

THE LAND REPORT

Number 35

Summer 1989

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Number 35

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Photographs in this issue by Land people. Prints on pages
5, 6, 10, 13, 17, 21, 22 by Bernie Jilka.

On the Cover

This summer interns and staff have met on Monday and Thursday mornings to plan research and garden work. A chalkboard attached to the west side of the classroom building helps keep the work organized between meetings. Problems and changes in schedules also are noted on the board. Terry Evans photographed the chalkboard, as well as the scenes on pages 32-33 and the compost pile on the back cover. This focus on the particulars of our surroundings provides a unique perspective of The Land Institute.

About this Issue--

Yes, we did skip the spring issue of *The Land Report*. The main reason was that the editor who does the layout and production did not learn Pagemaker, our new publication design program, until this summer. A special contribution last winter allowed us to purchase a new computer and laser printer, along with the Pagemaker program, for *The Land Report* and *Research Report*. But the hours of concentration necessary for this editor to learn Pagemaker weren't available until after the Prairie Festival and the board of directors' meeting. Although the program can do many tricks not applied in this issue, we now have enough experience with the basics to produce subsequent issues according to schedule.

Those reading *The Land Report* for the first time should know that the purpose of this publication is to inform readers about the work of The Land Institute, the people who do that work, and the ideas and values that guide us. The articles reflect our interest in a broad spectrum of issues that relate to the sustainability of agriculture, including natural resources conservation, environmental quality, human health, and the viability of rural communities. Staff, interns, members of the board of directors, and Friends of The Land contribute articles.

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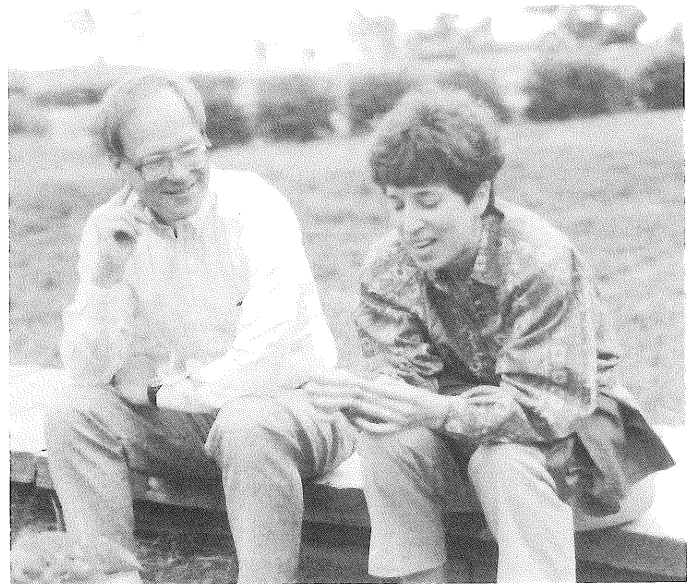
THE LAND INSTITUTE IS A NON-PROFIT EDUCATIONAL RESEARCH ORGANIZATION DEVOTED TO SUSTAINABLE AGRICULTURE AND GOOD STEWARDSHIP OF THE EARTH.

BOARD OF DIRECTORS: Paula Bramel-Cox, Bruce Colman, Mari Detrixhe, Terry Evans, Wes & Dana Jackson, Ivy Marsh, Jim Mayo, Conn Nugent, John Simpson, Alice Waters, Donald Worster
HONORARY BOARD: Wendell Berry, David Brower, Herman Daly, David & Joan Ehrenfeld, Alan & Joan Gussow, Frances Moore Lappe, Amory B. Lovins, Gary Nabhan, Karen Reichardt, Paul Sears, William Irwin Thompson, Gary Snyder, John Todd.

At The Land



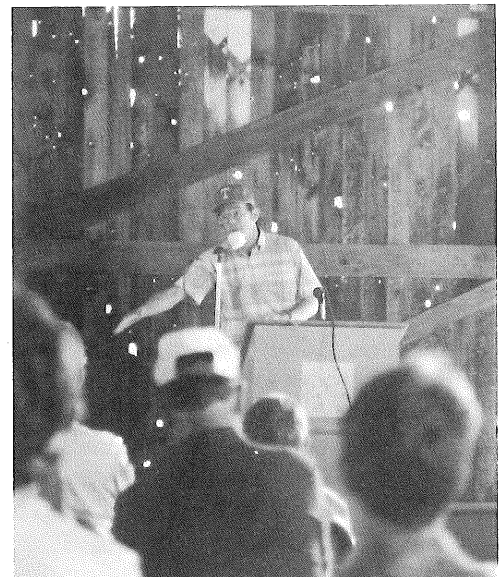
Donella Meadows



Paul Gruchow and Terry Evans



Sunday morning Meditation led by Land Interns



Rafe Pomerance

Prairie Festival 1989

"The Global Environment: a Prairie Perspective" was the theme of the 11th annual Prairie Festival at The Land Institute on May 26-27.

The celebration of the prairie ecosystem and prairie folk began on Friday evening, May 25, with *Prairie Miracles*, a slide show produced by Sounds of Kansas, followed by a campfire gathering and refreshments.

On Saturday morning participants experienced the prairie in walks on the Wauhob Prairie and The Land's 90 acre prairie reserve led by Jon Piper, staff ecologist, and Kelly Kindscher, author of *Edible Plants of the Prairie*. Jan Garton talked about birds that migrate through Kansas, and Terry Evans introduced her new exhibit of prairie photographs. *Earth, Air, Water*

and Fire." After general tours of The Land Institute and special tours of the community garden and The Land's commercial vegetable garden, everyone gathered in the big barn to hear Paul Gruchow from Worthington, Minnesota. The author of two books, *Journal of a Prairie Year* and *The Necessity of Empty Spaces*, Paul charmed the audience with stories about small farm life on the Minnesota prairie and his father who respected empty spaces. Saturday afternoon speakers challenged participants to come to grips with global environmental problems: Donella Meadows's topic was "Only One Earth and We All Count," and Rafe Pomerance spoke about "Warming the Air: Changing the Climate."

Donella Meadows, principal author of the *Limits to Growth* study which triggered worldwide discussion about the interactions of population growth, pollution and natural resources, is now an adjunct professor at Dartmouth College and a syndicated columnist ("The Global Citizen"). Rafe Pomerance, former President of the Friends of the Earth, focuses on global warming issues for the World Resources Institute in Washington, D.C.

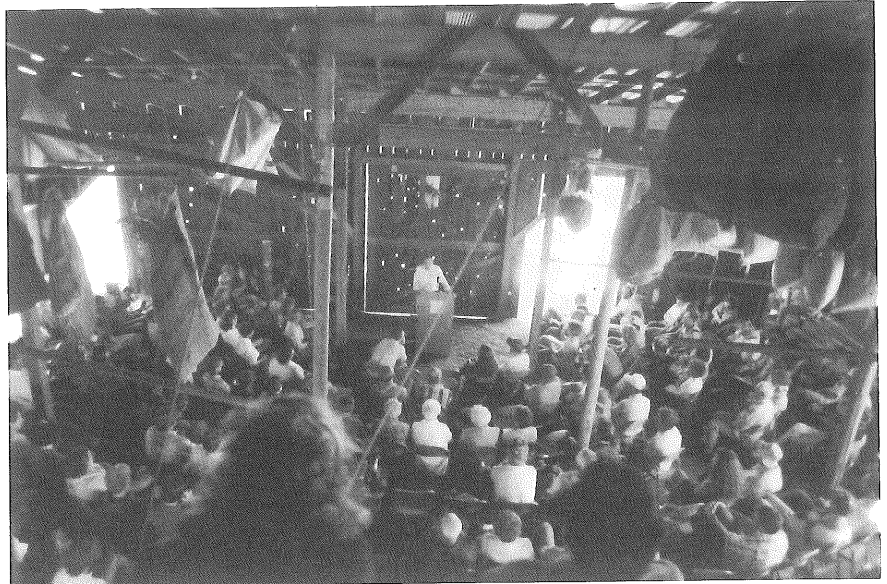
About 150 people toured The Land's experimental plots later in the afternoon to learn about research to develop mixtures of perennial grain crops. Others attended a presentation by Carl Esbjornson, Michigan State University, on "Reading the Prairie in American Literature" or a session on "Sustainable Agriculture in Federal Farm Policy" led by Ron Kroese of the Land Stewardship Project and Larry Krcil of the Center for Rural Affairs. Another group discussed the 20th anniversary of Earth Day in 1990.

Saturday evening was mostly fun and celebration, made possible by Ann Zimmerman and the Saturday Night Land Band.

*"The Earth, the air, the fire, the water,
return, return, return, return"*

The first line of this folk chant organized the festival. While Saturday programs centered around "the earth, the air," Sunday programs emphasized "the fire, the water." Mari Detrixhe, formerly a research associate in energy at The Land and later the director of the Kansas Natural Resources Council, opened the Sunday program by addressing "fire" in her talk, "Energy Realities: a Prairie Perspective." Don Wilhite, director of the International Drought Information Center in Lincoln, Nebraska, spoke about a major water concern, "Coping with Drought."

Participants broke into smaller groups later in



Seats in the barn loft were popular.

the morning, with opportunities to consider the impact of farming methods on water quality in presentations given by Mary Bruns, former Land intern and now a fellow at the Office of Technology Assessment in Washington D.C., and Tim Amsden from the Environmental Protection Agency, Region VII, and the implications of biotechnology on rural America led by Gabriel Hegyes and Larry Krcil of the Center for Rural Affairs. Don Wilhite, Rafe Pomerance and Wes Jackson engaged participants in a discussion about ecological disasters. Others chose to see the new National Audubon video special about the Platte River and the sand hill cranes.

After a picnic lunch catered by the Prairieland Food Co-op, Donella Meadows again guided the audience into the realm of worldwide environmental issues, focusing on examples of cooperation and accomplishment in different countries around the world. Paul Gruchow, in the final talk of the festival, brought the focus back to the individual and the prairie perspective.

This summary of the program does not give the reader a very thorough picture of what really goes on at a Land Institute Prairie Festival. It misses the personal exchanges of information and ideas among participants, the constant presence and activity of children, the landscape dotted with bright camping tents, the anticipation of people waiting in line as tables are loaded with food for the Saturday evening potluck, and the hard work of Land Institute interns and staff to have chairs, sound system, information and cars where they are supposed to be. The engagement of participants, who year around work in their communities for sustainable agriculture, environmental quality and peace and social justice, give the Prairie Festival its special inspiration and quality.

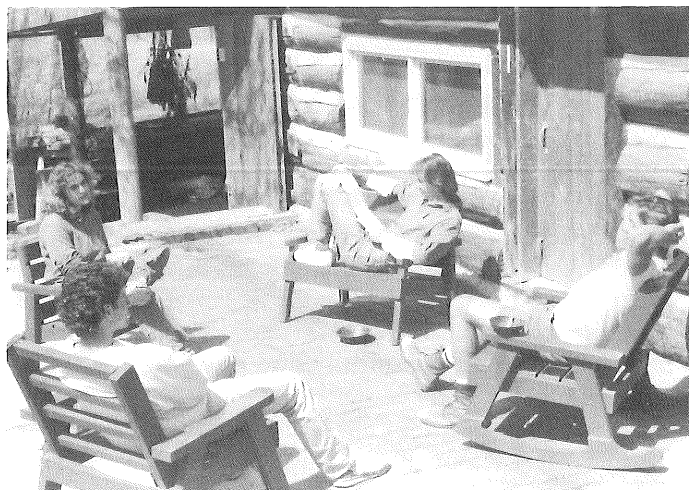
Intern Program in 7th Year

For 43 weeks, from mid-February to mid-December, eight to ten college post-graduates put their minds and bodies to work at The Land Institute. Background classes in prairie ecology, plant breeding, and plant pathology prepare them to carry out experiments which the staff designed during January. Discussions about the problems of industrial agriculture and the goals for a sustainable agriculture put the research program in context. Morning class sessions in the spring and fall (four each week) also cover a broad range of topics that are considerations for a sustainable society. During the afternoons, the interns prepare the soil, plant, weed, and water the experiments. They take data and analyze it. They also help with construction and maintenance of buildings and grounds. Regular morning classes do not continue during the summer, but interns sometimes lead discussions or present information about topics of their own choice. Summer programs in the past have included several sessions with visiting scholars.

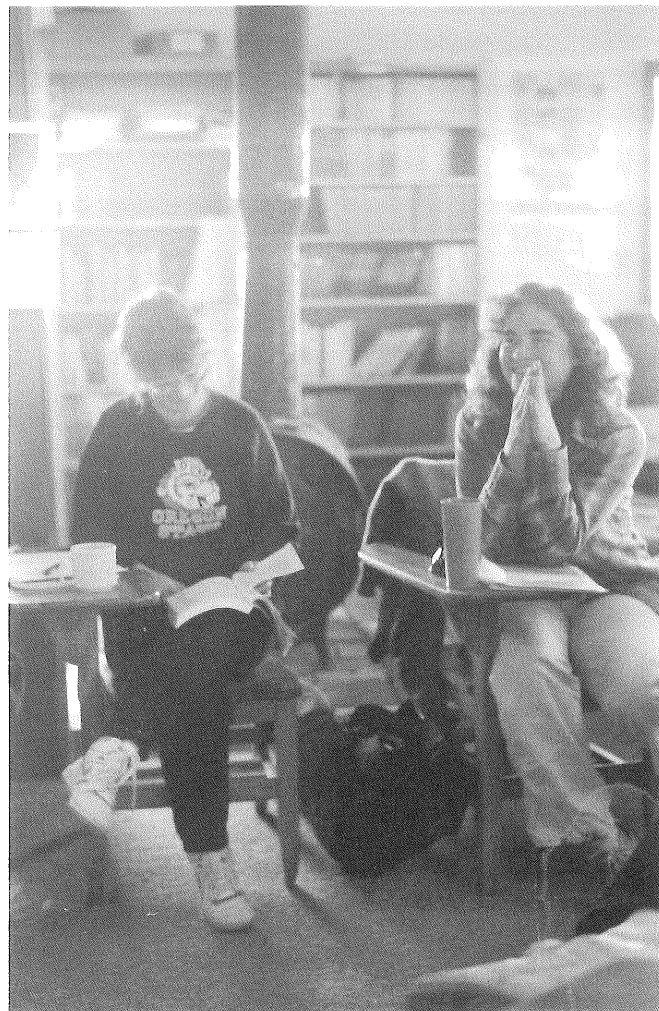
Persons with undergraduate degrees in biology, agriculture or horticulture are encouraged to apply, but The Land accepts interns from a variety of academic backgrounds.

Each intern receives a stipend of \$125 a week. Interns do not live at the Institute, but find and share houses or apartments in Salina. The Land is about five miles from Salina, so they bike or car-pool out each day. They work in the community organic garden at The Land and eat the produce. There is a kitchen in the classroom building that can be used to prepare lunches. Most interns join the Prairieland Food Co-op in Salina.

