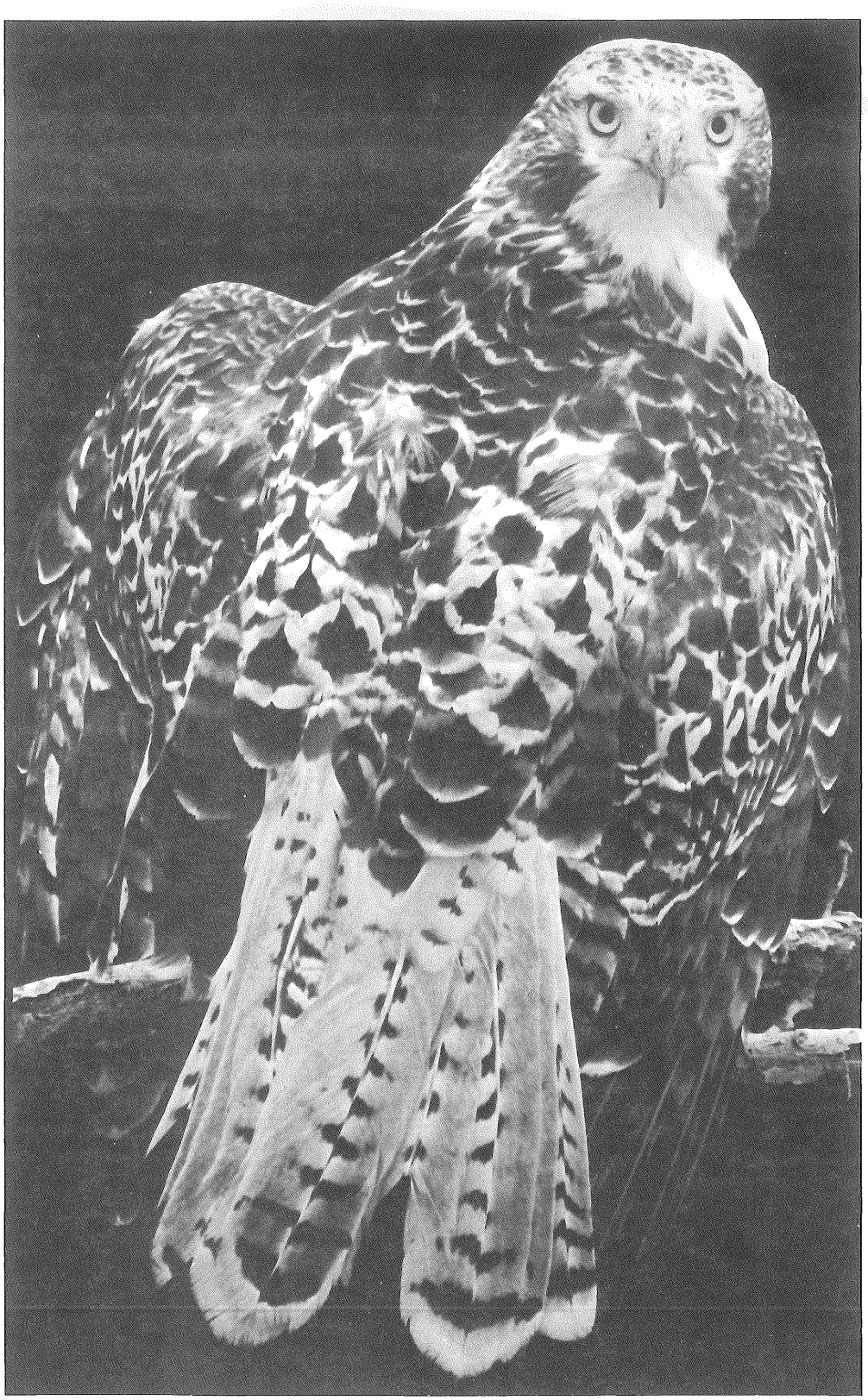

THE LAND REPORT

Number 20

Winter 1984

The Land Institute

Contents

Winter 1984

The 20th Issue of The Land Report

Dana Jackson

Number 20 on the cover means that this is the twentieth time we have written and produced a report of our activities at The Land Institute. Since the first ten page newsletter in December 1976, our publication has changed considerably in in size and appearance. Numbers two and three were twelve pages; number four was increased to 28 pages and became a regular magazine with departments in agriculture, energy and shelter,

(Continued on pg. 6)

At The Land

Ag Interns Complete First 43 Week Term

David Burris

All of the agricultural interns knew, since we first chose our experiments, that papers on the research would be due during the final stage of our term here. But they existed only as a nervous commitment in the backs of our minds.

We spent the summer, which seemed to be the hottest, driest summer of our lives, irrigating, weeding and pollinating, sometimes forgetting the purpose of all the work. In August, four of us went up to a much cooler Nebraska for a week to attend the Center for Rural Affairs conference on agricultural policy, where we met a diverse and interesting group of people working on many levels towards agricultural reform.

The rain came again in late August, and the temperatures began to drop slowly. Debra returned from her summer in New York, and the third and final session of the term began.

We appreciated the classroom sessions again, after a summer spent on physical work, even though the prairie ecology questions and genetics problems required considerable outside-of-class preparation. The readings on information entropy and evolution were some of the most theoretical and difficult we had ever been assigned at The

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THE LAND INSTITUTE IS A NON-PROFIT EDUCATIONAL-RESEARCH ORGANIZATION DEVOTED TO A SEARCH FOR SUSTAINABLE ALTERNATIVES: AGRICULTURE, ENERGY, SHELTER, WASTE MANAGEMENT.

