic matter, the prairie displays extremely tight nutrient cycles.[5]

The Land Institute's alternative vision for agriculture is based on two aspects of the prairie model. First, crop fields would comprise perennial, as opposed to annual, seed crops. Second, these crops would be grown in mixtures to provide the benefits of species diversity we see in the prairie. Species composition of such mixtures would vary with soil type and climate, and would consist of plants that differ in spatial and temporal nutrient use patterns. Features of such an agriculture include improved soil retention and health, efficient use of soil resources, low fossil fuel dependence, diversity within and between species, and few chemical inputs required to control insects, plant pathogens, and weeds.

Aspects of perennial polyculture that will promote soil accumulation and nutrient retention include constant vegetative cover and an extensive root mass. Continual root turnover in perennial systems builds soil organic matter, improves structure and porosity, and enhances nitrogen-fixation by free-living microbes. Herbaceous perennial crops can accumulate soil carbon and nitrogen (if legumes), reduce rates of leaching, and promote greater decomposer activity relative to annual crops.[6]

Studies in conservation tillage have demonstrated that reduced tillage allows the formation of soil strata similar to those of native soils that can enhance populations of organisms within the soil food web. Some of the organisms favored in no-till fields include predatory insects that can significantly reduce numbers of pest larvae. Where crop residues remain on the soil surface rather than being turned under, mycorrhizal associations develop that can help accumulate nutrients near the surface. Mulch also provides a buffer that protects the soil surface from wind or water erosion. Because approximately 20% of U.S. on-farm energy usage is associated with traction, any practice that reduces or eliminates tillage will also translate into savings for farmers.[7]

Intercropping, the simultaneous raising of different crops on the same field, enhances the efficiency of land use by taking advantage of differences in growth period and nutrient use among co-occurring species. Comparisons between intercropped systems and monocultures have shown more efficient use of available resources, increased productivity, and reduction in damage caused by pests in crop mixtures.[8]

Relevant to efficiency of resource use is whether a perennial polyculture can provide sufficient fertility via nitrogen-fixation, or accumulation by mycorrhizae, to compensate for nutrients removed in harvested seed. Legumes provide nitrogen within many types of multiple cropping systems, as atmospheric nitrogen is fixed by symbiotic bacteria then released to the soil from decaying roots. Such legume nitrogen can prove both energy efficient and cost effective. Studies have consistently shown higher yields in grass/legume mixtures than in grass monocultures. One study calculated that on a large scale, legume nitrogen could successfully replace synthetic nitrogen fertilizer, albeit with some reduction in yield.[9]

Overyielding, a yield advantage in mixture relative to monoculture, can occur when interspecific competition in a mixture is less intense than intraspecific competition, or where plant species enhance the growth of one another. Many factors can lead to overyielding. Crops may be released from competition for light by having different light requirements or differences in architecture that minimize shading. Roots of different species may explore different soil layers, or crop species may have complementary nutrient requirements or uptake abilities. Differences in the length of the growing period or in the seasonal periods of nutrient uptake among crops can

Charlie Pedersen, Dave Griffin, and Doug Romig harvest Illinois bundleflower.

promote overyielding.[10]

One difficulty we face is that it is not always possible to predict how a crop will behave in polyculture from its performance in monoculture. For example, some plants change their patterns of nutrient uptake when grown in association with different species. Prostrate plants that are vigorous in monoculture may be shaded out by taller neighbors in polyculture. Thus, selection of genotypes for use in perennial polyculture is more complex than is selection for monoculture. In addition to the traits needed to be a viable crop (e.g., adaptation to the growing environment, tolerance or resistance to insects or diseases, and reasonably high and stable yield), we must also select for or against competitive ability, tolerance to shading, and modifications to plant architecture that allow coexistence. Moreover, in perennial polycultures interactions between crops may differ in different years.[11]

Lastly, it will be important for mixtures of perennial seed crops to manage weeds, plant-eating insects, and plant diseases successfully. Weeds may be reduced most effectively via continuous shading of the soil surface by crop canopies or through allelopathy. Insect pests can be managed through combinations of predator attraction, inhibition of insects' ability to locate host plants, and trap-cropping. Disease incidence can be reduced by combining plants bred for resistance or tolerance with high species diversity.[12]

The prairie community provides the model for our polyculture designs. The prairie consists primarily of plants within four major groups. The warm-season (C_4) grasses are species that grow best during the summer and are largely dormant in early spring and late fall. These include big and little bluestem, Indiangrass, switchgrass, and sideoats grama. The cool-season (C_3) grasses, in contrast, grow in the spring and fall. Seed-set is typically from late May through June. Native cool-season grasses include Canada wildrye, western wheatgrass, and Junegrass. Legumes are members of the bean family. Most legumes of the prairie form symbioses with bacteria that can convert nitrogen from the atmosphere into a form that plants can use. Important prairie legumes include Illinois bundleflower, leadplant, wild blue indigo, and the prairie clovers. Many prairie composites, members of the family that includes sunflowers, asters, and coneflowers, tend to be fairly drought-hardy.

Our studies of the prairie since 1986 have documented how combinations of these four plant groups change on different soils. It is these general patterns we hope to mimic in the polyculture. We have seen that fertile prairie soils feature warm- and cool-season grasses, but few or no legumes. In contrast, infertile prairie soils support warm-season grasses and legumes, but cool-season grasses are rare. In a series of plantings in 1991, we are testing how different combinations fare using eastern gamagrass (warm-season grass), leymus (cool-season grass), and Illinois bundleflower (nitrogen-fixing legume).

The 1991 polycultures are designed to examine overyielding, the nature of plant interactions, and levels of insects and diseases in different cropping systems. With regard to maintaining soil fertility we are examining to what extent Illinois bundleflower can supply nitrogen to its neighbors. Since the plots will consist of perennial plants, we will need to examine changes in the plots over a period of a few years. Because outcomes of interactions are likely to shift on different soils, the study will be replicated in two environments. We are asking four general questions:

- 1. What are the effects of plant interactions on growth and reproductive behavior in monocultures and polycultures?

- 2. How do interactions between plants in monoculture and polycultures differ between environments?

- 3. How do interactions between plants in monocultures and polycultures change over a period of years?

- 4. What are the levels of insects and plant diseases in monocultures and polycultures, and how do they differ between environments and across years?

The answers to these questions will help us to understand whether the conclusions obtained in monoculture plots in one environment can also apply in polycultures in different environments and in different years. Specifically, results will indicate whether material previously selected for consistent high seed yield and competitiveness in monoculture is also vigorous in mixtures, and whether results obtained previously on a fertile soil are transferable to a marginal soil environment.

Work at The Land Institute to domesticate perennial seed crops began in 1978 with an inventory of nearly 300 species for their suitability to the environment of central Kansas and promise as high seed yielders. A second inventory examined 4300 accessions of perennial cool-season grasses. From these inventories, a handful of species was chosen for potential crop development. The 1991 perennial polyculture study uses three of these:

Tripsacum dactyloides, or eastern gamagrass, is a large C_4 bunchgrass native from the southeastern United States and Great Plains.

southward to Bolivia and Paraguay. Reproductive tillers may reach nearly 3 m (10 feet) high. Although eastern gamagrass is acclaimed as a select forage, it shows much promise also as a human grain crop. Gamagrass grain is both tasty and nutritious, being 27 to 30% protein and 7% fat. Ground seed has baking properties similar to those of corn meal. It begins flowering in central Kansas in late May and seed harvest begins in July. The major limitation of eastern gamagrass as a grain crop is low seed yield, typically around 25 g/m^2 (200 lb/acre equivalent). Plants generally flower in the second year, then annually thereafter.[13]

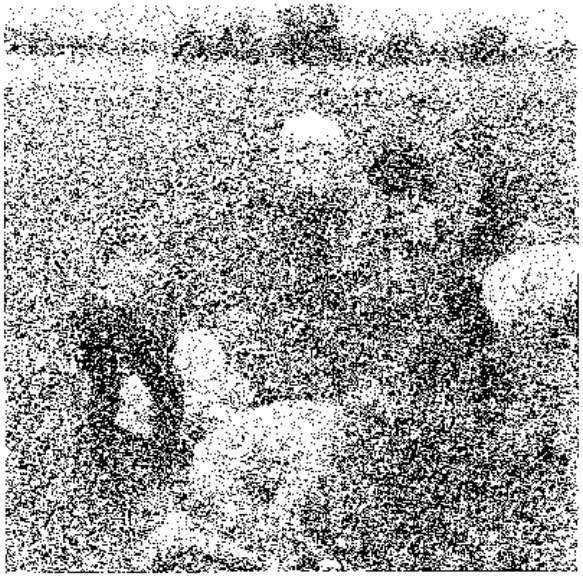
Leymus racemosus, or leymus, is a rhizomatous C_3 grass native to southeastern Europe. It can form weak perennial hybrids with wheat, rye, and barley. Grain of this species was eaten by Asian and European people historically, especially in drought years when annual grain crops faltered. Reproductive tillers average about 1.5 m (5 feet) high, and can range in number from 5 to 50 per plant. Highest seed yields in our plots have ranged from 51 to 83 g/m^2 (460 to 740 lb/acre equivalent). Leymus grows mainly in late autumn and early spring. Flowering begins in May and seeds mature by late June.[14]

Desmanthus illinoensis, or Illinois bundleflower, is a nitrogen-fixing legume that forms a deep taproot in its first year. It is native to the Great Plains, with a range extending northward to Minnesota, east to Florida, and west to New Mexico. Plants can approach 2 m (6 feet) high. It grows best during warm weather, flowering from late June onward. Small lenticular seeds are borne within clusters of legumes beginning in late July. Highest yields have ranged from 163 to 197 g/m^2 (1460 to 1760 lb/acre equivalent). The nutritional quality of the seeds (38% protein, 34% carbohydrate) suggest great potential as a human seed crop. Illinois bundleflower appears capable of fixing appreciable amounts of atmospheric nitrogen.[15]

The perennial polyculture plots have been replicated on two sites, 3 km (1.9 mile) apart. The first site is on a level Cozad silt loam, previously in a wheat fallow rotation, then planted to alfalfa in 1990. This soil is relatively fertile. The second site is the eroded south face of a hillside on Kipson-Clime Complex soils. This area was planted to native grasses (big bluestem, Indiangrass, and switchgrass) in 1982, but was continuously cropped before then. Nitrogen fertility on this site is relatively low.

We have developed non-destructive indexes of aboveground biomass for each species. These plant measurements will allow growth estimates without our having to harvest and weigh the growing plants.

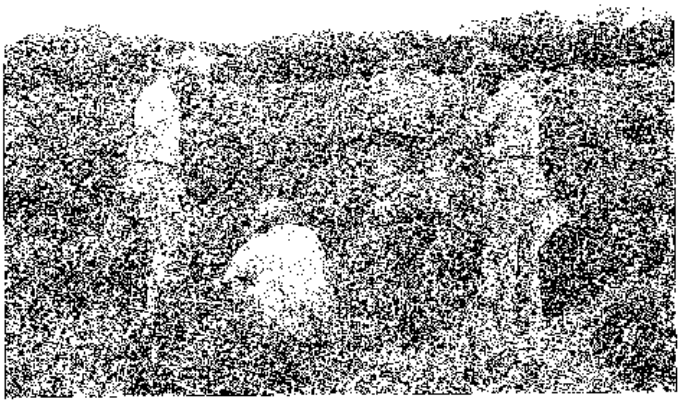
Because of the many-faceted nature of this study, we plan to have two interns work on it each year. This year, Michelle Mack and Volker Wittig established the plots and are taking data on the first-year plants.



Interns and staff transplant Illinois bundleflower.

We prepared the ground and laid out the plots in the fall of 1990. Leymus seed was sown in the field in March 1991, and we transplanted Illinois bundleflower and eastern gamagrass seedlings from the greenhouse into the field in early May. Each plot is 8 m (26 feet) wide by 10 m (32.5 feet) long. Rows are spaced 0.91 m (3 feet) apart, with plants placed within rows 0.75 m (2.5 feet) apart. Each plot contains 96 plants.

There are six cropping systems replicated three times on each of the two sites. Three cropping systems are monocultures of eastern gamagrass, Illinois bundleflower, and leymus. Two designs are a 1:1 mixture of gamagrass with leymus and a 1:1 mixture of gamagrass with Illinois bundleflower. Because of differences in plant size, the 1:1 gamagrass to leymus mixture represents 82% gamagrass and 18% leymus, a pattern of C_4 and C_3 grasses similar to what we have seen growing on fertile prairie soils. Because of a similar size inequality between gamagrass and Illinois bundleflower, the 1:1 planting of these two species actually represents a mixture of 77% gamagrass and 23% Illinois bundleflower. This design is our infertile prairie mimic. The sixth design comprises random mixtures of the three species in a 2:1:1 ratio, gamagrass to leymus to Illinois bundleflower. This should result in a mixture that is 65% eastern gamagrass, 20% Illinois bundleflower, and 15% leymus, based on aboveground biomass. Four-meter-wide strips between plots planted in alfalfa at the fertile site and native grass at the hillside site serve as barriers to reduce insect



Mike Hamm, Charlie Pedersen, Teresa Jones, and Mary Handley rate disease levels in eastern gamagrass.

and pathogen spread between plots.

To determine initial soil conditions, we sampled soil in March 1991 at 0-10, 10-20, 20-30, 30-60, and 60-100 cm depths. Samples were analyzed for nitrogen, phosphorus, potassium, organic matter, and other important nutrients by the Soils Testing Laboratory at Kansas State University.

To assess effects of cropping systems on soil nutrient status, and effects of nutrient status on plant interactions, we hope to sample soils each year during periods corresponding to emergence, flowering, and seed fill of the experimental plants. We will take a final round of soil samples at the end of the growing season.

Plant variables we will measure for eastern gamagrass include size; dates of emergence, flowering, and seed ripening; number of reproductive tillers; sex ratio of inflorescences (length of male portion to length of female portion); and seed yield. Measured variables for leymus are dates of emergence, flowering, and seed maturity; height and number of reproductive tillers; and seed yield. For Illinois bundleflower plants we will note dates of emergence, flowering, and fruiting; seed yield; and the summed diameters of stems at ground level.

