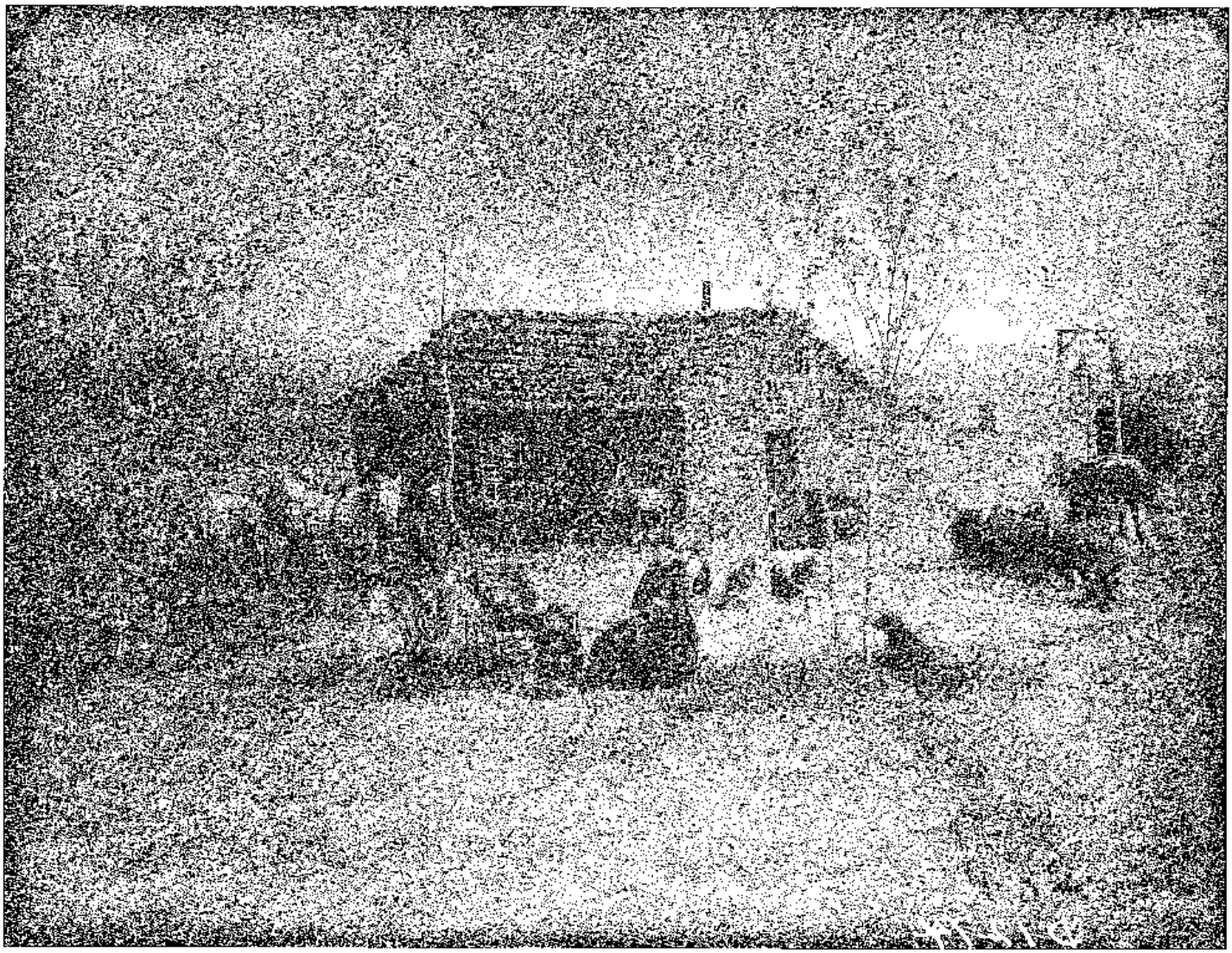


THE LAND REPORT

Number 26
Spring 1986

Spring 1986

Contents

On the Front Cover

The cover photo for this issue, "East Custer County, Nebraska, 1887," appears in a new book by John Carter, curator of photographs, Nebraska Historical Society: Solomon Butcher: Photographing the American Dream (University of Nebraska Press, 1985). John Carter will present a program of the same title at the Prairie Festival. Another Solomon Butcher photograph was used on the cover of the Prairie Festival invitation.

PLEASE NOTE OUR NEW ADDRESS
The Post Office has changed our address from Route # 3 to 2440 E. Water Well Road.

At The Land

The school year at The Land Institute officially begins in February, not in August or September. The new agricultural interns arrive in time to be oriented to our research program before the weather is right for preparing the ground and planting the experiments. They stay for a 43 week term, finishing in mid-December after all the data collection and analysis have been completed and papers written.

During the spring and fall sessions, the interns spend two hours in the classroom each day discussing assigned readings. During the summer they meet approximately once a week for seminars. Staff and students also have what we call a "warm up" period each day from 9:00 to 10:00, a time to report on individual reading and ideas, a time to discuss environmental, energy, peace and justice issues, and a time to plan the afternoon's work.

The physical work begins with construction projects and repairs in February and March. Research work gets underway in April, and all of a sudden in the middle of May, planting, weeding and watering all need to be done at once in the experimental plots and in the garden. Then it is time to get ready for the Prairie Festival.

Who are the folks following this schedule at The Land in 1986? The cast of characters is listed on the next page and appears in photographs throughout this issue.

The Land Report

is published three times a year by

THE LAND INSTITUTE
2440 E. WATER WELL ROAD
SALINA, KANSAS 67401

Editor.....Dana Jackson
Arts Associate.....Terry Evans
Circulation Mgr..Sharon Thelander
Printed by Arrow Printing Company

Contributing to #26: Brad Burritt, Danielle Carré, Bruce Colman, Mark Gernes, James Henson, Dana Jackson, Wes Jackson, Ivy Marsh, Gary Nabhan, Joe Paddock, Rob Peterson, Jon Piper, Paul Rasch, Mark Slater, John Thornton.

SUBSCRIPTION RATE: $5.00 ($10,00 foreign)

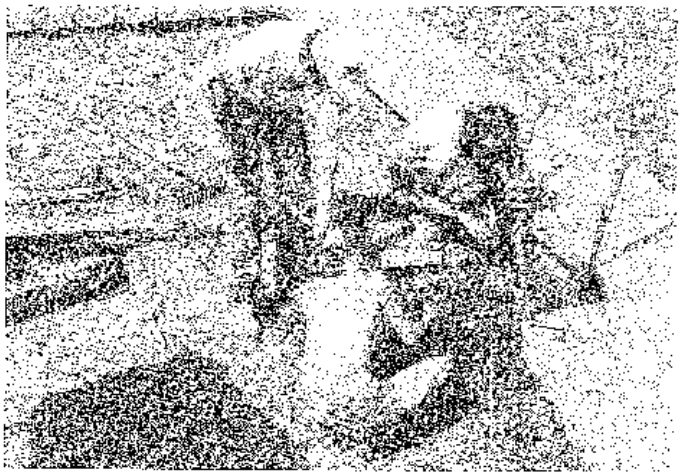
THE LAND INSTITUTE IS A NON-PROFIT EDUCATIONAL-RESEARCH ORGANIZATION DEVOTED TO SUSTAINABLE AGRICULTURE AND EARTH STEWARDSHIP

Who's Who at The Land Institute

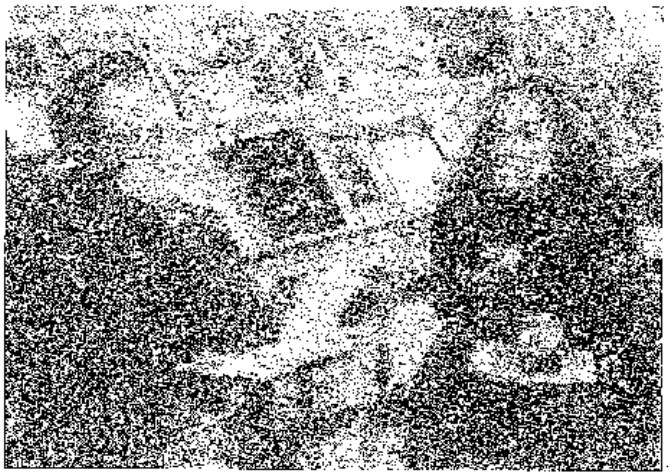
1986 AGRICULTURAL INTERNS

Patrick Bohlen: B.S.- biology, Univ. of Michigan, Ann Arbor,
Brad Burritt: B.S.- agronomy, Colorado State Univ., Ft. Collins
Michael Collins: B.A.- general studies and chemistry, Alfred Univ., Alfred, N.Y.
Mark Gernes: B.S.- biology, Bedmidji State Univ., Bemidji, Minnesota; M.A. candidate, St. Cloud State Univ., St. Cloud, Minnesota
Guy Grigsby: B.A.- biology and computer science,, Univ. of Colorado, Boulder
Rob Peterson: B.A.- French and African Studies, Kalamazoo College, Kalamazoo, Michigan
Dennis Rinehart: B.A.- biology, Liberty Univ., Lynchburg, Virginia
Melissa Sarlat: B.A.- environmental studies, Simpson College, Indianola, Iowa
Mark Slater: B.A.- biology, Colorado College, Colorado Springs

Mark S. and Patrick B. build new boardwalk.



Jon P., Melissa S. and Danielle C. landscape new boardwalk west of classroom building.



Rob F. and Melissa S. during warm-up.

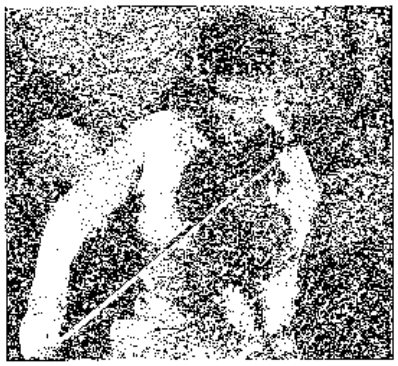
Michael Collins paints new beekeeping equipment.

LAND INSTITUTE STAFF

Research Associates
Jon Piper, Ph.D.- plant population biology, Washington State Univ., Pullman
Peter Kulakow, Ph.D.- plant breeding, Univ. of California, Davis (to begin mid May)
Post Doctorates:
James Henson: Ph.D.- plant breeding, North Dakota State Univ., Fargo
Teresa Maurer: Ph.D.- ecology, Univ. of Oregon, Eugene
Research Fellows:
Danielle Carré, M.S.- plant pathology, Univ. of Oregon, Eugene
Dana Price, B.A./M.A.- biology, Stanford, Stanford, California
Director of Research - Wes Jackson, Ph.D., genetics, North Carolina State Univ., Raleigh
General Staff
Dana Jackson, Administrative Co-director
Sharon Thelander, Secretary/bookkeeper
Rob Fischer, Operations Manager
Joan Scott, Director of Development (lives and works in Kansas City area)

Mark S., Patrick B., Dennis R. and Wes J. mix concrete for east wall of new shop in red barn which Rob F. built. Doors on new barn in background were built by interns in February and March.

Danielle Carré

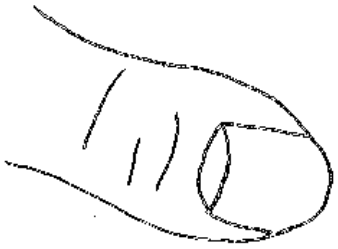


Dana Price

Lunch on the lawn in February sun.

Teresa Maurer

Sharon Thelander



Green Thumbs Gather

Saint Patrick's Day, or close to it, is the traditional time to plant potatoes in this area. It is also the traditional time for our biennial Green Thumb Gathering, an organic gardening workshop at The Land Institute.

Many attending this year's workshop on March 15 had already planted early spring crops, such as lettuce, spinach, carrots, onions, peas, and beets. The old planting instructions, "as soon as the ground can be worked," meant as early as January this year, so those who had not planted by March 15 felt behind.

The workshop was structured around questions turned in by the registrants. A panel of experienced gardeners, Ted Zerger, Fred Nelson, and Dana Jackson, considered each question, and then encouraged the other participants to respond. "Do roto-tillers with sharp tines damage soil structure?" "How can one control sow bugs?" "Do all manures require aging so they won't burn crops?"

Several of the questions led to discussions about how to save labor. Jobs associated with organic gardening, such as turning compost piles and picking squash bugs and potato bugs off plants, are definitely more time consuming than spreading commercial fertilizer and spraying pesticides. Experienced gardeners have adopted practices to eliminate work, such as letting weeds compost under mulch or in paths instead of putting them into compost piles which require turning. Ted Zerger cautioned against placing too much emphasis on labor saving, however. He observed that for himself saving labor in the garden is like using a short form of prayer - something is lost in brevity. "Things we do in the garden do things to us," he said.

The workshop recessed for lunch, and the 26 participants shared two large kettles of soup made from vegetables each had brought. All morning the vegetables had simmered in The Land Institute kitchen, resulting in uniquely flavored and delicious soups. Breads, jams, cheeses, cookies and fruits also showed up on the table, and lunch became a feast.

In the afternoon session, participants discussed seed saving, how to plant sweet potatoes, when to harvest Irish potatoes, and a variety of insect control methods.

Few attending the workshop based their practices on scientific information resulting from experiments with proper controls and repetition. Folklore, empirical evidence from gardening experience, good powers of observation, familiarity with climate, information in seed catalogues and intuition guided most decision making. At the home gardening or small commercial scale, this basis of knowledge is sufficient to produce satisfying harvests with little or no adverse effects upon the land. In certain situations, accurate, scientific information, explaining "why" as well as "how" could help a person garden more successfully. But good gardeners abound without that kind of knowledge, if they have green thumbs!

Prairie Festival 1986

Prairie Festival invitation/programs went into the mail early in May, and Land people are beginning to prepare for the 300-500 guests expected at our 8th annual Prairie Festival, May 31-June 1.

Two distinguished soil scientists will be featured on the program. Orville Bidwell, Prof. emeritus at Kansas State University, will teach about prairie soils from soil exposures made at The Land. He will take small groups to selected sites on Saturday morning and Sunday morning, to explain the structure and quality of prairie soil and agricultural land and answer questions. On Saturday afternoon, Francis D. Hole, professor emeritus of soils from the University of Wisconsin and author of a definitive text called Soil Genesis and Classification will speak Saturday afternoon on the topic "Touching the Earth." He will also do a Sunday morning program called "Conversation with the Soil." Francis is known for his enthusiastic presentations about soil, which include music and poetry.

Featured seed speakers on Saturday evening are Gary Nabhan and Karen Reichhardt, founders of Native Seed Search in Tucson, Arizona. Gary is the author of two books: The Desert Smells like Rain and Gathering the Desert. Gary and Karen will do a program together called "Seeds: Genetic Resources and Cultural Treasures," and each will also take a small group program Sunday morning. Raymond F. Wiebe, a specialist on Mennonite pioneer history who served on the 1974 Wheat Centennial Committee, will talk about how turkey red wheat was brought to Kansas.

The Minnesota poet Joe Paddock will open the Saturday afternoon session. His books, Handful of Thunder: A Prairie Cycle and Earthtongues contain humorous but serious, sad but joyful expressions of the prairie and prairie people.

The art exhibit this year will feature the pottery of Bob and Inga Bow with Guy Dawson from Abilene, Kansas. Bernd Foerster, a professor in the College of Architecture and Design at Kansas State, will present a slide show about folk architecture called "Structures from the Earth" on Saturday afternoon.

Old photos have a special place in this year's program. On Saturday afternoon, Lisa

Dennis R. labels Prairie Festival invitations.

Calloway from the Smoky Hill Historical Museum, will show photographs examining the impact of settlers on the North Central Kansas landscape in a program called "The Altered Landscape." On Sunday, John Carter, curator of photographs with the Nebraska Historical Society and author of a new book about Solomon Butcher, Nebraska photographer working in the 1880's and 1890's, will do a program called "Photographing the American Dream."

The Kansas Committee for the Humanities is supplying three Sunday programs. Tom Isern professor of history at Emporia State University, will give a talk entitled "The Plant Explorers: Shapers of American Agriculture," and he will also present "Folksongs of the Great Plains." Sally McNall, lecturer in the English Department at the University of Kansas, will portray the Nebraska novelist Willa Cather, who wrote about the prairie settlers.

Programs about prairie flowers and birds, as well as hikes, music, dancing, and fellowship will fill out the two day festival.

All interested persons are welcome to attend the Prairie Festival. Fees are $4.00 per day with preregistration, $5.00 per day if registering May 30-June 1. Call (913) 823-5376 for more information.

SUMMER CONFERENCES

JUNE 23-26, Tenth North American Prairie conference, Texas Women's University, Denton, TX.

The conference will consist of presented scientific papers in the areas of prairie composition, classification, ecology, management and restoration. Students and staff members of The Land Institute will present six papers which will encompass the range of The Land Institute's research.

Paul Winter Consort in Concert Oct. 11

The Land Institute and the Smoky Hills Audubon Society will present the Paul Winter Consort in Concert at the Salina Central High School theatre the evening of October 11, 1986.

The Salina Arts and Humanities Commission has awarded The Land Institute $2250 through the Horizons Special Projects Grant Program to help underwrite the concert.