Land Institute. After discussing "The Downward Slope to Greater Diversity" by Dan Brooks and Ed Wiley, Wes arranged a special seminar for us given by one of the authors, Ed Wiley, a professor at the University of Kansas. We also read articles about "reindustrialization," and population issues, including essays by Garrett Hardin. Later in the term, we read The Next Economy by Paul Hawken, and sections out of Building a Sustainable Society by Lester Brown and The Unsettling of America and The Gift of Good Land by Wendell Berry.

The classroom sessions sometimes went outdoors, such as the day we went over to the 160 prairie pasture to discuss succession. When Nick Fent drilled a water well in the southeast part of the 160, we watched and listened as Nick showed us each layer he drilled through and explained its composition.

The papers on our research became less abstract in October when harvest began and data began to come in. Wednesdays were set aside for work on the papers and trips to the Kansas State University library. We took an inventory of experiments; fear of failure and disappointment grew as it became obvious that some experiments and much labor would yield no results. A student receives one of two grades at The Land: success or failure. The tests are taken and graded daily, in one's own head.

Other events at The Land in October prevented us from worrying too much about reports on the experiments. Visitors' Day on October 2 was preceded by a week of clean-up and organizing. Dan Luten visited on October 14. After 24 years as a research chemist with Shell Oil Company, Dr. Luten taught resource geography at the University of California, Berkeley, for fourteen years, then was an emeritus lecturer in geography. He questioned our understanding of the "real value" of resources in the discussion we had with him in our morning session. Garrett and Jane Hardin visited on October 19 and 20. Dr. Hardin spent two classroom sessions with us and also gave a public lecture at Kansas Wesleyan the evening of October 19. Garrett Hardin is upsetting. He brings up the hardest of questions regarding population and

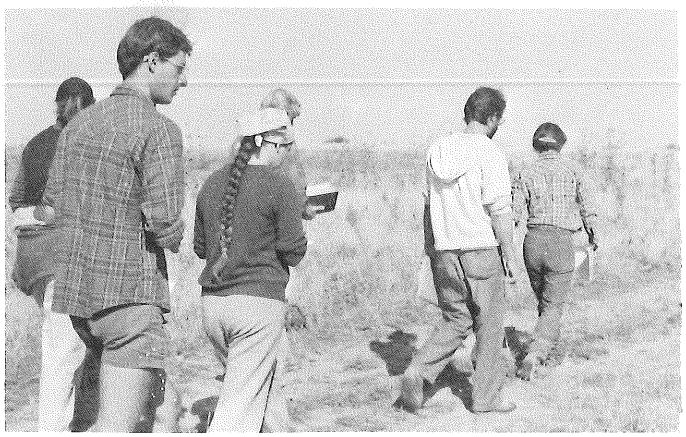
David Burris digging up a Wild Senna plant.

immigration. He challenges us to face the difficult decisions to be made in the present and realize the even more difficult decisions to be made in the future.

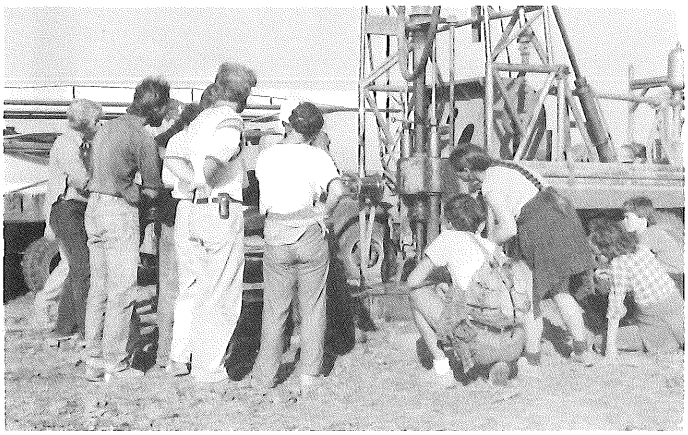
Early in November, other speakers came to our class: soil conservationists John Piscak and Earl Bondy (see pg. 13) and Randy Reichenbach, economics professor at Kansas Wesleyan, who spent a morning answering questions which came up while we were discussing The Next Economy.

We harvested vegetables from the garden until November 8, the date of the first killing frost. During the mild weather, we prepared for winter by sawing up a huge pile of scrap construction lumber into stove-size pieces with the new buzz saw on the back of the tractor.

The Land Institute participated in an energy fair sponsored by radio station KINA on November 12-13. Students took turns supervising an energy information booth containing books and publica-



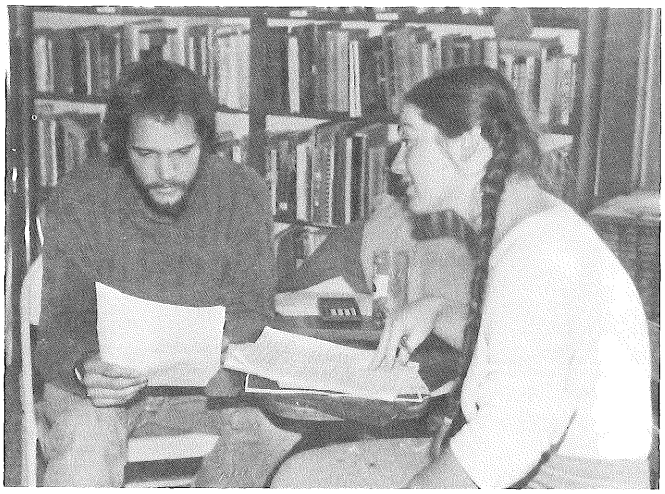
In the outdoor classroom.



Watching Nick Fent drill the water well.

tions from our library.