We have started monitoring beneficial and harmful insects in these plots. Illinois bundleflower is host to a beetle that feeds on its flowers and young fruits. In biweekly censuses since mid-June, we have also seen caterpillars, wasps, spiders, ladybugs, assasinbugs, lacewings, clickbeetles, and hoverflies on Illinois bundleflower. We are also rating plants for disease incidence. Eastern gamagrass is subject to a variety of diseases, including anthracnose, leaf rust, and maize dwarf mosaic virus, and is eaten by grasshoppers and planthoppers. Leymus can show high levels of ergot infection.

The ecological principles relating to plant interactions provide an organizing framework for agronomic research on new multiple cropping systems comprising perennial seed crops. The goal of agroecology is to apply what is known about natural populations, communities, and ecosystems to the design of successful agricultural systems. The 1991 polyculture study offers opportunities for testing theories from a natural ecosystem in an agricultural mimic. A study such as this can highlight the value of using nature as the standard for agriculture.

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Roots of Conventional Agriculture

Corn Show Genetics

Charlie Pedersen

As plant breeding, per se, is a wholly benign technology, any enhancement of it must be welcomed as being in the public good, no matter who does it; this statement is, I think, true, though contradictory of silly arguments heard in recent years to the effect that any commercial involvement in plant breeding is in some sense wicked, destructive of genetic resources, and socially discriminatory. --Norman W. Simmonds, Edinburgh School of Agriculture[1]

The small plots of vivid green surrounded by acres of dried up, drought-killed corn stalks were enough to convince most farmers, or at least the most progressive farmers. The droughts of 1934 and 1936 were a much better sales tool for the young hybrid seed corn companies than any dry university statistics or glowing testimonials published in *Wallace's Farmer*. This expensive, improved corn spread like wildfire through the cornbelt after it proved its worth, vindicating years of USDA policy and millions of dollars of government research money.

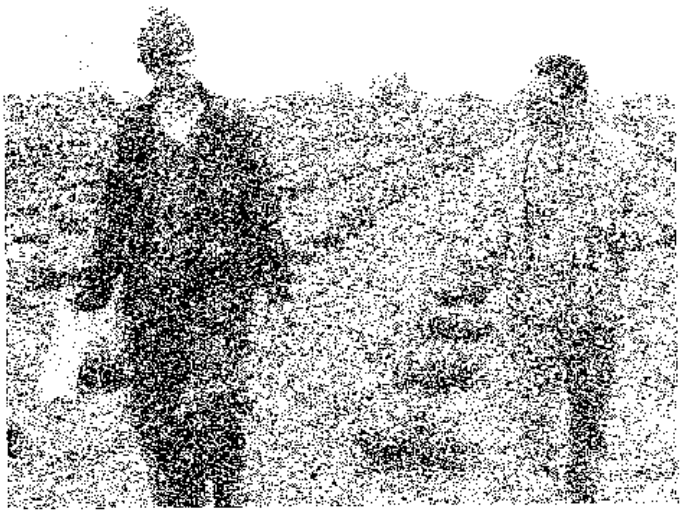
In 1934 only 0.4% of the corn acreage in the United States was planted with hybrid seed; by 1944 this percentage had grown to 59%, and in the Corn Belt 90% of the corn grown was hybrid.[2] This rapid adoption was tied to a fantastic increase in yields for a simple reason: the old varieties were much less productive than the new hybrid corn.

Up until the last sentence, this essay could have been cribbed from the lecture notes for an agronomy class at any land grant university. In that lecture hall you would hear, "...the new hybrid corn was superior to the old varieties." The difference between "the old varieties were much less productive" and "the new hybrid corn was superior" is substantial; it's reflective of different sets of assumptions about the nature of agricultural research. Superior, in this case, is loaded with meanings deeper than yield potential. Superior corn is assumed to facilitate mechanical harvesting and processing. Superior corn, presumably, also develops the commercial sector along with helping the farmer increase yield.

These assumptions of superiority were woven deeply into the coattails of productivity, sewn there by agricultural researchers, policy makers, and hopeful farmers. Since the old corn was found lacking, hybrid corn was invented in order to realize those same assumptions. Hybrids achieved fantastic yield gains. Increasing along with yields came the displacement of people by machines and the replacement of farmer initiative by borrowed capital. However, the main assumption that hybrid corn did not fulfill was the simplest one. Hybrid corn was not the only way to improve corn.

Until the time farmers began to buy bags of hybrid corn, the seed for a new crop was saved from the previous year's harvest. The largest and best-looking ears were meticulously selected and dried over winter, to be threshed and planted in the spring. Corn shows arose out of this tradition early in the twentieth century. They were sponsored by agriculturally-based industries and agricultural colleges to increase the efficiency of corn production, but they also provided a focus for social interactions. To enter the show farmers would select a ten-ear sample of their corn that conformed to the show's standards. Local winners advanced to national contests. The prize corn from these large contests was often profitably sold to other farmers. These sales, in conjunction with the new standards many farmers were applying to their corn, began to slowly alter the composition of corn fields. Ironically, the corn shows' ultimate effects were to stagnate, and then decrease, yields. Hardly anyone has been more derisive of this process than Henry Wallace, founder of Pioneer Seeds:

> "Uniformity" of both ear and kernel type was the objective of nearly all corn breeders from 1900 to 1920. So great was the prestige of the corn shows that very few of the corn show judges trained by the agricultural colleges thought of planting the grand champion ears in comparison



Teresa Jones and Charlie Pedersen discuss the finer points of eastern gamagrass genetics.

Hybrid Plants

"Hybrid" in the context of plant varieties has taken on vague connotations of being superlative. Even without an exact definition of what an F_1 hybrid is, seed catalogs, for instance, generally associate hybrid plants with ideas of vigor and uniformity. Then, when you reach the fine print on the bottom of the page, you see dire warnings not to plant any seed from the uniform, vigorous mules you've purchased, because the offspring of such hybrids are uniformly sickly. The muddled text on the page of that catalog contains all the information you need to know in order to understand the economic implications of hybrid corn.

A field of hybrid plants is uniform, because the two parent populations it comes from are each made up of identical individuals. These parent populations are called inbred lines.

Although the parents of hybrids are sickly and inbred, the hybrids themselves are vigorous and strong. This is called heterosis, or hybrid vigor.

An attempt to save the seed from a hybrid to grow a subsequent crop is doomed to failure, because the offspring will end up looking more like the sickly grandparents than the vigorous hybrid itself.[8]

> with ordinary corn to see how they would yield in competition with each other. And woe betide the corn judge who failed to place first that sample which was most "uniform" for ear length and kernel type![3]

There is nothing intrinsically wrong with large, uniform ears of corn. Although centered around the strange aesthetic of uniformity, corn shows were enjoyable for the participants and provided an interesting social outlet for farmers of the period. However, the idea that corn could be improved by looking at its ear while ignoring the rest of the plant, the soil, the climate during the growing season, the farmer's management practices, insects, diseases, as well as the corn's parentage seems silly in hindsight. The slipping corn yield averages in the U.S. between 1920 and 1935 are evidence that this silliness was the gospel of that period's corn breeding.

Although corn based on the show ideal was widespread, a hardy minority scoffed at these cosmetic standards and judged their corn as they pleased. This minority contained USDA officials and land grant university researchers, as well as entrepreneurs; these were the people who developed hybrid seed corn from an idea into an agribusiness. This minority also contained George Krug.

Krug was a farmer in Woodford County in central Illinois. Without a formal education or any assistance from professional agronomists, Krug bred the highest yielding non-hybrid corn ever produced. With a healthy disregard for corn show standards, Krug chose his corn according to how heavy the ears were and how strong the stalk was. By 1921 this simple method of mass selection had produced an open-pollinated corn variety that beat the best show corn in a three-year yield contest by a ten bushel per acre margin. The average U.S. yield that year was less than thirty bushels per acre.

I think Krug is notable for two reasons. First of all, he produced a type of high-yielding corn that was superbly adapted to his local conditions without a huge infusion of money. He had control of both his corn and the conditions under which it was selected and grown. Secondly, George Krug's corn is known today only because it is a huge part of the narrow genetic background upon which rest current commercial hybrids.

Although his method of corn selection was widely discussed in popular farming publications like *Wallace's Farmer*, Krug is not remembered as the yeoman who paved the way for any farmer with a sixth grade education to breed their own corn. Krug is remembered for producing a corn good enough for Lester Pfister to launder into an inbred line in his commercial hybrid corn production. This selective memory isn't a coincidence. The lack of value assigned to Krug and his corn reflects a deep common respect for the slick and easy.

Leon Steele started working with Funk Seeds in 1925. Centered in the new hybrid corn industry, he had a good opportunity to see what convinced people to plant the corn he worked so hard to develop:

> How could farmers be persuaded to give up their cherished seed corn that had been so painstakingly selected over so many years? ...Of all the advantages of hybrid corn, one was so easy to spot that everyone noticed, namely, that hybrids stood up! Any farmer still planting open pollinated seed corn who had a neighbor with hybrids became a believer in one season as he watched his neighbor able to pick his corn with a corn picker, while he struggled to pick 80 bushels a day by hand.[4]

The technological package that came with the new corn was just as important in driving the changeover as the potential for increased yields. Hybrid corn was expensive, usually requiring credit to finance its purchase. Furthermore, it needed to be purchased every year, which required even more credit . To really harness the new corn's productivity, a new corn picker was also needed, requiring even more credit. Nonetheless, it was a convenient and quick route to increased yields, which held the potential for greater profit via productivity. The fact that the farmers of the corn belt were willing to put

up with built-in obsolescence and increased debt shouldn't be surprising. The adoption of disposable corn bought on credit foreshadowed the rest of post-World War II culture in America, where the convenient was valued above all else.

As with most slick technological packages, hybrid corn was born out of an intense period of research and development, starting in 1922.[5] A decision to trivialize research of the type that George Krug practiced and favor hybrids was a policy decision made at USDA level.[6] This choice was made because of the potential for hybrid corn to stimulate the formation of commercial ventures, not because of the proven superiority of hybrids themselves.

> We are now in a position to see that the "miracle" of hybrid corn is certainly impressive, but hardly miraculous. It was the product of political machination, (and) a solid decade of research work...The development of hybrid corn can usefully be understood as agriculture's Manhattan Project.[7]

The Manhattan Project created nuclear weapons, and no one today has the option to dismantle or ignore them. Likewise today's farmers don't have the option to ignore hybrid corn and start growing their grandfathers' varieties. Highly productive corn is available, the lending and marketing infrastructure of agribusiness is geared for this corn, and the old varieties were diluted by the corn shows. Current corn farmers live without George Krug's freedom and room for new ideas. Those cantankerous souls who try to live in the tradition of Krug usually fall back into the mainstream, as he himself did: between his triumph at the yield contest in 1921 and the onset of hybrid corn in the mid-'30s, Krug's methods not only didn't make an impact on corn selection, Krug was influenced to start selecting corn on the basis of the uniform ear aesthetic.

Corn shows have been criticized because they fed strange standards to farmers. Although ridiculous, corn selected on the basis of simple cosmetic traits appealed to farmers and extension people because these criteria were simple and easy to grasp. Similarly, corn selected simply on the basis of economic traits is appealing and ridiculous. Although hybrid corn is amazingly productive and has fostered the formation of a huge seed industry, this success clouds the long-term impact of forcing farmers into cycles of increasing debt to increase efficiency and productivity.

This example of a transition assisted by the good-intentioned but moving from bad to disastrous is healthy to keep in mind. Sustainability is a complex idea and has no concrete definition. The problems present in our society are so prevalent that the temptation constantly arises to criticize scathingly, and then offer the simple, appealing, and ridiculous as a solution. This temptation is dangerous. If a definition of sustainability is constructed narrowly enough, then a simple, narrow measure of success can create the impression of sustainability, no matter what the facts.

Open Pollinated Plants

The corn that was grown prior to the advent of hybrids was called "open pollinated" because the male parent for a given seed was unknown. The pollen could have been provided by any male flower in the field. The breeding George Krug and other traditional plant breeders practiced is called population improvement. Krug's success wasn't based on the novelty of his selection scheme, but was due to the fact that he was selecting his corn on the basis of characteristics that were germane to production.

There is no proof that open pollinated varieties would have been as good as hybrids had they been given equal research attention. There is good indirect proof, however, based on the fact that breeding based strictly on inbred improvement foundered by the 1950s. To harness the additive genetic variance which is the basis for improving corn, a type of population improvement called recurrent selection then began to be practiced. This innovation was very successful, indicating population improvement is potentially as rigorous and as useful as selection based only on hybrids.

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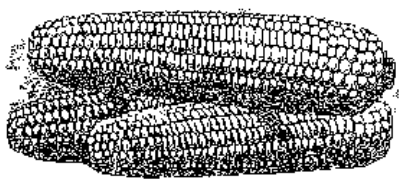

Routes to Sustainable Agriculture

Integrated Aquaculture for Sustainable Agriculture

Tim Coppinger

Aquaculture is the intensive management of water for the harvest of an array of aquatic animals and plants. Fish, eels, mollusks, shrimp, watercress, ducks, and algae are only a few of the organisms harvested from water. In aquaculture, organisms in the animal, plant, algae, fungi, and bacteria kingdoms interact to produce food and medicine for humans. Bill Mollison, who has written a book entitled *Permaculture*[1], states that an aquaculture system gives four to twenty times the yield than that of adjoining land under cultivation. The ideas I explore here focus on fish culture: case studies, environmental problems, and integration.

Fish culture can be incorporated into an agriculture that mimics nature closely. The Land Institute is mimicking nature by using the prairie as a model for agriculture. With over ten experiments every year The Land tries to answer questions that deal with the problem of agriculture: soil erosion.