Paul Winter and his jazz band have performed in Salina before, but the contemporary Paul Winter Consort, which mixes jazz with classical, folk and blues music, has not. The Consort's unusual combination of instruments includes soprano saxaphone, piano, French horn, cello, percussion, and vocals. Under the label of Living Music, the group records music that celebrates life, evoking sounds of streams, eagles, wolves and whales. Their latest, very popular album (currently on the top 200 list), "Canyon," celebrates the awesome wonder of the Grand Canyon by creating a typical day in the Canyon from sunup to sunset. This music appeals to all age groups with various musical preferences.

Paul Winter creates an original idiom of music that reflects his lifelong experience in jazz, symphonic and ethnic musical traditions. His renowned soprano sax sound, combined with the virtuosic and rhythmic music of the extraordinary Winter Consort provides an inspiring and uplifting musical experience which has enthralled audiences in over 1000 performances throughout the U.S. and in more than 30 countries around the world. As artists-in-residence at New York's Cathedral of St. John the Divine since 1980, the Consort has presented 30 special event programs, including the world premier of Missa Gaia/Earth Mass to capacity audiences.

The Land Institute will celebrate its tenth anniversary during the day on October 11. Friends of The Land are invited to attend the special afternoon program at The Land and then continue celebrating with us that evening at the Paul Winter concert. Details of the afternoon program will be announced later.

The Smoky Hills Audubon Society will be in charge of publicity for the concert. Watch for announcements in the fall, and mark October 11 on your calendar now as a special day to visit The Land Institute and hear the wonderful music of Paul Winter in Salina that evening.

Attention Alumni!

For our tenth anniversary celebration, we would like to compile a directory of former students, including information about jobs, marriage, children, travel, plans for the future and <u>current addresses</u>. Please send the information to Dana Jackson by July 1, 1986.

Sustainable Agriculture: A Concept Catching On

Dana Jackson

A symposium on sustainable agriculture, organized by the University of California and held the last week of January in Sacramento, California, may have been an important turning point in American agriculture. Sustainable agriculture is an evolving concept, until recently discussed primarily by organizations which are critical of conventional, industrial agriculture. Wes Jackson used the term in the 1980 edition of New Roots for Agriculture, and it became an important criterion in The Land Institute's search for alternatives in agriculture. Michigan State University sponsored a conference on sustainable agriculture featuring Robert Rodale in 1984. The Sacramento conference, however, was particularly significant because it included among its 400 participants representatives of the very institutions and agencies most responsible for the development of industrial agriculture. Of the 35 speakers, 26 came from campuses and units of the University of California. Note takers included cooperative extension agents, representatives of the California Wheat Commission, the California Beef Council, Del Monte Corporation, and Getty Agricultural Business, Inc.

Why all the interest? Would it have occurred if the farm economy were strong? I doubt it. But that really isn't important. California, the leader in mechanized, high production farming, is also a leader in agricultural chemical contamination of groundwater and farm bankruptcies. More and more both urban and farm people are asking for changes in the way agriculture is practiced. They are asking agricultural advisors how to reduce costly inputs and reduce pesticide use. The University of California professors at Davis are beginning to see the importance of this new trend, and the conference on sustainable agriculture in Sacramento was a significant response.

A larger conference, with 500 attending and about 200 potential participants turned away because of lack of space, was held immediately following the Sacramento conference. This sixth annual ecological farming conference at the YMCA camp near La Honda, was sponsored by the Steering Committee for Sustainable Agriculture. It did not, like the other conference, cover subjects unfamiliar to its registrants. The Steering Committee for Sustainable Agriculture, based in Davis but not connected to the land grant university there, has been promoting sustainable agriculture through public education since 1980. Their yearly conference has been attended regularly by people working at ecological agriculture, and it is known for informative and inspiring programs lubricated by good fellowship and organic food. I went to the conference in La Honda and found this reputation accurate.

Some of the people who attended the Sacramento conference later found their way to the Jones Gulch YMCA Conference Center. The accomodations, squeaky bunk beds in leaky cabins, didn't compare to the Sacramento Inn, but the food, a tremendous variety of organic products donated by California growers or merchants, was delicious and plentiful. Backpacks were more common than briefcases, and the gray-haired ponytail and bandanna more the norm than the three piece suit. The environmentally-conscious people of the 60's, who set out to live on the land without damaging it, are still there, making their livings. They haven't all turned into yuppies. But it would be wrong to leave the impression that all the ecological farmers who attended fell into that category. They weren't all from California, and they came from different sizes of farms growing every kind of crop from alfalfa to lemons and kiwis.

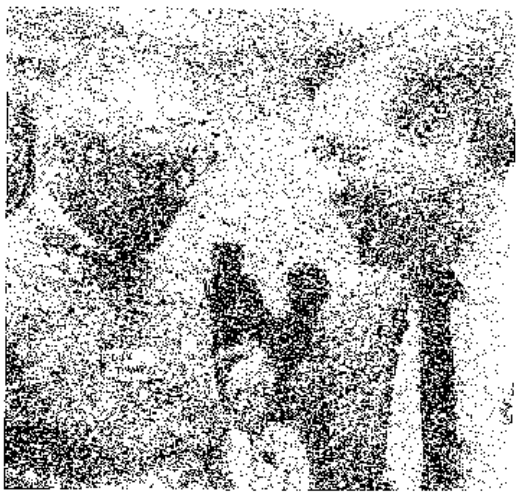
Whether or not the agronomy professors, bureaucrats, and financially-strapped industrial farmers who leaked into the La Honda Conference from Sacramento felt comfortable with the ecological farmers or not, they came because they thought there was something to learn from the more than forty speakers. Workshops covered such subjects as soil fertility management, weed management alternatives, organic nursery management, seed production, and certification of organic produce. Several farmers, including Steve Pavich, one of California's most productive grape growers, told how they changed from chemical farming to organic farming. The intent of the conference was not to promote organic farming in itself, but to encourage those who were thinking about reducing chemical

inputs, of making the transition to more ecological agriculture, to encourage a dialogue that would help form bridges. "Bridges to Healthier Farms" was the title of the conference.

In addition to the practical workshops, the Steering Committee scheduled some speakers because they could inspire, could articulate the ideals of ecological farming. Such a person was Lynn Miller, the editor of the Small Farm Journal who spoke on the topic, "Criteria for Evaluating Farm Success." "Farming must be the stewardship, the careful nurturing, the consumate love affair of our lives with planet earth. Nothing short of that is success," he concluded. The keynote speaker, Robert Rodale, spoke about regenerative agriculture (a term he prefers over "sustainable") being a step beyond and above organic agriculture. "I believe in the healing power of the earth," he declared. In his speech near the close of the conference, Marty Strange of the Center for Rural Affairs saw positive aspects of the farm economic crisis. He said that essentially American agriculture is stalled, is increasingly vulnerable financially. The "bridges" program and others like it represent "jumper cables" for American agriculture. Farming is busy being reclaimed by those not buying the barren philosophy of the past. He called this "resurgent" agriculture. The mainline agriculture people, those promoting what Robert Rodale called "full throttle" agriculture, are now on the periphery.

Some of those on the periphery do not like being there. They have felt public pressure for change. They are becoming involved in the evolving definition of sustainable agriculture. What we need to guard against is the co-option of that term, the inclination to define it in such a way that conventional, production-oriented agricultural research can be included under the umbrella.

When our book, Meeting the Epectations of the Land, was first planned at a caucus of writers held near Chicago in June, 1982, we more or less accepted Wendell Berry's definition:



Dick Thompson and Wes J. at KOP meeting.

"Sustainable agriculture does not deplete soil or people." I preferred a broader, more positive statement: Sustainable agriculture protects soil and water and promotes the health of people and rural communities.

Speaking at both California conferences, Terry Gipps of the International Alliance for Sustainable Agriculture in Minneapolis, Minnesota, set up four criteria in his definition, saying that sustainable agriculture needs to be "ecologically sound, economically viable, socially just, and humane."

We recognize that defining sustainable agriculture is much more difficult than defining successful agriculture in the conventional sense. The only criterion which has mattered for years is efficient high production. But terminology is getting careful scrutiny these days. The term "organic" is not in vogue. Because the proponents of organic gardening and farming have been accused of being too pure, too religious, too evangelistic, many people are substituting "ecological," "practical," "low-input," for "organic." Even the Bible of organic gardeners has changed its cover. The

word "organic" appears in much smaller letters, while RODALE is the word which stands out.

It is true that in these times of economic crisis for farmers, more are receptive to decreasing or eliminating chemical fertilizers and pesticides. To bring these into the fold, without scaring them off, perhaps these alternative terms are necessary. " Bridges to healthier farms" may be easier to build by changing terminology.

A relatively new organization, inspired by Dick and Sharon Thompson of Boone, Iowa, calls itself "Practical" Farmers of Iowa. Perhaps as significant as the sustainable agriculture meeting in Sacramento, was the invitation to Dick Thompson to speak to officials at the U. S. Department of Agriculture in Washington D.C. in February. Peter Myers, Assistant Secretary of Agriculture, asked Thompson to present a three hour seminar on ridge tillage without herbicides, interseeding cover crops in a ridge system, and on farm design for side by side, randomized, replicated plots. Dick and Sharon Thompson have become well known in the past few years for their successful transition to a more ecological farm system on their 300 acres, what Dick calls "balanced" farming. Their field day each summer draws hundreds of visitors from all over the country. But the Thompsons do not claim to be converting large numbers to the mostly organic farming system they have developed.

Dick and Sharon Thompson were the featured speakers at the Kansas Organic Producers' Annual Meeting in March, shortly after Dick gave the Washington D.C. seminar. The following is an excerpt from Dick's talk.

> I attended Iowa State University in the 1950's and received a B.S. and a M.S. in animal husbandry. From 1957 to 1967, we purchased everything the salesmen had to sell. The rotation was continuous corn with high rates of anhydrous, herbicides and insecticides. I was building my kingdom, where enough was never enough. From 1968 to present date, we shut the door on these salesmen and changed to balanced farming with a five year rotation of corn, soybeans, corn, oats and hay. Most farmers will not or can not make the necessary change in rotation and will not be able to close the door completely on purchased inputs. I have been on both sides of the fence, with formal training and then retraining.
>
> Our complete withdrawal from chemical inputs has not spoken to our neighbors. The vast majority of financially stressed farmers perceive that they can not jump from one extreme to another. Conventional farmers perceive that the organic movement is asking them to make a complete change from step A to step Z all at one time. This

> has given the organic movement and bad name and has built walls between people. The perception needs to be changed to a practical, sensible approach of moving from step A to step B and then to step C and then continue moving toward Z....The philosophy of the Practical Framers of Iowa organization is to make all kinds of farmers welcome and confortable at seminars and workshops. Our role is not of being the convicter, but share what we have witnessed."

The Kansas Organic Producers' meeting was well attended this year, many coming just to see slides of the Thompson farm and learn about their operation. It was heartening.

The concept of sustainable agriculture is catching on. But those who originated it must pay attention to the shifting terminology which surrounds it and protect the concept, as it gains respectability, from inevitable attempts to undercut or sidestep the land ethic which created it.

SUMMER CONFERENCES

AUGUST 8-10, The 2nd International Permaculture Conference, "Regenerative Systems for an Abundant Future," The Evergreen State College, Olympia, WA. For information contact the Permaculture Institute of North America, 6488 Maxwelton Road, Clinton, WA 98236.

Speakers include Masanobu Fukuoka, author of The One Straw Revolution, Wes Jackson, co-director of The Land Institute, and Bill Mollison, author of Permaculture One and Permaculture Two.

AUGUST 18-21, Sixth International Scientific Conference of the International Federation of Organic Agriculture Movements (IFOAM), Univ. of Calif., Santa Cruz, CA 95064. The conference will focus on research and issues related to agro-ecology and sustainable agricultural systems. The Land Institute staff will present papers.

1986 Research Season Underway

Jon Piper

A relatively mild winter has allowed us to get out early this year to "do what needs to be done" in the field. In meetings held over winter, the research staff (Danielle Carré, James Henson, Wes Jackson, Jon Piper, Dana Price, and former staff member Judy Soule, who returned for a few days in January to help us think) decided to pare down the number of experiments from last year and do fewer, but high-quality, projects. We are particularly excited to begin formal breeding programs for three species while we explore the characteristics of the prairie that contribute to its sustainability.

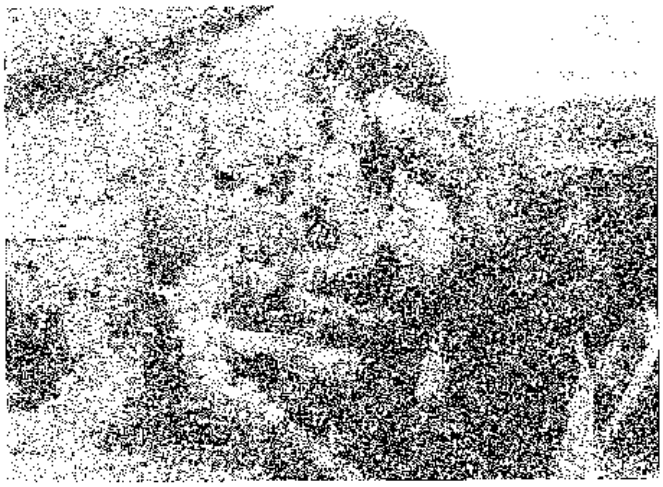
All our work relates to four research goals: 1) breeding high-yielding herbaceous perennial seed crops, 2) establishing the superiority of a polyculture of species over a monoculture, and developing an agricultural system that will 3) provide its own fertility and 4) manage successfully insects, pathogens, and weeds.

Results from past years' experiments have helped us answer some basic questions and, this year, we will focus our efforts on 17 projects:

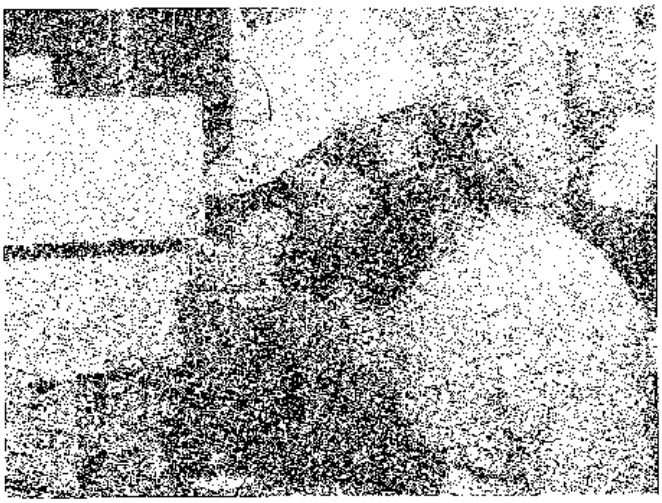
1. Patterns of seed yield in wild senna (Senna marilandica)
2. The effect of Maximilian's sunflower (Helianthus maximiliani) on naturally-occurring weeds
3. F_2 and F_3 Sorghum bicolor X Sorghum halepense selection
4. Competition in mixed swards
5. Monitoring the "complete" ecosystem
6. Density effects on yield and vegetative spread in Maximilian's sunflower
7. Insect and pathogen observations
8. Illinois bundleflower (Desmanthus illinoensis) density trial
9. Eastern gama grass (Tripsacum dactyloides) multiplication
10. Multiplication and comparison of wild rye (Elymus and Leymus) species
11. Vegetation of the prairie
12. Relationships among basal stem diameter, biomass, and yield
13. Recurrent mass selection for emergence and early flowering of Maximilian's sunflower
14. N_2 fixation in Illinois bundleflower
15. Breeding system of Illinois bundleflower
16. Recurrent mass selection for emergence of Illinois bundleflower
17. Methods of propagating wild rye, Maximilian's sunflower, and Illinois bundleflower

Early in the term, each of the nine agricultural interns chose two experiments for which he or she will be primarily responsible during the year. After data are collected and analyzed, the interns will present the results of their study at Kansas State University and publish a brief paper in The Land Report Research Supplement.

The list of experiments includes those both ongoing (numbers 1 through 10) and new for 1986 (numbers 11 through 17). Such projects as density effects in Maximilian's sunflower (no. 6), multiplication of eastern gama grass (no. 9), and methods of propagation (no. 17) have been well underway since the beginning of March. Work on the other experiments is picking up quickly as the sun ascends increasingly higher and the soil warms.



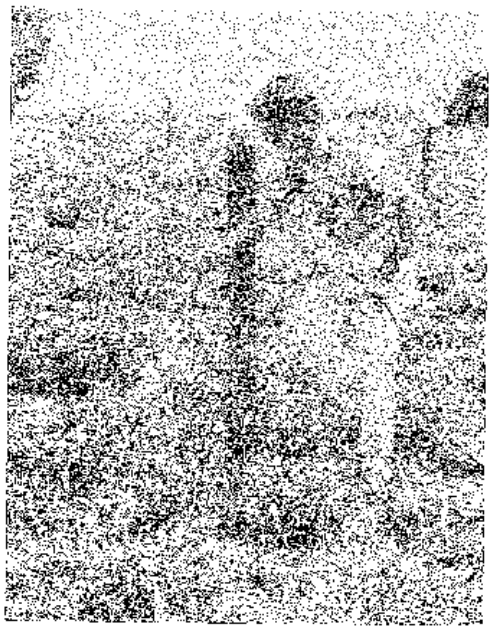
Melissa S. and Mark G. count seeds.