Applications for 1990 should be in by December 1, 1989. Write The Land for information about the application procedure.



Colin, Beth Jake and Ed have lunch on the patio.



Cindy and Beth in class.

1989 Interns

- Brooks Anderson:** B.A., cultural area studies, College of Wooster (Ohio)
- Nancy Baumeister:** B.S., horticulture, Oregon State University
- Pamela Cabbage:** B.S., biology, Univ. of Maryland
- Raymond Epp:** B.A., religious studies, University of Winnipeg (Canada)
- Cynthia Hurlbutt:** M.S., agricultural economics, Univ. of Massachusetts
- Bernadette Jilka:** B.S., horticulture, Kansas State University
- Colin Laird:** B.A., biology, Brown University (Rhode Island)
- Edward Orris:** B.S., agricultural engineering, Pennsylvania State University

Research Fellows (2nd year interns)

- Beth Gibans:** B.S., natural resources, University of Michigan
- Jake Vail:** B.A., political science, Ohio State Univ.



Nancy and Beth watch Ed, Brooks, Colin, Ray and Jake try out the hay rake.

News from Land Alumni

Frequently someone asks what our former students and interns do after they leave The Land Institute. On our tenth anniversary in 1986 we published a directory of former interns, and we plan to update that in 1990. Nearly every week a letter arrives from a former intern telling about his or her work, schooling or travel. Some samples follow.

Carol LaLiberte ('85) wrote about the place she works, Land's Sake, a nonprofit organization in Weston, Massachusetts. It involves young people in the community in organic gardening and landscaping.

Pat Dreese ('77) wrote about his new son and his work at the Kellogg Company in Battle Creek, Michigan.

Helen Attowe ('84) told about doing private consulting on organic pest management for orchards through her own company, Biodesign. She also manages the 200 acre Oclin Farm, which produces organic fruit and vegetables near Medford, New Jersey.

Dana Price ('84), a Peace Corps volunteer in Thailand, described her agricultural projects and the farmers and neighbors she sees every day.

Lois Braun ('85) wrote from Lesotho, Africa where, as a Peace Corps volunteer like Dana, she

helps villagers plant gardens and trees.

Rob Peterson ('86) described the locust invasion in Senegal where he writes and publishes a newsletter (in French) called *Entre Nous* for Rodale International. His goal is to foster information sharing on ecologically sound agriculture for Africa.

Pam Nelson ('79) survived the extreme winter in Kotzebue, Alaska, where she teaches high school science, and even managed to "put about 450 miles on the dog team."

Alisa Coffin ('81) wrote to us from Israel where she has been working on a vegetable farm.

Jess Ennis ('87) described a Wisconsin Rural Development project funded by a Low-Input Sustainable Agriculture grant from the federal government which he coordinates. Working with another agricultural economist from the University of Wisconsin, he is doing a study with thirty farmers, half of whom farm more or less organically and half who routinely use chemicals.

Caton Gauthier ('88) wrote to tell us about her first job after leaving The Land Institute which is at The Claggett Farm near Upper Marlboro, Maryland.

Keep those cards and letters coming!

Management Structure of Land Institute to Change

In September, 1989, The Land Institute will be thirteen years old. The board of directors and staff dealt with the growing pains of this adolescent organization in a two day meeting held June 3-4. Facilitating the discussions was Susan Gross of Management Assistance Group, a Washington D.C. consulting firm serving non-profit organizations. Prior to the meeting, the staff and board had read a report with recommendations prepared by Susan Gross who studied documents and publications and spent three days at The Land Institute in April interviewing all the staff and several board members.

Questions which the consultant dealt with in the report included the following:

- How can the organization reduce its dependence on its founders?
- What kind of organizational and management structure is now needed?
- How should the staff be structured and how should roles and responsibilities be defined?
- What should be the role of the board of directors?
- What other steps does the Institute need to take in order to strengthen its management, internal functioning, and capacity to sustain itself as an institution?

During most of the first day the discussion centered on clarifying the purpose of The Land Institute and discussing activities which carry out the purpose, the goal being to develop a framework for setting priorities in the use of time and resources.

On the second day, the group reached consensus on changes in management structure, some of which are listed below.

1. Wes Jackson will become President of The Land Institute. His responsibilities will continue and increase in the area of fundraising and public communication through speaking and writing. He will be responsible to the board of directors for the overall budget and operation of The Land Institute, but will not be involved in the day-to-day management of staff and programs.

2. The management of the Institute will be handled by a Management Team. Dana Jackson will be one member of the team; the others will be chosen by the staff with the approval of the executive committee of the board of directors.

3. Individual staff members will assume more responsibility for decisions about their own work and coordinate their activities with other staff.

4. The title of President of the Board of Directors has been changed to Chair of the Board. Mari Detrixhe was elected to fill the position of Chair for

the coming year.

5. The executive committee of the board (Mari Detrixhe, Terry Evans and John Simpson) will work more actively with the staff.

The processes for operating under this new system are yet to be worked out, but the staff has been meeting weekly and plan to have the new management structure in operation by the end of the summer.

The Land Institute is concerned with the long term ability of the earth to support a variety of life and culture. Our research to develop prairie-like grain fields is necessarily long-term. For The Land to continue operating with the long term in mind, it must work on its own sustainability by developing a broad funding base and strong leadership within the staff and board of directors. The organization took serious first steps towards these goals during the June meeting.

Staff Changes

---**Paul Rasch** left The Land the first week in June to take a new job at the Meadowcreek Project in Fox, Arkansas. Paul has had a long association with The Land Institute, first as a student in the fall of 1979, then as our appropriate technology intern. He left The Land in 1981 to attend Oberlin College, then traveled and worked in south Asia. He returned to Salina in 1987 and became the coordinator of our greenhouse design process, then the general contractor for its construction. Paul helped Brad Burritt and Danielle Carre get The Land's organic vegetable operation started last summer. At Meadowcreek Paul will be in charge of the agricultural part of the curriculum and coordinate the students' farm work. Paul is married to Sara Goering, and they have a son, Jacob.

---**Rob Fischer** resigned as operations manager in April to devote more time to woodworking and furniture making and to take a job in Lindsborg where he lives.

---**John Craft** became operations manager at the end of June. John has been teaching high school in Goessel, Kansas the past few years. John began working on wind electric generating machines at The Land Institute in the summer of 1977 and in a few years was recognized as one of the most knowledgeable and mechanically skilled persons in the wind energy business. The Windcraft, a machine he invented, can be seen on towers throughout Kansas, including The Land Institute. However, John is not coming to The Land Institute to work on wind generators, but to be in charge of repair and maintenance of all equipment and buildings. His versatility will make him an important asset to The Land Institute staff.

---**Tom Mulhern** joined the staff as Director of Development on May 1. Tom has been the Development Coordinator for Boston Aging Concerns-Young and Old United since 1987. From 1981 to 1987 he worked for the 18 county Area Agency on Aging located in Manhattan, Kansas. He was the executive director there from 1983-1987. Tom worked for Catholic Relief Services from 1976 to 1980, serving first as a full-time volunteer in Gambia, West Africa and then as director of relief and development operations for Gambia and Burundi from 1977 to 1980. Tom quickly put his professional experience and personal organizational skills to work for The Land Institute in May.

Board Membership Changes

Three members have retired from The Land Institute Board of Directors and three new members have been elected to three year terms.

At the annual meeting on June 2-3, the board of directors and staff members of The Land Institute expressed their gratitude to retiring members Karen Black, Orville Bidwell and Dwight Platt for the years of loyal service they have given.

Karen Black has been connected to The Land since the fall of 1971 when she and her husband John moved into the house Wes Jackson had built over the summer. The Jacksons moved to Sacramento, California, and the Blacks did finishing work on the house and planted grass and flowers. When Wes started the Institute in 1976, he asked Karen to be one of the founding members of the Board of Directors. Karen and John Black were among those first Friends of The Land who physically helped begin construction of a new classroom building after fire destroyed the first one in October 1976. A Salina attorney, Karen been a reliable counsel for The Land Institute, helping with all the land purchases over the years.

Orville Bidwell, professor emeritus in agronomy at Kansas State University has served on The Land Institute's board since 1983. Orville has been a member of the research advisory group and an important connection between Land Institute researchers and Kansas State University. Every group of interns has enjoyed learning about soils from Orville. (See page 22.) Orville has written for The Land Report and about The Land Institute for other publications. An article of his will soon appear in the Oberlin College alumni magazine about Oberlin students who have also been at The Land Institute.

Dwight Platt, a biology professor at Bethel College, has served three terms on the board of directors. He has always freely shared his expertise as a prairie naturalist with The Land Institute, as a Prairie Festival and Prairie Dedication speaker, and as a teacher about the Sand Prairie which he man-

ages for Bethel College. His perspective of The Land Institute's role in sustainable agriculture has been helpful to the staff.

Elected to fill the three vacancies on the board were Alice Waters, Donald Worster and Paula Bramel Cox.

Alice Waters is the proprietor of Chez Panisse, a famous restaurant in Berkeley, California, which serves fresh organic produce and meat from animals grown in a wholesome way. Most of the produce and meat are purchased from local farms and ranches. Ms. Waters is the author of the *Chez Panisse Menu Cookbook* and the co-author of several other cookbooks. She is a member of the board of directors of the Natural Resources Defense Council.

Donald Worster has been on the Honorary Board of Directors of The Land Institute for several years and twice has been a major speaker at the Prairie Festival. He is the author of *Dustbowl: the Southern Plains in the 30's*, *Nature's Economy*, and *Rivers of Empire*. For the last several years he has been a professor at Brandeis University in Waltham, Massachusetts. He will be moving to Lawrence, Kansas, this summer to take a position at the University of Kansas where he will teach Environmental History of North America.

The third new member of the board, **Paula Bramel Cox**, is an assistant professor and sorghum research geneticist in the Department of Agronomy at Kansas State University. Paula is a member of several professional organizations and has authored many professional papers. She has been a member of The Land Institute Research Advisory Group and has worked with Peter Kulakow and Land interns on sorghum breeding projects.

The next meeting of the board of directors will be on December 1-2 at The Land Institute.

Chevron Conservation Award

Dana Jackson received a Chevron Conservation Award at a dinner ceremony in Washington D.C. on May 17. The 35 year-old awards program honors outstanding contributions to the conservation of natural resources. It seeks to encourage those who have had little or no national recognition, as well as to honor veterans with long records of noteworthy achievement. The awards are presented in three categories: ten awards recognize professional conservationists; ten honor "citizen conservationists" whose activities are voluntary expressions of good citizenship; and five awards are given to nonprofit conservation organizations. Dana received a bronze medallion and \$1000 check for her work as a professional conservationist. Laura Benson, 1988 intern, nominated her for the award.

Conference to Discuss New Concept in Agriculture

The Rockefeller Brothers Fund has given The Land Institute a grant to host a two day meeting in October of highly-respected ecologists and agriculturists, representatives of the scientific press and mass print media, and individuals who influence agricultural policy at the federal level.

There is a groundswell of concern about the brittleness of industrialized agriculture in this country. People want to get agriculture back on its biological feet and away from the soil wasting, chemicalized, fossil fuel-dependent approach that industrialized agriculture has championed.

The Land Institute advocates approaching agriculture, including agricultural research, with nature as the standard. We would then judge agricultural practices by comparing their performance against the performance of natural systems. Information about how nature works at the ecosystem level would be applied to designing crop systems. Agriculturists would use the knowledge acquired by ecologists who study bogs and alpine meadows, unplowed prairies and deciduous forests, rainforests and marshes.

Invited participants at the conference will explore how the current new field of agroecology can engage more ecologists and make use of acquired knowledge in the discipline of ecology.

Questions to be discussed include the following:

a) How do we take such a discipline as ecology, a discipline which has been mostly descriptive, and apply this knowledge to agriculture where prescription is needed?

b) How do we begin to move ecology away from an emphasis on gathering pristine knowledge to the applied end of the spectrum?

c) How do we get agricultural researchers and ecology researchers to collaborate with one another?

d) At what point and how does the farmer fit in?

e) How do we explain the idea and express the importance of the idea to our policy makers and the public?

f) How can we encourage young scientists to enter this hybrid discipline?

g) How can we sustain funding during the long period before we begin to see significant beneficial results to the land and the farmer?

A desired outcome of this conference is an emphasis on nature-as-standard reflected in new positions in agroecology within the U.S. Department of Agriculture and agricultural universities. The ultimate benefits will go to the farmer and the consumer in a food system that is healthy for both people and the land.

Art Gallery Constructed

We have long wanted a proper place at The Land Institute to present art exhibits. Each Prairie Festival we have found a new location to display photographs, prints or pottery. The light has never been good nor the walls large enough to show works to good advantage. This spring a special contribution from a donor enabled us to partition off the back of the Krehbiel house garage and construct a real gallery. The rectangular room has large blank walls, and the slanting roof results in one high vertical space, which will allow us to show large works. New drywall, white paint and track lighting transformed the room into a proper setting for Terry Evans' photographs at the Prairie Festival, an exhibit called "Earth, Air, Fire and Water." Terry plans to arrange exhibits by other artists in the gallery several times a year. We can also use this room for scientific or historical displays.



Donella Meadows, Wes Jackson and Terry Evans (left center) in new gallery.

Visitors Get Involved

Three mornings a week during fall and spring, the staff and interns meet for an hour in the classroom for what we call a "warm-up." After work priorities for the day have been set and everyone has chosen which projects he or she will do in the afternoon, we take some time to discuss ideas, issues and current events. Topics frequently surface as a result of reading articles in our library or from listening to National Public Radio's morning edition. Once in a while visitors will attend warm-up, and frequently we ask them to talk about their work or projects.

Ianto Evans from Cottage Grove, Oregon was a visitor on April 17. He talked about his life and work at Approvecho, a resident community that produces eighty percent of its own food and teaches courses about permaculture. Approvecho has worked in several countries in Latin America and Africa teaching permaculture and promoting a fuel conserving cook stove for developing nations.

Alan Stovall, a professor in landscape architecture at the University of Georgia and a former Salina artist in residence, took part in warm-up on May 8. Alan reflected on his training under Ian McHarg, and talked about the importance of an ecological approach in developing land for human purposes.

One April day following "warm-up," our visitors Paul Sheldon and Christie Perala taught us Hopi, Croatian and Jewish rain dances. Paul and Christie are members of the Aman International Folk Dance Group from Los Angeles, and we had seen their spectacular performance at Marymount College in Salina on the preceding Saturday night. Our half hour of dancing out by the volleyball net did not bring



us rain. However, Paul reminded us that the Hopi perform their dances for days, not in one short period.

Visitors are sometimes invited to make presentations or take part in a discussion during the class period from 10:30 until 12:00 four mornings a week.