Masanobu Fukuoka, author of *The One-Straw Revolution* and *The Road Back to Nature*, is working on sustainable agriculture in Japan.[2,3] He is exploring an agricultural system that eliminates unnecessary work in the cultivation of rice and other grains. His methods enhance natural patterns by negating disturbance, and, somewhat like The Land Institute, mimicking natural processes. Mr. Fukuoka does not plow, does not use prepared composts, machines, or chemicals, and does little weeding. His yields are as high as those of conventional farmers in his area.

Bill Mollison's ideas center around permaculture and the development of integrated agricultural practices. In many ways these three approaches to agriculture are similar. They are ideas that could produce food for a growing population, and complement the environment rather than exploit it. It is Mollison's method of integration that I focus on as a method for a more sustainable agriculture.

Integration of crops uses most of the nutrients produced on a farm and closes nutrient cycles. There are thousands of options in working and designing a permaculture, including the integration of fish-culture. It is this integration that alleviates some of the problems seen in conventional agriculture. I will now discuss a few of the problems seen in aquaculture and proceed with ideas of integrated systems as a solution to these problems.

Conventional fish farming is not a means of producing cheap protein, economically or environmentally. Wes Jackson has vocalized an idea that introduces the accountant into a role that includes both environmental and financial obligiations. The following is an example of high fish yield but poor environmental accounting.

Steve van Gorder, who worked at The Rodale Reasearch Center, developed a home-scale aquaculture system that requires minimum amounts of energy for the production of fish.[4] He worked on this for several years and came up with some interesting and practical results that elimintate large uses of energy. However, integration is not a theme in his book. He expanded the method in scale and is now developing fish culture systems that remind one of factory chicken production. He uses large tanks, usually fiberglass or plastic, filled to maximum density with fish. Water pumped from the fish tanks flows through a bacteria-based filter and circulates back to the fish. The filter is simply a water-tight tube filled with a material such as sand, rocks or plastic. This material provides surface area for bacteria to grow. The bacteria detoxify the water that flows through the sand. Toxins that the biofilters remove are ammonium and nitrite, by-products of decomposing fish food, algae or fish waste. These can build up in the tank and become toxic to fish at certain levels. The bacteria convert the ammonium and nitrite into nitrate, a nutrient less toxic to fish and easily taken up by plants. Automatic fish feeders feed the fish in order to reduce excess food in the water, which uses dissolved oxygen to decompose. Fish need dissolved oxygen to survive. Fish growth decreases as dissolved oxygen decreases and fish die as oxygen depletes below a cetain level. Decaying food also produces more toxins for the fish.

The effort in Steve van Gorder's system is to maximize the conversion of fish food into pounds of fish in a small area. The end product is a large quantity of fish, but also fish sludge pumped into the municipal sewage system. This system is also dependent on large quantities of water, commercial feeds and energy. Dependence on commercial feed and the pollution that large-scale monoculture fish farms add to the environment is not a sustainable alternative to high yield or favorable protein sources. An accountant who considers economic gain and environmental pollution could easily determine the unsustainability of this system. To build a sustainable future there should be changes in this type of fish production. Like nature, integration of each organism into a more complex relationship with

another will minimize waste and maximize its usage.

Although fish culture, like small scale crop production, has been a problem for farmers, there have been some advances on small-scale farms in America. At Bioshelters, Inc., John Reid, a fish farmer in Massachusetts, produces 100 pounds of Tilapia fish and 140 cases of basil every week. The basil grows hydroponically in long narrow trays a few feet above the fish tanks. Water circulates through a biofilter then through the trays. Nitrate is taken up by plant roots and the water flows back to the fish.[5] Algae also grow on the insides of the aquaculture tanks, and take up nutrients from the water. Fish will eat the algae, a valuable protein source. Nitrite and ammonium produced by the fish, excess decomposing algae and food are all toxic to fish. A symbiotic relationship between four kingdoms (bacteria, algae, plant and animal) can reduce and use waste. A large greenhouse encloses the tanks and in the winter requires heat. A better designed greenhouse could minimize heating costs; however, the initial costs of setting up such a greenhouse limit the small farmer. I hold this system up as a model that uses waste more efficiently and approaches more sustainable food production.

Because of their high cost, greenhouses, biofilters, automatic feeders, and other technologies have limited use in the Third World. Farmers in the United States tend to get carried away with technology; we use high-tech electrodes to test the amount of oxygen, nitrite, and other chemicals in the water. In China they can simply look at the color of the water and know what to change for better water chemistry and better fish growth. If the water is a dark green they won't feed the fish that day, if it is slightly lighter they may do something else. Farmers in China say the best color is "fresh brown." They also say that it takes ten to twenty years before one is capable of managing a pond with this method. They produce 10% of the world's freshwater fish—1.1 million metric tons. With one-fourth of the population of the earth, China needs to produce even more food for itself, and through integration and generations of experience they are making progress.[6] By no means do I think that this culture is sustainable, for they are putting strain on the surrounding environment. However, many of their ideas are applicable to sustainable farming on a small scale.

Tim Coppinger and Mark Saville

Large-scale catfish farms in the southeastern United States, trout farms in Idaho, and salmon farms in British Columbia and Alaska are producing most of the cultured fish we eat in America. However, fish can be harvested on a small scale and can play an integral role in a farm operation. On-farm waste can be fed to fish, and high-nitrate fish waste composted or irrigated onto crops. One example of this is a farm in Thailand that raises chickens above pigs. The pigs are in a pen above a pond full of fish. The fish eat pig manure, the pigs eat chicken manure, and they all eat vegetables harvested from the pond water-irrigated garden. Even human waste grows food, and is not simply flushed down the toilet and chemically processed.

Farmers in China use integrated systems widely. Ron Zwieg, a scientist who researched aquaculture extensively at The New Alchemy Institute and is now working at The Woods Hole Oceanographic Institute, has spent much time studying the Chinese aquaculture system. He has noted that a polyculture of fish can increase total production of a fish pond. A typical fish polyculture would include grass carp and wuchang fish, which feed on terrestrial plants and aquatic macrophytes; silver and bighead carps, which eat phytoplankton and zooplankton, respectively; black carp, which eat snails; mud carp, which consume bottom detritus; and common carp, which feed on benthic invertebrates. In Israel, Yashouv shows the mutual benefits of fish polycultures by studying common and silver carp in monoculture and biculture. In monoculture the common carp grew to average of 390 kg/ha. In combination with silver carp, the common carp and silver carp grew an average 714 kg/ha and 1,923 kg/ha, respectively, amounting to a total 2,637 kg/ha for both species in the same pond.[7] Each fish species uses a different food source, and after digestion their fecal material is available for consumption by other fish in the pond. The common carp digs and plows the pond bottom and stirs up organic matter, which is then eaten by the silver carp. With such a polyculture we can start to understand why integration and diversity are important.[8]

This example of a polyculture over-yielding a monoculture is similar to the studies that The Land Institute is conducting: Can a polyculture of perennials outyied the same species in monoculture? Much of the data at The Land, thus far, suggest that it can.

Gerald L. Schroeder has researched the use of agricultural wastes in fish farming, and in one application is looking at single-celled organisms for protein production. By using agricultural waste, such as cow manure, it is possible to get high fish yields employing a multiple food chain. Single-celled organisms digest manure and fish will eat these organisms. The fish consume only a small amount of the manure. The minerals in dung-urine mixtures provide basic chemicals for growth of phytoplankton and photosynthetic production of oxygen by algae.[9]

Ocean trawlers catch most of the fish people eat in the United States.[10] These trawlers burn large quantities of fossil fuels. Commercial fish feeds use large amounts of fish meal caught by trawlers and imported from Chile and the Mediterranean. This system is economically and ecologically expensive, and a system that promotes more sustainable proctices should be devised or more widely accepted.

The aquaculture industry is growing rapidly and is the fastest growing agriculture business in the U.S. today. Catfish production grew from 40 million pounds in 1979 to 340 million pounds in 1989. Along with the growth also comes issues of the environment. Wetland preservation, the use of drugs and chemicals, waste discharge, and water use are only a few of the problems that fish culture poses on our environment.[11] Alternative methods of fish culture that eliminate environmental hazards must be developed. Large-scale monoculture aquaculture, like conventional agricultue, pollutes our environment. Without further knowledge, practice, and experimentation aquaculture will continue to pollute, use large amounts of energy and water, and depend on outside resources.

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The Great Plain Bread Company

Adam Davis

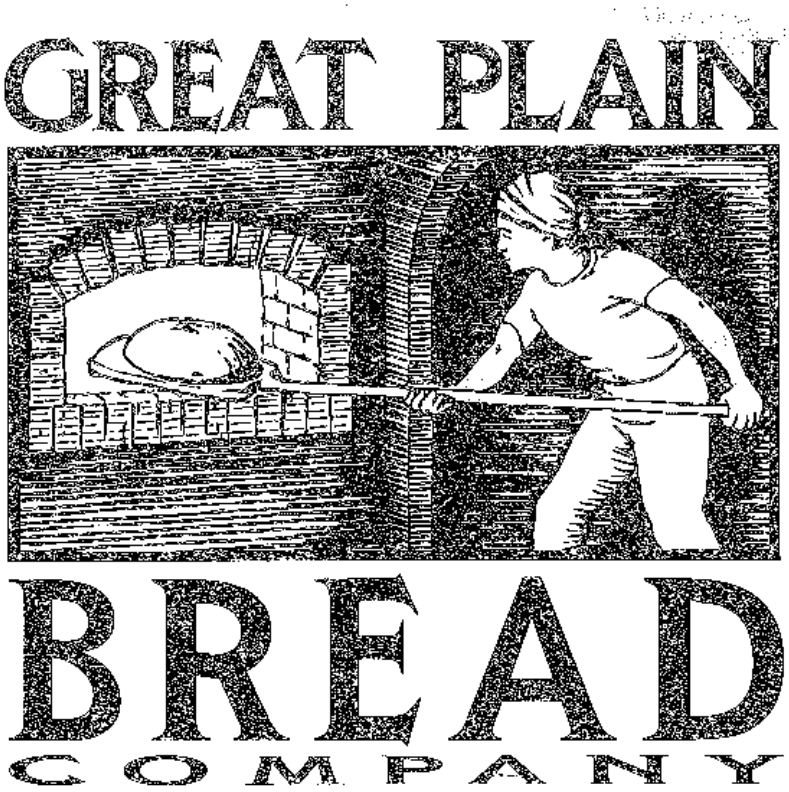
Thom Leonard likes to speak of himself and his nephew, Nelson Geis, as "practicing microbial ecologists." The two don't spend their time perched in front of microscopes and petri dishes, though. They bake bread.

Thom, a long time friend of The Land and director of the Grain Exchange, opened the Great Plain Bread Company in downtown Salina on April 9, 1991. He approaches the bread-baking process much as The Land Institute approaches agriculture: as management of a diverse ecosystem. At the core of the Great Plain Bread Company is natural leavening. Unlike commercial yeast, which is produced in a sterile environment to ensure that only one species of yeast is cultured, natural leavening is generally cultured on a ball of dough in a sack of wheat flour to encourage the growth of the diverse bacteria living on kernels of wheat. Before Louis Pasteur's 1872 paper on the process of controlled fermentation (originally developed to make France's brewing industry more competitive), all bread was started with natural leavening. Once purified yeast became available, the industrial manufacture of bread became widespread. The dense, nutritious loaves that our not-so-distant ancestors ate have become a rarity. Those naturally leavened breads were, in fact, an entirely different food than the concertina breads made with commercial yeast sold in all supermarkets and many bakeries. As Thom points out in his *Bread Book*:

> No one even tries to suggest that a field of mono-cropped corn is a tallgrass prairie ecosystem. And if a cornfield is not a prairie, how can a dough seeded with one purified variety of yeast be called bread?

As with most bakers of naturally-leavened breads in this country, Thom's methods have their roots in Europe, where the tradition of bread as the staff of life continues. Standards there are high for biologically produced bread (a label intended to distinguish the Real Thing from the industrial imitator). The baker must use natural leavening, bake the bread in a wood-fired (or indirectly heated) oven, and must not mix dough above a certain speed. Sticky details? Not if you're of the opinion that bread is more than the sum of its ingredients.

The care that Thom puts into his bread is apparent at every step of the bread baking process. First, Thom makes sure that his ingredients are top



quality. Every batch of bread contains a high percentage of organically grown Turkey Red wheat. This variety is the ancestor of many of today's wheat cultivars, and has more protein and better baking qualities than many of its descendents. Loaves are proofed (risen) in cloth-lined wicker baskets on handmade wooden rising racks. At the heart of his bakery is a big, beautiful wood-fired brick oven. Making loaves in this oven requires more know-how and effort than a gas-fired oven would. Thom spends long hours preparing the oven for a batch of bread (typically around sixty loaves, though the oven can handle eighty if needed). In the early afternoon, he builds a fire to heat the bricks that make up the oven walls. When only coals and ashes are left, he rakes them out and mops down the oven floor. All the while, Thom monitors oven air temperature to make sure it lies within baking range — 500 to 700 degrees F at "rake-out." Thom has had to learn the qualities of this particular oven: how it takes different types and lengths of wood, how quickly and evenly it heats, and how changing barometric pressures can affect its firing characteristics. The extra work is well worth it. Loaves produced in conventional ovens simply can't compare in texture or taste.

The elements of the Great Plain Bread Company that make for a superior product also have another important effect. They allow Thom's influence to extend beyond the microbial communities with which he makes bread to the human community of which he is a part. Buying Turkey Red wheat from local farmers supports organic agriculture, and helps to preserve heirloom stock. The vaulted brick oven was built by a local mason, the first oven he'd had a chance to do. Thom has an arrangement with a local woodworker whereby he hauls away hardwood scraps from the shop's waste pile. So, while obtaining the best fuel possible, Thom also saves a valuable resource from the landfill. Although business has dropped off a bit since the opening weeks, when every day saw all the loaves in the store sell out, Thom is reluctant to start wholesaling. He doesn't want to see his bread end up at a store 100 miles away—"then it's just bread with a wrapper on it, even if it does say 'wood-fired.'" Thom continues to make walk-in customers his marketing focus.