Mark Slater

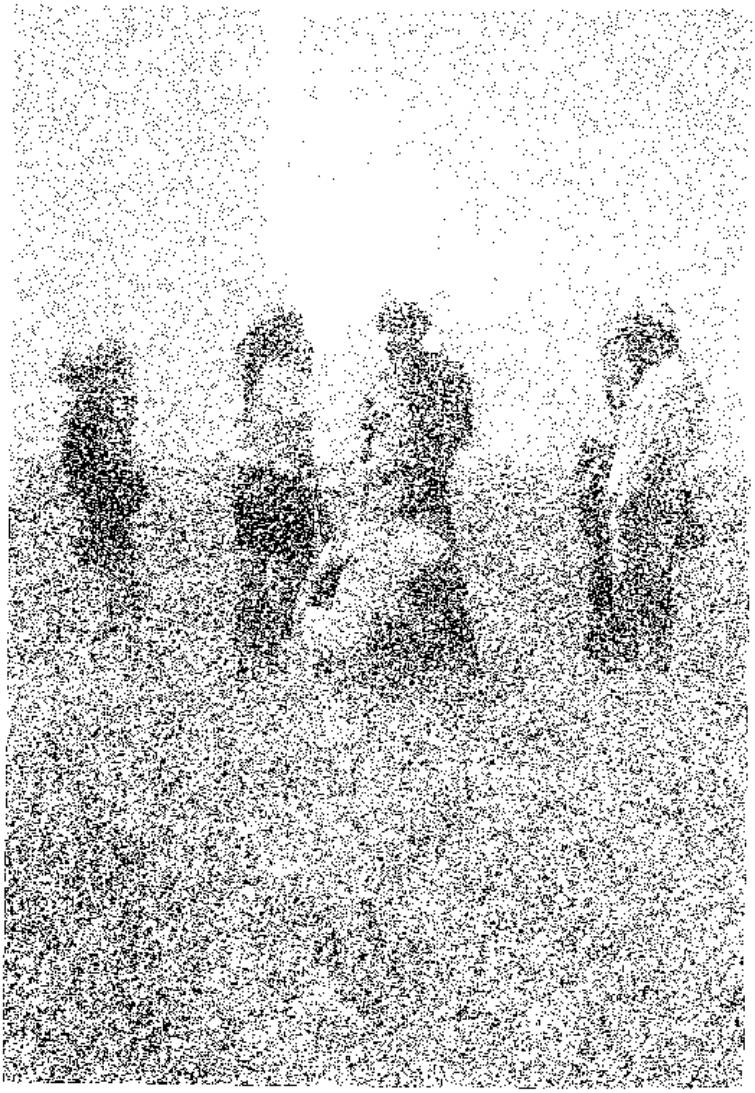
Steve Ela, 1985 intern, answers questions after giving a paper on his experiment to the Research Advisory Group at KSU in December.

Jon Piper, Craig Martin (Professor of Ecology, Univ. of Kansas) and Vern Stiefel (1985 intern) respond to presentation.



James Henson waters gamagrass seedlings.

The Land Report Research Supplement, Number 2, is now available. It contains papers about the 1985 experiments written by the interns and edited by Judy Soule. To receive a copy in the mail, send $1.75 to RESEARCH SUPPLEMENT, The Land Institute, 2440 E. Water Well Rd., Salina, Kansas 67401.



Melissa S., Dana P., Guy G., Jon Piper, and Mark S. study ecology outside on the prairie.

Allelopathy: Natural Phenomenon or Unproven Concept?

Mark Gernes

Plant aggression sounds preposterous, but the phenomenon known as allelopathy implies that plants are aggressive. Allelopathy occurs when plants liberate biologically toxic compounds (allelochemics) into the soil environment and affect neighboring plants.

An historical record of people recognizing allelopathy exists. Evidence of natural suppression of certain associated plants was first acknowledged by Theophrastus, the Greek father of botany, in 285 BC. He recognized chick pea's (Cier acietinun) ability to sour soil for successive plants, especially caltrop (Tribulus teresteris). The Swiss botanist DeCandolle in 1832 first recorded black walnuts' antagonistic effect on nearby plants.[1] The chemical julone, is excreted by walnut, and effectively squelches other plants' growth within the walnuts' periphery.

The term allelopathy, which literally means "mutual harm," was coined in 1937 by Hans Molisch. His use of the term included all chemical interactions, both detrimental and benefical, between plants and their associated microbes.[2] Because microorganisms are so ubiquitous in the soil, a working definition should include their potential to transform or totally degrade the liberated toxins.

Considering these transformations, two types of allelopathy exist. True allelopathy is the release of compounds which are toxic in their original form. Functional allelopathy is the microbial transformation of a benign compound into a toxic form.[3] Plant chemical aggression, along with competition, has an important role in natural plant communities and a potentially important role in agroecosystems.

Elroy Rice, author of two books and contributor of many scientific papers, is well known among allelopathy investigators.[4,5,6] Evidence collected in the laboratory by Rice and his associate Charles Olmsted III substantiated other conclusions of the ecological significance of allelopathy. Observations of old field succession suggested that two common plants from the first succession stage, brome grass (Bromus japonicus) and redroot pigweed (Amaranthus retroflexus), were strongly allelopathic, in natural settings, to other pioneer species. An associated companion of these two plants was three awn grass (Aristida oligantha). The two antagonists normally eliminated themselves within two years after establishment. Elimination of the competing plants stimulated growth of the three awn grass, which continued its role for several years.[7] In natural systems, many plants (thistles, crabgrass, ragweed, sumac, and sycamore) seem to have herbicidal activity on herbaceous vegetation within their vicinity.[8]

Several studies of allelopathy have concentrated on agricultural applications of the phenomenon. Rice devotes a large section to agricultural allelopathy in his 1979 review of allelopathy. Using low tillage practices so prevalent today, farmers purposefully incorporate crop residue into the soil or leave the residue intact on the soil surface. Many of the allelotoxins of crops and weeds are introduced by decomposition of residues.

Recognizing the importance of crop residue, T. M. McCulla has spent over 25 years studying residue toxins in Nebraska. Results from one of these studies suggest that toxins released and transformed by microbial decomposition of corn residue inhibit wheat germination and seedling growth.[9] D. T. Bell and D. E. Koeppe took a more direct approach in their 1972 study. They arranged mono cropped containers of corn and giant foxtail, alternating in a stair-step setup, in which excess nutrient solution drained into the container below. A pump at the lowest container pumped the liquid back to the top container. This procedure eliminated competition between the test plants, as each was given an equal amount of growth requirements. The conclusion was that giant foxtail strongly inhibited corn due to the leaching of a toxin from foxtail containers into corn containers.[10]

The sunflower (Helianthus sp.), an established crop and a prairie plant is a recognized suppressor of certain associated plants. Recently Gerald Leather from the USDA tested several sunflower (H. annuus) cultivars and concluded that all were antagonistic toward redroot pigweed and velvetleaf. Several herbaceous weeds, including jimson grass, wild mustard and giant foxtail were apparently stimulated by sunflower extracts.[11] In a study done in West India by S. S. Narwal and D. S. Malik, four separate legumes were intercropped with sunflower (H. annuus). The yields of all four legumes, including soybean, were reduced compared to control crops.[12] At The Land Institute, several experiments have been designed around the allelopathic nature of sunflowers. Two other allelopathic plants, sorgham and Johnsongrass, are the subject of a breeding program in another experiment. As a usable agroecological phenomenon, allelopathy is especially appealing for a perennial crop.

Interest in allelopathy is growing, but critics question if the phenomenon is ecologically important and even if it is an actual plant process. Those who believe it is have attempted to gather irrefutable evidence to prove allelopathy as an ecological process separate from competition. This evidence is chiefly of two types:(1) cataloging allelopathic plants

and compounds and (2) identifing specific interactions, including the mechanism(s). Advocates of allelopathy would like to be able to identify specific interactions and apply them to ecological succession or to a sustainable agriculture paradigm. The critics have many valid questions and arguments.

A typical criticism of allelopathy is that many of the toxic compounds are commonly found in plants as intermediates of normal metabolism. Other allelochemics are the end products of plant metabolism and are stored within the plant in vessels called vacuoles. This is the way plants remove waste products from their system.

In defense of allelopathy as a process, many of the toxic compounds increase in concentration within the plant tissue when the plant experiences certain stresses.[13] Many of these stresses such as drought, mineral deficency or changes in light would occur as another plant encroaches on the donor plant. If the potential allelopathic plant experiences stress by another plant, it may respond in a reciprocating manner by producing greater quantities of these compounds.

The allelopathic compounds are too numerous to list, but a list of the various classes of chemical compounds which have toxic effects includes terpenoids, sterols, alkaloids, gallotannins, coumarins and phenolics. As mentioned above, many of these compounds, though toxic, may play an important role in the plants' normal activities. However, all the compound classes have representatives which have no known metabolic function.[14] Of the alkaloids catalogued, none of them have a known function, other than protection.[15] The phenolics are accepted as a primary way of dealing with waste compounds. Phenolics are recognized for their toxic ability and are commonly stored in plant vacuoles.

Maximilian's sunflower shows allelopathic characteristics and is included in experiments at The Land.

Liberation of the toxic allelochemics into the soil environment is an important part of the allelopathic phenomenon. Four routes of release are recognized. First, compounds such as the terpenes which are components of the essential oils of plants, may volatilize. Two terpenes, cineole and camphor, released by volatalization from the California desert plant (Salvia leucophylla), effect a ring of bare ground around Salvia as normal, associated vegetation is not present.[16] These and other volatile allelopathic compounds can easily be released from plant shoots or residues of the plant. Second, leaching or a washing away of compounds by rain and mist will remove compounds stored near the surface of the plant shoot. Third, in the roots, forced exudations liberate many types of chemical compounds. In a concise treatise about the environment around the root, Elroy A. Curl and Bryan Truelove included the following as compounds occurring in root exudates: amino acids, sugars, glycosides, organic acids, vitamins, sterols, proteins, coumarins and a variety of other miscellaneous compounds.[17] Fourth, the last means of toxic evolvement is in the decomposition and leaching of plant residues. By any one or more of these processes, allelochemics are able to enter the soil.

Uptake of toxic compounds from the soil is a result of plants absorbing whatever they can from the soil in an attempt to fulfil their mineral needs. Each year millions of dollars are spent on herbicides on the assumption that target plants will absorb their lethal dose in their search for nourishment. Bicultural experiments have been done using radioactively labeled minerals to document that allelochemics are released and absorbed.[18]

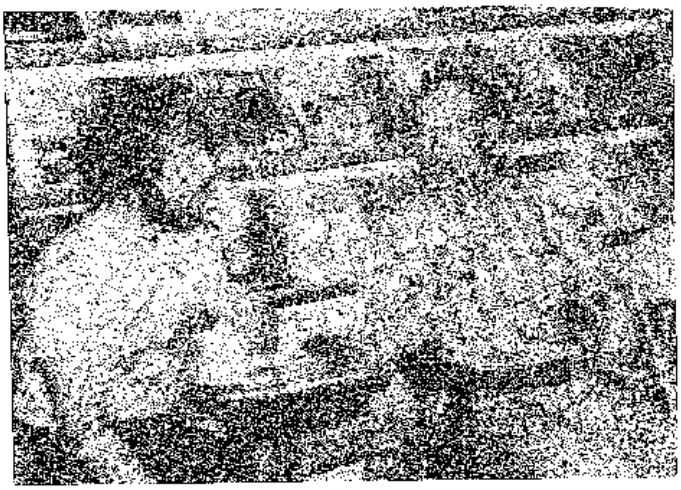
Natural selection serves to select the most fit genetic individuals within a specific environment. For plants without the capacity to deal with their own poison(autotoxicity), the reality of natural selection would be harsh. This would result in chemically efficient plants or plants able to attract and harbor specific microflora. Autotoxicity and selectivity are difficult to account for without some idea of mode of action of the constituent allelotoxin.

Two possible modes of action exist for allelotoxins. First, allelotoxins may effectively work in the external environment. Phenolics and gallotannins strongly absorb positively charged soil minerals(ions) which include the metal trace elements zinc, iron, and magnesium in particular. In alkaline soil environments these minerals are especially difficult for the plant to take up. If the ion is adsorbed by a Phenol it may be unavailible to the plant.[19] In the external environment the plant may rely heavily on the activating or decomposing role of bacteria and fungi to avoid autotoxicity by detoxifying soil in direct absorptive reach of the plant. Second, if the toxic compound is absorbed by another plant, several methods of toxicity have been proposed for specific allelochemics. Cell elongation and

ultrastructure of root tips seem to be affected in sunflower (H. annuus) by alkaloids from Thorn-Apple (Datura stanonium).[20] The alkaloid apparently inhibits the ability of these cells to break down starch. Tannins are known to effectively block the synthesis of the plant growth hormone gibberellic acid. The active uptake of positively charged ions is apparently inhibited at an enzymatic (ATPase) reaction within the cell membrane. This inhibition is closely related to the total phenol content in the soil. Other mechanisms which may be important in allelopathy are inhibition of photosynthesis or respiration and interference with certain key enzymatic reactions.[21]

Proponents of allelopathy have amassed evidence for chemical interaction between plants under natural conditions. As a phenomenon it must be considered separately from competition. Competition implies a stress due to removal or attempts at removal of potential growth requirements. Allelopathy results from the addition of entities into the environment. Since the two phenomena are closely related, the term interference should be used to include both concepts in one relationship.[22]

Allelopathy might not function for the explicit reason to unite with competition, to fight the stress applied by another plant. Rather, allelopathy may be a result of secondary metabolites and waste products which may harm or benefit another plant. If this is the case, then all plants may be capable of allelopathy. As the cataloguing continues this will become more apparent. Cyclic interactions will be recognized and may serve as ecological checks in applied systems. One such cyclic system was uncovered by a Russian worker S. F. Zabyalyendzik. He found mustard and lupine exudates stimulated buckwheat growth, whereas exudates of oats inhibited growth of buckwheat. Buckwheat extracts in turn stimulated oats and inhibited growth of lupine.[23] Even such a strong antagonist as sunflower has a natural check, the Thorn-Apple.



Mark G. listens to Dr. Stan Rowe after potluck lunch in the classroom.

Many scientists may never accept allelopathy as a proven plant process. But, nevertheless, observations in nature of the detrimental effects of some plants on others cannot be ignored. There might even be an agronomic application of allelopathy to control weeds in crops. Though we must realize that we will never be able to fully understand all the ecological relationships which would tell us how to completely exclude weeds from fields, there may be an important role for allelopathy in sustainable agriculture.

REFERENCES

1. Elroy L. Rice, 1974. **Allelopathy**, (Academic Press, New York).
2. Elroy L. Rice, 1979. "Allelopathy, An Update," **Botanical Review**, vol 45.
3. R.J. Aldrich, 1984. **Weed-Crop Ecology**, (Wadsworth Pub., Belmont, Ca.), pp. 215-241.
4. Rice, 1974.
5. Rice, 1979.
6. Elroy L. Rice, 1984. **Pest Control with Nature's Chemicals**, (Univ. of Oklahoma Press, Norman), pp. 23-49.
7. Charles Olmsted III and Elroy L. Rice, 1970. "Relative effects of known plant inhibitors on species from first two two stages of old-field succession," **The Southwestern Naturalist**, vol. 15.
8. Rice, 1979.
9. Rice, 1984.
10. Rice, 1979.
11. Gerald Leather, 1983. "Sunflowers (Helianthus annuus) are allelopathic to weeds," **Weed Science**, vol. 131.
12. S.S. Narwal and D.S. Malik, 1985. "Influence of intercropping on the yield and food value of rainfed sunflower and companion legumes," **Experimental Agriculture**, vol. 21.
13. Allen R. Putnam, 1983. "Allelopathic Chemicals," **Chemical Engineering News**, vol. 4.
14. F.B. Saulsbury and C.W. Ross, 1978. **Plant Physiology**, 2nd ed., (Wadsworth Pub., Belmont, Ca.).
15. J. Levitt and J. Lovett, 1985. "Alkaloids, Antagonisms and Allelopathy," **Biological Agriculture and Horticulture**, vol 2.
16. M.G. Barbour, J.H. Bank and W.P. Pitts, 1980. **Terrestrial Plant Ecology**, (Benjamin/Cummings Pub., Ca.), pp. 100-101.
17. E. Curl and B. Truelove, 1986. **The Rhizosphere**, (Springer-Verlag, Berlin) p. 71.
18. Rice, 1979.
19. Putnam, 1983.
20. J. Levitt and J. Lovett, 1984. "Activity of allelochemicals of Datura stramonium (Thorn-apple) in contrasting soil types," **Plant and Soil**, vol.79.
21. Rice, 1979.
22. Rice, 1979.
23. Rice, 1979.