Craig Martin, a professor of ecology at Kansas University, spent a class morning talking about the

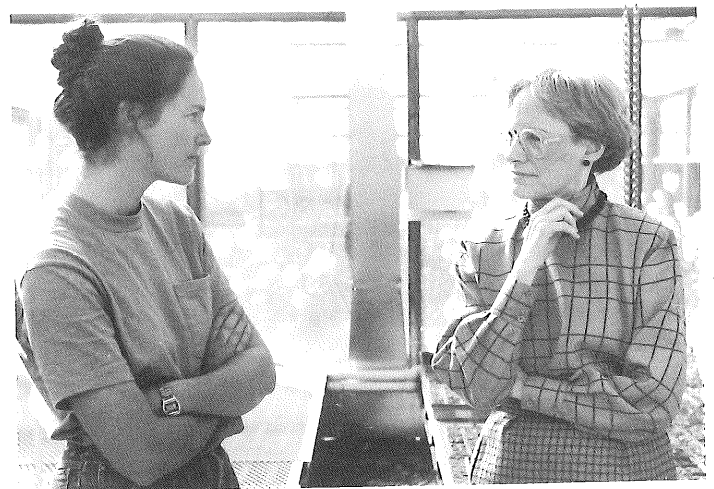
dilemma of university specialists finding the professional time and funds to address global environmental/agricultural problems, especially when the university reward system does not generally recognize such activities

Kenny Lee, state agronomist from the Soil Conservation Service office, talked about wind erosion during our class period on April 26.

Howard and Thelma Wright gave us a perspective of drought and farming realities in Nebraska during the 1930's, plus numerous tidbits of wit and wisdom, during class on April 27.

Don and Selma Duvick visited on June 26. Don talked about his work at Pioneer Seed International in Des Moines, Iowa, where he is currently vice president for research.

Many other individuals and groups visited this past spring and summer to learn about The Land as a place and to get an introduction to our research. Among those who toured The Land was Kansas Senator Nancy Kassebaum, who visited on the afternoon of March 31.



Danielle Carre explains organic vegetable production in the greenhouse to Senator Kassebaum.



Interns leave hoeing to meet Senator Nancy Kassebaum. Left to right: Nancy, Colin, Jake, Pamela, Ed and Bernie.

New Roots for Agriculture

The 1989 Experiments

Jake Vail

"Consult the genius of the place in all" urges Alexander Pope in his *Epistle to Burlington*. The 1989 research season is underway as we continue in our efforts to understand the genius of the prairie ecosystem and how its lessons can be applied to a sustainable agriculture. Such an approach led us to envisioning an agricultural system of perennial plants grown together in a polyculture. Considering such a perennial polyculture has given rise to four basic questions. All of our experiments this year address at least one of these:

1. Can perennialism and high yield go together year after year?
2. Can a polyculture of perennials outyield a monoculture of perennials?
3. Can such an agricultural ecosystem sponsor its own fertility, especially of nitrogen?
4. Can high yielding "domestic prairies" be put in place so that the problems of insects, pathogens, and weeds are sufficiently minimized?

In 1991 we will establish a large scale perennial polyculture in our 72 acre field along Ohio Street. In addition to exploring the above questions, this year's experiments (listed below) will provide us with some basic information on how to design this pioneering study.

1. Patterns and dynamics of native prairie.
2. Long-term seed yields of *Leymus racemosus* and *Desmanthus illinoensis*.
3. Plant-soil interactions.
4. Investigations into perennial polyculture.
5. Illinois bundleflower germplasm.
6. Evaluation of eastern gama grass germplasm.
7. Breeding Illinois bundleflower and eastern gama grass in monocultures and bicultures.
8. Levels of foliar disease on eastern gama grass in native populations, monocultures, and bicultures.
9. Seed yield and disease susceptibility of pistillate and normal Eastern gama grass.
10. Genetic variability in *Leymus racemosus*.
11. Perennial sorghum breeding.

1989 is the fourth year of an ongoing study of three native prairie sites at The Land Institute. Measuring annual above-ground growth and spatial and seasonal heterogeneity on very different soil types should give insights into prairie patterns and processes, and thus into what may be necessary for



John Piper and Jake Vail working on prairie study.

successful development of perennial polycultures. A new aspect of this study, which is being done this year by Pamela Cubbage, will be estimating annual seed production on the prairie.

Nancy Baumeister will be probing into plant-soil interactions in the second year of an experiment on the 72 acres. Last year three monoculture plots of Illinois bundleflower, eastern gama grass, and *Leymus racemosus* were established to examine how each of these perennials uses soil moisture and nutrients throughout the growing season and through the soil profile. Gypsum blocks buried at different depths and attached to electrodes measure soil moisture levels. To follow nutrient cycling we sample soil at different depths, then have the samples analyzed at Kansas State University. What we learn will help determine optimal planting densities and species mixes in our future large scale polyculture. Nancy will also be investigating perennial polycultures in a pilot triculture established three years ago. Again looking at Illinois bundleflower, eastern gama grass, and *Leymus*, but in this experiment planted together, we hope to get an idea of how long a polyculture can sustain itself, how yields vary within the plot, and how compatible the species are both spatially and temporally. We'll also be looking at insect populations, specifically following chrysomelid beetles which feed on Illinois bundleflower.

Illinois bundleflower is the focus of two experiments under the care of Raymond Epp, who will be examining genetic variation within this native perennial legume. 1989 is the second year of the Illinois bundleflower germplasm plot on the 72 acres, where 82 different accessions will be scored for such traits as vigor, growth habit, and seed yield. In observing this experiment last year we found a natural hybrid

occurring between a normal seed-shattering accession and an accession which produces mature non-shattering seed pods. This year we will plant and evaluate the F2 generations of this cross, and then plant its seed for future studies. Such a study of the inheritance of shatter resistance will serve as the basis for a breeding program selecting for lines of shatter resistance and high seed yield.

Another germplasm experiment has been initiated this year. Ed Orris will plant out and describe variation in over 300 accessions of eastern gama grass, the seeds of which were collected last summer from native populations throughout south-east Kansas and western Missouri. We will study variation both within and between natural populations in this experiment, to develop base populations for our gamagrass breeding program.

Cindy Hurlbutt has the best of both worlds, as she will be looking at Illinois bundleflower and eastern gama grass in monoculture plots and also grown together in bicultures. This study, which was established last year, will be important in determining the dynamics of this native grass-legume mix as we compare how different cropping systems affect growth pattern, seed yield and disease incidence in each species.

Eastern gama grass is a relative of corn, and serves as host to two fungal pathogens also found on corn, anthracnose and leaf rust. Much is therefore already known about these two diseases as they occur in conventional agricultural systems. But, to model an agro-ecosystem on the native prairie we need to know more about patterns of interaction between such grasses and diseases in natural systems. Bernadette Jilka will head a multi-faceted experiment which will not only follow these interactions in natural populations of eastern gama grass, but also in Cindy's monoculture/biculture plots, in disease susceptible gamagrass clones transplanted in restored prairie, and in clones transplanted from natural populations to our monoculture plots here at The Land. From this we also hope to learn how patterns of disease are influenced by a plant's context.

Colin Laird will be studying disease and eastern gama grass too, as he observes the third year of disease susceptibility and seed yield differences in two sex-ratio variants of eastern gama grass. Normal gama grass plants produce both male and female florets; there also exists a variant which has converted almost all its male florets to female. This variant, called pistillate, has the potential for high seed yield because of increased seed number, but more information is needed to determine if this variant will be useful in a perennial polyculture. Genetic variation for disease susceptibility exists in gama grass, and monitoring plants we have identified as susceptible and resistant and drawing correlations between

resistance and yield will be the second part of Colin's experiment.

Another grass we're researching is a cool season grass called *Leymus racemosus*. This year I have established a plot of over 200 families of *Leymus*, which will be observed for genetic variation of characteristics needed to develop it as a perennial seed crop.

Not everyone will be outside in the sun all summer, though. Brooks Anderson continues our fourth year of perennial sorghum breeding efforts inside in the sun, in the greenhouse. There he's already busy reversing the usual trend in crop breeding, trying to introduce some wild characteristics into an already domesticated crop. By crossing and backcrossing cultivated sorghum with its weedy perennial relative we hope to confer winter hardiness through rhizome production while retaining high seed yield. Brooks will also be completing a long term (five year) monitoring of seed yields in Illinois bundleflower and *Leymus* plots.

Like all of Kansas, we were affected by the drought and record high temperatures this spring (105 degrees on April 23). If this is any indication of what the summer will bring, we just hope our experiments--and our constitutions--are as resilient as the prairie.



Ed and Cindy hoe the eastern gama grass / Illinois bundleflower biculture.



Mary Handley and Peter Kulakow
check sorghum crosses in the greenhouse.

The Land Institute Research Report

The results of experiments carried out in 1988 are now available in *The Land Institute Research Report*, Number Five. Papers in this publication were written by the 1988 interns and research staff and edited by Jon Piper. Copies can be purchased through the mail for \$2.75, postpaid. Address orders to

Research Report
The Land Institute
2440 E. Water Well Road
Salina, Kansas 67401

Drought and the Prairie

Colin Laird

Since the autumn of 1987, the Great Plains region has received less than the average amount of precipitation. By the end of last year, Kansas had experienced its second driest year on record. In Saline county alone the rainfall was 65% of normal for 1988. Instead of the average 27.8" of rain per year, the county saw only 18.14" of precipitation.¹

It's hard to define drought. The term is relative, for it reflects one's concept of "normal." How is it determined? Commonly, fifteen percent of the normal amount of precipitation is referred to as drought conditions. Drought, though, is more than just a deficit of rainfall. The impact of moisture deficiency also depends upon the timing and duration of the weather event and the type of agricultural operation involved. As I. R. Tannehill in his 1947 book, *Drought, Its Causes and Effects*, explained:

We have no good definition of drought. We may truthfully say that we scarcely know a drought when we see one. We welcome the first clear day after a rainy spell. Rainless days continue and we are pleased to have a long spell of such fine weather. It keeps on and we are a little worried. A few days more and we are really in trouble. The first rainless spell of fine weather contributes as much to the drought as the last, but no one knows how serious it will be until the last dry day is gone and the rains have come again... we are not sure about it until the crops have withered and died.²

What we can say is common to all droughts is that they involve a deficiency of rainfall that results in water shortages for some activity, such as plant growth, or for some group, such as farmers. Drought reminds us how vulnerable our society is to changes in weather patterns.

It is no secret that this year's winter wheat crop in Kansas was severely stressed. The shortage of rainfall last year meant that subsoil moisture was not replenished. A mild winter with little snow and a dry early spring led people to speculate at the beginning of May that half of the state's 12 million acres of wheat might be abandoned, the most in 30 years. This would allow only between 150 and 175 million bushels of wheat to be harvested for 1989.³ In Kansas, 366 and 316 million bushels of wheat were harvested in 1987 and 1988 respectively.⁴

All of the talk this spring about the poor condition of the winter wheat crop due to the drought made me wonder how prairie plants were doing in comparison. By just looking from a distance at wheat fields and native prairie near The Land, it seemed, to a suburban New Yorker such as myself, that the wheat looked better than the prairie. The wheat fields were all green, and although the plants seemed a little short, I had no idea how tall they were supposed to be. In contrast, the prairie was still brown, just as it was in February. But from up close, one could see that the wheat plants were turning brown at their bases, indicating that some of the leaves were dying. The soil in the wheat field was gray, dry and powdery. By giving a little tug, I could easily pull a wheat plant out of the ground. In seeing the small roots I could understand why the plants were dying. Only moisture in the few top inches of the soil surface was accessible to the plant. During the fall, winter and spring, there had been little moisture, and the roots of this annual plant developed poorly.

CONTINUED ON PG. 19

Biological Controls Provide Help Off the Pesticide Treadmill

Bernadette Jilka

"The aphids are attacking my roses!" "Spider mites have ravaged my tomatoes!" "And the farmer next door lost her first cutting of alfalfa to weevils!"

Warm weather not only increases photosynthesis, but also the populations of insects. Having been in the garden center business for several years, I recall the numerous questions and frustrations of gardeners and home owners trying to save their plants from destructive pests.

At the conventional garden center, the solution for controlling insects is often contained in a brown bottle full of a foul-smelling chemical. Although all insecticides contain a small printed warning label explaining the toxicity of the chemical, many consumers assume the pesticide being purchased is a safe and complete answer to their problem. Pictures of weed-free green lawns and beautiful red sunsets over brilliant flower gardens don the covers of brochures printed by chemical companies, promising an unconditional guarantee to solve the customer's gardening dilemmas.

Chemical companies also sponsor educational seminars to teach the retailers how to sell and use their products. When a farmer goes to the local extension agent to receive helpful information for controlling insect problems, the control measures often include a long list of chemical pesticides recommended by the United States Department of Agriculture (USDA) or researchers at the land grant agricultural university.

But in the long run, the continual use of insecticides often creates greater problems with the pest, leaving farmers and gardeners helplessly dependent on new chemical controls to save their crop. Sole reliance upon chemical insecticides for pest control has resulted in 1) insect species becoming resistant to insecticides, 2) destruction of beneficial insects, 3) hazards to human health and the health of other animals, and 4) contamination of the soil, air, and water.

The reported number of insect species resistant to insecticides has grown from 428 in 1980 to 447 in 1984. Research indicates that pesticide use not only brings about pesticide resistance, but may upset plant metabolism making the plants more vulnerable to pests. In the past thirty years, pesticide use in the U.S. has increased twelve-fold and yet crop losses to pests have nearly doubled.¹

Some researchers are now looking at biological control of pests as an alternative to chemical control. Biological controls are living organisms, commonly other insects, that feed on the pest insects and de-

crease their populations. A biological control insect may be a predator which requires more than one prey to complete its development or it may be a parasitoid which develops either internally or externally on its host and requires only one host (prey) for complete development.² Because the parasitoid insect has a more intimate physiological relationship with its host than do predators, parasitoids are generally more effective.

Commonly known and naturally occurring predators include the ladybeetle which feed on aphids, Colorado potato beetle eggs, and spider mites. The praying mantis which is attracted to tall flower stems and grasses, preys on aphids, beetles, leafhoppers, caterpillars, and wasps. Another threat to chewing and sucking insects is the green lace-wing, a delicate small insect which can be found along fences and in woodlots. There are several species of parasitic wasps which attack and reduce aphid populations in nature and in greenhouses.

Nature has maintained insect populations by creating predators for every insect species. Scientists are studying these species that have been found world-wide, to determine if the predator will be able to control a damaging insect population.

Why haven't scientists worked more on biological controls as alternatives to pesticides? One reason has been the limited funds available for this kind of research, especially when compared to dollars available for chemical controls. Another is the complexity of importing, rearing, and mass-releasing natural predators.³ Field releases of a beneficial insect involve detailed and often difficult monitoring. The timing, behavior, physiology, biology, and climate all have to be considered when an imported predator is released.