In November there were more harvests, then drying, threshing and cleaning seed. We weighed seed, recorded data, and made more trips to the library at Kansas State. These daily tasks resulted in slow and steady progress toward our final result--the paper. A deadline of December 1 was imposed, the day we were to present our papers to a group of professors in biology and agronomy, who make up an informal Land Institute research advisory group. Work continued at an increasingly frantic pace in the last week of November. Classes stopped and weekend recreation stopped, as we spent our time clarifying the results of our data, organizing tables and graphs, and typing.

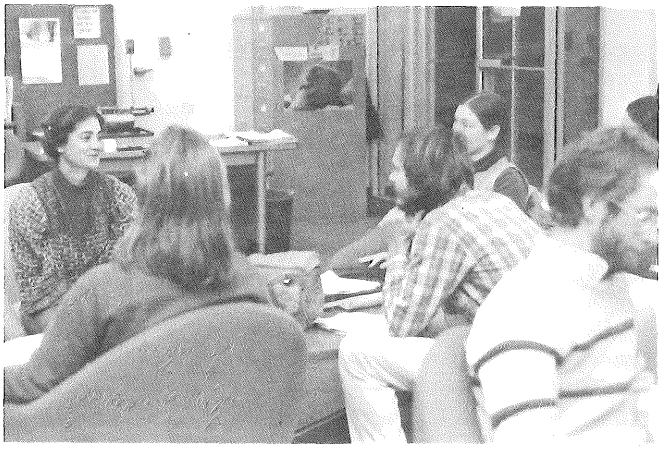


Juli and David working on their paper.

December the first came. In spite of our nervousness, the talks went smoothly, and the discussions afterwards with the professors were interesting and encouraging. The professors who attended were Orville Bidwell and Dan Rodgers from the Agronomy Department and Lloyd Hulbert and Dick Marzolf from the Biology Department at Kansas State; Bob Holt and Jim Hamrick from the Biology Department at the University of Kansas; and Jim Mayo of the Biology Department at Emporia State University.

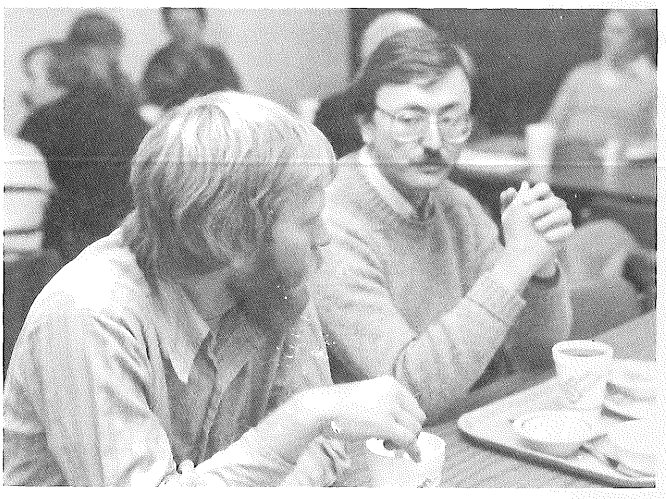
The papers still needed editing, rewriting and polishing. Work continued on the research write-ups after the presentations at K. State.

There was a break from the research work on December 6 when Wendell Berry visited our class and answered questions about his essays in The Gift of Good Land. That evening he read a new short story to the students, staff, and a few Friends of The Land. We all appreciated the opportunity to hear a good story, read well, in the company of friends.

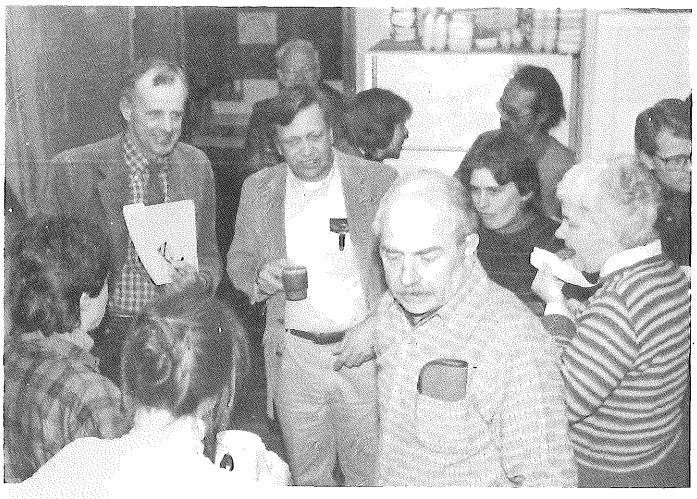


Helen, Alex, Mark, Juli & David at K. State waiting to present the papers.

All of the papers were turned in during the last week and will be published in a special Land Report Research Supplement later this winter, so we leave with a sense of completion. Each of us knows what his or her first step will be after this term, but no one is certain about a year from now. We are all, in a sense, uprooted again. Wendell Berry writes about staying on the land and staying put. While at The Land Institute, we've had a glimpse of what it means to set some roots. I hope we all have the chance to do that in the future.



Marty and Prof. Bob Holt at dinner following the presentations.



Wendell Berry, Wes Jackson and students visit with Friends of The Land.

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 stipends of approximately $80 a week. 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) 823-8967.

Marty Bender Resigns

Marty Bender, research associate at The Land, resigned in December. He will be working as a naturalist at the Glen Helen Outdoor Education Center in Yellow Springs, Ohio, from January to June 1984. In the fall he hopes to enter graduate school and work towards a Ph.D. in ecology.

The Land Institute had only been in existence two years when Marty Bender arrived as a student in the fall of 1978. Marty stayed on as an unpaid research associate the next year, then remained as a poorly-paid research associate, and advanced to the position of a low-paid research associate in 1982 and 1983. Since all positions at The Land are low-paying, his value to our educational/research program was not measured by his salary.