The Environmental Problems of Irrigation Agriculture

Brad Burritt

Can the earth provide enough food for the large human populations of the future? How can we significantly increase crop production? One answer is to irrigate land not now being irrigated or even farmed. "Make the deserts bloom," and there will be enough food for all.

Irrigated agriculture on a fifth of the world's arable lands provides us with a third of our food now.[1] But irrigated systems often detrimentally impact ecosystems in which they operate. Human well-being is intimately tied to the health of many ecosystems and their components, both living and non-living, whether we know their value or not. Frequently, impacts by irrigation on ecosystems threaten the very sustainability of the actual irrigation systems. This article will focus on the detrimental effects of irrigation schemes on ecosystems and consider whether in the long term we can count on irrigated agriculture to provide the additional food humans will need.

Before water ever reaches a farmer's field, the procurement and delivery of that water may have significantly lowered water tables and aquifers, or decreased river and stream flow and lake levels through diversion or damming.

Although most groundwater sources and aquifers have the ability to regenerate, some refill so slowly that they are considered to be non-renewable. Of 122 billion cubic meters of water pumped from the ground in the U.S. each year, a fifth is non-renewable.[2] A quarter of all water tables under irrigated land in the U.S. is falling, and pumping from the Ogallala aquifer in the High Plains of Texas has cut the area's water supply by one-fourth.[3] Many countries experience falling water tables, showing use beyond sustainable levels.

Land subsidence and saltwater intrusion may follow this unwise pumping. Mexico City, Beijing, China, the Central Valley of California, and the Texas coast have all experienced dropping land mass due to "mining" of water.[4] In many coastal areas, harmful saltwater may replace fresh water pumped from the ground.

Surface flows may also suffer serious depletion. In Soviet Central Asia, drawing for irrigation on flows that feed the Aral Sea caused the surface of that water body to shrink by 30%, and rivers which serve half the Soviet Union's irrigated land nearly dry up in some years.[5] We often lower river flows in the U.S. by 60 to 80%, though biologists recommend leaving at least 60% of the flow in the river.[6]

These reduced flows disturb animal and plant habitats and cropland in the stream and river communties. Beside the obvious effects of a decreased flow, such as warming, deoxygenation, siltation, and colonization by weedy aquatic vegetation, less visible effects result too. Some species, for instance, depend on periodic flooding for the completion of their life cycles. When dams are built and floodwaters subdued, some migrating fish can't make their way back to headwaters to spawn. Normal, naturally timed floodwater surges act on the fish both physiologically, to signal the "run," and physically, to provide the needed volume of flow.

When the Aswan High Dam was built in Egypt, certain species of plants disappeared from the riverbank that the Nile once flooded yearly. Before the damming, the great river blessed the valley each year with 100 million tons of rich silt. Lake Nasser, created by the dam, now claims the equivalent of 13,000 tons of calcium nitrate fertilizer in sedimented topsoil. The silt had also raised the levels of farmers' fields, providing better drainage. Now, lessened deposition in the river mouth allows the ocean to eat away at the delta.[7]

Once irrigation water reaches a field, another set of environmental impacts occur. The initial and immediate changes to the soil ecosystem have a great effect on the community of native organisms inhabiting the soil, especially in very low-rainfall areas. In dry soil in Egypt, harvester and carpenter ants, sand roaches, tenebrionid beetles, and predatory carabid beetles, ant lions and centipedes were all replaced by earthworms, collembola, mites, nematodes, and other organisms as soil came under irrigation. Some species of the original fauna, like nematodes and bugs, may remain and become crop pests. Populations of rodents may actually increase too, since they no longer suffer food scarcity or predation.[8]

Establishment of irrigation can also foster vectors of human diseases, such as occured in Kenya. As a large area became wet, the mosquito habitat was simplified, causing a reduction in the number of mosquito species, but a four-fold increase in total numbers. With changes in water flow and water table levels, a switch in relative population size occured, from primarily permanent-water breeders to temporary-water breeders. And, as people clustered in villages around the fields, their open sewage caused an increase in the number of "urban species" of mosquitos. A corresponding increase in mosquito-vectored diseases accompanied these changes.[9] Other diseases, such as Malaria, schistosomiasis, filariasis, onchocerciasis and sleeping sickness have all been linked to irrigation systems, especially in Africa.[10]

Changes in weed, insect and microorganism populations are included in the longer-term impacts of irrigation on the biotic community. Again in Egypt, the proportion of perennial weeds increased, with the genuses Cynodon, Cyperus and Convolvulus predominating. Grape

moth, corn stalk borer and cotton leafworm became inportant insect pests following immigration from the north. Perhaps these insects were only associated with the types of new crops grown. Also, microorganism populations, important in plant growth and soil health, showed trends away from diversity. One soil type, irrigated for eight years, showed three times the fungi and forty times the actinomycetes and bacteria the same non-irrigated soil type did. At the same time, the irrigated soil claimed only eight total genera, while the non-irrigated type displayed fouteen, with all eight of the former genera included. As with the mosquitoes, we see a shift from high diversity to high population.[11] These changes probably reduced the vigor and resiliency of the soil.

Let us now turn our attention to what happens in the mineral element of the soil in irrigated soil ecosystems. Generally, the worst effects are waterlogging and salinization, but alkalinization, compaction and sealing of the soil surface can occur too.

Waterlogging occurs when more water is applied to the soil than the rooting zone can hold. This excess amount may be quite small in very sandy soils, or those with more silt and clay but little organic matter. Too, in flood-type irrigation systems, the upper slope of a field may receive surplus water while the farmer waits for wetting of the lower field.

The water thus allowed below the root zone will be pushed ever deeper by subsequent irrigations until it meets an obstruction. An impermeable geologic layer may comprise such a barrier, as can a water table of either natural or created origin. (This water table may actually be providing pumped irrigation water, or it might be a separate, higher one sitting on an impermeable formation.) As more water flows through the soil, the water table can rise or flow laterally, causing problems either way. If it keeps rising, the soil above it waterlogs. If it flows laterally, it will show up in a depression or find a slope where it can drain.

Very few important crop plants tolerate constantly wet roots. This is one reason waterlogging creates great problems worldwide. Numerous places exist where a water table has risen from a 25-30 meter depth to a mere 1-2 meter depth in only ten years. In Australia, water tables have risen and become limiting to crop growth to the extent that farmers there have abandoned much land.[12]

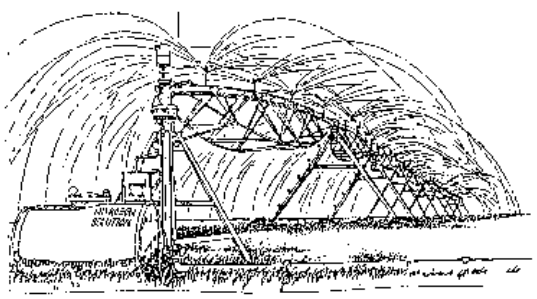
Waterlogging is also detrimental due to its association with soil salinization, since most plants cannot tolerate high salt in soil either. Even before it reaches the first field, irrigation water can pick up salt by running through soil or mineral strata naturally high in these substances. Likewise, most arable soils in even moderately dry areas contain fairly high salt levels below their top layer. As water leaves this top layer, it dissolves the salts and leaches them further downward. Now throw in the waterlogging effect. As the percolating salted water meets the salted water table, the water in the table rises. Remember too, that it can either keep rising or flow laterally to a low spot or slope where it can seep.

As the salted water table rises, capillary action pulls some of it upward to the soil surface where it evaporates. As the surface dries, more water is sucked from the water table. Since only fairly pure water can evaporate, the salt is left behind. Only halophytic, or "salt-loving" plant species, which are generally not edible, prosper in this environment.

One method used to combat the waterlogging-salting complex involves adding extra irrigation water and installing drainage tiles (pipes with holes along their length) below the root zone. This extra water, or "leaching requirement", dissolves accumulated salts and forces them through the root zone. The salt-contaminated water collects in the tiles and can be drained away, but only to affect other ecosystems as it continues down the watershed. If the water table finds a slope and seeps, the system is similar to one with installed tiles. But if the water table can't rise or seep, it will flow to a low area, where the water can evaporate and leave the soil with a huge salt content. Such an area is known as a "dry drainage"--a barren white-crusted area you can spot in many irrigated regions.

Nearly all irrigation systems are plagued with salting and its consequences. Dry drainage areas become so poor that practically nothing will grow in them. In systems with tile drainage or seepage, the saltiness of effluent requires farmers who reuse it to add even more water to fulfill the leaching requirement, which rises due to the water's greater salt content. Often too, the combined application of fertilizer and pesticides with irrigation water causes the effluent to contain fairly high concentrations of plant nutrients such as nitrates, calcium, potassium, magnesium and chlorine, along with many types of herbicides and insecticides.

Joining these leached pollutants, we can find many others, swept from the soil surface by runoff water that didn't penetrate the soil. Eroded soil, phosphorus, applied organic wastes such as manure and sewage sludge, and pesticides frequently show up in runoff water.



Perhaps the eroded soil is the worst of these pollutants, since both its absence from the land and its presence in water cause much respective damage. Eroded soil is less productive, and if the loss by erosion occurs fast enough, the soil remaining cannot produce crops. Irrigated land can have soil losses up to one centimeter per year—a rate that will remove one foot of topsoil in only 30 years![13] And once it leaves the field, the eroded soil becomes the nation's main pollutant by weight and volume. Fields further down the watershed can be innundated by this sediment, and we've all seen how it can muddy rivers and fill lakes and reservoirs.

Other pollutants mainly affect biological components of aquatic ecosystems, generally causing truncation of species diversity and changes in the numbers of organisms and the stability of their inter-relationships. Faring the worst are aquatic organisms such as algae, vascular hydrophytes, aquatic invertebrates, insects with aquatic stages and fish. Humans can be directly harmed too. Nitrates in drinking water are known to cause "blue babies" (methemoglobinemia) and there is evidence to show that this plant-nutrient-turned-pollutant can cause other complications too.

Present forces are driving the size of irrigated areas sharply upward. One lesson we must learn from analyzing environmental problems of irrigation is that if less water could be used, fewer detrimental impacts would result. Thus, by establishing systems which demonstate high water-use efficiencies, we can partly avoid groundwater and surface flow depletions, impacts on terrestrial and aquatic life, waterlogging and salinization, pollution, erosion, and climatic change. Salinization could be further ameliorated by using salt-free water.

Technologies already exist that can improve the present 37% water-use efficiency of irrigation, but they carry limitations and drawbacks. Land leveling can help water soak in evenly and more efficiently, and sprinkler and drip application systems apply water only where it's needed and in any desired amount. However, all of these technological remedies are very capital-intensive, and the sprinkler and drip systems, while able to eliminate salt and pollutant leaching by applying only enough water to fill the root zone, still cause salt accumulation unless the applied water is salt-free. As mentioned before, little natural water is free of salt, but some sources such as mountain streams do exist, and can be developed if in-stream flow needs and other considerations are met.

Other systems already in use demonstrate high degrees of sustainbility and ecosystem compatability. Farmers in dry regions around the world have planted in wadis (small, usually dry streambeds), letting natural streamflow irrigate their crops after rains. Such systems are in use in the Negev and Sonoran Deserts in Israel and Arizona. Also in the Negev,

researchers are working with micro-catchments, where small, shaped basins catch rainfall and deliver it to a tree or small crop plot. Such small-scale plans hold promise for other localities, but will not contribute much to the total production needed.

There is still the opportunity for some production in low-rainfall areas where farmers can lessen or even eliminate their need for irrigation water. They can use farming practices which leave plant residue on the soil's surface or organic matter throughout its depth which decreases the amount of water required. They can plant crops adapted to dry regions, which will require little or no irrigation to produce respectable yields.

Irrigation, especially on a large scale, creates many environmental problems. Besides these, another whole set of drawbacks exist, though not discussed in this article, relating to the negative impacts of irrigation systems on community relationships and culture. All of these problems must be given serious attention to prevent them from jeopardizing the ecological safety and durability of future farming systems. If our food producing capability is to be sustained, it may even be necessary to limit, not increase irrigated agriculture.

REFERENCES AND NOTES

1. V.A. Kovda, 1977. "Arid Land Irrigation and Soil Fertility: Problems of Salinity, Alkalinity, Compaction," In E. B. Worthington, ed.,**Arid Land Irrigation in Developing Countries** (Pergamon Press, Oxford), pp. 211-235.
2. Annual groundwater use from W. B. Solley et al., 1983. **Estimated Use of Water in the United States in 1980** (U.S. Geological Survey, Alexandria, Va.). Depletion figure from USGS, 1984. **National Water Summary 1983 Hydrologic Events and Issues** (U.S. Government Printing Office, Wash.,D.C.).
3. U.S. figures from G. Sloggett, 1981. "Prospects for Groundwater Irrigation: Declining Levels and Rising Energy Costs" (U.S. Department of Agriculture, Washington, D.C.). Texas figures from E. D. Gutentag et al., 1984. "Geohydrology of the High Plains Aquifer in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming", USGS Paper 1400- B (U.S. Government Printing Office, Washington, D.C.).

4. S. Postel, 1985. "Conserving Water: The Untapped Alternative", **Worldwatch Paper 67** (Worldwatch Institute, Wash. D.C.), p. 7.
5. Aral Sea figure from V.N. Bortnik, 1984. "Present and Predicted Changes in the Hydrological Conditions of the Aral Sea," **Water Resources**, July '84, translated from **Vodnye Resursy**, Sept-Oct '83.
6. U.S. Water Resources Council, 1978. **The Nation's Water Resources 1975-2000**, Vol.3, Analytical Data Summary (U.S. Government Printing Office, Washington, D.C.). Sixty percent figure from D. Pimentel et al., 1982. "Water Resources in Food and Energy Production," **Bioscience**, Dec '82.
7. Plant disappearance from S. I. Ghabbour, M. Imam, A. Mahir Ali and M. S. El-Abyad, 1977. "Changes in Terrestrial Biota," In: Worthington, pp. 329-333. Sediment information from Worthington, p.21.
8. Ghabbour et al.
9. M. N. Hill et al., 1977. "A Comparison of Mosquito Populations in Irrigated Areas of the Kano Plains, Nyanza Province, Kenya," In Worthington, pp. 307-315.
10. Worthington, pp. 46-48.
11. Ghabbour et al.
12. Water table level figures from Worthington, p. 30. Land abandonment in Australia information from S. Pels and M. E. Stannard, 1977. "Environmental Changes Due to Irrigation Development in Semi-Arid Parts of New South Wales, Australia," In Worthington, pp. 171-183.
13. V. A. Kovda, 1980. **Land Aridization and Drought Control** (Westview Press, Boulder, Colorado), p. 172.

Scientific Assumptions and the Problem of Agriculture

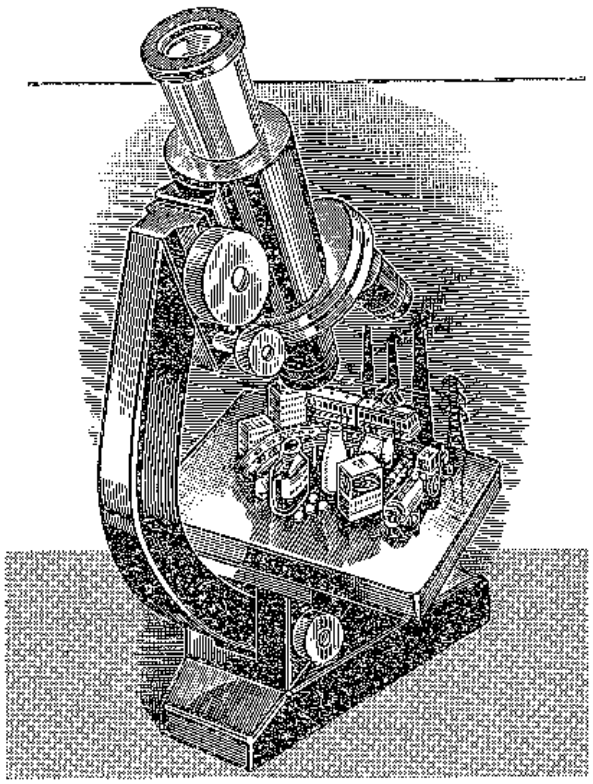
Wes Jackson

Part of the modern problem in agriculture is that our policy makers, if not the population at large, treat agriculture as an isolated part of the society -- a segment in which something has gone wrong. Expensive salvage operations are designed, therefore, around the notion that agriculture is a problem that needs fixing. The phrases that come tumbling out of many of the deeply troubled and the superficial are pretty much the same. One hears statements such as these: "Pure and simple, it is strictly an economic problem." "Agriculture is in trouble." "Something needs to be done about the farm problem."

Sure, scarcely three percent of us in the U.S. are on farms. It is true that farmers are a dispersed minority and have little political clout anymore. Were they a dispersed majority the farm vote would still make a difference. Were they a concentrated minority, they could be close enough together to hammer out their differences and speak with one voice, but of course they are neither.

While most of the phrases about problems on the farm are true, at least in a limited sense, none of them suggest that problems on the farm are more the failure of culture than of economics and public policy. Economics can define the problem, but only in part. It won't provide a solution, yet nearly all of the public policy decisions are based on economic assumptions.