Many of those who frequent the bakery have known Thom for years. The choice to open the Great Plain Bread Company in Salina was not made for want of other options. While visiting some of Europe's great bakeries two years ago, Thom received an offer for financial backing to open a bakery in a small Italian village. He thought seriously about doing it, but when friends in Salina expressed interest in the project, he was happy to come back to the States. "It's a romantic sounding idea, being a baker in a small European village, but it would never be home."

Buying bread at the Great Plain Bread Bakery is an experience. It's an awesome sight, to enter the bakery and see a wood fire roaring inside of an

expertly crafted oven, the very one that turned out the loaf of Turkey Red Walnut Raisin Bread that you will break on the way home. It's also an excellent opportunity to meet some of the people who feed us, and to befriend a diversity of Salinan macrofauna.

Thom Leonard's *The Bread Book* (1990, East-West Health Books, Brookline, MA, $11.50 ppd.) is available at the bakery and through The Land Institute.

The Tall Grass Prairie Bread Company

Raymond Epp

The Tall Grass Prairie Bread company is a small business begun in 1990 by four families from the Grain of Wheat Church Community and an individual from St. Ignatius Parish in Winnipeg, Manitoba. Our existence demonstrates that matters of ecology and economics and of culture and agriculture can begin a reconciliation. The bakery signifies that we need not be controlled by the forces of the global marketplace or by the ecologically and socially destructive drive of modern technology. In this reconciliation process we need to recognize our limitations without diminishing our humanity. We need to recognize that we are not God, and we do not create all the patterns. To presume so is hubris. We are to care for the household that we neither created nor own.

We do not, however, live in a vacuum. Daily we must confront forces of an economic order that continues to grow at the expense of nature and human nature. The ecological problems facing us today will not be solved by global management strategies concocted by transnational corporations, governments, and industries. Such large-scale abstract "solutions" are the problems. What is required of us is to see that our rightful place is in community with people around us and with the land of which we are a part.

The Tall Grass Prairie Bread Company had its genesis in the hopes and dreams of Tabitha Langel, a woman who grew up with a deep appreciation for good food and the spiritual significance of the work that goes into raising and preparing it. She worked for a few years at the Experimental Lakes Area in Ontario where Sharon Lawrence, a research scientist there, recognized the love and care that Tabitha put into cooking. Sharon shared an interest in Tabitha's vision, but it lay dormant like a seed.

Tabitha came to our community seven years ago, and was given the opportunity to share her visions with members of the Grain of Wheat Church. Three years ago we began the Grain of Wheat Bread Group. It was a project that provided an opportunity for common work, with people of all ages participating. Six people took turns baking bread on Saturday mornings, and children delivered warm, fresh bread to our neighbors by noon.

Besides providing good work to make good food, a not so readily apparent connection was being made to the land, the source of the grain. A few church members began a community in rural Manitoba, near Portage la Prairie. They raised grain for use by the bakery using practices that eliminated the need for synthetic fertilizers and pesticides.

The investment needed to get the Bread Group started was approximately $1,000, raised by asking members of the community to contribute. A mid-sized Hobart mixer, a small flour mill, and ingredients were purchased. Other financial arrangements were made as well: people who could not afford to pay for their bread using cash could volunteer time to the Bread Group by grinding flour, delivering bread, or baking. Those who liked to do their own baking could participate in the Bread Group and in return receive fresh-ground flour.

In June of 1990, a group of five families came together to explore purchasing a neighborhood bakery that had just closed. After a few meetings and times of prayer, we decided to move ahead in this venture. The five families brought to the new bakery different but complementary gifts. Tabitha Langel and Sharon Lawrence were part of the group. Nancy Pauls liked the idea of working part-time, now that her children were beginning to grow up and needed less attention. That she could work in the neighborhood was an additional bonus. Her son, Evan, and husband, Henry, also work at the bakery. Lyle Barkman has skills of economic analysis and a desire to be involved in work in which his family can be included. For a long while Lyle has wanted to work alongside his children, and the bakery gave him such an opportunity. He cut his hours to half-time with the city of Winnipeg to devote time to the bakery. I grew up on a farm in Nebraska. My interest in the bakery comes from a vision of building a culture that respects the needs of people and the land. I believe that work is an important component of a healthy culture, and must contribute to the common good of households and communities and respect nature's patterns. Communicating the necessity of an ecological food system to neighbors and friends is a task I have undertaken, and the bakery allows me to practice my beliefs.

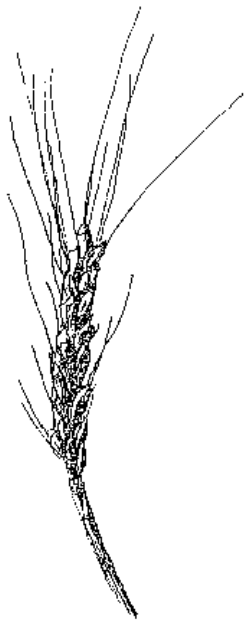
Inside The Tall Grass Prairie Bread Company, Diane Wurtz bakes cinnamon rolls.

In many ways this project meets community needs. It strengthens the community in so far as it incarnates our convictions. It provides good food and good work that is immediately recognizable, and benefits not some abstract concept known as the "free market," but our neighbors and friends. It supports a way of farming that is good for the land and good for the farmers who raise the grain, and, most importantly, it supports farmers within our own region. When I see that the average distance that a pound of food travels in North America before it is consumed is 1,300 to 1,800 miles, I question the sustainability of such a system. I also wonder what kind of economic power and control makes such a system necessary.

We soon began to see that city people and ventures such as Tall Grass Prairie Bread have an important role to play in the creation of a healthier culture and agriculture. A city need not be a vacuum that siphons wealth out of the countryside and returns only garbage. A more symbiotic relationship can exist, and must exist if life is to continue, for the land's health and our health is ultimately one and the same. Stewardship, a religious concept referring to management of the house, is closely related to economics and ecology. "Eco-" means house. The management of our households must be ordered toward sustaining life and ensuring that the cycles of nature can continue.

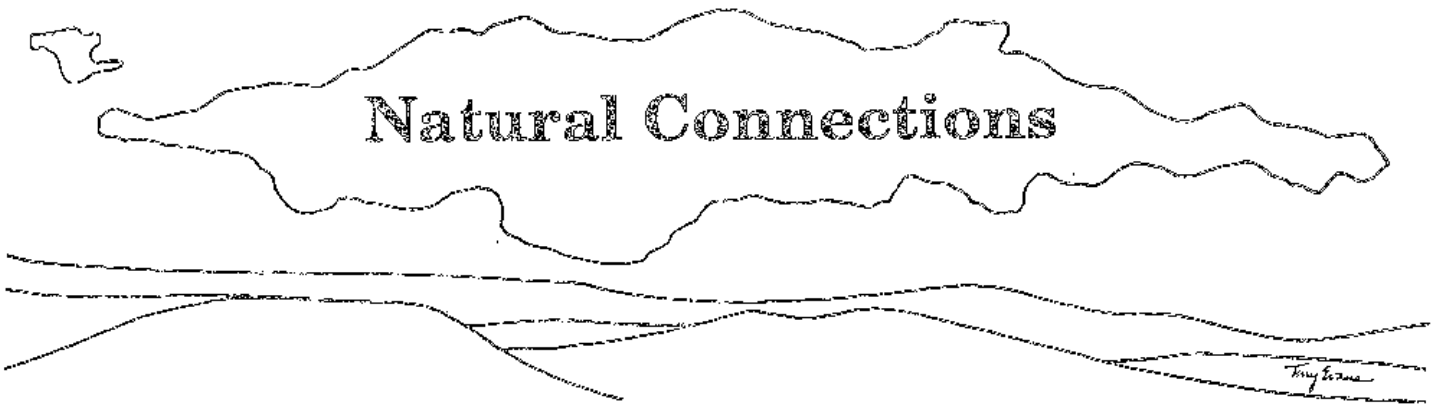
Our ecosystem is also our home, yet little we have done in agriculture has acknowledged the importance of eco-logical agriculture. We have committed two offenses. We have, with arrogance, destroyed the life-giving wisdom of the tallgrass prairie that once covered the center of the continent like a waving mat of green, protecting the soil from wind and water erosion while at the same time building soil organic matter and fertility. Secondly, we have robbed the Earth of great stores of fertility without thought of how such fertility could be maintained. Chemical fertilizers are but another theft, and cannot be resorted to indefinitely. I believe we need to begin to learn from what soil scientist Sir Albert Howard called "Nature, the supreme farmer." We need, like the Prodigal Son, to return home and understand our rightful place.

Part of the work of creating a healthy culture is choosing technologies that enhance the work of a local culture. Most of what has been called "progress" and "efficiency" in agriculture and industry has involved the replacement of people by capital. At the bakery we use a small-scale flour mill that enables us to grind fresh flour daily. Our mill and sifter could be looked upon as novelties (ours is the only bakery in Manitoba that mills its own flour), but more than this, the mill ought to be viewed as an element in the building of a local life that respects cultural, agricultural, and ecological patterns of the region. The mill is the prairie equivalent of Gandhi's spinning wheel, as it places control of processing into the hands of the people.



Ray Epp was an intern at The Land Institute in 1989. He grew up on a Nebraska farm and studied agriculture at the University of Nebraska. He holds religious studies degrees from Mennonite Brethren Bible College and the University of Winnipeg. In addition to his work with the bakery, Ray is coordinator of Stewards of the Land, a project of the Manitoba churches.

Editor's note: Ray visited The Land in early August, and told us that a large mill in Winnipeg was recently bought by U.S.-based Archer Daniels Midland. The Tall Grass Prairie Bread Company now runs the largest Canadian-owned mill in Winnipeg.



Ignoring Pleas of Environmentalists, Kansas Man Digs Up Virgin Prairie

excerpted from *The New York Times*, November 23, 1990.

Lawrence, Kan., Nov. 22 — The largest remaining stretch of virgin prairie in northeast Kansas disappeared under the plow this week after futile attempts by The Nature Conservancy and local environmentalists to buy it.

The plowing of the 80-acre Elkins Prairie was first noticed soon after sunrise on Sunday, and the news quickly spread to a community group that had worked for two years to preserve the land, one of the few remaining unspoiled pieces of the 200 million acres of tall grass prairie that once covered North America... By late Monday, only a small strip of virgin prairie remained.

Only about 2 percent of the original tall-grass prairie in North America remains, and Craig Freeman, coordinator of the state's Natural Heritage Program, said the Elkins stretch, about a mile ouside this booming college town, was a particularly fine example of the complex prairie ecosystem. It was home to 150 species of plants, including two threatened species, Mead's milkweed and the western prairie fringed orchid.

Sod Busting

Steven Hind

So civilized, this curve
Of mirror steel, carving
The wild animal, rowing
Back the skin of native
Earth, hair-side-down,
Like skinning a buffalo
Really, to make a lap robe —
So a man makes his rows over
The land, erasing what he
Had never memorized in its
Self-sustaining meander
Through time. A man comes
To love straight rows,
Disguising his clumsy dance
With the seasons. He glances
Back at the sleek steel work,
A god in his own time who
Never thinks, Enough is enough.

Steven Hind is a native of the Kansas Flint Hills. He lives and teaches in Hutchinson, Kansas. Printed by permission.

A Flint Hills Field Trip

Laura Sayre

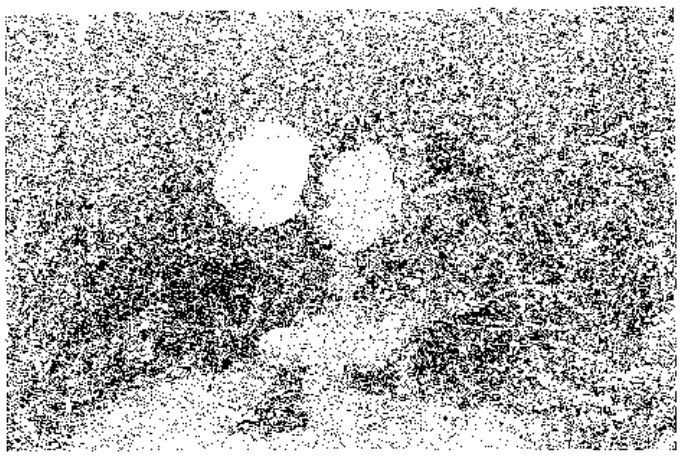
On June 15th and 16th, I am overjoyed to say, the intern group finally took our first field trip—not counting our trip to the Platte River to see the sandhill cranes, not counting an afternoon's jaunt to birdwatch at Cheyenne Bottoms and have dinner at the bar in Red Wing, not counting a trip to Bethel College to help Miner Seymour with his tire house—not counting a dozen partial, quick, hastily-organized outings with which we have broken up the work this year and begun to familiarize ourselves with Kansas's midsection. This field trip was official: not a single intern was permitted to be absent; we travelled in the recently-acquired Land Institute van; each step of the complicated itinerary was planned in advance; the weeds in the research plots grew an additional day's worth of inches, unhoed, for the sake of our collective and individual educations. We went to the Flint Hills.

I am a great proponent of field trips, particularly in the Midwest, and this one ranked among the finest I have taken. The weather was perfect; it was not too hot, and the wind didn't blow too strongly. We didn't fall behind schedule and we arrived nowhere early. We slept on the prairie on top of the world and woke up soaked with dew in the fine dawn, the sun peeping out from the tall grass of its distant bed just as we peeped out from the depths of ours. We bore witness to the existence of multitudes of roadside eastern gamagrass and Illinois bundleflower populations, and even rated disease levels in some. We demonstrated, by the low number of miles travelled and the high number of stops made, that great yet oft-contested fact: the sheer density of cultural opportunities in this landscape. Maxwell Game Preserve, Peabody, Cedar Point, Clements, Matfield Green, Sharpe's Creek, Cottonwood Falls, the Z-Bar Ranch, Council Grove, Council Grove Lake, home. And, of course, all the vistas in between.