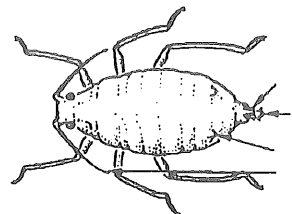
One example of the process of identifying and studying biological control insects is the Russian Wheat Aphid research. The USDA has been following the path of the Russian wheat aphid which originated in Turkey. This particular aphid species is quite damaging to oats, wheat, rye, and barley. In 1982 this pest migrated from Europe and Asia to Mexico and was blown north by the wind into Texas where it was found in 1986. The Russian wheat aphid was found in Kansas in 1987. The aphid injects a toxin into the plant causing leaf curling. It hides and reproduces under the leaf, making contact insecticides ineffective. Scientists are studying parasites, predators, and pathogens for possible control measures. With international cooperation, researchers have imported four parasitic wasp species from

Turkey, and have introduced several European strains of ladybeetles. They will study these predators to see if they are adaptable to our climate.⁴

Dr. James Nechols, an entomologist at Kansas State University, has been doing research on biological controls.⁵ Projects include controlling the Russian wheat aphid and the greenbug on grain sorghum, and effectively reducing musk thistle populations with a weevil predator that eats the flower parts. He has also made field releases of two parasitic wasp species in alfalfa fields to examine their effects on alfalfa weevils. He is involved with a project at Garden City to study the effects of a parasitic wasp which attacks the pupae stages of feedlot flies. Elizabeth Vogt, a graduate student working with Dr. Nechols, is researching a natural enemy of the squash bug, and has collected colonies of parasitoids. These predators attack the eggs of the squash bug and have been found naturally in Eastern Kansas.

Some biological control insects are commercially available. Examples which may be extremely important here in Kansas are grain insect parasites. A major problem of grain storage in the Midwest has been the destruction of kernels by grain weevils, moths, and beetles. The most damaging are the granary weevil, maize weevil, rice weevil, Australian wheat weevil, and the Angoumois grain moth. There are four beneficial insects that either eat the pests or parasitize their eggs and larvae. When the pests are consumed by the predator, the predators then die due to lack of food.⁶

The use of predators and parasites for insect control requires careful planning. Cultural processes can improve the effectiveness of biological controls. In vegetable gardens, flowering herbs interplanted among crops may attract beneficial insects. Results of research done by the New Alchemy Institute in Massachusetts suggests planting fennel, caraway, and mint to create insect activity.⁷ Weeds also can effectively provide a protective niche for natural



Russian Wheat Aphid

predators. After an investigation in 1981, University of California entomologist Miguel A. Altieri reported that a field crop with a thick mixture of weeds was inhabited by more beneficial insects than a weed-free field.⁸ Woodlots not only break the wind for a garden or field, but provide an excellent habitat for natural predators, such as insects, birds, spiders, reptiles, and amphibians. If a woodlot is not available, a barrier of fast growing plants can be created within a growing season. Kochia, comfrey, sunflowers, and tall grasses would be suitable for a living fence.

Agricultural practices such as plowing, mowing, and burning may be harmful to natural enemies which often need crop residue for nesting shelters. Monocropping and heavy pesticide use have disrupted the interaction of the insect pest and predator, resulting in uncontrollable infestations of damaging pests. Crop rotation is a valuable cultural practice in pest management.

Biological controls can play an important role in sustainable agriculture. However, introducing insect predators to decrease the populations of insect pests will be successful only if people recognize that there must be tolerance for some level of both harmful and beneficial species. Also, farmers and gardeners must have a different attitude about the level of control necessary to raise healthy food in a healthy manner. Rather than attempt to destroy any species which interferes with our food production systems, humans must learn to place more value on the natural balance necessary for sustainability.

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Organic aphid control in the greenhouse--Raymond and Bernie wipe off sorghum leaves with paper towels..

— Traditional Roots for Agriculture —

Large-scale Organic Farmer Expresses Optimism

Cindy Hurlbutt

On the Friday afternoon before the annual Kansas Organic Producers meeting, Fred and Janet Kirschenmann visited The Land Institute. Interns and staff came in from the fields, the greenhouse, and offices and gathered in the classroom for a question and answer session with Fred and Janet about their 3,000 acre Organic and Biodynamic farm in North Dakota.

The Kirschenmann family farm is made up of 3,000 acres broken down into the following sections: 250 acres of permanent alfalfa (which must be re-seeded every 6 to 7 years), 900 acres of native grass pasture, a feedlot for cattle during the winter months, and over 1,000 acres of crop land. They maintain a 100 head cow and calf operation with low production costs due to the fact that they are able to produce all of their own feed. They rotate the cattle through a series of eight native grass prairies. This rotation prevents any one area from being over-grazed. Cattle also graze on crop stubble, and during the winter months they eat alfalfa hay along with the residue from grain processing.

All of the cropland is worked in a rotation which includes the following: spring wheat, rye, sunflower, buckwheat with clover, and a year of soil building which combines clover (as a cover crop and green manure) with animal manure.

The Kirschenmanns sell all crops directly to the Mercantile Food Company which exports Certified Organic and Biodynamic grain to Europe where there is a highly developed market for these products. The company also markets some grain in New England through the Bread & Circus natural food grocery chain.

Beyond their farm, the Kirschenmanns also are known for other contributions to sustainable agriculture. Janet has performed the role of "Annie" in "Planting in the Dust," a one-woman, one-act play about land stewardship, throughout the northern plains states. They belong to the Northern Plains Sustainable Agriculture Organization, a network of growers in the Dakotas, and Fred is a frequent speaker for programs sponsored by similar organizations in other states, such as the Kansas Organic Producers.

'Looking to the Future from Down on the Farm'

Joe Vogelsberg concluded his introduction of Fred Kirschenmann at the Organic Producers' meeting the next morning by saying, "Always remember that even the mighty oak was once a nut." That was all it took to relax the audience and give Fred a chance to down-play the Ph.D. label that keeps surfacing, despite his efforts to keep it quiet. Like most farmers, Fred learned about agriculture from other farmers and not from course work.

In order to look toward the future one must first assess where he is now, and Fred quoted the assessment of a 59 year old farmer who lives near him. "I'm just glad I'm as old as I am because we are facing so many problems. I'm glad I won't be around much longer."

Fred Kirschenmann believes that there are two ways we can look at the future of agriculture "from down on the farm." One is to see the hopelessness and despair expressed by Fred's North Dakota neighbor. The other way is to view the current situation as the "end of a bankrupt agriculture and hope for a promising new future".

Fred believes that "the recognition of a problem is probably the most effective first step to new possibilities," and he is optimistic about the future. He thinks a paradigm shift is taking place.

According to Fred this revolutionary paradigm shift comes about in four stages. First come the problems; these may take the form of "puzzles which can't be solved as easily by the old values, beliefs, and techniques." Next, by necessity, comes innovation. Someone comes forward who says, "I have a new way to solve the puzzle." Initially this person may be passed off as crazy, but soon there are those who adopt the new way and they enter the third stage. Then finally, "WHUMP!"-- the new way is accepted as better and the shift takes place.

The problems in agriculture that seem to be pointing toward a paradigm shift can be divided into three categories: economic, environmental, and social. Fred emphasized the interconnection of the three problem areas.

Perhaps the clearest sign of economic problems is the proliferation of subsidies. Then there is the theory of "Rape Management," which says it is acceptable and good to "squeeze every gram of grain out of every inch of soil and every pound of gain out of every

animal." As if that were not enough, both cost-effectiveness and cost-accounting are being ignored, and all that matters is "the year end bottom line."

Fred's solution to the savings and loan companies' financial problems is: "Confiscate all the property of the s&ls that are in trouble and remove them from the debt roles! If that's how to create a healthy farm economy, why not the banking economy?"

Fred reviewed the well-known environmental problems in agriculture: over-use of non-renewable natural resources, contaminated water, unsafe food, and depletion of the soil. He said that the social problems stem from the disappearance of farms, which leads to depressed rural communities, and when we lose these rural communities, "a whole range of irreplaceable resources will disappear that will affect society as a whole."

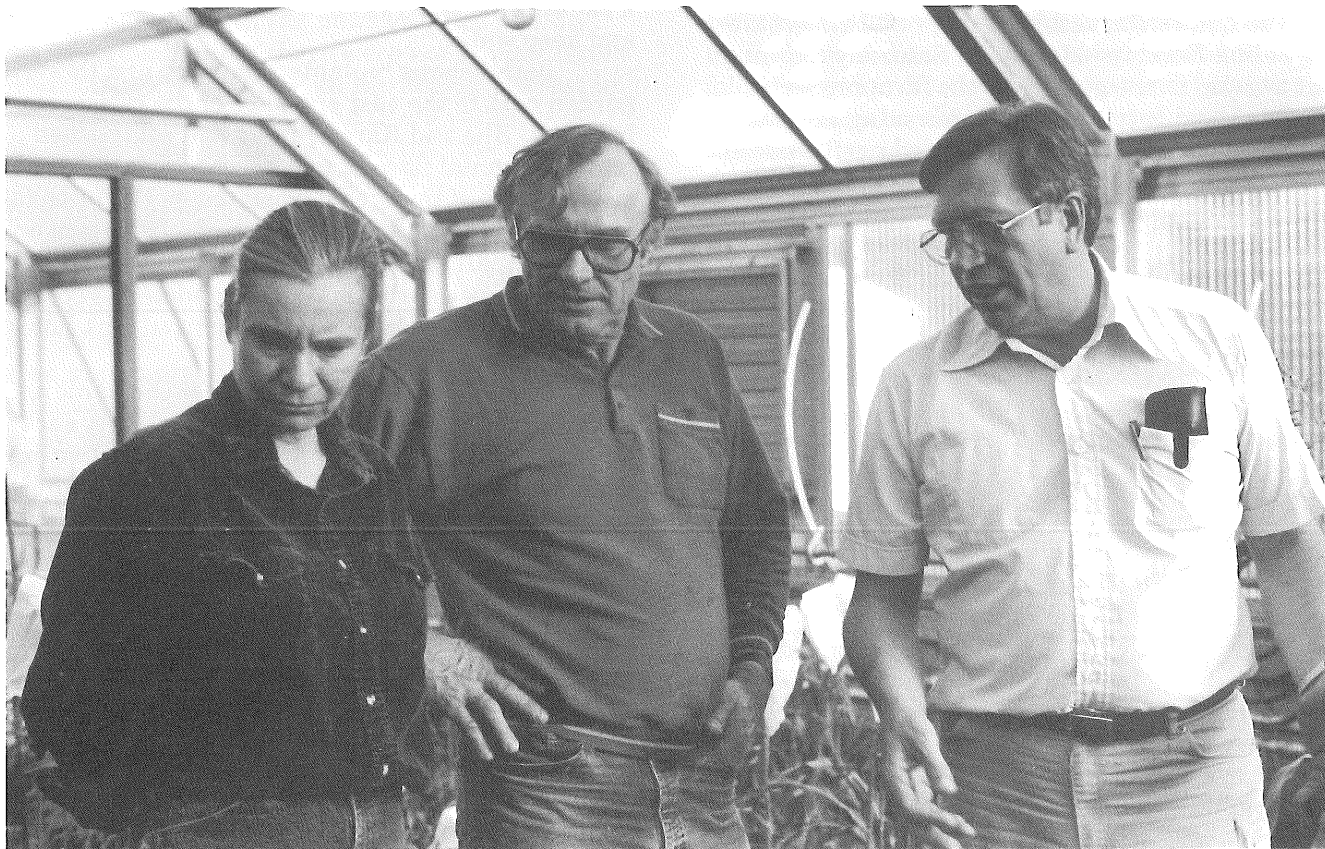
Fred sees the beginning of a change of attitude everywhere he looks: on the farms, within the environmental community, the scientific community, and even within our federal government. Farmers are looking for alternatives and asking questions about "sustainable" agriculture. Communities understand that the "top-down stuff does not work anymore." People need to be involved in the decisions which directly affect their lives. There is a move toward

"personal knowledge, personal management, and personal marketing."

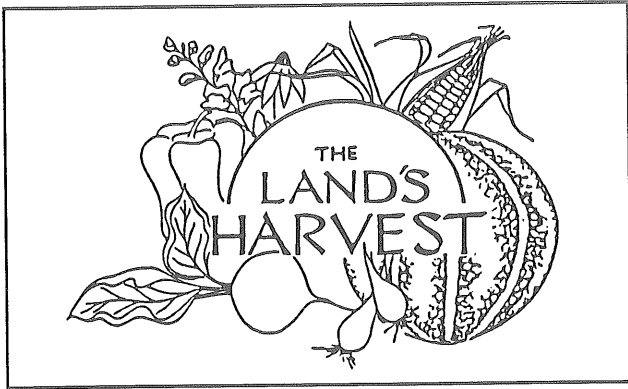
In the scientific community folks are beginning to recognize the need for "whole farm research, farmer/researcher teams, new methodologies, and organismic science". The federal government has modestly funded a very significant program known by the acronym LISA (Low Input Sustainable Agriculture). Fred believes that the key importance of this program is that "researchers, farmers, and community members must work together."

In farm policy, there is a growing need to install incentives that will do two things: "reinterpret quality in terms of food for nutrition rather than food for profit, and recognize the interconnectedness of economic, environmental, and social values." Fred feels that it is very important to put the various agricultural alternatives on a level playing ground. This means the government must stop subsidizing conventional agriculture, and that farmers must be freed from the bondage of "commodity base" and "proven yield" tread mills.

Fred's general optimism and his sense of excitement about the future is contagious. After his visit, Land Institute folks and Kansas Organic Producer members now continue their work with some of Fred's spirit.



Wes Jackson (right) shows Janet and Fred Kirschenmann the greenhouse.



The Land Institute owns 72 acres plus a house and a cottage on south Ohio Street. Most of the experiments in our research program have now been established on the Ohio Street property. In 1988 we began the transition to farming the remaining acres organically. Last summer we grew a few acres of vegetables and marketed them as "The Land's Harvest." Brad Burritt and Danielle Carre, both former interns, started this project. They manage the farm and live in the Ohio Street house with their son Ian.

This year about ten acres are devoted to horticultural crops: four acres to sweet corn, an acre each to strawberries, asparagus, potatoes and melons, and smaller areas to flowers, raspberries, onions, garlic, beets, carrots, turnips, cucumbers, sweet potatoes, snap beans, okra and cole crops.

The Land's Harvest sells its produce downtown at the Salina Farmers' Market on Saturday mornings and at a stand in the garage on the farm property.

The Land Institute will be pursuing organic certification through the newly formed northeastern Kansas chapter of the Organic Crop Improvement Association, an international third part certification organization.

Community Garden Thrives in Spite of Drought

Dana Jackson

The drought extending from the summer and fall months of 1988 through the winter of 1989 discouraged Kansas gardeners in the spring. No real substantial moisture fell to heal the large cracks in the ground at The Land until mid May. But in fits and starts we finally planted the community garden next to the classroom building.