What I hope to offer for consideration here is that some of the problems <u>in</u> agriculture are mere derivatives of the problem <u>of</u> agriculture; which in turn is part of a systemic problem for the culture at large.



Our European pantheist forebearers saw spirits in rocks, in waterfalls, in the deer of the forest, in the bear. Pan, by definition, was everywhere. The early Christians who came into the wilds of Europe insisted that all of Nature was "nothing but." To worship rocks and streams, bears and bees was to participate in the sin of idolatry. To move one's eyes away from the earth was encouraged in another way, for even the most casual student of the stars could see there was order in heaven. On earth were uncertainties and constant problems with which to cope. The earth was an unlikely resi-

dence for God. Because the heavens were so orderly, any decent sort of God must live there. It is not that God couldn't and didn't roam around, but heaven was, more or less, his permanent address.

Those Christians who believed in a hereafter immediately translated this as going to heaven. The earth was viewed as sort of a launch pad, a place long on material and short on spirit. With the eventual extirpation of pantheism over vast stretches of the globe, the desacralization of Nature was right on its heels. The consequence is that science and its applications as we know it today, was made possible. It is doubtful that the dissection of living animals and plants could be done by those who believe them to be Holy. Trees to a pantheist could not be viewed as just so many board feet. That which is sacred would be handled with a certain reverence.

Francis Bacon told us that knowledge was power, that the methodology of science would free us to sufficiently organize the world enough to give us a higher measure of comfort and security. More and more of us now know that comfort and security are not the solutions to the human condition, but very few people knew it then. The experiment hadn't been run.

Long before the time of Bacon, people were wanting power over nature. I don't doubt that there were some who believed that more power over nature would create the slack necessary to control their own lives. Also, as far back as the 13th century there were sporadic pockets of individuals who were breaking from the dominant circumstance in which an individual's social position determined who he or she was. This change did not culminate until the 17th and 18th centuries, but by then individuals were determining their own social relationships, leading to what was called the bourgeois revolution. The fossil fuel epoch and the "opening up" of the new world coincided with the age of enlightenment, the scientific revolution. Power over Nature, much of it fossil fuel dependent, created lots of slack.

In their thoughtful book, The Dialectical Biologist, (Harvard Univ. Press, 1985), Richard Levins and Richard Lewontin point out that the social ideology of the bourgeois society, this recent invention, is that the individual is "ontologically prior to the social." Individuals are free moving social atoms with their own intrinsic properties. Society is a collection of such individuals. In other words, society as a phenomenon is the outcome of the individual activities of individual human beings. This supports the view of Descartes, a view which became a central notion of modern science. The Cartesian view, says that the part has priority over the whole. It is not just a tool or a method of investigation; it is a commitment to how things really are. As Levins and Lewontin say, "The method is used because it is regarded as isomorphic with the actual structure of causation. The world is like the method." To say that knowledge is power, may not seem all that bad on the surface. What was not perceived, I suspect, at the time of Bacon, is that the quantity of knowledge obtained by future scientific investigators would reward them, the investigators themselves, with power. "The success of the Cartesian method and the Cartesian view of Nature," Levins and Lewontin say, "is in part the result of a historical path of least resistance. Scientists work on the problems that yield to the attack." A career will not be advanced, or should we say, power will not be achieved by an investigator if he or she has worked on a problem that is likely to lead to failure. "Brilliant careers are not built on persistent failure."

We can readily see how the path of least resistance has been employed in agricultural research. The amount of research devoted to the development of agricultural systems which will conserve soil, sponsor nitrogen fertility, manage water effectively and control insects, pathogens and weeds through biological, as opposed to industrial means, is practically nil. Such research would require us to study whole systems and would violate the Cartesian view which places priority on parts over the whole. So the question now beomes, "How do we break the stranglehold of Cartesianism?" Levins and Lewontin say that we should "look again at the concepts of part and whole."

We used to justify wholism or wholistic thinking with the simple argument that the whole is greater than the sum of its parts. Levins and Lewontin point out: "the parts acquire new properties ...(and) as the parts acquire properties by being together, they impart to the whole new properties, which are reflected in changes in the parts, and so on. Parts and wholes evolve in consequence of their relationship, and the relationship itself evolves." Like soil building.

The purpose of the argument of Levins and Lewontin is to show that this relationship between parts and wholes which is non-Cartesian, this relationship which has subject and object in constant interchange, this relationship of parts which can cause new properties to emerge in the parts themselves as the context changes, entails "properties of things that we call dialectical." That is to say, there is a thesis, an antithesis and a new synthesis or thesis. The Cartesian view believed that the world is like the Cartesian method: that method is used because it is like the "actual structure of causation." Levins and Lewontin believe the dialectical method is more like the actual structure of causation.

The authors point out how the Darwinian theory of evolution is a "quintessential product of the bourgeois intellectual revolution." Number one, it is a materialist theory, in that existing forces act on real existing objects, a rejection of the Platonic ideals. Second, evolution is a theory of change as opposed to stasis. The 19th century was devoted to the

idea of change, and biological evolution was simply a late example. Third, Darwin's idea of adaptation of living things to the environment "is pure Cartesian." The Darwinian assumption is that organisms change in response to an alien environment. The dialectical view also accepts the first two premises of Darwin, the materialist theory and the theory of change, but rejects the third premise of Darwin that organisms are alienated objects of external forces. The dialectical view would hold that organism and environment interpenetrate so completely that both are at the same time subjects and objects of the historical process. Levins and Lewontin point out what numerous biologists and soil scientists have known for a long time, that there is an interplay between organism and environment and that both are changed due to the presence of the other. Soil scientists are probably the most aware of this for they can readily see how the living world works to help form soil. Most biologists are less sophisticated.

Civilized people know that to objectify a person is dehumanizing, not only to the person but also to the one who objectifies. Racism is a form of objectifying. Language that deals with the sexual parts of a person's body, that does not carry a sense of reverence for the whole, we call obscene. Language that calls attention to skin color or ethnic background, language that elevates those factors above the whole person, we call racist.

We understand this very well when we talk about the human body but, not when we think of nature. To talk about "the environment" as something out there is to separate the environment from us and ignore the fact that we were made from, and are maintained by, the environment.

Levins and Lewontin point out that many people will now admit that social and economic factors strongly influence science. A freshly trained plant breeder with a Ph.D. can command a starting salary one-third greater than a freshly trained ecologist with a Ph.D. Plant breeders can produce usable results faster than ecologists. Science is clearly influenced by the structure of social rewards and incentives. Look at the defense industry and its impact on science. The social and economic scene, pure and simple, influences science. But, and there is a big but, "nothing evokes as much hostility among intellectuals as the suggestion that social forces influence or even dictate either the scientific method or the facts and theories of science say Levins and Lewontin who believe "science in all its senses, is a social process that both causes and is caused by social organization." Whether one likes it or not, to be a scientist is "to be a social actor engaged in political activity." The speed of light may be the same under socialism or capitalism, but, they ask "is the cause of tuberculosis a bacillus or the capitalist exploitation of workers?" Would the death rate from cancer best be reduced "by studying oncogenes or by seizing control of the factories?" When Monsanto produces seeds bred to be resistant to a herbicide they market, "the environment" will receive an herbicide load because the crop is "protected." To deny the interpenetration of the scientific and the social is itself a political act. It allows scientists to hide behind scientific objectivity and, however unwittingly, to perpetuate elitism, dependency, exploitation, etc.

I believe, that there is a law of human ecology which, bluntly stated, is "Values dictate genotype." I think we can safely say that our major crops, for example corn, soybeans and wheat, have genes that we might call "Chicago Board of Trade genes." There are also wellhead genes and computer genes. In other words, there are ensembles of genes in our major crops that would not be there in their particular constellation were there not a Chicago Board of Trade or fossil fuel wellheads or computers. Our values arrange the molecules of heredity themselves. That's interpenetration.

Gary Nabhan, an ethnobotanist at the Desert Botanical Garden in Phoenix, Arizona, tells the story about an Indian woman in Mexico who had several ears of corn from her corn crop arranged before her as she shelled grain off each ear. Some ears were tiny nubbins. Ears that were long all had seeds of various colors. As she shelled grain from each ear to save for the next planting, Gary asked her why she saved seed from the small ears. Her reply was that corn was a gift of the Gods and to discriminate against the small in favor of the large would be to show lack of appreciation for the gift. What she was doing, of course, was maintaining genetic diversity. Values dictate genotype.

I don't think it is proper to say that the earth is an organism. An atom is an atom. A molecule is a molecule. A cell is a cell. A tissue is a tissue. An organ is an organ and an organism is an organism. Going on up the hierarchy, we can say an ecosystem is an ecosystem and the earth is the earth. I believe that those who insist on calling the earth an organism are taking a provincial view because they happen to be organisms. We don't really know what the earth is, but we do know a little about it. We know that it is very dynamic, that the inside is very hot representing the heat left over from its early days. And yet we have evidence that the very hot core of our earth is even responsible for life as we know it.

The old assumption is that the biota itself is enough to renew the earth. Even in organic agriculture we assume that we can simply plant legumes, practice a rotation and a piece of land can be renewed. This is true, but in a sense that is more limited than we used to believe. Taking a very long time frame, a more accurate larger assumption is that the biota alone cannot rejuvenate an area; there must be some non-living capital that will accommodate life. Looking at the geological time scale, the source of this capital involves large changes in the earth's surface, changes that are largely abio-

tic: glaciers, shifts of the tectonic plates, volcanoes. We know that the Amazon once flowed toward the West, before the Andean uplift. Nutrients that were once headed one way are now headed another. In the pygmy forest, there are terraces which make up the staircase in Mendocino County of northern California, and each step represents about 100,000 years. We have evidence that the verdant growth went into decline, as nutrients became unavailable over time. What once supported lush redwood forest now supports a vegetation that appears to be greatly stressed. Yet life has been constant in this area, and if life alone were enough, living forms could bootstrap themselves to a level of greater diversity and large biomass turnover, but apparently nutrients have leached down and become non-available for plant growth.

What this illustrates is that life working alone on this earth is not enough. Reverence for life alone is incomplete. The pantheists were more right than they probably knew, for the very inner heat of our earth is essential to make the necessary geological moves that will sustain the biota as we know it. So are the gases heated by the sun we call wind. The tides controlled by the moon provide a nutrient wash on our coasts to support an abundance of life. The interpenetration of moon and earth, of sun with earth, of soil with organism are all essential for our livelihood.

One can look at the agricultural crisis as the interpenetration of part with the whole. It is not an economic crisis. As I mentioned earlier it is a crisis which can be reflected in economic terms, but the economic problems are a derivative of the cultural crisis. It is not a problem curable by economics. Yet what is happening to the farmer and the farm represents a faint foreshadow for what is to come to the culture at large. The farmer is not an atomistic unit or satellite sitting off to the side that needs fixing. Neither is the farm. Agriculture in the largest sense cannot be fixed independently. Vulnerability and helplessness begin with the fields which are subject to erosion and pollution. Next most vulnerable and helpless are the people who work those fields. Next are the suppliers of inputs, the farm machinery and fertilizer companies, and then the rural bankers. This is an inverted pyramid of vulnerability with the land on the bottom and the base widening as we move upward to include the larger society.

The ecological pyramid illustrated in the basic texts of ecology surely stands as a rough model for an alternative economic order. It has been billions of years in the making. In such an economy the producers, at the base of the pyramid, are many and the mere consumers are few, exactly as Confucious described a healthy human society tens of centuries ago. When we impose the industrial or extractive economy on the land however, the base of the pyramid representing society's wishes are at the top. The point of the pyramid is stuck into the land like a needle as the land receives all the injections necessary to meet the demands of society. Why is the pyramid inverted? Cheap oil? Human nature? The oil is about gone and never in the history of our country have we been more up against human nature than we are today. In 1776, this continent could absorb lots of bad human nature. The frontier was before us. But the land frontier came to an end. Rather than face our problems squarely we keep looking to expand our frontiers for the purpose of exploiting them as we always have. We have gone into the inner recesses of the atom and the nucleus of the cell. The exploitation of both is not at all unlike ripping open the prairies, the heart of our continent, or going into third world places like Brazil where skilled welders are paid a dollar an hour to make farm machinery for America's fields. It is all of the same stuff.

Frederick Jackson Turner developed the thesis that the American's definition of self is derived from the early frontier days. It is a devotion of that spirit that pushed us to colonize both longitude and latitude. About the time we were fresh out of longitude and latitude we funded a space program and went for altitude. But colonization is not discovery. The quintessential aspect of colonization is exploitation and violence. Astronauts headed for orbit may be given more status than a farmer protecting a hillside from erosion but a farmer who is successful in discovering ways to arrest nutrient loss on his sloping farm has made a more profound discovery that all of the colonizers of space combined. So has the farmer who is gradually weaning himself from costly input farming, who is shifting the ratio from being so much a consumer to more the producer side. These are people who comprehend the idea that the discovery of America lies before us, that so far we have only colonized it.

The Cartesian world view allows us to talk about trade-offs as though for each gain there must be a loss. On the other hand, an ecological world view based in the dialectical method will tell us that one thing done wrong can create numerous problems throughout the system. Or more positively, if something is done right, if something is done that fits, several problems are taken care of at once. Where the ecological world view is not overly-tainted by the industrial model, there is a profound awareness of the total interpenetration of parts with the whole. This is the view we need in order to understand the problem of agriculture as it interacts with the culture at large. It is the view we need to develop a sustainable agriculture.

On Herons, Human Senses and Healing: The Wild Thread

Gary Nabhan

At age nineteen, while gandydancing on an industrial railroad line edging Lake Michigan, I watched a half dozen migrating great blue herons looking for a place to land.

To this day, they loom as large in my mind's eye as Mesozoic pterodactyls. I can still see them flying low in the heavy air over the steel mills of Gary, Indiana: the slow wing beats; their hoarse squawks as they called to one another over the mill roar. At one level, the herons seemed oblivious to the mills, which were built over the sand swales and interdunal lagoons so well described in the writings of Edwin Way Teale and Donald Culross Peattie. The herons loped along as if searching for some feature beneath the blast furnaces, refuse heaps and train tracks. I sensed that they had been pulled to that place by a memory of marshes which had served their ancestors for the last nine thousand years.

The herons circled the slag pile nearest me, where a shallow pond had once lain in an interdunal depression. They slowly flew onto the next debris-filled depression...the next...then the next...until they passed from my sight and the mills' property to the tenuous refuge of Indiana Dunes National Lakeshore. I stood still on the tracks, watching them pay respect to the ancient pit-stops strung along some primordial migration route. I stood still, yet my heart flew with them.

Do such incidental observations of natural phenomena qualify any teenager as an incipient naturalist? At the time, I certainly did not work or look like our stereotype of one: a spike maul in my hands instead of binoculars; a pin-striped railroad cap and tar-stained coveralls as costume in lieu of khakis, camouflaging, or other apparel from the L. L. Beanery. I suspect, as Ann Zwinger once cautioned me, that we can't rightfully claim to be fully-functioning naturalists until we are well into our fifties in age. For the flavor of our own distinctive observations to distill, we need time to ripen, to cure, to be exposed to the proper conditions, or rid of extraneous influences.

Our evolutionary history has suited us to a peculiar kind of nature-sensing, relative to that of other species. We came to some of our senses as forest-dwelling primates, others as savanna and shoreline hominids, and still others as wide-ranging hunters, fishers and gatherers. Our increasingly upright posturing and frontal vision allow us to see into the distance more than they absorb what is directly around us. Combine these tendencies with our opposable thumbs, and we become capable of holding onto binoculars to see even further into space. Yet we miss much of the world that other creatures perceive.

Thanks to our mid-range color vision, flowers stand out from their background, but not as vividly as they do for bees which see into the ultraviolet range. Our noses can lead us to a fragrant night-blooming cereus hidden in the evening shadows of the desert scrub, but we're hardly fazed by the many animal pheremones spewed out all around us. Our hearing is sharp enough to warn of the sidewinder's rattle, but we lack the sense to pick up the sonar signals of pallid bats.

If we had the sensory organs of a gopher or a Colorado River razorback sucker instead of our own hominid holdings, would we still say "I see" to mean "I understand?"

The world gets thoroughly filtered through the warp and weft of our network of perceptual faculties. Regardless of all the messages that never reach us, we are still left with more than just food for thought. For millions of years, we have sifted through the wild growth, finding enough to eat, to drink, to shelter us. As a species, our physical and mental agility has been honed by the richness and harshness of wilderness.

Farming people have gone on to simplify the natural communities in which they live, but some of them have not forgotten the connection between wildness and wellness. Piman-speaking native farmers use the terms doajig for health, and doajk for wildness. These words are derived from doa, "to be alive," or "to be cured," as are doakam for "living creatures" and doajkam for "wild or untamed beings." Taken back to their roots, Piman terms for healing and recovery convey a sense of becoming wild and whole again.

The wilderness has historically served as a sanctuary for sad, disturbed or dis-eased people troubled by their society and their personal discrepanies with it. Medicine men and hermits, homesteads and monks, biologists, herbalists and artists have sought cures to their sicknesses and sorrows in the deserts, jungles and boreal forests. By letting other elements and organisms into our lives, perhaps we dilute the

poisonous human preoccupations with status, security and societal acceptance.