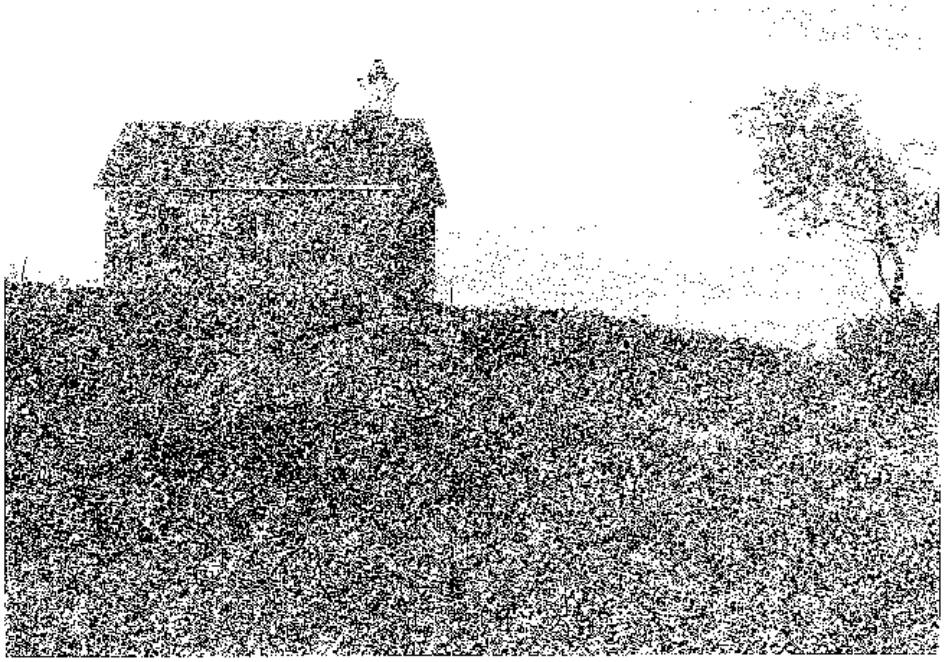
Van trips are always too fast, perhaps, although they are slower than car trips, and the continual stopping and starting provides a funny rhythm by which to learn a countryside. We would roll through towns and between fields, and then stop in a town, and then roll through more fields and towns, and then stop to look at a field, or a flower, or some other inhabitant of the country. Yet of the two atmospheres, both were quiet, and neither could deliver the final word, leading me to reflect that in this landscape the towns and the vistas were equally essential. They came in alternating succession, and each provided such poignant counterpoint to the next: underdeveloped, dying yet vital towns and overdeveloped, vital yet dying fields and pastures in evident, and yet somehow mysterious, connection.

The towns were the more articulate, if the rarer, of the two. There was so much palpable history in the surfaces of those buildings. In Peabody we found a tiny historical museum housed in the first free library erected in Kansas. Beautiful old houses held one another at arm's length and arranged beautiful old trees like jars of flowers on the flat tables of lawn which separated them. We jay-walked lazily across the wide empty main street from one ornate corner bank, now harboring a spotlessly clean Pepsi restaurant, to another, now occupied by a quiet antique shop. In Cottonwood Falls we prowled from top to bottom of the oldest county courthouse still in use; out front we read, on an informative sign pertaining to the demise of the Cottonwood Falls-Strong City interurban tramway, the admission (by a federal agency, no less) of a failure of technology to improve life in a single historical instance. Lovely limestone blocks reflected their dates of relocation sharply back into our eyes from both sides of the street as we walked from the courthouse square down to the river. History poked in brightly at our brains; but the county seat lacked the money for a full, comfortable, air-conditioned historical explanation of how the town had come about, and why the people weren't more numerous, and why the invisible tourists had to be persuaded to buy deli sandwiches and antiques. A dozen captionless black and white photographs on the courthouse walls, and that was all.

In between the towns, and flinging them apart, existed the true countryside, experienced mainly as vistas, as the far-away meeting of sky and land. The countryside, if less articulate than its already reticent towns, was more ubiquitous. It seemed to contain a few of the answers the imaginary museums withheld, but again they were persistent rather than obvious, and we were in even greater danger of becoming



Missouri evening primrose



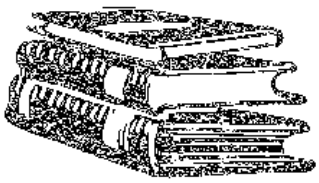
The 109-year-old Fox Creek School, near Cottonwood Falls, Kansas.

merely dazed. My first overwhelming thought, as I stood knee-deep in the prairie on top of the world, was, Good heavens, I have never seen anything so beautiful—so green, perhaps it comes down to—in all my life. Not a very profound observation, but powerful nonetheless: every one of us wanted to throw down his or her camera and raise beef for a lifetime without a second thought. Willa Cather's *My Antonia*, I remembered, began in the fall, as though the golden dryness of the prairie were quintessential. This, along with the golden dry wheat, had led us to think of Kansas as uniformly yellow; but in the Flint Hills we could see that it was actually intensely green, and diverse, and even more beautiful than we could have guessed. The wheat fields turned gold as the prairie turned green and vice versa, in a harmonious alternating dance we almost found natural. Almost. Reluctantly, we retrieved our cameras from the grass.

We travelled, it must be remembered, in the height of the patriotic season, at the center of wheat harvest, when the threshed berries filled up the little erosive gullies in the soft shoulders that border the country roads. We had been to Konza Prairie, but that, being a preserve, seemed different. For most of us Chase County was our first confrontation with Kansas rangeland, virtually untouched by wheat, but still very much touched by towns. Perhaps it was this that pointed up the contrast, that allowed the towns to chisel into the prairie's surface in our minds and give us a more complete sense of this landscape. These prairies were not quite wild, were far from wild. We were generous enough to be enchanted by the tamest wild landscape, the most altered of green views, particularly when the alterations could be invisible without prior knowledge—a stranger could easily be persuaded that the prairie has always consisted of nothing but birds and grasses, and yet think it beautiful. I even asked myself, can one be sustained by a chorus of upland sandpipers? Are the towns so sustained? Are they? And finally I thought, really, perhaps, yes, perhaps exactly yes.

There was history in the prairies and in the towns, and those histories went together: there was everywhere a wildness that had been endlessly tamed and was perpetually going wild again. It was a manifestly tame landscape, yet it harbored an immanent wildness in the heavy heat and the vigorous weeds. Nothing could harm one here, we thought, momentarily cavalier, except maybe isolated craziness or the subtle revolution of a half-abandoned world, the whim of a breaking board on the stair of a rotting house or the random violence of lightning. Having invaded the sanctity of the old mill at Cedar Point and slept on the land of a Chase County rancher, we could at least feel that much.

Field trips are wonderful because they accelerate the accumulation of one's idea of the landscape: all one can do is look, talk to people, perhaps read, and try to see more. In the Flint Hills we discovered spaces and climates we didn't know existed, and gained infinite respect for the people who live in that space and that heat. Now we look at our own land a little differently—and will do so until our next field trip, July 28th and 29th, south to the Sand Prairie.



Books

The River of The Mother of God and Other Essays by Aldo Leopold

Susan L. Flader and J. Baird Callicott, eds.
University of Wisconsin Press, 1991, 384 pp., cloth. $24.95.

Reviewed by *Jake Vail*

"Practice resurrection" — The concluding words of the manifesto of poet Wendell Berry's Mad Farmer's Liberation Front were surely gleaned from close observation of the natural cycles with which his farming life is intertwined. The Mad Farmer's imperative sounds to us Westerners undeniably and perhaps uncomfortably religious, but this only shows how far removed we are from the cycles of life.

Another discipline shares with farming a constant involvement with death and rebirth: history. History teaches not only of prior events and people, but that the past is a living and essential part of the present. Like farming, history also teaches humility, a sense of being part of something larger than oneself, and a sense of indebtedness to that "something larger." Recently an historian and a philosopher have brought a great part of our past alive. With *The River of the Mother of God*, Susan L. Flader and J. Baird Callicott have resurrected Aldo Leopold.

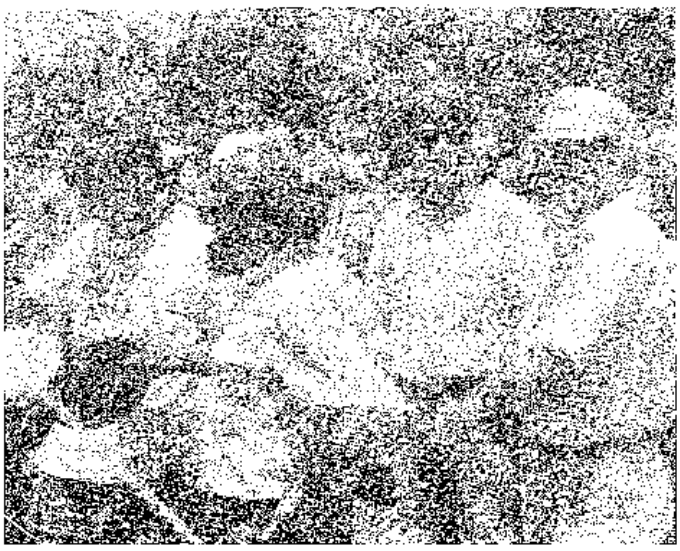
Aldo Leopold (1887-1948) is best known as the author of *A Sand County Almanac* and the formulator of the land ethic. Born in Iowa and educated at the Yale School of Forestry, Leopold spent many years working for the U.S. Forest Service and teaching at the University of Wisconsin. In 1935 he helped found the Wilderness Society. Nowadays he is mentioned in the same breath as Henry David Thoreau and John Muir, is frequently called a prophet, and is as near to the hearts and minds of the founders and friends of The Land Institute as anyone.

The latter for good reason. The Land's vision comes from an appreciation of the centuries-long interplay of human and natural history known as agriculture and the young science of ecology. Aldo Leopold's familiarity and concern with agriculture is obvious to the most casual reader of his works, and his thoughts on it are among the most lucid to be found: "The bulk of all land relations hinge on investments of time, forethought, skill, and faith rather than on investments of cash." His descriptions of ecology are similarly clear:

> Recent discoveries in mineral and vitamin nutrition reveal unsuspected dependencies in the up-circuit; incredibly minute quantities of certain substances determine the value of soils to plants, of plants to animals. What of the down-circuit? What of the vanishing species, the preservation of which we now regard as an aesthetic luxury? They helped build the soil; in what unsuspected ways may they be essential to its maintenance? Professor Weaver proposes we use prairie flowers to reflocculate the wasting soils of the dust bowl; who knows for what purpose cranes and condors, otters and grizzlies may some day be used?

The Land Institute's idea of an agriculture of perennial polycultures grew from studying the prairie "down-circuit" that created the rich soils local agriculture depends on. The prairie was a great teacher and source of inspiration to Aldo Leopold as well, and from grasses, farms, and forests he wove essays exploring not only agriculture but aesthetics, history, government, conservation, ethics, economics, and education. He didn't use the word "sustainable" very often, but he knew and helped us learn that it is a political and not a technical word.

Aldo Leopold was highly regarded as a teacher,



Volker Wittig, Donald Worster, Bryan Norton, and Baird Callicott at the Prairie Festival

and was proof that the best teachers are the best students. In the 59 essays in *The River of the Mother of God*, presented chronologically from high school writing assignments to seeds of *A Sand County Almanac* (which was published in 1949), we can see a fascinating dialogue grow between Leopold's thought and the ideas of ecology. For Aldo Leopold came of age alongside ecology, and contributed to it nearly as much as he took from it. While a student at Yale from 1906 to 1909 he was exposed to the organismic models of ecology of Henry Cowles and Frederic Clements. In the 1930s he befriended zoologist Charles Elton. Leopold's essay "A Biotic View of Land" borrows directly from Elton's community ecology, and the biotic pyramid that Leopold sketches returns a decade later as an important part of his land ethic. Ecologist Arthur Tansley introduced the concept of ecosystems in 1935; Leopold knew of his work and the concurrent studies of John Weaver. Weaver, the premier ecologist of the prairie, is cited in several of the essays in *The River of the Mother of God*, including, again, "A Biotic View of Land."

Delivered to the Society of American Foresters and the Ecological Society of America in 1939, "A Biotic View of Land" synthesizes history and ecology and examines issues of land use and the growing wilderness movement. Noting that evolutionary changes are usually slow and local, Leopold observes that "man's invention of tools has enabled him to make changes of unprecedented violence, rapidity, and scope." He asks, "Can the land adjust itself to such a new order? Can violence be reduced?" Yes, he thinks, but it will take a "revolution in the land-holder" — the emergence of a land ethic.

Author Barry Lopez has observed that in the past twenty or so years nonfiction writers have taken over territory abandoned by American fiction writers. "That territory is, for example, the question of what is the relationship between the individual and God or between the individual and the state, what is the relationship of the individual to landscape." This recent embracing of moral territory has come about, I believe, largely because of Aldo Leopold. Leopold is among the first and finest of a continuing line of nature writers who think about human values and what he described as "the extension of social conscience from people to land." Aesop-like, Aldo Leopold teaches ecological parables to new generations wondering how to live right.

> In the tamaracks, if you have any, you should find the regurgitated pellets of the long-eared owl. Note well the mouse skulls; three skulls per pellet, one pellet per day, 100 days in the winter, 300 mice per owl per year. Can you afford to let some rabbit-hunter with the trigger-itch shoot him just for fun? Is it worth while to keep a few tamaracks just to have owls around?

In reading *The River of the Mother of God* we should learn not only from Leopold's ideas, but from his example. No ivory-tower ecologist, Leopold was constantly in the field, taking "notes on the behavior of pintail ducks in a hailstorm," or speaking to a group of foresters, the American Association for the Advancement of Science, a garden club, or his Wildlife Ecology 118 students at the University of Wisconsin. When striken by acute nephritis in 1913, he used the 18 months it took to recuperate to write (and illustrate) several articles for the U.S. Forest Service publication, *The Carson Pine Cone*.