Marty was the first employee hired after Wes and Dana Jackson and has been a partner in the evolution and growth of the educational-research program. Marty helped establish the first small polycultures in the spring of 1979 and transplanted the first plots of Eastern Gama Grass that fall. He worked hard during the summer of 1980 to get the 4' X 24' plots of native grasses in bicultures established south of the barn. Marty collected seed from all over the Great Plains and the Midwest and started the Herbary. He helped set up and modify the irrigation system. He designed and planted new experiments on the 160 acres which The Land purchased, and he helped plan experiments for the first group of agricultural interns. Marty kept research records, and he created an extensive file of articles and information related to ecological agriculture. Marty also wrote many articles for The Land Report, and he co-authored papers with Wes, which were published in various journals.

We cannot list all the different responsibilities Marty took on during his five years and four months at The Land Institute, nor adequately express our appreciation for his dedication. We shall sorely miss Marty, but we know it is right for him to pursue his interests and ambitions elsewhere at this time.

Garrett Hardin

Excerpts from Garrett Hardin's Speech

"If each sovereign nation asks, 'What do we need in the way of immigration?' it will turn out that the vast majority will need no immigration at all. The trouble arises because certain constituent elements will benefit by this immigration which harms the whole. And the most conspicuous example in our country are the people who want to hire workers, particularly the farm workers, but also factory workers, for very low wages. They say they can't get workers to do this job. Then we say, 'Why don't you pay a higher price?' They say, 'Well, I can, but it will add so much to the price of my product that nobody will buy it.' Now they may be right, in which case then your next statement is, 'If nobody will buy it at a price that includes a decent wage for free agents, maybe you shouldn't make a profit out of it.' This has happened in the past. For example, there used to be a fine Brussels lace two centuries ago. It was made at the expense of blinding women who made the lace. They became blind early in their middle age. Nobody makes fine Brussels lace anymore. If they did, it would have to be sold at such a high price, nobody would pay for it. That's fine. So, if nobody will pay the price for a head of lettuce that pays a decent wage for the lettuce picker, we can do without the lettuce."

..."People look backwards and say that immigration brought in a lot of fine people. Everybody...is descended from an immigrant. That's true. What's new? The same thing could be said in any country in the world."

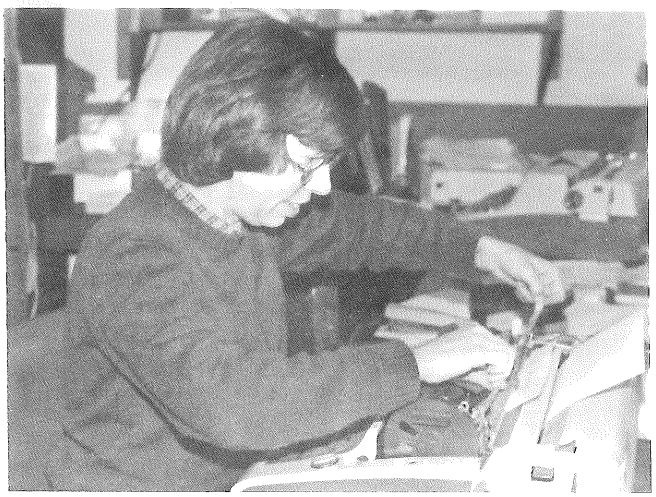
The 20th Issue (Continued from pg. 2)

as well as a news section called "At The Land." We moved up to 32 pages in number eight, and to 36 pages in number ten. All issues from ten through twenty have had 36 pages.

Despite the changes, The Land Report is still published for the same reason: to report on the activities of The Land Institute. The articles describe both the physical and mental work carried out by students and staff. Agricultural research and energy projects are explained. Sometimes students and staff write articles about subjects they have been researching, or environmental, energy or agricultural issues they think are important. Most of the content is related to sustainable alternatives in agriculture, energy, shelter and waste management, although we have also included sections on alternatives in nutrition, health care, social structure and work. In addition to the departments about alternatives, The Land Report contains sections called "A Sense of Place," "The Great Plains in Transition," "Prairie Images," "Perspectives," and "Books." All are not presented in every issue.

In the fall of 1982, this magazine told how The Fate of the Earth by Jonathan Schell had increased our understanding that nuclear war would be the most serious of all ecological problems. In the fall of 1983, the general public was alerted to this by publicity from "The World After Nuclear War" conference and the TV movie, "The Day After." People heard Carl Sagan say on TV that the movie understated the disaster by not showing "nuclear winter," which would prevent food production. We know that our work in agriculture must include intense efforts to halt the arms race, or it is meaningless. In future Land Reports, we will include more articles about these efforts.

People associated with The Land contribute the material for each issue. The authors of articles are sometimes former students, members of our board of directors, or Friends of The Land, as well as current students and staff members. Students contribute illustrations and photographs, although all of the cover photographs

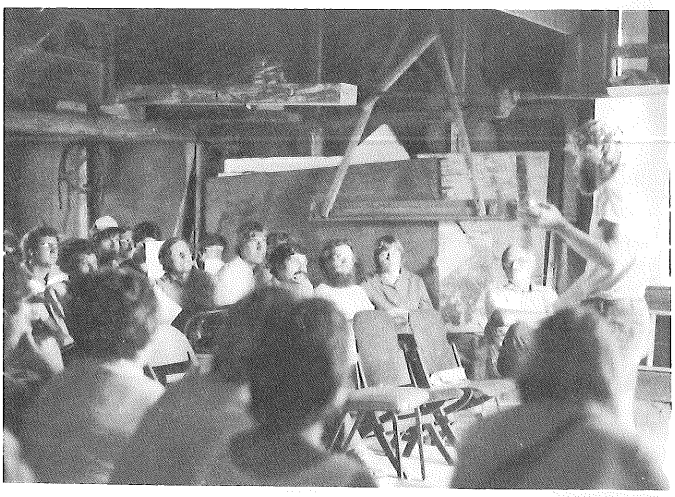


Linda Okeson

have been by our Arts Associate, Terry Evans. Two of the cover sketches were drawn by board member Dick Courter, and two were by Iralee Barnard, a Friend of The Land.