If wild habitats challenge us to be alert and agile, then it is easy to despair over the conditions in which we find the planet and its peoples today. In worked-over, manicured environments, we are simply not in touch as much with the wild stimuli that set us on our path. We must find our way along an obscure trail, hoping that someone has not already kicked down all the cairns.

Not too long ago, I found myself working on the floodplain of the lower Rio Colorado, where the one-time wild river had crazily meandered over centuries and centuries. Several dams upstream now tame its flow. Where farmlands have replaced its grand riparian forests, and levees sharply separate water from land, the floodplain has a petrified, frozen feel to it.

One hot August, however, I watched this landacape thaw with my own eyes. And as the land grew fluid again, a heron arose out of it.

It was after a week of work in the fields and remnant mesquite forests that I found myself in a small plane over this river valley. In the dawn light, I saw that its earthen history was buried alive, but still breathing, underneath the fields of monocultural crops. As we passed across miles of cotton, I could see beneath them the patterns of the ancient meanders: oxbows and backwater sloughs. Each old land feature was marked by a soil of another hue. The cotton plants had started as evenly-spaced seedlings, but could not maintain any uniformity on such heterogeneous substrates. Each piece of earth was still charged by how the river had run through it, and even the narrowly bred, tightly-tended stands of domestic plants could not hide this fact.

Edging one of the fields laid out over a dark-soiled slough, a concrete irrigation canal ran in a straight line clear to the horizon. From the shallow standing water of that newly-irrigated field, I watched a great blue heron take flight. Would the heron rise to follow the straight-running concrete canal? Or would his flight again find the underlying curvilinear meander?

ABOUT THE AUTHOR: Gary Paul Nabhan is the 1986 John Burroughs Medal recipient for the natural history/ethnobotany book with artist Paul Mirocha, Gathering the Desert (University of Arizona Press). He is also author of The Desert Smells Like Rain (North Point Press) and the forthcoming Saguaro: A Naturalist Looks at Saguaro National Monument and the Tucson Basin (Southwest Parks and Monuments Association). Dr. Nabhan is Assistant Director of the Desert Botanical Garden, Phoenix, Arizona, and a cofounder of Native Seeds/SEARCH with his botanist wife, Karen Reichhardt. Gary and Karen will be speakers at The Land's 1986 Prairie Festival May 31, and June 1.

Letters from a Virginia Farmer

Fincastle, Va. 24030
April 18, 1986

Dear Mr. & Mrs. Jackson,

Last fall I wrote to you pledging for reasons therein stated the proceeds from the sale of one of my cull cows. Shortly thereafter I did sell a cow, but she was not a very good cow, nor was the market very good. Wanting to spare you the vicissitudes of farming, and needing the cash myself, I decided to defer until spring. In recent months I have sold several cows, the best one bringing $438.90. I am therefore remitting that sum. Since I probably can't do this every year (we dairymen may be on the top deck of the ship, but the thing is still sinking), you may want to consider this a capital contribution. In any event, it is yours to use however you see fit.

Yours truly,
John Thornton

April 28, 1986

Dear Mrs. Jackson,

Thanks in turn for your kind thank you note. You may of course use anything I have sent you in any way you see fit.

I have very much enjoyed The Land Report. It, among other things, has inspired me to a great deal of reading and self-inspection, from Aldo Leopold and Loren Eiseley to Hans Jenny and Carl Jung, and made me realize that fundamentally I have always been attracted to farming as an ecological discipline.

Unfortunately, none of my farmer friends see any value to unmanipulated nature, and none of my urban friends who enjoy nature have any real knowledge of the economics and natural forces colliding on a modern commercial farm. While this often makes me feel quite lonely and a little sad, I do cherish my work and feel it rises to the level of a calling. I think it is no exaggeration to say that all nature and human culture come together each day on every one of our farms, and it is up to us to get out of bed and see what we can do to make it come out all right today.

I think that The Land Institute is helping us do this.

Yours truly,
John Thornton

P.S. I do envy you your intern in the garden though!

Celebrations of Nature

Danielle Carré

It is lovely indeed, it is lovely indeed.
I, I am the spirit within the earth.
The feet of the earth are my feet;
the legs of the earth are my legs.

The strength of the earth is my strength;
the thoughts of the earth are my thoughts;
the voice of the earth is my voice.

The feather of the earth is my feather;
all that belongs to the earth belongs to me;
all that surrounds the earth surrounds me.

I, I am the sacred words of the earth.
It is lovely indeed, it is lovely indeed.

Navejo,"Song of the Earth Spirit"
in Song of the Earth Spirit
by Susan Anderson.

Spring creates a mood of celebration. As temperatures rise, buds begin to break, and flowers bloom, we all experience a sense of joy. This is the season to appreciate the earth's beauty and the renewal of life.

In our fast paced modern world we tend to forget that we obtain all our sustenance from nature. A primary concern when purchasing vegetables at the supermarket is the price of the produce, not how and when it was grown. A prediction of rain on a weather forecast only causes irritation, we consider rain an inconvenience not as a vital element for healthy crops. We are no longer intimately involved with hunting, gathering, or the production of our food, and as a result we are only dimly aware of planting and harvest cycles. This lack of awareness contributes to the abuse of the land. What is needed then is a reevaluation of our perceptions of nature. As Wendell Berry points out in The Unsettling of America, "..we are not distinct from the bodies of plants and animals with which we are involved in the cycles of feeding and in the intricate companionships of ecological systems and of the spirit." The question is, how do we regain a sensitivity to the connections between people and land?

Celebrating different aspects of nature may be one of the ways of heightening our awareness of these connections. Festivals and feasts during planting, harvest, solstices, rainy and dry seasons can serve as a joyful way of reminding us of our bonds to the earth.

If we look at our history, as far back as the Paleolithic period, humans have always observed, appreciated, and feared nature. Hunters and gatherers relied on a precarious food supply, and maintaining this supply was their primary concern. The hunter recognized a spirit in the animal he was to kill and felt a sense of kinship with the animals he hunted. But the relationship between humans and nature was not totally benign; there was always a certain element of fear as humans dealt with natural forces beyond their control. Celebrations and rituals were developed to promote fertility, give thanks, and appease the spirits. Art may have been a means of bringing humans and animals together. Many of the cave paintings of the Upper Paleolithic period found in France and Spain, depict humans with the bodies of animals. These paintings may have been part of elaborate rituals performed to create a mystical bond between humans and the supernatural forces controlling the food supply. The hunters and gatherers endeavored to maintain a positive interaction between their activities of food procurement and the spiritual and natural forces.[1]

The food supply was just as precarious for the early agriculturist as it was for the hunters and gatherers. In the fertile crescent, where agriculture replaced food gathering, ceremonies and celebrations were associated with the health and regular growth of the crop. The agriculturist was confronted with an unpredictable environment that could readily destroy his crop, and he attempted to satisfy the desires of the gods controlling these natural forces with his rituals. The seasonal rituals developed from a cult of the mother-goddess, a maternal figure connected with the process of fertility and birth. The seasonal rituals emphasized the major aspects of fecundity, propagation, and nutrition. Eventually the mother-goddess or earth mother became associated with the sky father who sent rain to fertilize the soil through a sacred marriage with the goddess. Many of the planting and harvest festivals practiced today were initiated during this period.[2]

Interesting examples of seasonal cele-

brations come from Egypt. Successful agriculture in Egypt depended on the rise and fall of the Nile river. The river began to rise in June and finally receded in October after depositing a rich layer of soil. Numerous festivals centered on the floods of the Nile. During the season of the inundation, the Egyptians celebrated the feast of Opet. This festival lasted 24 days since a majority of the population was unable to work in the fields. There were festivals for the period when the waters were at their height called The Season of Coming Forth (Tybi). When the waters finally declined and farmers had planted the crops, preparations for the harvest began with the Coming Forth of Min, the god of fertility. Finally, The Season of Deficiency (Pakhen) marked the decline after the grain sown in November had been harvested and summer approached.[3]

Native Americans also developed a complex culture that emphasized their connection to the earth. The Indians recognized the cyclical nature of life. They viewed life as a sacred circle and maintained an awareness of their position within this circle.

> " The wind moves in round whirls, the sun comes and goes in circles... if man is not aware that he too has within himself this sacred center, that he is a part of the mystic circle with all other creatures, then he is not a man."
>
> The Sun Dance People
> by Richard Erdoes.

The ceremonies and celebrations of the Indians focused on their dependence on nature. Religious ceremonies requesting the help of supernatural powers usually proceeded food gathering. The Indians considered the animals and plants they depended on as sacred and developed rituals and ceremonies around these sources.

Many of the Christian holidays we observe today have replaced pagan ceremonies that celebrated nature. It was the policy of the early church to transform pagan festivals and give them Christian significance. For example, the date of the birth of Christ has always been a matter of speculation since the early Christian era. The date settled on sometime in the third century coincided with the winter solstice festival, The Birthday of the Unconquered Sun, celebrated throughout the Roman empire. Many of the Christmas traditions we now practice, such as decorating the house with evergreens and colored lamps, originated from this solstice festival. Easter is another major festival that has a prechristian origin. A similar festival of the dead and risen Adonis, the god of spring, was observed in early spring. The name Easter is derived from Eostre the goddess of spring.[4]

The origins of other special days we observe can be traced (sometimes indirectly) to pagan nature festivals. Tradition has it that a priest named Valentine was put to death for refusing to follow the unchristian edicts of the emperor. The church may have allocated February 14 as Valentine's day because of the prechristian Roman festival of Lupercalia, a festival celebrating fertility and new life, which was practiced on February 15. May Day is thought to have originated from the Roman festival to Maia, the mother of Mercury. Because of the prominance given to the maypole, some think that May Day may be a relic of pagan tree worship. Halloween used to be the eve of the Celtic new year, an autumn festival in honor of the sun god in thanksgiving for the harvest. The Romans had a similar festival at this time, only they honored Pomona the goddess of fruit. Thanksgiving is the only current national holiday where we give thanks for a bountiful harvest.[5]

Before the Christian era, we had a long history of celebrating nature. One wonders if renewing these celebrations can really make us think about our connections to the land. The modern world is burdened with a philosophy that separates humans from nature; nature's only function is to serve the needs of humanity. Many "primitive" cultures do not have this dichotomy; they recognize the bonds they have with plants and animals, and their rituals and celebrations serve a vital function. This may be because they are directly involved with their own food production. These societies not only have a deep respect for nature, but also a certain amount of fear because of their vulnerability to the vagaries of the environment.

Reviving celebrations of nature can, if nothing else, induce some thinking. Earth Day carries a serious message behind a pleasant exterior: recognize the impact we have on natural ecosystems. Although this and similar observances serve important functions, I believe regional celebrations will play a greater role in increasing comprehension of our relationship to the earth. People have an easier time understanding a bioregion they live in than they do the entire globe. We have limited ability to appreciate things we never come in contact with.

Festivals centered around some aspect of a region and its culture can bring the community together, and even make some cognizant of the association between community and land. Harvest festivals are still celebrated throughout the world, providing people the opportunity to come together and rejoice in the bounty received. In some areas the work done at harvest is still a neighborhood experience, though, unfortunately, this is no longer common in the U.S. Joe Paddock in his poem, "The Body with a Hundred Hands," (Handful of Thunder: A Prairie Cycle, 1983) reminds us of the lighthearted fun that occurred when a group gathered to shuck corn: if a girl found a red ear, the boys would kiss all the girls. These shared tasks, traditions, and celebrations are vital for the survival of communities. The Prairie Festival provides another good example of a regional festival. This festival celebrates various aspects of the prairie and our ties to it. It also celebrates the culture of the region, bringing in artists, musicians, and poets, connecting human culture with the prairie ecosystem.

Numerous bioregional groups have emerged throughout the country. The members of these groups have made a commitment to learn and care about the region they inhabit, leading to a reconciliation with the land. There is also a group of people calling themselves "pagans" who are devoted to becoming caretakers of the earth. The pagans, like the bioregionalists, consider the natural boundaries of the earth more important than the arbitrary divisions imposed by humans. Developing loving ties with the land and community of the region is the central tenet of both these groups. Celebrations are an essential way of expressing these relationships.

There will always be a few in our society who maintain a reverence for nature, and it will be from these people that the celebrations of nature will spring. The impact they will have on the rest of society will probably be rather limited until we all become more intimately involved with some aspect of nature. But what does this mean, especially for someone dwelling in New York City? Perhaps yearly excursions into the wilderness will remind us of our association with the earth. If we become surrounded by an environment that we have no possibility of controlling, the respect and awe we should have might be renewed. I think becoming involved in some aspect of our own food production is also an important step. If we all made a commitment to growing at least our salad greens for the summer, we would become aware of the planting and harvest cycles. These are very small steps toward a large change in attitude. It would be wise to remember that it is better to appreciate something while we still have it, rather than waiting until it is gone.

REFERENCES

1, 2, 3. E. D. James, 1961. Seasonal Feasts and Festivals, (Jarrold and Sons Lmtd., Norwich, Gt. Britain).

4, 5. Robert J. Myers, 1972. Celebrations -- The Complete Book of American Holidays, (Doubleday, Garden City, N.Y.).

MEADOWLARK

Over the brown grass of early spring
the songs of meadowlarks
hurt my bones
with their sweetness.

I am a yes
to that song.
If I had one such true utterance,
I would repeat it at intervals
through every day of my life.

CONTINUANCE

The days of his life
and all they contained:
spring moon over apple blossoms,
gutted deer and bumper crops
of wheat, a young wife's thighs
shriveling in time
like windfalls.....

These days streamed
through his body and mind,
all those many years,
and when they heaved
his ashes into the wind,
all over the world, rivers
of seasons
continued to murmur:
apple blossoms, deer, wheat, wife....

And he was in them.

BY *Joe Paddock*

U and I

Rob Peterson

The search for alternatives in agriculture entails an exploration of questions touching all aspects of life, including economics, politics, religion, and personal relationships. Some of our neighbors in Kansas are exploring such questions on their small farm near Marysville, in their communal living arrangement, and in their relationship with the larger society. They recently published a magazine called U & I as a format for discussing the community's concerns and for extending the discussion to all who wish to participate.

The second issue of the magazine focuses on Kansas and the prairie. Poems, photographs, drawings, stories, essays and letters portray the beautiful and the ugly in this part of the country and in the people who inhabit it. The subjects are diverse: the mining and depletion of the Ogallala aquifer to sustain corn-fed beef in Western Kansas, morel hunting, relationships between men and women, the "farm crisis" as part of a bigger cultural crisis, and their neighbors.

The importance of relationships among people lies beneath almost every piece in the magazine. This theme is expressed particularly clearly in the sections dealing with the community's neighbors and neighboring communities. Their farm, the Benton Farm, is located near the sight of Bigelow, a small town razed by the U.S. Army Corps of Engineers around 1960 to make room for the Tuttle Creek Dam's reservoir.

The U & I article extols the bonds that made Bigelow a close-knit community. "We shared troubles, tragedies and happiness like one big family," says one former resident. Bigelow epitomized the best of sharing and responsibility in a community, and now it is gone. However, rural neighborliness has not been wiped out. The U & I magazine pays tribute to that sense of community in several other articles about their neighbors, young and old. The Benton Farm people have learned much of what they know about farming from their older neighbors, whose help has been crucial.

Another article illustrates the farm crisis as it affects one of their neighbors. When the government said to plant fence row to fence row to help feed the world, this neighbor went eagerly into debt for bigness. Idealism, excitment about high yields, and greed motivated him. Now, his land damaged and his debts stacked up, he realizes the mistakes, swallows some pride and is cutting back desperately to save his farm. He realizes that he neglected a responsibility to his land and to those who would farm it after him.

The farm crisis is a reflection of a wider cultural crisis. According to the magazine, it

is a "crisis of relationship." At the heart of this problem lies a separation of people from each other and from nature. This separation is behind war, mistreatment of neighbors, and misuse of land. The magazine's writers feel that the breaching of this separation must start with personal relationships and can only go as far as personal ties will bring it. Their community is a start. Their magazine, which is very personal, is an effort towards extending the conversation to a larger circle.

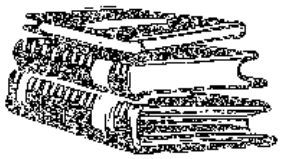
To get the magazine write to U & I, P.O. Box 93427, Los Angeles, CA 90093, and send $5.00 for each copy, specifying whether you want the first or second issue.

SUMMER CONFERENCES

FRIDAY, JULY 18, "Creating a Research Agenda for the Revitalization of Rural America." A discussion day and farm tour sponsored by the Center for Rural Affairs, Small Farm Resources Project. For information, contact SFRP, P.O. Box 736, Hartington, NE 68739.

AUGUST 10-15, "The Land Question," The 1986 Rural Institute, Center for Rural Affairs, P.O. Box 405, Walthill, NE. 68067. The purpose is to teach agricultural policy analysis skills, to improve understanding of social and economic issues in agriculture, and to provide an alternative to conventional agricultural education.

Presentations and discussions will be led by Marty Strange, Co-Director of the Center, Jack Doyle of the Environmental Policy Institute and author of Altered Harvest, and Mike Cannel, farmer and member of the Wisconsin Rural Development Center.