Potatoes went in as usual on March 17, but we held off watering them for about three weeks, thinking surely it would rain. When they finally began to grow, we had a disappointing stand from our eighty

pounds of seed potatoes. We watered them every week and filled in the large gaps with hills of pumpkins to compete with the bindweed.

Bindweed doesn't need water to grow. It covered the ground vigorously this spring with no competition from the grass and native plants that usually share territory at The Land. No sign of white clover appeared on the terrace by the garden and the bindweed just took over. When it finally rained, its headstart over all other plants allowed it to remain the dominant plant.

We planted and replanted lettuce, spinach, peas and beets, barely keeping them alive by diligent watering until the mid-May rain. A special lettuce/spinach bed for the Prairie Festival went in on a Friday in mid-April, followed by a week with several days reaching over 100 degrees. By watering up to four times a day, we did get germination, and much to our amazement, on May 27 we had a gorgeous salad bed for the Prairieland Food Co-op to use in the meal they catered.

We didn't plant corn. When no rain had fallen by the first week in May, we decided not to make a large investment in time and water, especially when we knew The Land's Harvest would be planting a large corn patch.

We planted tomatoes, eggplants and peppers with special care, digging deep holes and twice filling them with water before setting in the plants. We left a saucer-like depression around each plant to catch and keep water.

Beth Gibans replanted the herb and flower garden next to the east entrance of the classroom building. She and Karen Finley had established many perennial flowers and herbs last spring, only to see a section of the area devastated by the installation of a septic tank and construction of a bathroom on the east porch last fall. Beth started flowers and herbs in the greenhouse early this spring and persevered with replanting in spite of drought, dogs and sink holes over the septic tank.

The interns plant and care for the garden. One intern has special garden responsibility each week and during the summer works about two or three hours a day. The garden is on the weeding schedule with experiments, and once in a while a large crew moves through the garden with gratifying results.

The rains of early June provided beautiful salad greens, radishes and onions for lunch, along with peas and beets. We're crossing our fingers, hoping for favorable summer weather for squash, melons, cucumbers, tomatoes, peppers, beans, okra, and eggplant.





Grain Exchange Grows

Thom Leonard

When the Grain Exchange came to The Land Institute from Port Townsend, Washington, in February of 1987, we had somewhere around 125 members. A year later membership had doubled to 250. In May of this year we passed the 700 mark. To what does the Exchange owe this better-than-geometric growth? Mostly free exposure in the garden press. *Harrowsmith* and *Organic Gardening* both have listed the Grain Exchange in resource lists in recent issues, and these listings have led to other, smaller publications picking up the address and publishing it. While most of the response from these sources has been requests for more information, a significant number of inquirers have responded favorably to our two page flyer and sent in membership fees. Kent Whealy, director of the Seed Savers' Exchange (SSE) in Decorah, Iowa, has continued to endorse the Grain Exchange in SSE publications, and to encourage SSE members to support the Grain Exchange.

Full page adds in the newsweeklies wouldn't generate membership if there were not at least latent interest. There is certainly an increasing interest in bread patch" grain growing and in old varieties of staple crops. I would like to think that the work of the Grain Exchange has contributed to that, but I suspect that the Exchange is more a part of the interest than a cause of it.

A trial run of our "Garden Grains" catalog, offering garden-size packets of a variety of cereal crops, proved a limited success and was promising enough that we are planning to repeat it on a larger scale next season. I calculated that we sold a bushel of "Turkey" hard red winter wheat for just over \$300. We'll probably need at least that to make anything at all on this year's wheat crop.

For ten weeks this summer the Grain Exchange has an undergraduate intern from College of the Atlantic. Kirstin Stockman will participate in all aspects of the Exchange from hand pollination to researching the varieties of maize, wheat, and sorghum grown in our region since the late 1800's.

Basic membership to the Grain Exchange is \$10 per year. Retaining, Sustaining, and Lifetime memberships are \$25, \$50, and \$250 respectively. All contributions are tax deductible to the extent permitted by law. Write to us at The Land Institute for information.

Prairie and Drought -- CONTINUED from pg. 13

While transplanting eastern gama grass into a restored prairie for one of the experiments this year, another intern and I were surprised at what we found in the prairie soils - moisture. When we took out some of the leaf litter from between the prairie grasses we found a cool, firm, dark, and moist soil. By removing some grasses, a task only accomplished with a sturdy shovel, we found plant roots permeating the soil to the point that the soil and roots were almost one and the same. It was strange to find the soil so moist, but these soils had been covered all year long, protected from the drying sun and wind.

The prairie soil was protected from wind erosion during the drought, unlike soil in the wheat fields. The March 14 dust storm, the worst since the 1950's, destroyed 160,000 acres of crops and ground cover.⁵ The winds of the Great Plains can pick up soil particles and deposit them far from their site of origin, expose plant root systems, uproot plants, damage plants by sand blasting, and actually cover plants with soil. It only takes winds of about thirteen miles per hour at one foot above ground or eighteen miles per hour at thirty feet above ground to start to move bare soil.⁶ The key word here is "bare."

Most of the prairie plants are perennials while our grain crops are annuals. For the annual plant, there is no provision for a bad year because its life cycle is only one year. It has to get through that cycle to produce seed to ensure a new generation the following year. In contrast, a perennial plant's resources can be allocated to its own survival first and then produce seed for future generations when conditions present themselves. During a drought, the perennial can hold back and wait for better conditions, using its deep, extensive root system or large tap root to reach moisture at low levels in the soil. In a drought year such as this one, lack of moisture killed the annual (wheat) while the perennial used its deep root system to wait out the dry period, ever ready to take advantage of future rains. And while the perennial prairie plant protected itself, during the drought, it also protected the soil.

Another important characteristic of the prairie's response to drought is that it is an ecosystem response and not an individualized species response as is the case with wheat and other monoculture crops. In the prairie there are multitudes of different plants and plant species responding to the environmental conditions. The chances are much greater that within that diversity some plants will be able to survive.

The prairie offers some lessons for agriculture if we are willing to observe and learn.

CONTINUED -- References on pg. 35



Natural Connections

The Platte River and the Prairies of Nebraska-- Saving What's Left

Raymond Epp

A warm south wind blew as we stirred in the predawn hour. A group of dreary-eyed Land interns awoke from their brief night's rest at the Mormon Island Wayside Area near Grand Island, Nebraska. We came to witness the annual migration of the sandhill cranes. Five hundred thousand cranes, nearly eighty percent of the population, roost on a relatively short segment of the Platte for up to six weeks before continuing their northward journey. We met other interested birders, including the Jacksons, at the Grand Island Holiday Inn at 5:20 a. m. and, under the direction of our interpretive guide, drove to an observation blind located on land managed by the Platte River Whooping Crane Trust.

As we walked along the path to the blind under the cover of darkness, we could hear the distinct call of the cranes. We settled into the earth-bermed concrete blind and awaited the first morning light. Our early monochrome vision revealed what looked like large sandbars in the midst of the wide Platte River, but as the dawn's light brightened we found the sandbars to be massive flocks of sandhill cranes. It was an awesome sight. Thousands of these red-capped birds, which have a wing-span of six feet and stand three and one-half feet tall, began to take off from their roosting sites in various sized groups to spend the day foraging in the surrounding corn fields and wet meadows.

Watching this March morning drama may not be possible in the future. The number of Platte River roosting and feeding sites for the sand hill cranes have decreased, and more are threatened. Stream flows in the Platte River have been reduced by 70-90 percent over the past fifty years. The Kingsley Dam, on the North Platte, and the Tri-County Diversion

Canal in South-Central Nebraska have caused the reduced streamflows. Reduced streamflow results in more fixed river channels. Trees and shrubs grow on islands and sandbars once scoured by high waters. Lost in this process are the wide open expanses of river needed by the cranes for roosting. Declining flows in the Platte also threaten the marshy meadows which the cranes depend on for a food supply of earthworms, insect larvae and snails, a necessary source of protein and minerals. The marshes are especially crucial for supplying calcium (via the snails) which is needed to produce strong egg shells when the cranes nest in Canada, Alaska, and Siberia.

A potential threat to the cranes and the Platte River habitat is the Two Forks Dam Project in Colorado. Two Forks was proposed to supply water for the future growth of Denver. Fortunately, the project has been halted, at least temporarily, by the new director of the United States Environmental Protection Agency, William Reilly.

The Platte River is not the only habitat being threatened in Nebraska. Remaining prairie remnants are also quickly disappearing. Congress passed the Sod Buster provisions in the 1985 farm bill to prevent additional grassland from being brought into production, but pasture and prairie can still be broken if farmers choose to stay out of the farm program.

The farm bill's carrot of program eligibility was not enough of a safeguard to keep a forty acre prairie remnant in Hamilton County Nebraska from being threatened. I heard of this remnant and its plight from my friend Mel Friesen almost two years ago. His efforts and the work of others saved the prairie from the plow. I wanted my fellow interns to meet Mel while we were in Nebraska, so the day before we saw the cranes we visited Mel and Connie Friesen on their farm just thirty miles to the east of the "Crane River" roosting site and a few miles west of Henderson.

When we approached Mel and Connie's small mixed-grain and livestock farm from the north, we were immediately impressed by all of the trees surrounding it. The north windbreak, a thick stand of cedars planted by Mel's father in the late 40's, pro-

vides excellent cover for rabbits and birds as well as protection from the cold north winter winds. Walnuts, spruces of all types, and a variety of fruit trees grow on their farmstead. The trees, however, are not the only eye-catching feature on their farm. Between the house and the north windbreak is a conspicuous 7000 square foot prairie. Mel reestablished a variety of tall and medium grasses as well as a number of forbs with the help of his friend Bill Whitney from nearby Aurora, who is a co-director of the Prairie/Plains Resource Institute.

"My interest in the prairie grew out of my interest in trees," Mel replied when he was asked how he became interested in the prairie. It is rather unusual to find a farmer in these parts who still has an appreciation for the prairie. Nearly all of the rough ground in this region has been developed for irrigated crop production. Little is left of the native tallgrass prairie. Three acres remain on Mel's home quarter, and other small patches exist scattered about. They are mostly little corners that are not worth farming.

Mel and Connie believe that the remaining prairie remnants should be saved, for they serve as reminders of how we have radically altered the landscape. Mel has often wondered what the vast unbroken prairie must have looked like to the 37 Mennonite families who originally came to live and farm the fertile land around Henderson in 1874. Being a descendent of these pioneering people, he

wonders what kind of legacy he will pass down to his own children and grandchildren.

Concern for prairie preservation provoked Mel to find a way to save an ungrazed forty acre remnant located on a quarter section of land four miles from his home. The land was first put up for sale in August of 1987. Mel told his friend Bill Whitney about the existence of the prairie. Neither of them had the money to purchase the land, but together they were determined to find an alternative. Bill enlisted the help of a Nebraska doctor whom he had met previously at the Prairie Festival. This benefactor had grown up in the Henderson community and shared a common interest in prairie preservation. He bid on the land at the auction and secured title to the entire 160 acre parcel. Then he sold 120 acres, all the land except the prairie, to the farmer who had previously been renting that land. The forty acres of prairie were given over to the Prairie/Plains Resource Institute at a ceremony on June 3, 1989.

Saving the Platte River and its wet meadows is essential if we want to prevent the extinction of whooping cranes and preserve the spectacle of the sandhill crane migration in Nebraska. Protecting the remaining prairie remnants from the plow is essential if we want to understand the principles of the prairie ecosystem and learn how to develop a sustainable agriculture. Our Nebraska trip introduced us to individuals and organizations dedicated to this work. They deserve appreciation and support from everyone.



Sand hill cranes leave the Platte River early in the morning.

"Loam, Loam on the Plains"

Nancy Baumeister

Typic Argiustoll? What does that mean? Is it English? Is it alive? Does it live in Kansas? Is it animal, vegetable or mineral? The answer to all these questions is-- yes. It is alive, it does live in Kansas (on about four million acres in 25 counties), and it is animal, vegetable and mineral. This odd phrase is used by soil scientists to designate a particular soil, more commonly referred to as Harney silt loam.

And what is a Harney silt loam? The Harney silt loam is the quintessential prairie soil, the kind that made Kansas famous as the wheat producing state, and the one which the Kansas Association of Professional Soil Classifiers recommends to be designated as the Kansas State Soil.

Dr. Orville Bidwell is professor emeritus of Soil Science at Kansas State University. In over 35 years in the Agronomy Department, he has taught many college students. Now in his retirement he is educating legislators and the public about soils and trying to persuade the legislature to adopt a state soil.

Kansas is well known as the "Wheat State," yet few people understand the special climactic and geographical factors which make wheat grow so well here. One important factor is our abundant prairie soil. Kansas is blessed with more acres of prairie soils than any other state.

Prairie soils are special soils, uniquely fertile. They develop under conditions that favor the accumulation of soil humus. In Kansas the long hot summers develop luxuriant plant growth, while the dryness slows decomposition. The cold winters similarly slow decomposition. Further south in Oklahoma and Texas, they have the hot, sunny summers, but their winters are too warm, and humus decomposes about as rapidly as it forms, resulting in no net accumulation. Further north, the growing season is shorter, and though production of humus is still faster than decomposition, the accumulation is slower and not as noticeable as here in Kansas.

Most people look at the above ground biomass production of the prairie plants and assume that leaves and stems are the humus producing components. In fact, the below ground portion, roots and crowns, are much more important. Much of the above ground growth will eventually be decomposed, burned or grazed, its carbon lost to the air. But the below ground components decompose slowly in place, leading to the slow, steady increase in soil humus.

Humus in the dark prairie soils has been a kind of "black gold," containing nutrients that wheat crops need. Some Kansas farmers still depend upon the stored fertility in the soil and do not use commercial fertilizer on their wheat. But the humus is disappear-

ing. Like oil, it is literally being burned, oxidized, by till agriculture.

Dr. Bidwell and other supporters of a state soil want Kansans to value the prairie soil and take better care of it. He believes that naming Harney silt loam as the state soil would be a way of commemorating "the fabulous treasure that the prairie gave us."

The bill to name a Kansas soil passed the Senate during the 1989 session and is now in the House Federal and State Affairs Committee. It will come up again in the 1990 session of the legislature and needs the support of many Kansas citizens. Some legislators became more interested when they learned that the Agricultural Hall of Fame in Bonner Springs, Kansas, contains displays from other states promoting their state soils, but a state soil for Kansas is conspicuously absent.

Orville Bidwell has been disappointed that school teachers in Kansas have not shown much interest in adopting a state soil, especially when



Dr. Bidwell shows a soil profile to Jon Piper during a special class for Land interns and staff at Kansas State.

compared to teachers in Wisconsin and other states where school children effectively supported a state-soil drive. Science teachers, otherwise strong in biology, chemistry and/or physics, reveal little to no comprehension of soil degradation, genesis or morphology. Vocational agriculture teachers, as a whole, are too occupied with livestock judging and shop work to stimulate enthusiasm for the soil and its management.