Editing The Land Report has been a "learn as you go" project for me. This is strictly a "homemade" job, as all the text is typed here (only headlines are typeset), and I do all the layout and paste-up, taking "photo-ready" copy to the printer. I have greatly appreciated the suggestions of Terry Evans and the help of Bill Chegwidden at Arrow Printing. Linda Okeson types most of the material, copy editing along the way, and is our circulation manager. Without her patience and encouraging good will, producing The Land Report three times a year would be nearly impossible.

When the students and I go to Arrow Printing to collate The Land Report, I wince at the crooked headlines, the typos, and the misspelled words, which always remain invisible until 2,000 copies are printed. But nothing is more satisfying than taking the mail sacks of Land Reports to the post office, and finally sending off another issue to our contributors and subscribers.



Marty Bender speaking to guests on Visitors' Day.

Fall Visitors' Day

Although not an elegantly-decorated meeting room, the east section of the barn, with its newly-poured concrete floor, was satisfactory as the location for the 1983 Visitors' Day Program on Sunday afternoon, October 2. As we expected, approximately 100 people attended, too many to meet in the classroom.

Wes and Dana Jackson began the program by explaining the history and goals of The Land. Visitors were then offered tours of the research plots for plant breeding, research plots for ecological studies, the organic garden, or the renewable energy systems. A slide presentation on Amish agriculture concluded the program.

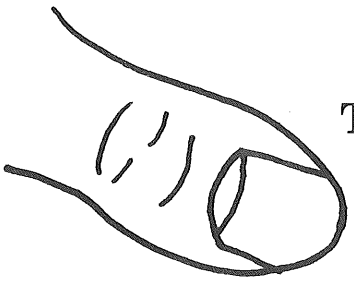
Visitors' Day is held every fall to give Friends of The Land and other interested persons a chance to meet all the people working at The Land and find out what they are doing.

Position for Ecologist Open

The Land Institute is accepting applications for a research associate to begin work as soon as possible in 1984. We are seeking a plant ecologist with a Ph.D. who is comfortable with systems modeling, but likes plants better than mathematical models. The ecologist would do some classroom teaching and assist agricultural interns in research related to perennial polycultures. The salary is negotiable. Contact Wes Jackson, 913-823-8967 or 823-5376.

1984 Calendar

Feb. 13	- Friends of The Land Study Group
Feb. 13	- Spring Session Begins
March 17	- Green Thumb Gathering
May 26-27	- THE SIXTH ANNUAL PRAIRIE FESTIVAL
June 4- Aug. 31	- Summer Session
Sept. 4	- Fall Session Begins
Oct. 7	- Visitors' Day
Dec. 1	- Applications for 1985 interns due
Dec. 14	- Fall Session Ends



The Green Thumb Gathering

Five years ago, when March 17, St. Patrick's Day, fell on a Saturday, The Land sponsored a GREEN THUMB GATHERING, a workshop on organic gardening. We are going to do it again on Saturday, March 17, 1984.

The workshop will begin in the classroom at 9:00 A.M. and end at 2:30 P.M. Participants should bring sack lunches. The Land will provide coffee and herb tea.

We will organize the workshop around seven categories of garden produce: leaves, legumes, stems and roots, cole crops, cucurbits, miscellaneous fruits, and herbs. With each group, we shall discuss choosing varieties, planting times, spacing and interplanting, special needs (soil types and nutrients), watering, weed and insect problems, mulching, harvesting and preserving.

Experienced gardeners will lead the workshop, but there will be ample opportunity for all participants to learn from each other. Everyone is welcome, from the novice to the most experienced gardener.

Pre-registration by March 14 is required. Those on our mailing list will receive a flyer with a registration form on it in the mail early in March. The fee for the workshop is $5.00 per person or $6.00 for a married couple. Friends of The Land pay only $2.50 each or $3.00 a couple.

Prairie Festival '84

Herman Daly to be Speaker

"Ecology and Economics" will be the theme of the sixth annual Prairie Festival to be held on the weekend of May 26-27 at The Land Institute.

Herman Daly, Professor of Economics at Louisiana State University, will be the featured speaker. He is well known for his interest in economic development, resources, environment and population expressed in some fifty articles in professional journals and anthologies, as well as four books, including Steady State Economics (1977) and Economics, Ecology and Ethics (1980).

Dr. Daly has been a Ford Foundation Visiting Professor and a Senior Fulbright lecturer in Brazil, a Research Associate at Yale University, and a Visiting Fellow at the Australian National University. He was the recipient of Louisiana State University's Distinguished Research Master Award. He has also served on the boards of advisors of numerous environmental organizations, including Friends of the Earth.

The two day Prairie Festival will feature many other speakers, workshops and activities related to the theme, as well as prairie walks and prairie-related programs.

Invitations to the Prairie Festival with details of the program will be mailed in April. Those not on The Land's mailing list may receive an invitation by requesting one.

Friends of The Land Study Group

Friends of The Land are invited to participate in a special study group which will be organized on Feb. 13, at 7:30 P.M. in the classroom. There will be no fee, but participants will purchase their own books.

This group is for those who would enjoy reading and discussing books related to social, economic, political and ethical concerns of the environmental community. Economics, Ecology and Ethics by Herman Daly, The Next Economy by Paul Hawken, Standing by Words by Wendell Berry, Progress and Privilege by William Tucker are examples of books which might be used. Members of the group will choose the books to be read and take turns organizing the discussions. The group will set the dates to meet and the number of meetings for each book.