Books

Gathering the Desert

by Gary Paul Nabhan
illustrations by Paul Mirocha
Univ. of Arizona Press, 1985, 206 pages, $19.95

Reviewed by *Mark Slater*

The Sonoran Desert may appear to be a sterile and harsh environment, but it has sustained human life for many centuries. Its plants have been the staff of life for desert dwellers. In Gathering the Desert by writer Gary Nabhan and artist Paul Mirocha, sketches of twelve Sonoran Desert plants bring to light the mystery of the plant-human interactions.

"For ninety-nine percent of the time that humans have inhabited the Sonoran Desert, life was inconceivable without plants such as the ones in the following sketches," Nabhan writes. The palm provided the Desert Cahuilla people with "home, hearth, cloth, food and fiber." Agave, a plant which most Americans think of only as the cactus (sic) that produces tequila, "has been a caloric mainstay, a fiber, medicine, and ceremonial element in desert cultures." Tepary beans were cultivated by the Sand Papagas in the Pinacte region, where a desert ecologist called agriculture impossible.

The native people knew the landscape and the plants. They modeled their lives in accordance with the environment. The plants shaped their cultural identity. Yet, during the last one percent of the time that humans have inhabited the desert, the desert-plant identity has been lost. Fossil fuels and fossil waters have allowed the introduction of an agriculture based on plants that are not indigenous to the desert. The cultures developing from the new plant-human interactions are not described by plants, but by ORV'S, air conditioning, and "neon palm trees." As a result, the health of the native plants and people have suffered.

We know little about the ninety-nine percent of human history in the Sonoran Desert. Fossil fuels and fossil waters are ephemeral. Knowledge of the native cultures is rapidly being lost. How will people live in the desert if this knowledge is lost? It is this question that makes Nabhan's and Mirocha's work of utmost importance. They are "gathering the desert"--the traditional wisdom of native plant uses, the intrinsic value of native plants, and the culture of the native people. Nabhan expresses their goals in the form of several questions:

> ...what interests us most is the diversity of historic responses that individuals and cultures have had to the set of potential plant resources in the region. Why do certain people seem to be attracted to selected plants more than others? When were particular wild resources brought into cultivation and why? What are the reasons that some of these plants have fallen from use while others have not? Which plants are more vulnerable to over-exploitation or to habitat degradation? When a useful plant does diminish in abundance, how do people respond?

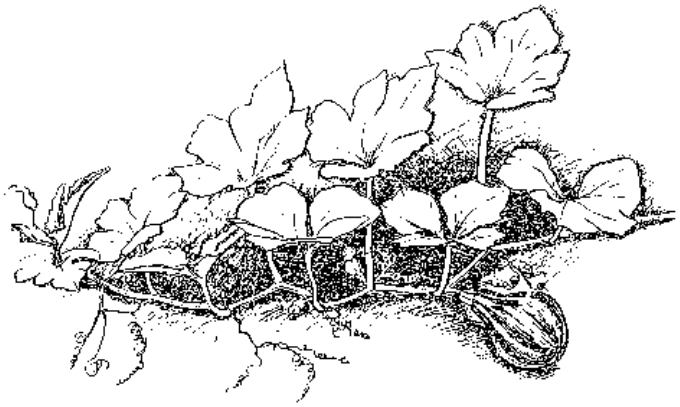
By answering these questions, we may be able to design an agriculture more suited to the desert environment. Nabhan explains:

> ...by evaluating native desert plants as potential economic resources, and comparing them with conventional crops, we stand to learn something about the tradeoffs between short-term productivity and long-term persistence in unpredictable environments.

Each chapter in this book is devoted to developing the character of a particular plant. Nabhan describes the choosing of the plants:

> ...Though somewhat arbitrary, our choice of these particular plants is based on considerations that reach beyond mere utilitarian criteria. Each exemplifies either a symbolic or an ecological relationship which Sonoran Desert dwellers had with numerous plants. A literary challenge was involved as well. Can our sketches express the character of plants, in the way that people sense the spirit of certain animals?

Nabhan and Mirocha have met this literary challenge. Mirocha's drawings add a dimension to the plants that words or photographs cannot capture. Nabhan's sketches give each plant its own identity and character through the myriad of relationships the plant has with its environment. For example, in the chapter " The Creosote Bush Is Our Drugstore," Nabhan describes the



creation myth of the creosote, its use as a medicinal cure-all in Native cultures, current research into its medicinal properties, and its continued growth in spite of being decimated by a thermonuclear blast. The character of each plant is further developed from fossil records, Native American folklore, modern and past uses, and present ecological and physiological knowledge. Nabhan's anecdotes and what has been called his "coyote sense of humor" embellish each section.

Perhaps the most important part of the book is the feeling that grows in the person reading it. Nabhan and Mirocha bring the desert to the reader, and the admonition at the end of the first chapter is clearly understood:

... Even if you don't gather the desert,
let it gather a feeling in you. Even if you
don't swallow it as medicine
meditate upon it:
the desert can
cure.

Final Harvest

By Andrew H. Malcolm
Times Books; 320 pages; $17.95 (April 1986)

Reviewed by *Bruce Colman*

On the foggy morning of September 29, 1983, on a farm in the heart of the American heartland, deep in Garrison Keillor country, a banker named Rudy Blythe, Jr., was shot and killed. Murdered with him was Toby Thulin, manager of the bank that Blythe owned in nearby Ruthton, Minnesota.

The shooter was either Jim Jenkins or his eighteen-year old son, Steve. Jenkins had owned the farm at one time; Blythe's bank had repossessed it from him a few years before for nonpayment of the mortgage.

Around the murders, Andrew Malcolm has constructed Final Harvest: An American Tragedy, a book that bears a family resemblance to Joe McGinniss's Fatal Vision and Norman Mailer's Executioner's Song--a nonfiction procedural of a famous murder, with its attendant investigation, trial, and punishment that shows us a variety of lives as they move up to, through, and past a moment of transforming violence.

More than the Mailer or McGinniss books, however, Malcolm's puts this reviewer in mind of the reports Calvin Trillin gathered in Killings. The murders are, for the writer, an opportunity to talk about a particular place and its values, about a particular set of social changes and conflicts. (Malcom quotes Trillin briefly in Final Harvest, on how Midwesterners feel about living in New York. The quote is, one may gather, a gesture of homage.)

Blythe had come to Ruthton in 1977, from an east-coast, big-city background. His hope in buying the Buffalo Ridge State Bank was to help a community get back on its feet.

But Ruthton had been dying for decades. It was set in its ways and resentful, in a traditional sort of way, of outsiders especially outsiders who seemed to have money. And it is a part of small-town tradition to mistrust bankers. Blythe's wife and son, Sue and Rolph, who are large figures in Malcolm;s account, felt this xenophobia more strongly than Blythe did. Somehow, nothing they did was ever right by their new townsmen. And little that Blythe tried at the bank worked out.

Jim Jenkins was a local, on the other hand. A moody man, perhaps, given to silences, but to the people of Ruthton, Malcolm writes, "He wasn't different strange. He was different familiar." Farming regions are full of guys like Jenkins: good with their hands, thrifty, willing to work endless hours under miserable conditions for little pay, figuring that sweat and patience will eventually pay off in ownership of a little dairying or haying operation. Steve was another matter: a boy who played soldier and guns a little too long for anyone's comfort.

Blythe and the Jenkinses were all caught by the farm credit crisis of the early 1980s. Blythe's death and his murderer's trial were widely covered by national news organizations because they seemed symbolic of the plight of rural areas. (About the time Blythe died, farmers were rioting to stop foreclosure sales in some places, and in North Dakota, a bankrupt farmer, spouting crazed deep-right-wing nonsense, killed two federal marshalls before being slain, himself; Trillin wrote up the incident for The New Yorker, and Malcolm mentions it.)

The Soviet grain market is closed for political reasons, crop prices fall, inflation drives up the cost of supplies, interest rates float towards 20 percent; and the bank to which Blythe's bank is mortgaged puts the squeeze on so Blythe puts the squeeze on his debtors, including Jenkins. Violence is one result.

Malcolm is too subtle to make Blythe the simple victim of that process alone--the evidence is there in Final Harvest that he died of someone's sheer viciousness, mainly--but it is natural for him, as a New York Times reporter and editor, to draw those sorts of connections. And it is a good thing, his taking this opportunity to explore the ways the old values of thrift, labor, hope, and community in the heartland have proved of little use in this late age; have, in a certain sense, been crushed by the two coasts' mechanisms of money and mass media. No amount of labor will overcome inflation and high interest rates; no front porch conversation can hold a candle to television. All of us--Blythe, Jenkins, you and I--have lost a lot in the process.

Reprinted from The San Francisco Chronicle. Bruce Colman was one of the editors of Meeting the Expectations of the Land.

Speak Often and Carry a Big Check

A Guide to Political Effectiveness

Ivy Marsh

On the drive back from Topeka, the conversation turned to the topic of political effectiveness--how an individual or a small, poorly-financed group can establish credibility and have a positive effect on public policy. The three of us had attended a meeting of the Kansas Department of Health and Environment (KDHE) Environmental Awareness Council (EAC) where KDHE Secretary Barbara Sabol talked about the recent Ways and Means sub-committee hearings on appropriations. To her disappointment, no one from the public had appeared to speak for KDHE's budget or about environmental issues, while the following day, when health issues were being discussed, the crowd was so large the meeting had to be moved to another room. Certainly momentous issues were involved in the budget hearings which should concern all Kansans: the monitoring of the Wolf Creek Nuclear Power Plant, the Superfund for hazardous waste cleanup, numerous groundwater protection issues, the joint oil and gas program, land burial of low-level redioactive waste, etc. Why hadn't the public taken part?

Appearing at the EAC meeting with Sec. Sabol was State Senator Paul Feleciano, a member of the Senate Energy and Natural Resources committee whose eleven members have oversight responsibility for thirty-seven state agencies. He stressed the importance of EAC members getting involved--and urging others to do likewise. "It's frustrating to address issues with a lack of public input," he said. "The accessibility is there if you use it." The nuts and bolts of law-making takes place in committee meetings, and the senator explained that it's important to become involved at the sub-committee level, especially for appropriation bills, because it's rare for the full committee to overrule its sub-committee. He advised that while letters and phone calls are helpful, the best thing to do is to attend the hearings and testify.

One EAC member from Western Kansas was obviously distressed. He had attended three regional public hearings on water issues and had written and telephoned legislators on specific bills, but the limitations of geography and economics plus time constraints made it impossible to trek to Topeka on every bill that seemed crucial. He suggested that KDHE compile constituents' letters and phone calls and present this body of information to the appropriate sub-committee. "I think I am involved," he said, but concluded; "maybe I've been doing the wrong things."

Feleciano responded with an interesting analysis of the differing ways legislators perceive the will of the people, but reiterated that while stacks of mail and phone messages pile up in his office, all of them read and appreciated, still "I'd rather have thirty people in the Senate sub-committee room. It intimidates Senators, being eyeball to eyeball. A thousand people should show up at a hearing, even though only five of them may choose to speak." Agreeing that it is impossible for those living a great distance from the capital to attend hearings often, he said the next best thing is a telephone call where the caller speaks directly with the senator or representative. "That's also very effective. The ideal thing, of course, is to do it all--write, call, and come in person."

Feleciano complimented Sabol for the fine job she does in attending meetings and testifying, but agreed with her that often legislators view that as "empire building," a bureaucratic tactic. He told the EAC that there are times when they would be horrified at the legislative process---on an important bill there may be only a five-minute staff presentation, then the bureaucratic appeal, followed by testimony from a few special interest groups and conferees. "Overall we need to hear from more citizens and lots of special interest groups. Make the system accountable! It's not being done. Please get involved in the process."

It is interesting to compare the responses of legislators when they do hear from their constituents. One day in March, 1986, I telephoned the offices of Representatives Jayne Aylward, Bob Ott, and Larry Turnquist, and Senator Ben Vidricksen to express opposition to HB3133, which concerned the monitoring of the power generation facilities (a fox-in-the-chicken-coop bill that weakened KDHE's monitoring of Wolf Creek and in effect allowed the utility-owners to monitor themselves). None was available to speak to me directly, so I left an explicit message with a staff member in each office. The only response I received from this contact was from Rep. Jayne Aylward, who said she would oppose the bill and appreciated knowing my concerns, which was especially

"The ideal thing, of course, is to do it all--write, call, and come in person."

courteous since I am not even in her district.

There is another area where public participation is needed. Nearly as important as the Kansas legislature are the regulatory bodies. The Kansas Corporation Commission (KCC) deals with a number of matters that affect Kansans on a daily basis, especially in energy and utility areas. At rate hearings most "intervenors" are high-priced experts who represent well-financed special interests; it's more difficult for volunteers who lack money and power to organize and testify. Coalitions can be formed when grassroots organizations find common ground. In the KCC's Wolf Creek nuclear power plant rate hearings, low-income, senior citizens, environmental, small business and other groups joined forces in fighting the excessive rate structure proposed by the utility owners even though they may have been opposing it for different reasons.

At the February, 1986, meeting of the Consumer Information Board (CIB: a consumer advisory group to the KCC), members heard KCC General Counsel Brian Moline and State Representative Ken Grotewiel give a legislative update and review of bills relating to energy and utility regulation. Both delivered messages similar to those of Sabol and Feleciano--"Get involved! Bring your friends along!" Rep. Grotewiel expressed his disappointment that HB2871, to establish a residential utility customer office (known in some states as a Citizens Utility Board--CUB), had received little public support. Grotewiel said that as a representative he sees that people with no special representation generally get the short end of the stick. "With the regular involvement of a lobbyist, you're just bound to get the ear of people and get results," he said. HB2871 failed in this session; supporters hope to bring it up again next year. Even when a bill seems dead, often it is miraculously resurrected. One wag said he'd told his family that if he ever became ill he wanted to be brought to the Kansas legislature, because nothing ever really dies there.

It's interesting to speculate about group dynamics. A House/Senate committee is an intimidating body--one with the advantages and drawbacks of any group. A group can accomplish formidable tasks more effectively than an individual ("many hands make light work", "two heads are better than one"). A group tends to feel strong, powerful, righteous. Consensus becomes so important that it can discourage a search for alternatives. It's hard for an individual to disagree with his/her group decision. Pinpointing responsibility for the consequences of a group decision or action is more difficult. ("There's safety in numbers", "might makes right".) The anonymity of the group provides a sort of "no-fault" policy for its members. Yet our task as environmental activists is to reach an individual member of the group and persuade that person to be politically courageous enough to champion our cause.

It would appear that ours is a government of checks and balances in more ways than one.

How do we go about influencing legislative or regulatory decisions? Some try arm-twisting tactics. More ordinary lobbying tactics include advertising, promotional programs, public forums, letters, phone calls, public testimony and private conversations. One legislator (and he's one of the "good guys!") candidly advised, "Make a donation to their re-election campaign. Every time you write or call, mention your past support. If it's a $100 donation you won't have to mention it--they'll remember. That doesn't mean you'll get your way, but you will get their attention. This isn't what you want to hear, not what you learn in a civics class, but that's the way it works." (It would appear that ours is a government of checks and balances in more ways than one.)

We are taught that our elected representatives act with the consent of the governed. David Stockman, in his new book The Triumph of Politics, agrees with that, saying that his earlier belief that the will of the people was at drastic odds with the actions of the politicians was erroneous. "Despite their often fuzzy rhetoric and twisted rationalizations, congressmen and senators ultimately deliver what their constituencies demand." [1]

In addition to dealing with the flood of bills, hearings, meetings, information to digest, reports to make, questions and concerns of constituents to investigate and handle, and keeping in touch with party leadership and key supporters (for the spectre of re-election is ever-present), an elected official is expected to represent a particular geographic area, the best interests of Kansas and Kansans, the "Party", and still listen to his/her conscience. These diverse interests are not always easy to reconcile. There are times when the most important criteria is "what the home folks think," while on another issue representatives may consider themselves free agents whose constituents trust them to excercise their best judgement based on experience, circumstances, and the best-available information. Along with the good stuff we feed them, they also receive input from the biased and the unenlightened.

A civics textbook adds:

> Severe time limitations and the frequent necessity to make decisions with only a few hours or even minutes' notice force legislators to depend on trusted peers...Members often ask one another what they think of a piece of pending legislation and, in particular, they ask respected members of the committee

working on the bill...Nearly always bonds develop, information is traded, and the norm of reciprocity often takes hold.[2]

All of these aspects lead to the voting decisions which result in the making of our laws. The process is cumbersome, unaccountable, elitist, and frustating. It's amazing that it works as well as it does.

Politics has been called "the art of the possible." It involves compromise, which is sometimes viewed as weakness. Today's allies may be tomorrow's antagonists, depending on the issue and the special interests involved. In a funny, irreverent but often on-target article titled "Hurrah for Politicians" (Harpers Magazine, September 1975), Garry Wills points out that Eugene McCarthy's presidential campaign failed in part because McCarthy found it so difficult to compromise. "McCarthy could compromise, but preferred not to, believing himself bound to the illusion of principle." Wills says that a politician's view must be endlessly reversible and cites the case of Lyndon Johnson. "In 1953 he told a journalist friend that Vice-President Nixon was 'just chicken shit'. The next week Nixon returned from South America a mistreated national hero, and the first to hug him at the airport was Senator Johnson. The journalist asked him about his earlier opinion of Nixon. 'Son', Johnson replied, 'in politics you've got to learn that overnight, chicken shit can turn into chicken salad.'"