To promote Harney silt loam, David Margolis, entomologist at Kansas State University, wrote a song about it to the tune of "Home on the Range." Margolis and his wife, state representative Sheila Hochhauser, sang it on National Public Radio in March. Supporters of the state soil hope school teachers will teach it to kids and that organizations will use it in their programs.

*Oh give me a home on the Harney silt
loam
And I'll plant it in acres of wheat,
This soil is the tops
For producing our crops
So our nation has plenty to eat.
Loam, loam on the plains,
And Harney silt is its name,
This soil holds the key to our economy
And gives Kansas its reason for fame.*

The Herbarium to be a "Natural Connection"

Beth Gibans

Walking back and forth between the office and the classroom ("east campus" and "west campus"), one can't avoid passing by or through the herbarium, our garden of prairie plants which has come to be a landmark of The Land Institute. In order to remain a good landmark, it needs some renovation. This spring we have begun a several year project to give the herbarium a facelift.

The Land's first research associate, Marty Bender, started the herbarium in the spring of 1978 as a living inventory of perennial prairie plants. These species have served as candidates for the Land Institute's polyculture research. In the start-up year, forty prairie plant species were established in five meter long rows. By 1982, the herbarium contained about 300 species, most of which Marty either planted from seed obtained from the Soil Conservation Service Plant Materials Center near Manhattan, Kansas, or collected on field trips in Kansas, Oklahoma, Nebraska, Texas, New Mexico, Missouri, Ohio and Mexico. Students recorded observations on the growth habits, times of flowering and seed maturity, seed shattering, and seed yield for each species. Based on these data, the research staff selected several plants to study further, including our current species of Illinois bundleflower and eastern gamagrass.

The herbarium has served as an educational resource for the Land community and local groups interested in the prairie and its flora. The labeled rows have made it easy to identify species and observe their life cycles. Herbarium plants continue to serve as sources of future germplasm.

The herbarium today, however, exists as a thin framework of its early vigorous days. Many species

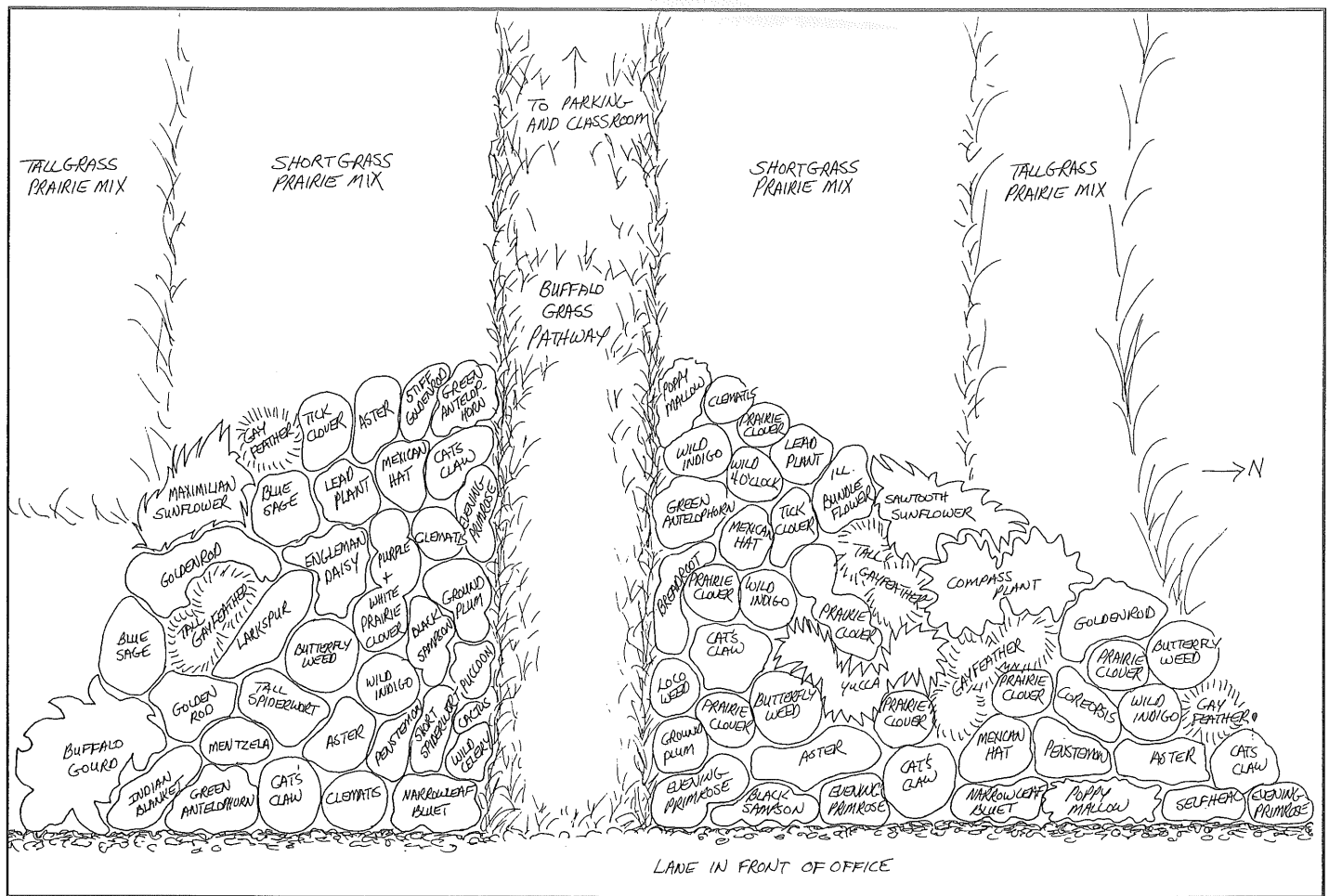
have died out; some have seeded themselves outside their rows and replaced other species. Through the years we have come to realize the difficulty of maintaining the herbarium as it was designed.

We asked Iralee Barnard to redesign the herbarium in order to enhance its educational and aesthetic functions and reduce its maintenance requirements. Iralee is a long time Friend of The Land who is known for her illustrations of prairie wildflowers.

We are very excited about Iralee's design. She has planned for the renovations to occur in several phases, each phase to be completed within a year. Phase one, which we began this spring, features a main path of buffalo grass and blue grama grass between the Krehbiel office and the classroom parking lot. It also establishes two main wildflower beds, one by the classroom driveway and one by the office driveway. Once the buffalo and blue grama grasses are established, we will transplant current herbarium rows into patches along the path. We will then plant native tall grasses adjacent to the short grass path.

Eventually we will sow two more short grass paths and move more herbarium rows within those established paths. The larger surrounding areas will be sown to tall grasses. In the meantime, the area will, unfortunately, look rather unkempt as we wait for the grasses to become established and the forbs to bloom.

When all the planting has been done, Iralee will help us produce a booklet that maps the species and describes some of them. The booklet and signs along the path will teach both Land people and visitors about the prairie plants as they walk through the new herbarium.



Iralee Barnard's sketch showing her suggestions for species arrangement at the east entrance to the herbary path.

Planting in the Dust

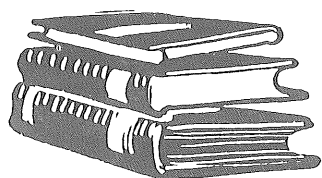
In the one-act play by Nancy Paddock, *Planting in the Dust*, Annie, a thirty-five year old farm woman, speaks intimately to her old friend Annie, who is visiting from the city, about her life on the land. She describes how she feels about soil erosion on neighboring farms, and her sense of responsibility to take care of the land.

"It's just that he (her neighbor, Jordan,) surrounds us! No matter which way the wind blows, we get his dirt. Of course, he's not the only one. Even my parents farmed over the terraces Grandpa put in. And tried to drain the pond. But with gullies washing into it, it was never anything but a mudhole to lose a tractor in. Now Jordan's gullies drain off into our waterways and his herbicide kills the grass that's supposed to hold the soil. Water doesn't recognize fencelines, Allie. Wind either. It's all connected like one bloodstream."

Dona Freeman, an actress chosen two years ago to play the role of Annie in this one-woman show, has given these lines thirty times to audiences all across Kansas and to one in Colorado. In June she performed for about seven hundred people attending the Assembly of Evangelical Lutherans and for the Prairie Quilt Guild in Wichita. On October 16, Dona will perform the dramatic monologue at a Bethel College Convocation, and on November 17 will present it at the Heartland Faith and Farming Conference in McPherson.

Dona has agreed to continue presenting *Planting in the Dust* as a land stewardship program for The Land Institute. On most occasions, Dana Jackson introduces the play and guides a discussion with the audience following the performance. For further information about scheduling and making arrangements for the play in Kansas, contact Dana Jackson at The Land Institute (phone 913- 823-5376).

To schedule the play in states other than Kansas, contact The Land Stewardship Project, 14758 Ostlund Trail North, Marine, Minnesota 55047, (phone 612- 433-2770).



Books

Family Farming: A New Economic Vision

By Marty Strange

Co-published by Univ. of Nebraska Press and the Institute for Food and Development Policy, 1988.

311 pages, \$18.95 (hardcover) \$7.50 (paper)

Reviewed by *Bruce Colman*

Marty Strange is a co-director of the Center for Rural Affairs which does research and lobbying on social issues related to agriculture and rural communities. The Center operates out of the corn-and-hog-raising country of eastern Nebraska. Strange's take on the crisis in American agriculture, *Family Farming: A New Economic Vision*, is refreshingly free of the sentimental, ideological, and emotional pleas we're used to in writings on the family farm.

Oh, he does make a ritual invocation of "the agrarian tradition" that "calls for people to be neighborly...and to believe in the dignity of work, to be frugal, modest, honest, and responsible for and to the community."

But he makes his case with hard-headed statistics (and tables and graphs) from the Department of Agriculture, Census Bureau, and Federal Trade Commission; from scholarly books and papers; and from his Center's own research.

At heart, Strange is saying that owner-operated, family-centered farms with annual sales between \$45,000 and about \$130,000 make the most sense economically. That's if they raise diverse crops and farm only as much land as crop sales will pay for. In a long chapter on economies of scale, Strange demonstrates that such farms turn capital inputs (such as seed, tractor fuel, fertilizers and pesticides) and labor into crops for sale more efficiently than larger ones. They are far better able to weather the busts that are inherently part of the farm-economy cycle, too, he says. "Smaller farming operations...are resilient and difficult to crush," he writes, despite authorities' belief they should just go away. "They crop up like bindweed in July, waving their way through the nooks and crannies left by the destructive

forces of large-scale farms."

It's the bigger guys who take the crippling hits when the downturns come, Strange argues, the farmers who have opted for "the industrial agribusiness model," by specializing in one or two crops; counting on overseas markets; separating ownership, management, and labor "into distinct roles"; and especially by borrowing heavily to buy land they can only pay for if land prices keep rising, and to buy specialized, single-use equipment. Strange makes a bizarre example of livestock buildings that will accommodate only hogs being fattened, but not suckling piglets or pregnant sows--and certainly not cattle--which then need separate facilities.

Farmers made such choices widely in the 1970's, when exports were booming and the government was egging industrialization on, but in the 1980's, export markets closed and the U.S got outcompeted by such exporters as China (for grains) and Brazil (soybeans).

The result was falling crop prices and falling land values--and headlines about foreclosures and bankruptcies. Farms of every size are stressed, of course, Strange, says, but the big ones hurt most. By 1984, 15.3 percent of those with sales over a half million dollars were having trouble paying their debts, versus 9.2 percent of those selling \$100-249,000, and 8.7 percent with sales of \$50-99,000, according to one of Strange's tables, while farms with annual sales over a quarter million dollars (less than one percent of all farms) owed more than 38 percent of the distressed debt nationwide.

"Being big," he writes, "is not the same as being wealthy... It is the process of trying to become bigger that has put many farms of all sizes on the brink of insolvency."

To the end of clarifying the questions we should ask (a main goal of Strange's) in order to make constructive policies that will encourage these resilient smaller commercial operations, the author introduces the lay reader to a history of credit in American farming, to the biases in conventional analyses of farm size, and to the ways tax and credit policies drive farmers to get big or get out, and also to a usual litany of on-farm pollution, failing small towns, and rural poverty.

All this is presented in serviceable, if sometimes bureaucratic prose above which Strange occasionally rises to deliver a memorable remark: "Private property," he writes, "evolved as a community commitment

to stop the meanest guy with the biggest stick from taking it all," and "Studying economics of size--"in ways our author deconstructs--"is like evaluating a group of basketball players only on their ability to 'slam dunk'...The biggest guy will do it best. But can he also play defense?"

This review appeared in slightly different form in the *San Francisco Chronicle*. The reviewer, Bruce Colman, is a member of the Board of Directors of The Land Institute.

Enduring Seeds: Native American Agriculture and Wild Plant Conservation

By Gary Paul Nabhan

University of Arizona Press
22 pages, hardcover, \$18.95

Reviewed by *Jake Vail*

This past February I spent two and a half days at a conference entitled "A Planet in Peril," where speakers presented "the facts" about humanity's influence on the biosphere, specifically "facts" about the phenomenon of global warming. As serious as this problem is, at a gathering such as this one can get numbed to it unless there is an opportunity in the midst of all the fact-flinging to slow down, assimilate and reflect. Fortunately, the conference planners possessed foresight enough to schedule a talk by the Chief of the Onondaga Nation, Oren Lyons.

In a stirring speech, Chief Lyons calmly and passionately spoke of where we are and how we got here. He reminded us that when Europeans first landed on these shores, Native Americans acted as their guides. He spoke, too, of the inborn talents of the four colors of the human race, and the need for us to learn from each other. White people are infinitely clever; red people are spiritual and wise. The cleverness of the white people has enabled them to conquer the continent and launch into new frontiers of scientific and technological progress. But, as global warming makes clear, there's no such thing as a free launch. Cleverness applied without wisdom has led to dust bowls, pollution, and disease, and, as we're now realizing, a biosphere much less diverse than it once was.

Wes Jackson has said that in our first 500 years here we Europeans have only colonized America -- the true discovery of the land lies before us. Chief Lyons urges us to seek the guidance of the land's original dwellers as we embark upon this discovery. Ethnobotanist Gary Nabhan has been doing so for many years,

and offers some of what he has learned in his new book, *Enduring Seeds: Native American Agriculture and Wild Plant Conservation*.

As agriculture ultimately comes out of nature, human culture ultimately comes out of agriculture. Wise farming, then, is both an effect and a cause of wise culture. No better illustrations of this dialectic can be found than in the parables offered in *Enduring Seeds*. Striking in their simplicity and wisdom, the agri-cultural tales of Ojibway and wild rice, Hopi and sunflowers, Seminole and gourds, Mountain Pima and turkeys, and Hidatsa and maize are woven together by a concern for the preservation of ancient and coevolved cultural and biological information, and the realization of the ease with which this heritage can be lost forever.