VISITOR POLICY: Visitors are welcome at The Land on week days. Please write or call ahead of time to make arrangements. Good News! Construction began on a new bridge in December, but we can't guarantee its completion by the Prairie Festival.

A Review of the 1983 Ag Research Program

Wes Jackson

We have just completed the first year of our agricultural intern program. To accommodate this new emphasis, we changed our calendar so that students can be here for 43 consecutive weeks beginning in mid-February and ending in mid-December. We abandoned the traditional semester calendar and oriented our academic calendar to the growing season.

Even a 43 week calendar does not give us enough time, it seems, to keep from feeling rushed. We have to start preparing the ground for planting in March, leaving little time for designing experiments with the students or giving them the necessary background in the literature to thoroughly know what is going on here. Once seeds are in the ground, the experiments run the experimenters more than the other way around, for then comes the necessary weeding, irrigating, pollinating and harvest. After harvest, we still have to clean the seeds, dry them, record weights and analyze data before the results are written up. Mid-December is here before we know it.

We have had problems this first year of the new program. We expected many of them, but could not have anticipated the complications of their interactions. Now we know more, thanks in large part to this first group of pioneers, who may, in fact, have contributed more than they gained. All subsequent students will be forever reminded of the debt they owe this first group.

During most of January, and until the students came in mid-February, Marty Bender, Walter Pickett and I spent countless hours discussing and outlining possible experiments on the blackboard in the classroom. We ranked them according to importance and ability to carry out, given our resources. We classified them according to three biological questions or considerations:

1. Can perennialism and high yield go together?
2. Can a polyculture of perennials outyield the same species in monoculture?
3. What are the management problems associated with sunlight-sponsored fertility and pest control?

By the time the students had arrived, we had narrowed the number of possible experiments to 43. Shortly after their arrival, they were given a sixty page handout describing these 43 experiments, with the explanation that they needed further clarification. Of course, all of them could not be done this first year, so we asked the students to pick those which interested them most, and weighed their choices against our priorities. Some of the students also had a few experiments of their own in mind. We finally selected a total of 25 candidates of varying degrees of complexity to be carried out by ten people, counting both staff and students.

Each student, along with Marty and Walter, then selected from two to four experiments for which he or she would assume primary responsibility. All were asked to refine the write-ups of any experiments chosen, each to fit on one page (front and back). They were to state the purpose of the experiment, tell how it fit one of the three questions, and outline the procedure. Each experiment was given a letter of the alphabet; they were lettered as experiments A through Y. For one reason or another, five experiments were never written up, reducing the number to 20.

Experiments were further classified according to how long it would take to completion. If they could be finished in one year, they were candidates for which a student could assume primary responsibility. If they required more than one year, in most cases the staff assumed primary responsibility. Some experiments were conducted to provide baseline information only. The results of these are necessary for our work, but not regarded as publishable.

Mortality of the experiments did not stop at the planning stage. Some were dropped after a devastating mid-May cloudburst. Some were ill-conceived; they had not been thought through carefully enough by Walter, Marty and me. I mowed through one replication of an experiment by David Burris with the Ford tractor and the six feet rotary mower one weekend. David was kinder to me than I would have been to him had it been the other way around. Some experiments which had been nursed through one of the worst droughts in history, then carefully harvested, the seed cleaned and weighed, showed statistical results of "no difference," especially disappointing to the students in charge, but also to all of us.

What did we learn from the research conducted during the past 43 weeks (other than how to tighten up our experiments, how to better organize

Alex Stone & Wes Jackson discussing experiments.

our work force, how to ask better questions, how to dry our seeds, how to marshall the pertinent literature in a more efficient manner, how to better coordinate our classroom work and research interests)? The results of some of our experiments will appear in write-ups to be published in a special Land Report Research Supplement, which we will make available to anyone upon request.

Some of the more salient things we learned can be summarized as follows.

---Bicultures of Illinois Bundle Flower (a nitrogen fixing legume) and Wild Senna (a non-nitrogen fixing legume) did not overyield in the first year. (Overyielding occurs when two plants growing together produce more than both growing in monoculture.) It made no difference statistically whether they were planted in alternating rows or alternated within rows. How dense they were planted did not affect these conclusions. We intend to keep studying these plots though, for nitrogen may eventually accumulate enough to make a difference.

---The growth rates of first, second and third year Maximilian's Sunflower plants are the same. The second and third year plants shot up earlier in the spring, drawing on the resources stored in the parts below ground. The first year plants were seedlings and germinated after their older relatives emerged, but their rate of growth was the same.

---We found no correlation between flower weight and seed weight in Maximilian's Sunflower, an important consideration for any future breeding work with this species.

---The amount of biological material the perennial Wild Senna allocates to reproduction compares favorably with domestic annuals. More research is needed, but these results indicate that some perennials may be able to compete favorably with annual grains. In other words, it is not out of the question for perennials to allocate a substantial quantity of biological material to seeds.

---The yield of Wild Senna for the second year is now in. Several accessions (an accession is seed from a locality in nature) were higher yielding in the second year than in the first.

Helen Atthowe in plot of Maximilian's Sunflowers.

Ruskin Gould harvesting corn.

Though the yields overall were down in the second year, I believe we can blame the drought and high temperatures in some part. Many of the hot, dry winds came right at flowering time, and it made little difference that there was plenty of irrigation water at the base of the plants.