Manipulation is another important tactic in politics: constituents and lobbyists try to manipulate (persuade) decision-makers, while politicians try to manipulate (rouse) the public. Often the manipulator truly believes his message, erroneous as it may seem to any thoughtful person. In today's political climate, broad and complex issues are sometimes reduced to a simple choice between good and evil. Separate entities such as spiritual revival and civic duty are linked as though they were Siamese twins. In addressing a Spirits of America Rally, President Reagan said:

> It's people like you who show us that the heart of America is good, the spirit of America is strong, that the future of America is great...You give meaning to words like entrepreneur, self-reliance, personal initiative...We need only to believe in each other and in the God who has so blessed our land.[3]

"The thing that scares me is that American politics is losing its substance. It's losing the depth; tough problems require discussion."

From patriotism to capitalism to heaven in three easy steps--no wonder the drudgery of study, introspection and analysis fails to attract converts. It has been said, "Belief is a slow process for it requires a great deal of time to have opinions."

Most of us are ignorant and uninformed about the majority of the hundreds of bills introduced in a single legislative session. We hone in on the half-dozen that most affect us and try to become semi-specialists on those. Elected representatives do not have that luxury; they must deal with all of them. Garry Wills says in the Harpers Magazine article that a politician is more occupied with what will happen in the next ten minutes than with what is six months ahead. It's easy to see why they would welcome input from a well-informed constituent or lobbyist. How willing are we to do the research, then develop the relationship? Walter Mondale, after his 1984 defeat, said, "The thing that scares me (is that) American politics is losing its substance. It's losing the depth; tough problems require discussion."[4]

With his popularity and charisma, President Reagan has been called "The Great Communicator." It's obvious that he is sincere about what he espouses, yet his speeches are models of over-simplification and manipulation, of setting up a straw man and knocking it down. In a 1984 campaign speech, he declared:

> America is a decent and a just place, and it deserves our love and fidelity. There's a mood, a general feeling that patriotism isn't something to be embarrassed about, but something to be proud of...Our optimism has once again been turned loose. And all of us recognize that these people who keep talking about the age of limits are really talking about their own limitations, not America's.[5]

Gracious! When the policy of unlimited growth is wedded to patriotism and decency, what callous, un-American, pessimistic bully would advocate slaying the golden calf? By inference, those who oppose unlimited growth threaten America's heart and spirit. (It's odd that political conservatism does not embrace conserving our natural resources but instead squanders them in liberal fashion.)

In his Denver Post opinion column (date not recorded on clipping), Neal Peirce commented that the young "kamikaze environmentalists" of

the 1960's have been replaced by leaders more managerial and less confrontational than their predecessors. "They form alliances with farmers (on issues like soil conservation) and labor (on toxic wastes)." They are "professional in economics and science but also know how to advocate colorfully... a band of problem solvers, not screamers", who focus on market and state-based programs. One such group in Kansas is the bright young staff of the Kansas Natural Resource Council. They have earned the respect of legislators and regulators by out-researching their opposition, then presenting their findings in a positive fashion.

One of the best national lobbying (and litagating!) groups, according to a January 13, 1986, article in The Wall Street Journal, is the Natural Resources Defense Council:

> The NRDC has grown to be a kind of shadow EPA. It has influenced laws on air pollution, water pollution, toxics, drinking water, pesticides, nuclear wastes, strip-mine reclamation, land use, energy conservation and much more. It's hard to find a major environmental law it hasn't helped shape within Congress, the courts and federal agencies.

NRDC employees spend most of their time doing research and haggling with government and industry officals over the writing and inter pretation of laws and regulations. NRDC lawyers say that the tedious and complex work of monitoring and trying to influence the writing of regulations produces some of their most important results. Joining KNRC and NRDC might be the most politically effective action a person could take.

The trip-home-from-Topeka conversation didn't lead to any new or earth-shaking conclusions about political effectiveness, but it did result in a sort of informal support system. We touch base with each other during legislative phone-tree-alerts initiated by various groups, and we compare notes on phone calls, letters, and responses. In a covert form of oneupsmanship I hurriedly make my legislative contacts so that when my EAC friends call to share strategy tactics I can assure them I've done my civic duty, whereas without that prod I might have delayed action indefinitely. I've even offered to drive to Topeka and add my physical presence to the subcommittee room while others testify. But the $100 contribution suggestion, effective though it might be, was defeated by unanimous vote in our household's annual budget hearing. I'm willing to speak often, but the big check is out.

"We must all remember, however, that institutional efforts to protect the environment must be extrapolated from the values and commitments of society at large. Nothing falls from grace more quickly or unceremoniously than good intentions strayed from the public will.

It is, therefore, absolutely essential that you, as educators, include in the classroom curriculum exercises which not only explore the environment, but which also subject environmental ethic to rigorous definition and debate. Through debate and definition comes vision by which we can direct and chart our societal efforts to sustain the environment and conserve resources.

Our understanding and use of resources must be derived from the distinction between renewability and non-renewability. Failure to use resources in a manner which is careful and appropriate is, as history has demonstrated time and again, a fast track to environmental, economic and societal dislocation.

I believe that rigorous self-scrutiny is a major part of our movement toward technological progress and environmental harmony. Rigorous self-scrutiny is necessary if we are to achieve the foresight that will allow progress and harmony without the incidental damage to the environment and community, to move in advance and not as a result of the next crisis."

Barbara Sabol, Secretary of the Kansas Department of Health and Environment speaking to the Kansas Advisory Council on Environmental Education, Nov. 13, 1986

REFERENCES

1. David A. Stockman, 1986, **The Triumph of Politics: Why the Reagan Revolution Failed**, 1986, (Harper, & Row); excerpts printed in **Newsweek**, April 28, 1986, p.64.
2. J. MacGregor Burns and J.W. Peltason with T. E. Cronin, 1975, **Government By The People**, 9th edition (Prentice-Hall, Inc., N.J.), p. 360.
3. Paul D. Erickson, 1985, **Reagan Speaks: The Making Of An American Myth**, (New York University Press) p.92.
4. Erickson, p. 122.
5. Erickson, p. 100

To join the KANSAS NATURAL RESOURCE COUNCIL, mail $20.00 to KNRC, 1516 Topeka Ave., Topeka, Kansas 66612.

To join the NATURAL RESOURCES DEFENSE COUNCIL, mail $20.00 to NRDC, 122 East 42nd Street, New York, N.Y. 10168.

By Paul Rasch, c/o World Neighbors, P.O. Box 916, Kathmandu, Nepal, February 1986.

On The Road Again

Walking back from a village five hours distant the other day, it was easy to understand why people pay so much money to come to Nepal for hiking. With the sun shining full, a breeze at my back and mountains all around me, it was all I could do to keep from skipping as I whistled and hummed my way up the trail. When I left to Bahunapati people had, as always, worried and wondered about my travelling alone. "Don't you have a friend?" they asked with concern. "Not a one," I replied with a grin. But then, in very un-Nepali fashion, I enjoy travelling on my own.

From Bahunapati, I started off on what is to eventually be a road for busses and jeeps (although neither seems to require much of a trail here!). With national elections approaching, the long-promised road work is finally resuming (the work drew to a halt just after the last elections, five years ago). For a half hour I walked along this "real" road before it faded into the familiar one-foot wide, well-worn type of trail which provides the only transportation and communication to and from most Nepali villages.

As always, I met all sorts of people along the way. At a tea stall in the next village, I swapped nonsense with a few familiar faces as best I could, while draining glasses of the sweet, milky and ever-so-tasty tea. Off again, I was heralded from far up the hill by a tribal woman and two children, who quickly expended their English vocabulary with boisterous, echoing "Haaalooo." Here and there, I was passed by people heading the other direction. If men, I usually was asked where I was going and why, allowing me to launch into jumbled discourse on my work with citrus and apples. If a group of women passed by, little or nothing was said, each looking me over closely with a gaze bordering fear and humor until they were safely past, when they broke into laughter and/or excited talk.

Past the village of Malemchi, I turned off the main trail and started to trek along the Malemchi River. Glacier fed, it runs fast and clear and is always refreshing to be around. All along the river trail, farmers were planting wheat or mustard in fields which had recently yielded a precious crop of rice. In places, others were plowing small fields by hand or with oxen, preparing the ground for potatoes, onions or other vegetable crops. Pleasant sounds accompanied these sights: children playing games with laughter and taunts, men coaxing their animals to work with a chant, curse or song, goat kids crying for their mothers, women chatting as they winnowed recently dehulled rice. And always the river rushing over rocks and sand. Step after step, mile after mile, the dance of village life lulled me to a relaxed stroll. Every now and again my daydreaming was grounded by scantily-clad kids shouting out "chocolate namastes," "Haaalo, Namaste" (Greetings). "Give me one chuklate, Give me one Skuul Pen" - a sure sign that this is a route used by tourists. Leaving the little beggars behind, I would resume my strolling and daydreaming, until I came upon someone or something new. At one point, I caught up with a couple of Nepalis my own age, and we walked and chatted together, first in English and later in Nepali:

"Which is your country?"

"America. What is yours?"

"Nepal" (laughs, since that is obvious).

"How do you like Nepal?"

"I like it a lot."

"But Nepal is a very poor country, and America is a great country."

"That's what everyone here says."

"It's true. Here there is no development. You can't find good roads or good vegetables, people don't have any money, there are no schools..."

"Yes, but a least people here are still clean. In America we also have problems: a lot of divorces, much of our air and water is polluted, and in some places there are so many thieves and killers that it's not safe to walk."

"Really? But American has good schools, good hospitals and good roads."

"True. Nepal also needs these things. But Nepal should not be like America or England. It should develop in its own way, according to its own needs."

"But people are rich in America."

"There are also a lot of poor people in my country. And besides, rich people are not usually happy people."

"Maybe," (thinking, probably, that this kind of talk is easy for me, a rich American).

Then on we rambled into more important matters like am I married, how many brothers and sisters do I have, how old am I, is sex "free" in America, what am I doing in Nepal, where did I learn Nepali, and how long will I stay? An hour down the road we stopped for tea, then went our separate ways with the familiar parting, "Maybe we will meet again."

Back on my own, I started thinking about other people I've met along this trail. Once, on my way from Katmandu, I was carrying my guitar and was stopped by a slightly inebriated old man who insisted on hearing some "noise from my twang twang." So stirring was the performance that he offered me 20 rupees ($1.00) for the guitar and case, to which I replied that I'd take 20 rupees and his oldest son. The crowd that had gathered roared with laughter at that and recounted it the next time I came through.

Another time I met a young Maoist, decked out in western garb, and we argued in NepEnglish for hours abut how useful Mao's ideas are for Nepal.

Inevitably the things you carry become topics of roadside conversation. Unknown to most tourists, Nepalis speculate openly about the lode of wealth contained in a foreigner's backpack. If you speak Nepali, they just ask you point blank or, if given a chance, look for themselves. When I came back from Christmas in America carrying a portable cassette player which I'd bought for a friend, the trail buzzed with curiosity, the questions of the day being, "Is it a cassett" (yes), "How much did it cost?" (1000 rupees - cheap for Nepal), "When are you going back?" and, of course, "Will you bring me one?" (sure, if you buy my airplane ticket). I had anticipated as much. A few weeks later, though, a boku (woolen vest worn by Sherpa Tamang people) which I bought aroused even more interest than the radio. I guess that few foreigners wear them, so speculation was high about how much I paid for it, etc. I wore it on a 2-day hike to a place high in the mountains where I gave a series of trainings on apple tree management. The trip took me up and over one mountain, then down to the river, then up another slope, and I was bombarded every step of the way by questioning Nepalis. The scrutiny grew even more intense as I started up the last stretch of mountain, since it is a Tamang area which prides itself on its bokus. Tamang men and/or women gathered in groups would see me coming and start in on speculating:

(To Me) - "How much did you pay for it?"
Me - "20,000 rupees" (1,000 dollars - said with a straight face)
Them - (laughs) "Where did you get it?"
Me - "On the Malemchi side (over the mountain). It cost 200 rupees."
Them - "Oh, expensive! And the quality is not very good."
Me - "How much do you pay for a boku here?"
Them - "180 rupees."
Them - "Do you want to trade?"
Me - "I thought you said it was expensive and poor quality! I'll trade your boku plus 150 rupees for mine."
Them - (laughs) "Where are you going?"
Me - (pointing) "Over that way" (the expected generality).
Them - "You should buy another boku for your father."
Me - "I doubt yours would fit."
Them - "Buy it and see."

So it went the whole trip. But I've strayed from my story. I was originally telling of my trip from Bahunapati. As I approached Mahankal, where I stay, the sun was drawing low. Marching towards me was a group of people led by several police officers. Two teenage girls were in the group, leading me to suspect that this had something to do with the notorious trade in young prostitutes which is carried out on an appalling scale in this area. People come from Bombay and literally buy young girls from their parents, promising fantastic sums of money if all goes well. To the people of isolated mountain villages the temptation is often too great, especially now that years of such activities have liberated social norms on the matter. The girls often stay in Bombay five to seven years, then generally return home a little wealthier and able to marry without any substantial loss of face.

The police I met had intercepted the Bombay-bound group and taken the girls back to their parents to validate the claims of the girls' "escorts" that the parents had consented to the journey. As always (or so I'm told), the police found this to be true and hence were powerless to stop the trip. As I passed the group, I became aware of the somber mood which had settled on the trail, as groups of people huddled, mumuring about this disquieting trade.

Alas! A five-hour trip has taken six hours as I finally come to the last shaky suspension bridge before Mahankal. But then, so what? Nepal comes to life while "on the trail," and the sights, sounds and people all suggest the wisdom of casting aside unnecessary worry about time. So I strolled unhurried into Mahankal, warmly remembering the homecoming I received after returning from the States in January, when friendly faces crowded all around asking not what I had brought them, but about my family and friends.

Nepalis do not understand why I like hiking their roads so much or, for that matter, why I like their country so much. To them, hiking long distances over trails is a necessary part of their difficult lives, the only way to get goods, see people of other villages and hear non-governmental news. Hiking is certainly not something that they would pay to do or even take much pleasure in. But they have not been to America, where we travel along in cars isolated from others and the land around us, always in a hurry to get somewhere else, rarely able to enjoy where we are. Life on the road here is quite different, for the way is more than just the trail that you trod. It's also the people you meet, the sounds that greet you and the Nepali culture that absorbs you.

Paul Rasch was a student and appropriate technology intern at The Land in 1980-81. He is the recipient of a Shansi fellowship, awarded to Oberlin College graduates to do service projects in the third world. This is one of several required reports.

SUMMER CONFERENCES

AUGUST 25-31,, North American Bioregional Congress II, Camp Innisfree, Traverse City, MI. For information contact NABC II, Box 3, Brixey, MO 65618. Many kinds of programs are offered, all centered around the bioregional concept.

Agricultural Intern Program

The agricultural intern program runs from mid-Feb. to mid-Dec., the Growing Season Term. During spring and fall, mornings are spent in the classroom, and afternoons are used for physical work related to research, construction or maintenance. Research work dominates the summer session, but occasional field trips and seminars are scheduled.

Interns receive tuition scholarships and a $4000 stipend for the 43 weeks. They find their own housing in Salina and bike or carpool to The Land for the 9 AM to 5 PM day.

The Land admits students of any race, color, national or ethnic origin. For more information about the agricultural intern program, write The Land or phone (913) 823-5376.

Visitors and Tours

If you would like to visit, please call or write ahead of time and make arrangements. Mornings are all right in the summer, but during the spring and fall, we prefer that visitors come in the afternoon. Weekdays are best.

Changing Your Address?

The Post Office does not forward 3rd class bulk mail. Please inform us if you change addresses. If 26 appears on your label, your subscription expires with this issue. PLEASE RENEW NOW.

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

Non-Profit Organization
U.S. Postage Paid
Permit No. 81
Salina, Kansas 67401

Friends of The Land

NAME _____

ADDRESS _____

_____

PHONE _____ DATE _____

CHECK CATEGORY OF CONTRIBUTION)
(Contributors receive The Land Report)

_____$15 _____$25 _____$50

_____$100 _____$500 _____Other

_____$5 U.S. subscription to THE LAND REPORT

_____$10 Foreign subscription - THE LAND REPORT

The Friends of The Land have been extremely important. Many helped collect materials to build the first classroom/office/shop; many donated their time and labor to begin reconstruction after the building burned in October 1976. Friends donated books and money to help develop another library and began contributing to the general support of The Land through yearly gifts. The Land needs these friends, and new friends, too.

The Land Institute is a private, educational research organization. In recent years, several private foundations have awarded grants for special programs. These would not have been made if The Land had not shown a record of broad-based support from individuals who make annual contributions. Continued financial support from Friends of The Land is vital.

Contributors receive THE LAND REPORT and other occasional publications, plus notices of events sponsored by The Land Institute. The Land Institute is a non-profit organization, and all gifts are tax deductible.