Editors Flader and Callicott have provided short prefaces to each of the essays in *The River of the Mother of God*, a bibliography of Leopold's works, a biographical chronology, and an excellent general introduction. In the introduction the historian-philosopher duo trace the evolution of ecology, aesthetics, and ethics in Leopold's writing and outline four areas of public policy that Leopold contributed to. Wildlife management, conservation economics, sustainable agriculture, and wilderness preservation have all travelled their respective roads because of Aldo Leopold. Probably few who work in these fields realize the scope of their indebtedness, but the essays included here could remedy that. Uncle Sam should put our tax dollars to good use and buy a copy of *The River of the Mother of God* for anybody who works in these policy areas, any interested students, and anybody who has never given much thought to it. Pioneers and Gullies, The Conservation Ethic, The Arboretum and the University, Letter to a Wildflower Digger, The Farmer as Conservationist, Land-Use and Democracy, Ecology and Politics... Each essay makes wise contributions to both public policy and to private practice.

The contents of *The River of the Mother of God* could change many lives (and not just human lives). But there is also much to be learned from the story of Aldo Leopold himself. I have long been intrigued by his transformation from self-sure manager to humble steward and teacher. *A Sand County Almanac* hints at it, but here the metamorphosis is made clear. In his early years with the Forest Service, Leopold toed the Gifford Pinchot/Yale School of Forestry line, promoting management of forests for production and recreation and management of game for increased numbers. In "The Varmint Question" (1915), he wrote of a need for a "practical, vigorous, and comprehensive plan of action" to eliminate "varmints." A few years later, in "Some Fundamentals of Conservation in the Southwest" (1923), he saw the earth as an organism and conservation as a moral issue. "The Virgin Southwest" (1933) is proof of Leopold's keenly

developed ecological eye and how well he had learned to read the land — and our effects upon it. The next year, in "The Arboretum and the University," he anticipates the now-popular field of restoration ecology. In "Threatened Species" (1936), Leopold recants his 1915 position and urges the protection of wolves and other species, and pioneering another "new" position, urges the protection not just of species but of ecosystems. "Wild life management...has already admitted its inability to replace natural equilibria with artificial ones, and its unwillingness to do so even if it could," he writes in "Means and Ends in Wild Life Management" that same year. "A Biotic View of Land" was written in 1939. A few years later the one-time hater of varmints and manager of game gave the world the land ethic. Here is a transformation myth for our time.

In the decades since Aldo Leopold wrote, the population of the United States has increased from 150 to 251 million people. Rates of population growth in other areas are far faster. An insistent demon whispers that we may have already exceeded the earth's carrying capacity. Panicking but confident, macromanagers constantly boast clever solutions so we may continue our extractive ways. Will it take each of us thirty years to come to the realization that management is unable to replace natural equilibria? "Are we...limited to patchwork until such time as Mr. Babbitt has taken his Ph.D. in ecology and ethics?"

"This land is too complex for the simple processes of 'the mass mind' armed with modern tools. To live in real harmony with such a country seems to require either a degree of public regulation we will not tolerate, or a degree of private enlightenment we do not possess." With *The River of the Mother of God* we may now possess such enlightenment, or at least with its aid may reach it in less than the several decades it took Aldo Leopold.

Co-editor Susan Flader explains in a recent *Wilderness* magazine article that the basin of the River of the Mother of God, in Amazonia, is probably the most diverse ecosystem in the world. Sixty-seven years ago Aldo Leopold saw "Rio Madre de Dios" on a map and was moved to write an essay that sings praises to unknown places and, foreseeing a time when unknown places disappear, laments "the tragic absurdity of trying to whip the March of Empire into a gallop." In these days of global warming and desert storming his essay is as timely as ever. As around the world deserts storm over what used to be livable lands and the golden gravel of Rio Madre de Dios is mined, we should all take a slow boat down *The River of the Mother of God.*

Who Are Those Romantic People Who Move in the Prairie Landscape?

A Comparative Review of *Dances with Wolves* and James Fenimore Cooper's *The Prairie*

Laura Sayre

When I came to The Land Institute this spring I felt I had no choice, as a literature major interested in sustainable agriculture on the Great Plains, but to read the piece of American literature named after the fundamental focal point of our research: James Fenimore Cooper's romantic adventure novel *The Prairie*, published in 1827, the third of his five immensely popular Leatherstocking Tales. Around the same time I was induced to go see Hollywood's extravagant, Oscar-winning tribute to the same geographical region: the 1990 film *Dances with Wolves*. The film, I can report, was generally popular among the Land interns. I immensely liked the novel; and I relished both film and novel the more for having encountered the two concurrently. I was immediately struck by the profound similarities that exist between these two images of prairie culture. Anyone who enjoyed Kevin Costner's twentieth-century vision of the nineteenth-century prairie, and perhaps too some who didn't, might well be entertained by J.F. Cooper's idea, a century and a half earlier, of the same area, one half-century previous.

The prairie, after all, is more than just a disappearing biotic community which may embody crucial dicta for Midwestern agricultural practice. It is also a large, diverse, distinctive geographical region supporting a similarly large, diverse, and distinctive human population which has changed through history and which has, throughout that history, endlessly produced images of itself. Understanding the wider cultural characteristics of the prairie is as important as understanding its strictly biological aspects. *The Prairie* and *Dances with Wolves* reflect these cultural characteristics and thus provide us with information about our cultural idea of the prairie landscape, the people who live in it, what happens to them, and why—in short, about the popular conception of the prairie. In this essay I would like to look at a few of the trademarks of this conception.

Before offering a brief summary of the two plots involved, I should note that the two texts hold in common at least three significant formal characteris-

tics: both develop their plots around a standard romantic formula; each is relatively long and uneventful by the standards of its genre; and, perhaps most importantly, both were produced and received as popular items. These formal commonalities go a long way to bring the two stories together, and indeed lead one to suspect that *The Prairie* and *Dances with Wolves* represent two instances of a single tradition, despite the evident distance between their localities of production—despite one hundred sixty-three years of history and the differences between the novelistic and cinematographic modes. The similarities between the two texts are truly shocking—especially for those who believe that *Dances with Wolves* offers a new, revisionist perspective on the events of the pacification campaign—and should thoroughly reassure us, among other things, of the tenacity of our Euro-American cultural stereotypes of the prairie region and its inhabitants.

Dances with Wolves is the story of a soldier in the Union Army, in 1863, who on the strength of a single heroic act is promoted to lieutenant and sent to the post of his choice, a lonely one in Indian country on the very edge of the frontier. The fort is deserted when he arrives. All alone on the prairie, he gradually befriends a nearby group of Lakota Sioux, learns their language, participates in their activities, dons their dress, and marries a White woman who has lived among them from early childhood. Just as he decides to go completely Sioux, he unluckily makes a last trip back to the fort and is discovered, and arrested as a traitor, by a new company of soldiers who have arrived in his absence. His Sioux friends rescue him, but his peaceful rejection of the culture of his birth is rendered impossible: the film closes with our knowing that the U.S. Army will look for him, find him, and slaughter his adopted people in the process.

The Prairie depicts Natty Bumppo, the versatile hero of the Leatherstocking epic, as an octogenerian trapper wandering on the vast plains west of the Missouri River in 1804. The story opens with an encounter at sundown between the old man and a family of squatters who have migrated west from Missouri in pursuit of free land. In the night the squatters are robbed of their horses and cattle by a band of Sioux, an injustice for which they immediately begin to seek retribution. At the same time, two reluctant members of the squatter party—a tag-along scientist-naturalist-explorer known as Dr. Battius, and a young woman named Ellen Wade, the adopted orphan child of the squatter mother's former husband's brother—splinter off from their disreputable companions and attach themselves to the trapper. The splinter group is further enlarged by two young men (Paul Hover, a bee-keeper from Kentucky and the betrothed of Ellen, and Duncan Uncas Middleton, a captain in the U.S. Army) who have been secretly trailing the squatters. The goal of the trapper's faction is to liberate a beautiful young aristocratic woman named Inez, the wife of Middleton, who has been kidnapped and transported west by the squatters in a conspicuously mysterious tent.

To complicate matters, a renowned Pawnee warrior materializes, and a pair of shaky alliances is formed between the trapper's group and the Pawnee on the one hand, and the squatter family and the band of Sioux (stolen cattle notwithstanding) on the other. The story thus becomes a slow and intricate four-sided maneuver in which, eventually and with lengthy philosophical consideration and infinite demonstration of skill and wisdom on the part of the old trapper, the young lovers are reunited, the naturalist is made to look thoroughly ridiculous, the squatter family is temporarily discouraged from claiming land in Indian country and set back on the right moral path, and the good Indians win a battle over the bad.

If *Dances with Wolves* explores the role of the Civil War as a catalyst for interracial contact on the Great Plains, *The Prairie* examines the similar, although less violent, function of the Louisiana Purchase of 1803. Both events arose out of internal tensions within the young nation, and both had the effect of scattering people, and the tensions along with them, into the heart of the unknown country. Cooper begins his tale with a discussion of the consequences of the Louisiana Purchase:

> It soon became apparent...that, while nature had placed a barrier of desert to the extension of our population in the west, the measure had made us the masters of a belt of fertile country, which, in the revolutions of the day, might have become the property of a rival nation. It gave us sole command of the great thoroughfare of the interior, and placed the countless tribes of savages, who lay along our borders, entirely within our controul; it reconciled conflicting rights, and quieted national distrusts.[1]

Many of the internal difficulties of the new nation were themselves the products of interracial and interethnic conflicts, as Cooper implies and as was grossly evident by mid-century. Issues of cultural difference, then, according to our texts, weighed heavily (if largely subconsciously) on the minds of the Whites who came to the prairie region.

It is worth noting that while each text seems to consider itself broad-minded for not categorically labelling all Native Americans as savage and ferocious, the Native American group depicted as "good" by the film (the Sioux) is portrayed as "bad" by the book, and vice versa (in the book it is the Pawnee who represent the peaceful, dignified side of the perceived

Native American personality). This may be because *The Prairie* takes place in southern Nebraska while *Dances with Wolves* is located in southern South Dakota, so that each text is more sympathetic toward the more local Native American group. At the same time, however, this difference only makes more clear the rigidity of the stereotypic forms shared by the two texts for the portrayal of Plains Indians—forms which dictate, for instance, that Native American groups must be either ruthlessly hostile or sublimely pacific.

It is these stereotypic forms which provide the most dramatic, because they are the most detailed, points of comparison between the two works. They exist, moreover, not only for the representation of Plains Indians but for the representation of many aspects of life on the prairie. Book and film contain, for example, virtually identical visions of the definitive Sioux democratic council and the definitive Sioux personalities that constitute it. Each work glorifies the male Indian's innate dignity and superlative abilities either in war or in the spiritual realm, but never in both. Both stories incorporate the necessary romantic theme while delicately avoiding the culturally sensitive issue of interracial sexuality. Both book and film include many scenes charged with the suspense of possible violent ambush, and both turn their plots around examples of those exhilirating, dangerous, quintessentially-prairie events, the buffalo stampede and the prairie fire.

Although one immediately notices and begins to critique the representational treatment received by Plains Indians in *The Prairie* and *Dances with Wolves*, it is important to recognize that neither story is really about the Plains Indians. Both, rather, are about the emigration of White Americans to the prairie region, and only incidentally—albeit essentially—portray the Native American inhabitants as important contributors to the White experience of the prairie. Our central question in looking at the two texts, then, must pertain to the tradition from which they emerge: What, according to our sources, happens to White people when they move to the prairie?

They are, first of all, awed by the change of landscape. This is an experience to which anyone who has moved from one part of the country to another can testify, but also one which receives such profound emphasis in these two texts as to force one to conclude that the prairie landscape is the central determinant of the prairie experience. The White response to the prairie landscape is at once powerful and ambivalent: Lieutenant Dunbar falls in love with the sea of grass even as he is frightened by it; Cooper, as we have seen, imagines it simultaneously as "a barrier of desert" and "a belt of fertile country." The distinguishing characteristics of the prairie, according to the two texts, are its vastness and its unfamiliarity: a vastness which causes the Whites to feel dangerously exposed, because of the terrible rapidity with which hostile forces can appear and disappear; and an unfamiliarity which makes them feel profoundly insignificant. Both book and film are obliged to create focal points for human action—a rock outcropping, a stand of trees around a stream—in order to combat the loss of human identity in the immensity of the prairie and to provide a means of seeing a landscape for which visual standards previously did not exist.

Perhaps it is the strange, threatening emptiness of the prairie which is in part responsible for the second notable experience to befall white people on the prairie. Individuals respond to the prairie landscape in a variety of ways, but both book and film express a sense, shown particularly in the soldiers who arrive at the post toward the end of *Dances with Wolves,* of the frontier as a magnet for dissolute, misguided, immoral Whites. The officer at Fort Hays from whom Dunbar receives his orders and supplies is sloppy, fat, pathetic, and a royalist; Cooper's squatter family has no respect for the law and has fallen under the influence of a white "trader in human flesh." The officer and the slave trader both kill themselves, overcome with shame and without the moral strength to mend their ways. Whether the weak and immoral Whites have deliberately gone west in order to eschew lawfully regulated society, or whether they have arrived there accidently and lost their moral sense of direction in the absence of bustling, orienting civilization, one cannot be sure; both texts merely express the fear of what may happen to the dislocated and unsupported individual.