These are a few of the results from the past year. There are numerous experiments underway which are of the long-term variety. Much of the breeding work is still in the early stages. We have a mutant gene in Eastern Gama Grass which changes the male parts of the flower into female. This means more seed set is possible. In fact, these female flowers so derived are double seeded, in contrast to the regular females which are single seeded. As the result of numerous crosses, the gene responsible for this is now present in over forty plants.

Walter has also produced several hybrids between winter-hardy Johnson Grass and the common sorghum this past year. This is an important step toward making sorghum, which is perennial in the tropics, winter-hardy in the mid-latitude zones. There is, nevertheless, lots of breeding work yet to be done.

We will continue our breeding work with sunflowers and perennial wheat grasses and will start a breeding program next year to increase the yield in two species of wild rye. The Giant Wild Rye is a perennial native to sandy lake shores in the Soviet Union which grew an eleven inch head at The Land this year. Its relative grows in Scandanavia. Both seem to have good yield potential.

Next year, each person will be responsible for fewer experiments, but we hope to have ten agricultural interns instead of six, thus more researchers. We will particularly miss Marty Bender who has been with us the past five and a half years. He has worked hard and effectively in nearly every phase of our program.

We expect to work more closely with researchers at Kansas State University, the University of Kansas, and Emporia State University next year. Several of them will give seminars here. Their critique of our work on December 1, 1983 at KSU

was most useful, and their suggestions for next year's research, very helpful. I hope that some of our agricultural interns can go directly into graduate work with these professors and that they can build on some of the research started here.

The Land Report Research Supplement

To receive a copy of The Land Report Research Supplement, which will be ready in March, send your request with $1.00 for postage to RESEARCH SUPPLEMENT, The Land Institute, Rt. 3, Salina, Kansas 67401.

Contents of THE LAND REPORT
RESEARCH SUPPLEMENT

An Alternative to Revolving Door Crop Varieties

Walter Pickett

In the last 100 years, we have seen yields of various crops increase dramatically. We have also seen cases of one variety replacing another at a steady rate. A new disease resistant variety is released, and in a few years it has the disease that it had been resistant to. A new variety, resistant to the same disease, is developed, and in a few years it also has the disease.

When Turkey Red Wheat was brought to Kansas, it had some problems. Its straw was weak, and it wasn't resistant to certain insects and diseases.[1] But after 100 years this variety is as good as ever. How does it differ from newer varieties which start out better than Turkey Red, but seem to deteriorate?

Part of the answer is the farmer's seed source. Farmers used to harvest their grain, set some aside for seed, and eat or sell the rest. The pathogens (bacteria, fungi and viruses causing plant diseases) adapted to the crop, but the crop also adapted to the pathogens. Plants that were killed before producing grain left no seed in the next generation. Pathogens that killed a plant too quickly were trapped in the dead plants, and they themselves died. Most pathogens can only multiply in living plants. Therefore, the crop and its pathogens co-evolved.

Today, farmers generally buy seed rather than saving their own. Almost all farmers buy new corn and sorghum seed each year. Many buy new wheat and soybean seed every three years.

Plant breeders greatly speed "evolution" in their laboratories and greenhouses. They grow thousands, sometimes millions of plants and innoculate them with various pathogens. The only survivors are those most resistant to disease. When it leaves the plant breeder, a modern variety is high yielding and disease resistant, but that variety's evolution is finished, while its wild pathogens continue to evolve.

Disease Resistance

The first year that a variety is released, it appears resistant to many diseases, just as it did in the laboratory. Usually it has a newly discovered gene for resistance to a given disease. But in that first year, perhaps a mutant spore lands on the new variety, and the new resistance gene can't stop the mutant. The mutant will multiply, but in this year it hurts only the one plant it is on. No one notices.

Farmers who grow the new variety brag about how well their wheat is doing, and next year more farmers grow it. In the meantime, the original mutant spore has multiplied itself into a few thousand or more, but who worries about a few thousand sick wheat plants in Kansas? That's not even one sick plant per acre. The fields look as healthy as ever.

In the third year, still more farmers grow the new variety. By now there are millions of the mutant disease spores. A few farmers may notice the disease is back in their fields, and they'll say that the new variety is deteriorating. Yet the variety hasn't changed. Indeed, the whole problem is that the variety hasn't changed, but the pathogen has.

In this way, plant breeders have bred pathogens since the beginning of plant breeding as a science. It has been a constant job. It has taken an average of fifteen years to produce a new resistant crop variety.[2] The resistance has usually lasted only about five years per new gene.[3]

Of course, breeders looked for new resistance genes. Wheat breeders, for example, first looked at the old "land races," or "open pollinated" varieties of wheat, and then the less closely-related perennial grasses they could cross with wheat. Most of the genes worked well for a time, but the record for stem rust resistance, as one example, is about fifteen years.[4] By the mid-1970's, some plant breeders were worrying about the day we would run out of genes for disease resistance.[5]

All this time, the wild grasses continued to hold their own against diseases. What were they doing right? What were they doing wrong?

Is the susceptibility to diseases due to the higher yield? No, not directly. Almost all crops grown today in the U.S.A. and Europe and much of the rest of the world are pure lines or F_1 hybrids. F_1 hybrids are the first generation hybrid between two pure lines, but "pure lines" needs some explaining.

"Pure Lines"

In the late nineteenth century, it was discovered that a "land race" of wheat, Turkey Red for example, was really a mixture of similar lines of wheat.[6] One can take a single plant of Turkey Red wheat and grow all the seedlings of that plant, and they would be much more uniform than the original Turkey Red. If the plant were better, its offspring would be uniformly better; if the plant were worse, its offspring would be uniformly worse. Either way, one would have a "pure line." Except for occasional mutations, it would remain pure and uniform.

Of course, the same line can be uniformly better in some ways and uniformly worse in other ways. But if 100 different lines were compared, the best line would be as good or better than 99% of the original land race. In practice, thousands of selected pure lines were tested. For each thousand, there should have been ten that were better than 99% of the land race, but only the best one was saved in most cases.