As Chief Lyons began his plea for wisdom with some history, Mr. Nabhan also begins by looking back. Before the agriculture of today came the explosion of plant diversity as angiosperms evolved, followed by the explosion of human populations, the birth of agriculture in the western hemisphere, and the coevolution of crops and culture in traditional farming systems. The author then takes a look at what underlies these native systems, what ethnographer Eugene Anderson calls an "ecology of the heart" which may come with (and only with) persistent cultures living within a place.

This ecology is the key to the messages of both Chief Lyons and Gary Nabhan. Wisdom takes time, and comes not from the sciences of the head, but from the feelings of the heart. Aldo Leopold knew: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." As described in *Enduring Seeds*, the traditional agricultural and cultural practices of the Ojibway, Hopi, Seminole, Mountain Pima, and Hidatsa were right. They listened to the present, thought for the future, and planted and harvested accordingly. Their systems were flexible. We have much to learn from them.

"Walk softly," said the Onondaga, "for the faces of the next generations are looking up at you."

Altars of Unhewn Stone (1987) by Wes Jackson (\$9.95) and *Meeting the Expectations of the Land* (1984), edited by Wes Jackson, Wendall Berry and Bruce Colman (\$12.50) can be ordered from
Northpoint Press
850 Talbot Avenue
Berkeley, California 94706

New Roots for Agriculture (1980 & 1985) by Wes Jackson (\$6.95) can be ordered from
University of Nebraska Press
901 N. 17th Street
Lincoln, Nebraska 68588-0520

Rishi Kheti -- The Agriculture of the Sages

Brooks Anderson

In August of 1987 I traveled to India to study the consequences of the Green Revolution. I also wanted to learn about the efforts of individuals and agencies to design alternative practices to Green Revolution technologies. I spent eight months visiting agricultural projects, experiments, and farms.

It is not difficult to find farmers who have been using hybrid seeds and agro-chemical inputs for over twenty years. The Government of India has made the nationwide modernization of agriculture a high priority. Through the market and extension efforts, it has made fertilizers, pesticides, herbicides and hybrid seeds available to farmers even in remote villages in an attempt to boost production of grains and other staples.

Now one hears many cries of discontent among farmers who were the earliest adopters of this new technology. Primarily, they are having financial trouble. The cost of production exceeds the market value of the crop. But, there have been other negative consequences of the green revolution also.¹

One farmer with 100 acres producing mostly wheat in Madhya Pradesh explained to me that he now sells wheat in the market at a loss. After paying for the chemical inputs, land tax, fuel, labor, and seed, he breaks even, at best, when he sells his crop at the price set by the government. In a report of an experiment performed by the Gandhi Peace Foundation and the India Institute of Technology, the authors estimate that farmers growing hybrid grains with conventional modern technology in India spend two thirds of their income on chemical inputs and fuel for the next crop.² After accounting for other expenditures, profits are negligible.

In Rasulia village there is a fifteen family, agriculturally based community called Friends Rural Centre. Ten years ago they became aware of the long and short range consequences of the green revolution techniques which they were using. Under the encour-

agement and guidance of a new director, Dr. Partap Aggarwal, Friends Rural Centre made significant changes in their farming practices. The community decided to use no more chemicals on their 25 acres. They sold their tractor and other machinery. They also made the radical decision to stop tilling some of their fields.

On these fields they began a method of farming which they call Rishi Kheti. Rishi Kheti means, "the agriculture of the sages." In ancient India the sages are said to have preferred food produced without the plow. Such food was simply gathered naturally.

For this bold change, the people at the center were inspired by the experience of Masanobu Fukuoka in Japan.³ Fukuoka farms using four principles of natural farming:

1. no cultivation
2. no chemical fertilizers or compost
3. no weeding by tillage or herbicides
4. no chemicals

In Rishi Kheti, as on Fukuoka's fields in Japan, farmers broadcast or scatter seed by hand into grasses or a standing crop which is nearly mature, approximately two weeks prior to harvest. These seeds germinate during final irrigation. The farmer will harvest and thresh the mature crop and return all of the waste straw to the fields to cover the young seedlings of the next crop. This mulch retains soil moisture and provides fertility as it decomposes.

Fukuoka grows a cover crop of white clover, heavily mulched with rice or winter grain straw, to provide additional nitrogen and compete with weeds. He also applies some poultry manure to add fertility and speed up the decomposition process.

At Friends Rural Centre they use a grain legume rotation on most fields. The possible combinations are quite large because of the variety of legumes in India. They may follow rice or wheat with masoor dhal, toordhal, lentil, pea, chana, dhal, groundnut or mung. In addition, they grow mustard and sesame seed, millet, and clover. The clover is cut three times and used as a fodder for their dairy and work cattle. They sell some of these crops locally for food and for seed. They also sell milk from their dairy.

Yields on the naturally farmed fields at Friends Rural Centre are generally lower than on conventionally managed fields, but considering the lower cost of production and environmental soundness of Rishi Kheti, it is an acceptable and desirable compromise.

EDITOR'S NOTE: Interns with diverse backgrounds come to The Land Institute. They have attended colleges in all parts of the country, have majored in varied fields, and have held many different kinds of jobs. Some of their most significant educational experiences have occurred through travel. When they describe these to Land people, we also learn. In this section, Brooks Anderson and Ed Orris relate some of their observations and questions as a result of contacts with people and places beyond the United States.

One and a half kilometers from Friends Rural Centre is the Titus family farm. The Tituses have more recently implemented Rishi Kheti on their farm. Five years ago Raju and Shalini Titus were farming their twelve acres with hybrid varieties of grains and intensively applying agro-chemical inputs. They had farmed this way for over twenty years, but it had become clear to them that they would have to either fundamentally change their practices or quit farming. According to Raju, the costs became too great, both economically and environmentally.

After closely following the experience of Friends Rural Centre for several years and talking with the people there, the Tituses came to recognize the importance of restoring and maintaining high soil fertility and stopping soil erosion. They became aware of variables in the food production equation which they had not previously been considering, profits and losses which are almost impossible to quantify in dollar or rupee equivalents, but which are possibly more important.

Such costs can be seen as widely as the well being of the entire rural community, or as narrowly as the health of one's own child or self. These issues all became more important as Raju and Shalini began to reexamine their relation to the world and the role which they should play in nature.

Although it has not been easy or simple, the move to Rishi Kheti has felt natural and necessary to the Tituses. They began by broadcasting combinations of legumes and are now in their fourth year of that system. Raju believes that combinations of legumes, vetch with chana in some fields, pea with lentil in others, are the best way to restore fertility to his exhausted soil. These legumes are an important

part of their diet. They use a portion of their crop to pay the people who help them with broadcasting and harvesting. Soon they plan to resume growing grains in rotation with these legume combinations.

On undulating portions of their land the Tituses maintain tree crops and vegetables. As I wandered on their property I found squash growing next to a lemon tree, bananas next to berries with beans underneath. I found no rows of crops. Instead, vegetable seeds and seedlings had been planted among weeds and trees. The weeds were cut back to give the vegetables a chance to become established, but they would be permitted to grow back to provide ground cover. Some of the vegetables grown by the Tituses in this way were gourds, cucumbers, okra, tomatoes, chilies, pumpkin, radishes, carrots, and leafy vegetables.

The adoption of Rishi Kheti has cut the cost of farming substantially for the Tituses and Friends Rural Centre. They believe that they are now practicing a more ecological and sustainable agriculture. As agro-chemical inputs become more expensive in rural areas of India and continue to contribute to environmental degradation, other farmers may look to the agriculture of the sages as an agriculture for the future.

References and Notes

1. For a more detailed analysis of the green revolution see Susan George, 1977. *How the Other Half Dies*, Pellican Publications, London.
2. *Eco-development*, Gandhi Peace Foundation, New Delhi, p. 18.
3. This method of farming is explained in Fukuoka's book; see Masanobu Fukuoka, 1978. *The One-Straw Revolution*, Rodale Press, Emmaus, Pennsylvania.

Questioning the Sustainability of Westernization

Ed Orris

During my four year enlistment in the US Coast Guard, I lived in Alaska for one year and on an Arctic-bound icebreaker ship for two years. During this time, I observed the integration of modern Western culture with traditional ways of life among Arctic indigenous peoples. Since then my mind has been grappling with a series of questions concerning the technological and cultural evangelization of Arctic indigenous peoples by Western society and the sustainability of both the Arctic native and Western societies.

From March 1985 to March 1986, I lived at US Coast Guard LORAN Station, Port Clarence, Alaska, located approximately eighty miles northwest of Nome on the western coast of the Seward Peninsula on a spit of land called Point Spencer. In the year that I

spent at Port Clarence, I never traveled more than eight miles from the station.

The Port Clarence area is a tundra ecosystem. In the warm months, various grasses, mosses, lichens, and bushes carpet the gently undulating landscape. Numerous pools of snowmelt water dot the tundra. Mosquitoes flourish. Wildlife abounds: walruses, seals, caribou, arctic fox, arctic hare, and numerous species of birds. Fish are plentiful in both the Bering Sea and the bay of Port Clarence.

In the cold season, the Bering Sea and the bay of Port Clarence freeze. Seemingly endless, strong winds drift snow across the tundra. The long Arctic winter darkness sets in. Located in this harsh yet bountiful area are two predominantly native villages: Brevig Mission and Teller.

Natives from Brevig and Teller regularly visited LORAN Station Port Clarence. Mainly, they visited to sell scrimshaw (walrus tusks engraved with artwork) and other handcrafted wares (slippers, beadwork, carvings, etc.), but they also stopped by to be sociable. Carrying hunting rifles and garbed in clothing that could be ordered from any outdoor gear mail order catalog, the natives arrived on snowmobiles in the winter or ATCs (three wheeled all terrain vehicles) in the summer. Very occasionally, one of the villagers traveled to the station by dog sled.

At the station after working hours, the visiting natives were free "to make themselves at home" in the station's recreation room and mess deck. They usually watched satellite television, conversed with station personnel, smoked cigarettes, and drank coffee or sugary drinks.

From their outward appearance, these people seemed fairly content. In many ways, they were still living close to nature: subsistence hunting, fishing, and making some traditional native goods and artwork (scrimshaw, dog sleds, tanning hides, etc.). But even though these natives partially maintain a subsistence type of lifestyle, Western culture seems to have heavily influenced them. I observed a variety of negative consequences:

1. Dependence on fossil fuels. Once energy independent and sustainable, these natives now rely on fossil fuels for heating, lighting, and transportation needs just like the energy-dependent Western society. Villages along the coast must be supplied during the summer by fuel barges.

2. Dependence on manufactured goods (clothing, rifles, snowmobiles, ATCs, boots, tools, etc.). In this culture, people formerly handcrafted all goods locally from local resources; now they depend on mass produced goods, manufactured and transported across the world. They are a part of the global economy.

3. Alcoholism and substance abuse. Before the influence of Western culture, they had no exposure to alcohol or other drugs and probably no psychological need for them.

4. Dental and medical problems. The majority of the natives I saw had some kind of dental and/or medical problems most likely resulting from the change from a locally evolved meat/fish diet to a highly refined Western diet.

5. Introduction to an economic system that encourages greed. These people shifted from a subsistence economy to a mixture of a traditional subsistence economy and a monetary economic system. The shift has been accompanied by greed and waste. On a seven mile run down the beach, I would usually pass by several beheaded walrus killed only for their valuable tusks.

6. Boredom, depression, the loss of cultural identity, and other psychological problems. Several

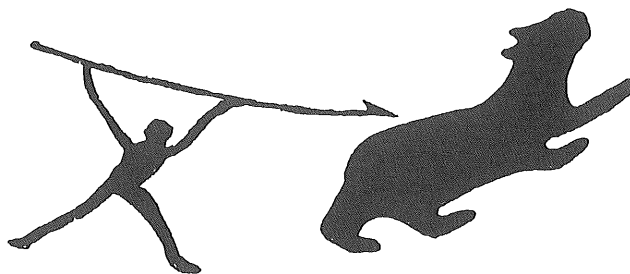
natives who liked to watch TV told me that they were bored. One native woman told me that she was worried about "getting fat." The same woman wanted to move to the continental U.S. and get an office job. One native man told me he heard that a nuclear war had already taken place. For these native people, television seems to have produced confusion about the future and a general dissatisfaction with traditional ways of life.

After a year in Alaska, I returned to the continental U.S. and traveled to my next duty station, Cape Hatteras, North Carolina. I did not expect to ever see the Arctic again, but in May 1987, I reported on board the USCGC Northwind, an icebreaker ship bound for Kalaallit Nunaat (the proper name for Greenland, a Danish territory with home rule).

In July, the Northwind arrived at Thule Air Force Base, a U.S. early warning radar site designed to detect launched Soviet missiles. Thule Air Force Base, built in 1951 under the then top secret Operation Blue Jay, is located on the northwest coast of Kalaallit Nunaat. A decision by Denmark and the U.S. in April 1951 "strictly forbade all contact between the natives and Americans on the base."¹ The Thule natives were relocated 125 miles north to Qaanaq to prevent their corruption by Western culture and technology.

According to Jean Malaurie, a French geomorphological and demographic researcher who lived with the Thule indigenous peoples in 1950-1951, the confusion and corruption brought by western culture had already affected the Thule natives from the onset of base construction. Utaaq, a Thule native, gave Malaurie his impressions of the base:

"Thousands and thousands of Americans," Utaaq said in his hoarse voice. Amerlaquaak (many), you lose track of how many. They come down from the sky every day. There's the atomic bomb too... We've been here a thousand years, we Inuit. We always thought Thule was an important place on earth... After all, we were the ones who discovered it... The Inuit also say that they're (the Americans) going to heat the ice field and make it melt... Then they're going to send us to the North Pole."²



Malaurie also provides this view of the Thule peoples meeting with Western culture.

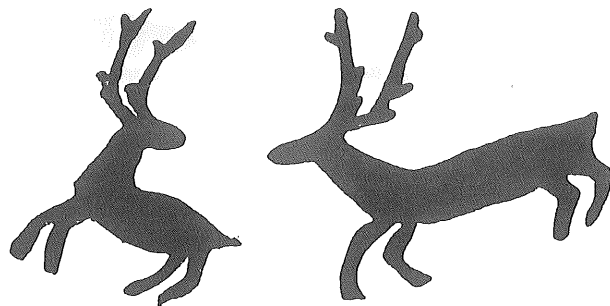
Qisuk (a Thule native) personified it. Wearing a gray-green jacket with the words "United States Navy" in black block letters on the back, he was pushing a sledge piled high with cases of tinned corned beef, ham, marmalade, and bundles of magazines over rocky ground. The dogs were struggling to pull the load. Qisuk, streaming with sweat, forced them on, belaboring them with cans of vegetables. He was followed by a crowd of kids wearing jockey caps; Lucky Strikes drooped from their mouths. They were coming from the store; the stock had been replenished, the Americans having generously given their surplus to the Eskimos through the Danish administrator. Already the shore was strewn with empty tin cans and scraps of clothing.³

Thule was the most bizarre place that I had ever been. The coastline approaching Thule was pristine and picturesquely beautiful (rocky and craggy terrain, glaciers, polygons of broken sea ice, and jagged/jutting pieces of icebergs/bergy bits floating serenely). Once Thule Air Force Base came into view, the picture began to change. Although the area surrounding the base still radiated rugged beauty, Thule Air Force Base looked like a scene out of science fiction, a post apocalyptic wasteland serving as home to a few survivors of the industrial age.