A third distinctive prairie experience depicted in *The Prairie* and *Dances with Wolves*, and again one that can be presumed to contribute to the violence of some individuals' response, is a difficulty of communication. The characters in these stories scarcely know what to say or how to say it, and when they do their listeners don't understand. The people who meet on the prairie come from a number of different cultural locations, speak different languages, and have different ideas about political and social procedures; communication is thus always difficult and frequently humorous. *In Dances with Wolves* John Dunbar, in spite of his status as the dashing hero, constantly trips, bumps his head, gets his U.S. flag wrapped around his face, looks foolish, and can't express himself. Much of the film is occupied with the language-learning process of Dunbar, Stands with a Fist, and Kicking Bird. In Cooper's *Prairie*, similarly, the procedure of translation is given careful emphasis: not only do the Native Americans and Whites have difficulty communicating, but formidable language barriers also separate the Sioux from the Pawnee, the Kentuckian from the Easterners, the old from the young, the scientist from

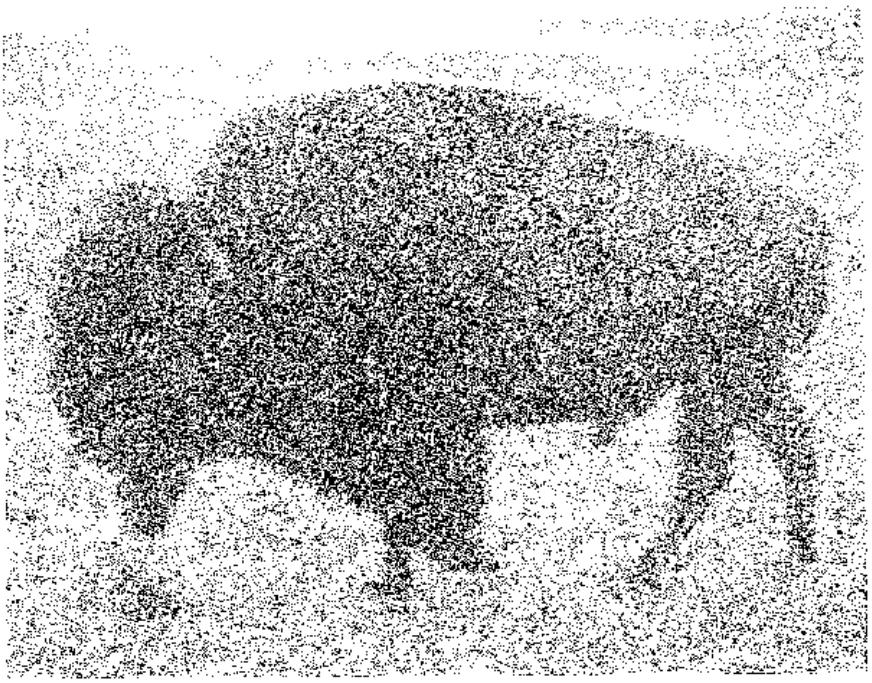
Charlie Pedersen, Jake Vail, Tim Coppinger, and Volker Wittig in the Flint Hills.

the non-scientist. Indeed, Cooper uses Battius's science-speak as a demonstration of the quintessence of obscurity in language, as one more unintelligible language employed by one more prairie inhabitant. Language itself must be renegotiated for communication to occur at all between these diverse groups, just as visual standards for the landscape must be redefined.

The prairie experience, in sum, is employed by both book and film as a means of examining (primarily White) human nature. The distinctive elements of the prairie experience, at least as developed in this stereotype, lend themselves very well to such an examination: on the prairie frontier Whites are at once stripped bare of most of their civilized cultural accouterments and exposed to intense levels of nature, including "uncivilized" examples of themselves. Both book and film—and perhaps we must conclude, the prairie intrinsically itself—cater to an anthropological and a philosophical interest, raising all the standard questions: How natural are we? Where is the boundary between instinct and reason? How do we distinguish between "good natural" qualities and "bad natural" qualities?

If the two texts pose a single philosophical dilemma, however, they do so in distinct ways, and imply different possibilities for its resolution. *Dances with Wolves*, constrained by the more tersely-visual film format, is obliged to streamline the romantic-adventure frontier story given full and indefatigable expression by Cooper and to compress and simplify the personalities which compose it. The film neglects much of the diversity of frontier Whites, combining into a single Lieutenant Dunbar personalities Cooper spreads over three or four individual characters, virtually eliminating frontier White women, leaving out Cooper's wonderful representation of the frontier scientist-naturalist, and largely ignoring the distinctions between settlers and soldiers. It may be that Cooper's stereotypes are more complex because they were to some extent still in formation at the time of his writing, insofar as the intercultural contacts from which they sprung were more tangibly still occurring, while the stereotypes available to the creators of *Dances with Wolves* have been considerably further distilled from their historical context. At the same time, the genre of the novel makes it possible for Cooper to include a garrulous old man who is disillusioned with civilization but still intensely interested in human nature, and who can phrase in general terms issues which remain largely personal in the musings of John Dunbar.

The bolder simplicity of the film, moreover, can I think be related to the other obvious difference between the two stories, the greater confidence with which *Dances with Wolves* articulates White guilt



A bison at Maxwell Game Preserve

over the destruction of the prairie and its original inhabitants. *The Prairie* and *Dances with Wolves* have an important element in common in their relatively radical and sympathetic portrayals of the Plains Indians: both assert the superiority of the Native Americans' land ethic and reject the prevailing psychological fear of interracial rape, even implying that White women are more seriously threatened by the violence of White men. Yet I would assert that the accuracy of the two texts' portrayals of the Plains Indians (although an important issue) is less at stake than what those portrayals say about the texts' assumptions concerning human nature at large. Here again, *Dances with Wolves* is both quicker to simplify and less equivocal in its condemnation of the tendency of history. Natty Bumppo laments the rapidity with which the settlements are deforested; Dunbar observes the wasteful and pointless slaughter of hundreds of bison. Cooper shows us a white woman abducted by an obscure slave trader and rescued by her husband; Costner exposes the mistaken vindictiveness of the U.S. Army in pursuing the liberation of White "captives" from Native American hands.

The film, then, by sticking to the most dramatic and clear-cut injustices of the tragic but still complex historical period, is able to give fuller expression to the anger we now feel in contemplating those events. Yet neither story succeeds in resolving the human dilemma both address. *Dances with Wolves* ends with the imminent completion of the story we know so well, the slaughter of the Sioux and the triumph of the crasser and more atrocious side of the White mentality; *The Prairie* closes with the death of the old trapper among the peaceful and adoring Pawnee. The squatter family returns to the East in humble disgrace, but again, peaceful integration of the two opposing cultures has tangibly not occurred; any reconciliation is only partial or temporary or both. One comes away from *Dances with Wolves* wishing blindly that the greater number of the Whites who met the Native Americans at the frontier could have been the moral, sympathetic, honest, Christian representatives of the race. *The Prairie*, by contrast, is more realistic insofar as it is more detailed, acknowledging—or perhaps just portraying more completely—the fundamental contradictions and hypocrisies of American culture that have produced immoral people capable of atrocious acts, and paying greater tribute to the ambiguous variety of human nature.

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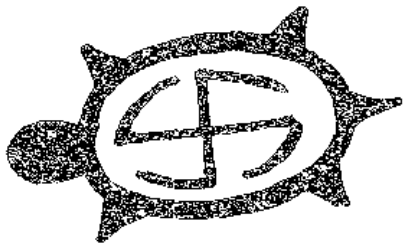


Gary Snyder: Dimensions of a Life

Jon Halper, ed. Sierra Club Books, San Francisco, 451 pp., paper, $17.00.

Dimensions of a Life, published in honor of Gary Snyder's 60th birthday, is a collection of 64 essays and reminiscences. The book finishes with the following essay, reprinted by permission.

Everlasting Life by *Wes Jackson*

We can take part of the credit here in Kansas for Gary Snyder, for in a way he is a child of the prairies of central Kansas. His great grandmother is buried thirty miles west of here near the ghost town of Carniero near the old emigrant wagon road by a big stone that once had a child's hand engraved on it.

But that's just to establish a connection.

In 1971, some California friends said I would like Gary Snyder's poetry. I had not read any of it. I liked more than his poetry; I liked his essays, too. Like countless others, I felt an immediate kinship with Gary, partly because I had long held a strong interest in the upper Paleolithic, and he did, too. Some of my friends (and more of my enemies) said I was too preoccupied with the idea of what it meant to be hard-wired for countless Paleolithic predispositions. By discovering Gary Snyder, I had one more in my corner willing to speculate on what life must have been like following the retreat of the ice and what that means to us moderns.

Gary's writings have given me and countless others the courage to seriously think about the life of the gatherers and hunters and the nature of their landscapes before agriculture. An extension of this interest contributed to my thinking of an agriculture in which nature is the measure. We have included that thinking into a philosophy here at The Land Institute, a philosophy which is now the foundation for all of our research. We look to the unplowed native prairie as an analogy when we design our experiments each January.

The poets in my life seem to have honed my thinking even more than agriculturists and naturalists, even though I don't read as much poetry as I do, say, scientific papers, but Gary Snyder and his work (along with Wendell Berry) hover around here every day guiding my thoughts and actions.

There is a law, I think, a law which implies that our "values dictate genotype." I know there are Chicago Board of Trade genes in our major crops now, ensembles of genes that would not exist were there no Chicago Board of Trade. There are also computer genes and fossil fuel wellhead genes—nucleotide units arranged to accomodate human desire and needs. It pleases me to realize that, in the plant species with which we work, one day we will begin to accumulate "Gary Snyder genes," ensembles of genes that would not exist if Gary Snyder, his writings, and his conversations had never existed. It is pleasant to contemplate a future in which every spring, as perennial roots push forth new growth, we will witness the resurrection of Gary Snyder in every plant body, and if that's sustainable, it will be an everlasting life. Think of that: the resurrection of the body and of the life everlasting. To Gary Snyder, and Buddhists everywhere—you're welcome.

Debating the values that could dictate genotypes. From left: Tim Coppinger, Adam Davis, Sarah Williamson, Mark Saville, Dave Griffin, Michelle Mack, Teresa Jones, Laura Sayre, and John Craft.

Considerations for a Sustainable Society

Newspaper Bedding for Cows

Michelle Mack and Volker Wittig

"We like to keep up on the news, and we like to keep our cows up on the news as well." —Tiz Williams, in *Hoard's Dairyman*.[1]

In Salina, Kansas, the League of Women Voters' bi-monthly recycling sweep trucks an average of ten tons of newspaper down Interstate 70 to the trash mainline of Kansas City. A contrast is the Brookings, South Dakota, recycling program. There, Boy Scouts and other re-use-minded citizens carry their newsprint as far as the next dairy barn, where it is used to bed cows.

Keeping up on the news has become imperative. Market demands have molded newspapers into a condensed and readily available means to keep us aware of rapid and ephemeral change. But there's a trade-off for quick information: today's news is tomorrow's garbage. In recent years, recycling has been touted as the solution to overflowing landfills. Recycling, however, seems to be more of an urban solution, a solution for areas with a high density of consumers, transportation, and industry.

The geography of the Midwest leaves few choices for the disposal of newspaper. Landfills are not a sustainable solution for the disposal of organic material. Additionally, transportation from rural and remote areas to recycling hotspots can be consumptive of resources.

Newspaper bedding in dairy barns is an alternative to recycling. It can be a local and creative way to reuse newspaper, and is an economically viable alternative to conventional straw. Land interns Volker Wittig and Tim Coppinger recently visited the South Dakota State University (Brookings) Experimental Barn to explore their newspaper bedding system and ask questions about its sustainability.

Involved are 80 dairy cows, half of them bedded on newspaper, half on straw. According to Dr. William Foster, Assistant professor of Dairy Sciences and leader of the project, it is primarily a study of cost feasibility and cow comfort.[2]

In Brookings, the newspaper bedding system begins with Boy Scouts collecting papers from private homes and the SDSU Greens collecting on campus. This yields more than enough to supply each of the 40 paper-bedded cows with about five pounds of shredded paper per day, which works out to ten days of bedding per ton of paper. On the market, newspaper is currently bought at $10 per ton, compared to small-grain straw, the conventional bedding material, at $60 per ton.[3] "Here alone," said Foster, "farmers could save 85% by switching." And newspaper is often available cheaper or free through churches, recycling centers, and other civic organizations.

In the Experimental Barn a shredder powered by an eleven-horsepower combustion engine adds chopped paper to the open stall three times a week. The shredder, purchased new for about $2100, can chop 100 pounds of straw per minute; it takes four to five minutes more to chop the same mass of paper. The cows don't seem to mind the extra time and noise required to chop the paper into one-inch-square pieces. Chopping paper produces much less dust than straw, and the squares of paper absorb more moisture and smell; a real plus in dairy barns where excess moisture provides a growing medium for bacteria that cause infections such as mastitis. According to the Iowa State University (ISU) extension office, field tests have shown newspaper ink to have bactericidal effects and to lower fly levels.[4]

But ink strong enough to kill pests gives newspaper a more aggressive nature than straw, raising questions of environmental health: What effects could pest-toxic components have on cows?

Cows have a tendency to snack on their bedding, making up to two percent of their diet, according to researchers at Cornell University.[5] Studies have been done where cows were fed diets consisting of ten percent black and white newspaper—to no ill effects, according to the Institute for Comparative and Environmental Toxicology at Cornell. Though no abnormal levels of mutagenic substances or heavy metals were found in the paper-fed cows' milk, there are cautions. Use of colored ink—especially in advertising supplements—is not regulated and has not been tested on cows. Dioxin levels (used in paper bleaching) have not been tested either.

Newspaper ink rubs off on the knees and teats of cows, and, though considerably less dusty than straw, chopped paper dust can get snorted up cow noses. The newspaper industry's change to safer, soybean-based inks in the early '80s has reduced toxicity, but the carcinogen polycyclic aromatic hydrocarbon (PAH) is still present and plays an unknown role.[6]

And though SDSU and ISU are supportive of newspaper bedding, the New Jersey Department of Environmental Protection[7] and Cornell[8] are more cautious, calling it a promising substitute but refraining to issue any recommendations until more research can be done.