Diesel tanks dotted the landscape as did offices, hangers, and military style housing. Most of the buildings were dull metallic or drab colored rectangular boxes. Vegetation was practically nonexistent on the terrain.

Dust or mud covered everything. Any moving vehicle left behind a long plume of dust. The water of North Star Bay (the crash site of a hydrogen bomb equipped B-52 on January 21st, 1968) near the base was brownish green and silty. The water a few miles from the base was crystal clear.

Occasionally, I saw natives around the Thule Air Force Base area (mainly riding in outboard motor equipped fishing boats), but for the most part, I only saw remnants or signs of native life in the area. Hiking southeast about eight miles, I found a native camp (probably utilized for summer hunting and



fishing). No one was around. The camp consisted of approximately seven to twelve shacklike dwellings constructed of the refuse (corrugated metal, scrap plywood, and sheets of plastic) of western industrial culture. The one structure of the camp that surprised me the most was a ten to fifteen feet-long radio antenna of some sort with wiring leading into one of the dwellings. In this remote "corner" of the world, the native peoples had a direct link with the electronic technology of the modern world.

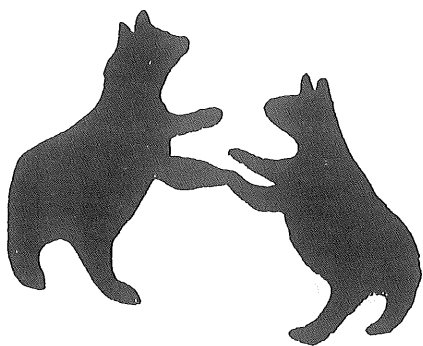
Hiking with my friends from the ship to Mt. Dundas (approximately four miles northwest overland from the base), we crossed a grassy plain on which a native village once stood. The abandoned sod houses greatly contrasted with the base a few miles away and especially with the abandoned missile silos a half a mile away.

On the one side was a symbol of a sustainable, ecological, close-to-the-land, probably very satisfying way of life; on the other side stood a symbol of technology, morals, and values gone haywire, the pinnacle of achievement for a death culture. The sustainment of life versus the end of the world.

After an almost surreal stay in Thule, the Northwind traveled south to our next port of call, Nuuk (Godthaab). Nuuk, the capital city of Kalaallit Nunaat, is located on the southwest coast. Out of Kalaallit Nunaat's total population of 54,000, 10,000 live in Nuuk. In this population of 54,000, the native "Greenlanders" outnumber the Danes approximately five to one.

Nuuk, nestled into the surrounding hills, has an urban feel. Natives and Danes drive cars around the city, although there are no roads that go any great distance from Nuuk. Most of the buildings resemble those found in other Scandinavian countries. Souvenir stores sell native artwork to tourists. (A Soviet cruise liner pulled into port the same day as we did.) The supermarket sells anything available in an





American/European supermarket: candy, oranges, coffee, Pepsi, Coke, milk, convenience foods, alcoholic beverages, etc. The employees are both Greenlanders and Danes. Just about everything necessary to lead a Westernized city life is available in Nuuk.

Rising out of the landscape of the city are high rise apartment buildings that bear a striking resemblance to the housing projects of New York City or other inner city areas. I saw litter, especially beer bottles, strewn around the apartment buildings. Graffiti was scrawled on many of the apartment buildings. A few native youths tried to sell me hashish. Groups of native youths "hung out" on street corners drinking beer. Prostitutes including teenage prostitutes were available. The whole atmosphere felt very slum-like, but there was a difference.

The natives in the apartments still seemed to have some ties to the old ways of life. There were fish hanging out to dry and seal skins stretched out to be tanned on the back porches. In an atmosphere so seemingly removed from their traditional ways, these natives were preserving a remnant of their native culture. Here was a hunter-gatherer people that either by choice or the force of Western culture lived in apartment buildings in a city instead of traditional native dwellings.

We departed from Nuuk after one day, made several other short stops in Kalaallit Nunaat, and returned home to the states. Back in the states, looking back at my Arctic journey, I grappled with a series of questions. These questions concern the spread of Western technology and culture into the culture of Arctic indigenous peoples. These questions need to be addressed by Westerners, but they are relevant to the sustainability of all cultures.

1. Could Arctic indigenous peoples return to their traditional, ecologically sustainable, and spiritually satisfying ways of life? Has there been enough cultural information and knowledge retained to

return to traditional ways? Is there any desire to give up the "conveniences, comforts, and perceived glamour" of Western civilization to retrieve the sustainable ways of life of the past?

2. Could and should these native peoples become completely Westernized and embrace the benefits of Western technology, but have to face the negative consequences that come with modernization: environmental destruction, materialism, dependence on unsustainable energy consumption patterns, loss of cultural awareness, lack of spirituality, chemical dependency, a refined foods diet, etc.? Can they thrive utilizing Western culture and technology that are currently proving themselves to be unsustainable? How much will these people and their lands suffer by completely Westernizing or remaining "stuck"?

3. Can these peoples try to develop an alternate way of life? Can they develop a lifestyle that utilizes the best of both cultures in a manner appropriate to their material and cultural needs?

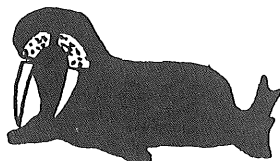
In *The Last Kings of Thule*, Jean Malaurie conveys a statement of hope for the Arctic indigenous peoples. Although Malaurie was referring to Greenlanders, his words can be applied to any of the Arctic indigenous peoples:

The Eskimos of Thule are an extraordinary symbol, not just for Greenland but for all the west as well: they recall the Arctic legends, the primordial humanity of Genesis, in which the sons of God gave birth to a race of northern giants, and the Greek myths in which the Hyperboreans were consecrated to Apollo, the god of the sun...⁴

I am confident about the future of Greenland if it masters money, which threatens to serve there also as an end in itself, and to transform the nation's fragile groups into ghosts manipulated by outside forces. It is an article of faith, an internal voice of the heart and of memory that whispers to me: Have confidence in the perennality of the Eskimos of Thule, of the entire Eskimo people.⁵

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1. Jean Malaurie, 1982. *The Last Kings of Thule*, E.P. Dutton, Inc., p. 394.
2. & 3. Malaurie, p. 384-385
4. & 5. Malaurie, p. 431

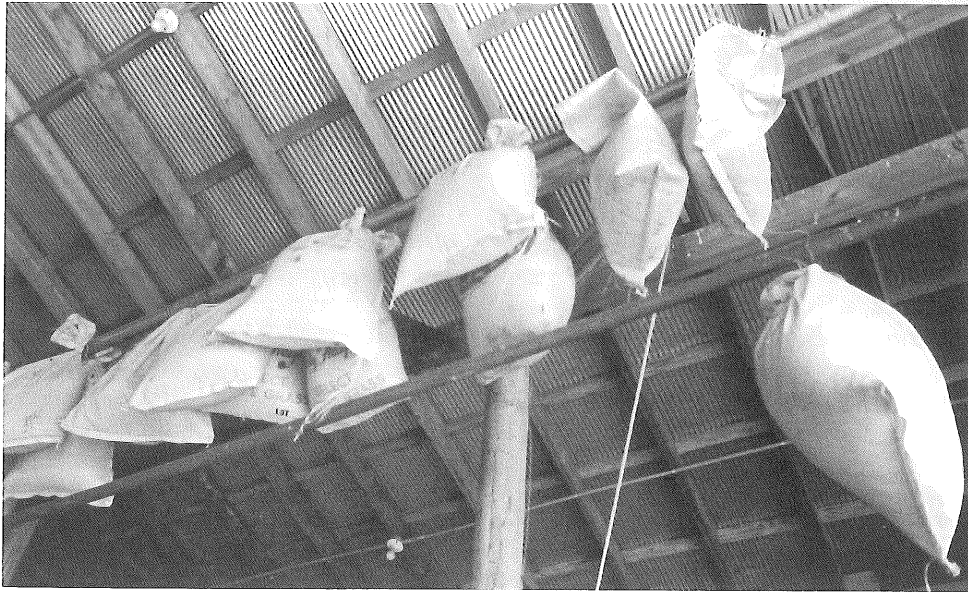




A Closer Look

The setting for work and study around the classroom building includes details we may not notice from day to day. On these pages we take a closer look through the camera's eye. (Clockwise) Foliage from the fragrant sumac and trumpet vine nearly hides the front door. Full sacks of seed, harvested from the experimental plots and hung up to dry, dangle near the barn roof. An entrance to the garden invites pickers and weeders. Concord grapes growing more visible among the vines and leaves show promise of a good harvest.





"What on Earth Can We Do?"

Pamela Cabbage

Saturday, April 22, 1989 was the nineteenth anniversary of Earth Day. The first Earth Day celebration, which took place on April 22, 1970, was organized by Denis Hayes, a Stanford University student. His organizational effort began at the Stanford campus and then moved to Washington D.C. It was a large and successful demonstration with an estimated twenty million people participating nationwide. On Earth Day 1970, the mayor of New York City banned traffic on Fifth Avenue, turning it into a pedestrian mall; the U.S. congress adjourned so that representatives could go home and listen to the concerns of their constituents; and millions of bottles and cans were collected in communities such as Pittsfield, Massachusetts, where a local bank sponsored a litter clean-up campaign. Two thousand colleges, ten thousand schools, and many communities took part.

Because of its broad community support, Earth Day 1970 was a great success. It created a public consciousness about environmental problems which led to the establishment of the Environmental Protection Agency, the passing of the Clean Air and the Clean Water Acts, and the removal of several congressmen with poor environmental voting records from office.

The first Earth Day did not, however, lead to solutions to all our environmental problems. Nearly twenty years later, as Earth Day 1990 approaches, we still have many of the problems we had in 1970, as well as an entirely new array of serious concerns. Thousands of tons of soil have eroded, millions acres of rainforest have been cut down, we have had major nuclear power plant accidents at Three Mile Island and at Chernobyl, and the threat of massive climate change due to the buildup of greenhouse gases and ozone depletion is upon us.

To observe Earth Day, 1989, a group of Land Institute staff and interns attended a protest sponsored by the Kansas Save the Earth Campaign at the Vulcan Chemical Company's Racon facility in Wichita. Racon is one of the five largest producers of chlorofluorocarbons (CFCs) in the United States. The purpose of the protest was to show public disapproval of the production and use of CFCs, which are major air pollutants. CFCs are used to make styrofoam, refrigerants, and solvents for the electronics industry. They react with and destroy the ozone layer which protects the earth from damaging ultraviolet radiation, and they are greenhouse gases which contribute to global warming.

Outside Wichita, on a section road one half mile from the Racon facility, about 750 people gathered in the 95 degree heat and strong south wind to hear speakers representing such organizations as the Kansas Farmers Union, the Rainbow Coalition, Native Americans for A Clean Environment, and the Kansas Organic Producers. There was also a short theater performance, an environmental take-off on the Wizard of Oz, by a Lawrence, Kansas group. The actors and actresses encouraged us to assume our personal responsibility in maintaining a clean environment by recycling, gardening, and boycotting products packaged in styrofoam.

This was the strongest statement of the afternoon. It emphasized that each of us at the demonstration had a personal responsibility for Racon's production of CFCs. Otherwise the demonstration left me feeling a little uneasy. Many people had attended the rally to show their disapproval of the alarming use and production of CFCs, but I wonder how many left realizing that it is not just Racon, but all of us who use styrofoam and refrigerants who are responsible for the environmental destruction these chemicals cause. I left the protest feeling that I had participated in a necessary action, but I also felt somewhat powerless, wondering what I can do to regain and maintain a healthy environment.

That question "What on earth can we do?" is the question of the Earth Day 1990 Committee, an organization which is acting as a catalyst to make the celebration of Earth Day 1990 a worldwide, week-long event. The Earth Day 1990 Committee, chaired again by Denis Hayes who is now a California attorney, is encouraging people everywhere to show that they do care about the environment by organizing events through their organizations, schools and communities. The Committee, which will work as a networking group, will pass along ideas for Earth Day activities from one community to another. It will publicize Earth Day 1990 and provide background information to participants.

Some of the events that are encouraged for the Earth Day 1990 celebration include planting trees (they would like to plant one billion worldwide), holding teach-ins for groups of all ages, including environmental teach-ins with congresspersons and the communities which they represent, and having people convince their local broadcast networks to focus on environmental issues for the month of April 1989. The goal of the Earth Day 1990 committee is to launch a decade of the environment, promoting

biological diversity, human health, and regenerative agriculture. The Committee hopes to involve a broad cross-section of the society in creating a groundswell of support for environmentally sound products, investments, and policies.

Earth Day 1990 will be a day, a week, a celebration of the environment. It will be a chance for people everywhere to gather together and be heard. As was the first Earth Day in 1970, Earth Day 1990

can be the start of a greater social and political consciousness if we all become involved in our community's celebration. We can turn our powerless fears of environmental catastrophe, such as those evidenced at the Racon protest, into a force of great change. Let's do it!

For more information on the Earth Day 1990 campaign, write to Earth Day 1990, P.O. Box AA, Stanford University, Stanford, CA 94305.

Contd. from pg. 19, DROUGHT AND THE PRAIRIE References

1. Marisa Daniels, "Jet Stream Faulted for Weather: Farmers Hope for Moisture for Crops," *The Salina Journal*, Jan. 18, 1989.
2. Donald A. Wilhite, William E. Esterling, Deborah G. Wood, 1987. *Planning for Drought: Toward a Reduction of Societal Vulnerability*, Westview Press, Boulder, p. 13.
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4. *The Wheat Grower*, October 1988. From a chart, "Wheat Production in NAWG States, 1986-88", p. 29.
5. William Robbins, "Crop Dried in Kansas, Focus now is on Land," *The New York Times Sunday Edition*, National News, March 19, 1989.
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For Your Interest

David Grubin Productions of New York has announced a summer encore of several Smithsonian World television specials. *The Promise of the Land*, which features Wes Jackson and Wendell Berry, will be shown on September 1. Check local listings for exact times.

The Atlantic Monthly will do a cover story on Wes Jackson and The Land Institute in their November issue. *Audubon* magazine will also feature an article about The Land Institute in November.

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