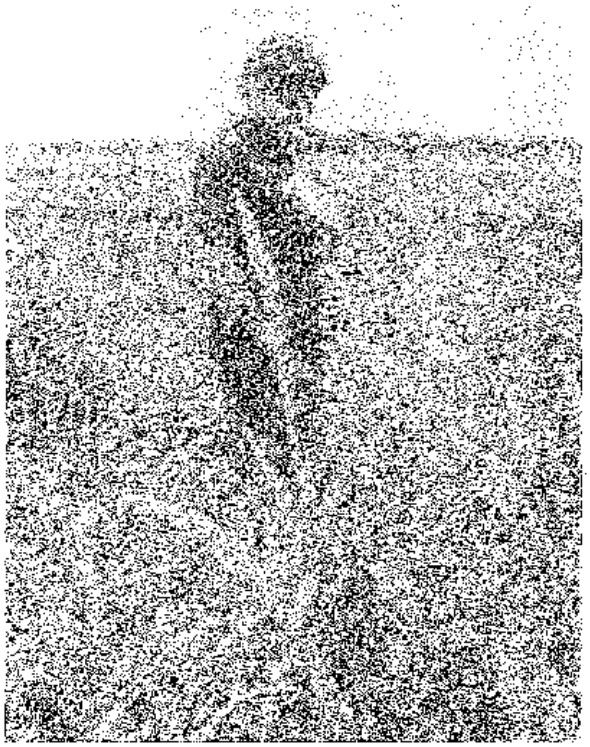
Once a week, or, if necessary, more frequently,

the newsprint bedding is removed from the research barn's open stall and deposited on the manure pile. From there, the semi-composted cellulose sludge is spread onto the fields with a regular manure spreader, much like straw manure. As the post-barn handling of the paper does not differ from that of straw, there are no extra costs.

Environmental costs of newspaper mulch are less clear. Heavy metals don't seem to be a problem. According to Cyane Gresham of the Rodale Research Institute, the heavy metal level in newspaper mulch is comparable to that of yardwastes.[9] A University of Minnesota study indicated that most land can support a 70-year application of up to 100 tons per acre of mixed paper before the addition of heavy metals to the soil becomes a "concern."[10] Another concern is the slow breakdown of pH. If newspaper mulch is not completely composted, the acid paper can take a long time to decompose. Environmental problems associated with dioxins and PAHs are again unclear.

The mission statement of USDA research is to "establish a high-yielding agriculture that also supports a quality environment and conserves energy."[11] It is clear that SDSU's newspaper bedding research fits right in. ISU states that newspaper could provide a consistent, efficacious, and cost-effective bedding source, which may "transpire to economic development in local communities."[12] Locally printed and circulated newspaper could be processed and marketed locally as bedding, both keeping and creating jobs in rural communities. Since bedding straw comes from small grains, straw farmers who were edged out by newsprint would still have a commodity. SDSU suggests that leaving straw in the fields would be a step towards increasing the organic matter content of the South Dakota soil, which has lost forty to sixty percent of its organic matter since the sod was broken at the turn of the century. SDSU also offers a less-sustainable alternative: changing land use away from straw would give farmers the option of switching to more profitable crops, such as corn or alfalfa. Storage space, labor, and machinery would also be freed up for other more high-yielding uses.

As we left the comfortable cows of the SDSU dairy barn, we found ourselves musing over the creativity of the bedding system as a recycling alternative; keeping wastes, jobs, and resources local are necessary steps towards sustainability. But as we got farther down the road and closer to home, we began to ponder Foster's last statistic. If all ten million U.S. dairy cows were bedded down on paper, sixteen percent of our discarded newspaper would be used up.[13] What are we going to do with the other eighty-four percent? We're back again to the question of sustainability in a culture that believes in unlimited growth. Should we add cows to the list of those subsidized by the ancient forests of the Pacific Northwest? It becomes clear that our only choice is to reduce.



Volker Wittig studies leymus and eastern gamagrass in the perennial polyculture experiment.

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John Simpson: A Long-time Friend of The Land

Tom Mulhern

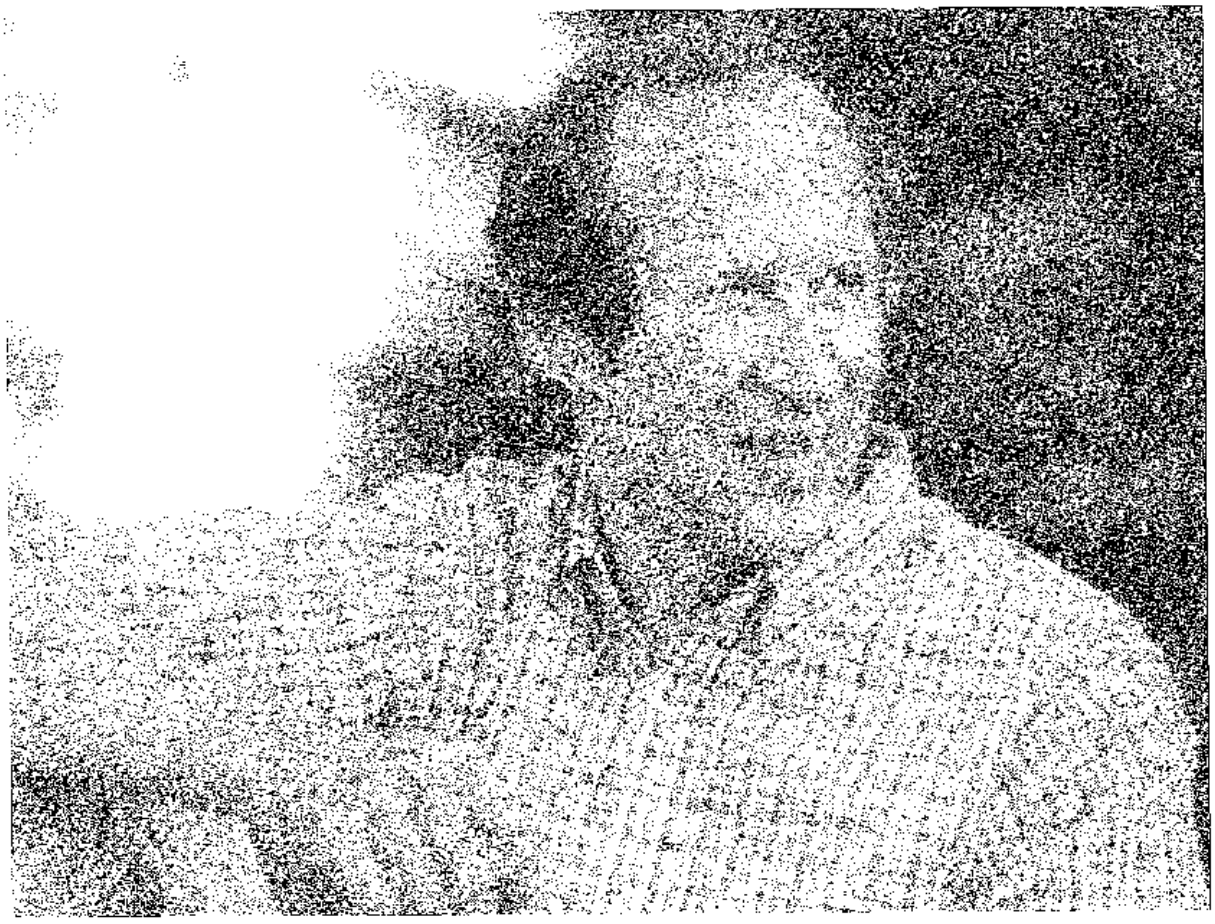
John Simpson has been a friend of The Land Institute about as long as anyone. He was born and raised in Salina, and he knew and admired Wes Jackson from the early days of Wes's teaching at Kansas Wesleyan University. When Wes and Dana came back from California to start The Land Institute in 1976, John Simpson was one of a small handful of local people who encouraged and supported their efforts. That encouragement and support continues to this day.

"I've always been attracted by the long-range focus of The Land Institute" says John. "A long-range focus is what it will take to solve our environmental problems, and there aren't many groups or individuals with that kind of a view. Most take a more immediate approach."

The development of his own career as a lawyer was something of a long-term effort on John's part. He started out with an accounting degree from the University of Kansas, spent two years in the Navy, worked with a CPA firm for two years, then began working with the grain business founded by his father. John's father was a veterinarian and a school teacher who ended up in the grain trade, and John went into accounting as a way to support the family business. After he had been there four years, the business was sold and John decided to go to law school at the University of Kansas.

John then practiced law for several years in Salina, where he became a partner in the firm Kennedy, Berkeley, Simpson and Yarnevich. He got involved in politics, starting with a four-year stint on the Board of Education in Salina. In 1971 he was elected to the Kansas State Senate, and he served as a State Senator from 1971 until 1979.

John was a strong supporter of environmental protection at a time when there was less attention paid to environmental issues than today. He was effective in the day-to-day business of political compromise and decision-making, but he also helped stretch the environmental consciousness of his fellow legislators. For example, he introduced a bill in the Kansas Senate, based on a similar law in Michigan,



John Simpson

that would have given individuals standing to bring lawsuits to protect natural resources. The idea was to provide additional legal means for environmental protection. That bill, although it never became law in Kansas, shows the pragmatic idealism that characterized John's political life.

The same kind of idealism led him to take on incumbent Bob Dole as the Democratic candidate for U.S. Senator from Kansas in 1980. Dole won re-election. John hasn't sought elected office since that time; instead, he expresses his keen interest in public policy through other channels.

One of these channels is his law practice. At age 46, John left his home in Salina and moved to Kansas City. There he has developed a law practice that focuses on environmental, civil liberty, and public interest issues. According to John, "These things are now more important and more interesting to me than the conventional business law that I did earlier in my career."

John also provides support to the efforts of the Kansas Natural Resource Council (KNRC). KNRC is a membership organization that lobbies on environmental and resource issues at the state level. KNRC is the only full-time staffed natural resource organization in the state capital, and John Simpson is their primary source of legal support.

John, his sister Sarah Dean, and their families own several Kansas farms which they rent to farmer-tenants. During the past three years, they have been working with the farmers to convert to more sustainable and organic practices, while still trying to maintain a reasonable income. "It's not been easy" John says. "The system just doesn't emphasize a more sustainable approach, and we've really had to scratch around to get information and support. However, I feel we've made some reasonably good progress, and we hope to keep getting better with time and experience."

John gives generously of his time and experience as a member of the board of directors of The Land Institute. He has served on the board from the beginning, and recently accepted the position of Chair for the coming year. He has been a consistent presence and a strong voice for an active public policy role on the part of The Land.

When asked to evaluate current environmental public policy action at the state and federal level, John says, "Things are moving too slowly." He feels it gets back to politicians being too shortsighted and not taking the longer view. "They're looking for the quick economic return and thinking about the next election, instead of looking ahead at the problems that are coming. We need politicians who are willing to be leaders of the public rather than just followers of public opinion."

Fall Visitors' Day is October 13

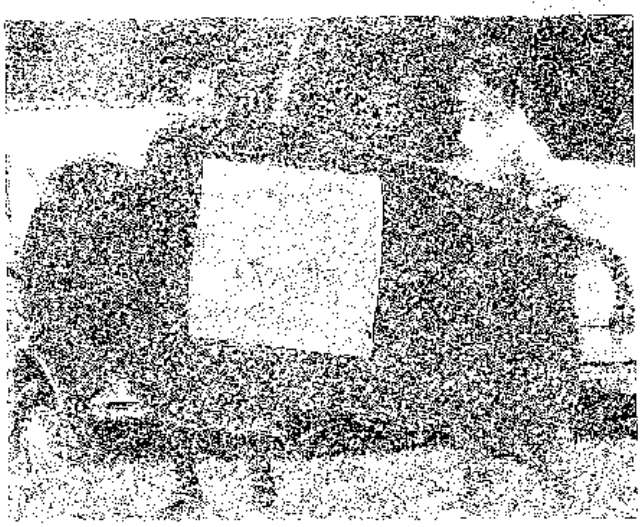
The Land Institute invites you to learn first-hand about our work in sustainable agriculture during our Fall Visitors' Day Open House, Sunday, October 13th, from 1 to 5:00 p.m. The day will include tours of the research plots, prairie walks, children's activities, and a slide show. Refreshments will be served, and admission is free.

From time to time, Friends of The Land ask about including The Land Institute in their will. It's a wonderful way to make a lasting contribution to the long term work of The Land Institute, and it's easier than you might think. You simply include a bequest in your properly-executed last will and testament. Listed below you'll find sample language for two kinds of bequests to The Land Institute, unrestricted and restricted.

• Unrestricted Bequest: I give [describe dollar amount, property to be given, or proportion of residuary estate] to The Land Institute, Salina, Kansas, a Kansas not-for-profit corporation, for its general educational and charitable purposes.

• Restricted Bequest: I give [describe dollar amount, property to be given, or proportion of residuary estate] to The Land Institute, Salina, Kansas, a Kansas not-for-profit corporation, to be used first for [describe the designated program or activity that you wish to support: Research Program, Intern Program, and so on] and secondly for The Land Institute's general educational and charitable purposes.

Please contact Tom Mulhern at The Land Institute if you'd like more information about making a bequest to help sustain the work of The Land in the future.



The 1992 Intern Program

The Land Institute is offering up to nine internships in sustainable agriculture for the 43-week term beginning February 17 and ending December 11, 1992. Applications for next year's program are due by December 1, 1991. Candidates should be college graduates or upper-level undergraduates.

Please write for information on The Land's intern program and how to apply.

Left: "Follow the buffalo to the prairie" reads the sign on this plywood bison's side. Adam Davis and Harrison Pollak lead children to The Land Institute's "prairie in the park" at the Smoky Hill River Festival.

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The work of The Land Institute is based on a vision of a way of agriculture—and a way of life—that protects the long-term ability of the earth to support a variety of life and culture. If you share this vision and would like to get more actively involved in making it a reality, please clip and return the form below to The Land Institute.

YES! I WANT TO JOIN
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Here's my membership gift for sustainable agriculture and good stewardship of the earth.

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PLEASE SEND ME INFORMATION ABOUT:

___ Establishing an endowment fund
___ Making a gift of stock
___ Receiving income from my gift
___ Making a gift through life insurance
___ Generating a tax deduction from my personal residence or farm
___ Providing for The Land Institute in my will
___ Making a gift of art or antiques
___ Setting up a memorial fund
___ Joining the Friends of The Land

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