In many ways, this was an improvement. The original land race was a mixture of lines with slightly different heights, yield, dates of maturity, degrees of winter hardiness, drought tolerance, and disease resistance. All these traits were uniform in the new pure lines. But as the acreage of the pure lines went up, disease resistance and yield began to drop. The drop in yield was due to disease. As explained earlier, the drop in disease resistance was due to the ever-evolving pathogens adapting to the non-evolving pure lines.

A line selected from Turkey Red was originally only one of the millions of similar lines that made up Turkey Red. Any of Turkey Red's millions of lines, which were exceptionally susceptible to a common pathogen, would be damaged by that pathogen. It would yield little, decrease in number relative to other lines, and perhaps die out completely.

Lines that were exceptionally resistant to the same pathogen would yield better, and become more common. This is especially true of any new mutant that is more resistant to a pathogen.

On the other hand, each species of pathogen was (and still is) a complex mixture of lines. Some pathogen lines cause a more serious disease in some wheat lines than in other wheat lines. The wheat lines more susceptible to pathogen line A becomes more rare, due to pathogen line A. Then the pathogen line A loses its advantage over other related pathogen lines, and it will itself decrease.

In this way, a land race of a crop, such as Turkey Red wheat, can co-exist with a population of pathogens. It is not a static balance, but a self-correcting, dynamic equilibrium that can last indefinitely. Newton and other pure lines of wheat cannot do this.

"Multilines"

Does this mean that we must accept short-lived varieties or else go back to the old land races which are often agronomically inferior? No. There is another way. It has been suggested that new varieties be developed that are "multilines." Multilines would be mixtures of lines that have the same height, maturity, yield, milling and baking quality, etc., but differ in disease resistance. Some pathologists have suggested that as few as three lines be combined to form a multiline variety.[7] Others have suggested mixing ten or more lines.[8] Some have been developed. For example, a multiline wheat variety is being used in Columbia.[9] Multiline oat varieties have been developed in the U.S.A.[10]

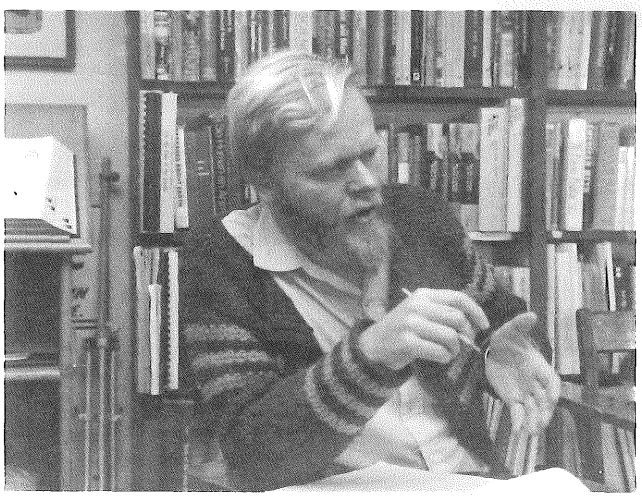
The multiline varieties are working so far, but they are new and still considered experimental. I see one major problem with static multilines: they are not co-evolving with the pathogens. In time, a mutant will appear which overcomes the resistance of two or more lines. Then that mutant will increase, and in time it will mutate again and be able to increase even more. After enough time and enough pathogen mutations, the resistance of a static multiline would be overcome just as the resistance of pure lines are.

But the multilines need not remain static. If Kansas State University started with Newton wheat right now, by 1986 it could have several sublines that are 15/16 Newton, but each differing from the original Newton by one or more disease resistance genes.[11] By 1990, farmers could be planting a mixture of these lines. Each line would be similar in yield, height, maturity, and other needed agronomic traits, as well as baking quality. So far this is a standard multiline breeding program.

But the program should continue. Every year or two, KSU or various seed companies should release a new Newton subline. Each farmer could mix the new subline with his seed. This would continuously upset the adaptation of the pathogens to the multiline.

Furthermore, different farmers would have different proportions. And different sublines might be adapted to different parts of the state. Then as spores are carried around by the wind, they would land on different multiline combinations. How can a pathogen co-evolve with something that changes constantly? I don't believe it can.

Why aren't multilines more common right now? The concept is relatively new, and breeders in charge of most breeding programs are relatively old. But it goes beyond simple reluctance to change when the old method still works, sort of. It probably hasn't escaped the notice of seed companies that they would sell less seed with this system, but I do not think that explains why breeders at public research stations



Walter Pickett

are not working more on multilines. Some will say that they are concentrating on increasing yield, but meanwhile insects and diseases are reducing yield by more than new varieties outyielded varieties of a decade ago. In other words, the fastest way to increase yield is to reduce insects and diseases.

I think that a plant breeder explained the real reason that multilines are not more popular when he told me that backcrossing (the way sublines are made) is "boring." But like many boring jobs, it can now be automated to a great extent.[12]

Synthetic Varieties

Multilines as breeding tools are restricted to self-pollinated crops such as wheat, barley, and soybeans. Crops where we are used to F_1 hybrids, such as corn, should be treated somewhat differently.

We have all been told that we should not save seed from hybrids. Most people have not been told why. Seed saved from a hybrid will lose one-half the hybrid vigor. In other words, if hybrid corn gives 100 bushels per acre, and its inbred parents give 50 bushels per acre, seed saved from the hybrid would yield 75 bushels per acre. It would stabilize there, if treated like an open-pollinated variety, but few people would accept the 25 bushel per acre loss.

Now if two unrelated hybrids were crossed, the new hybrid would yield the average of the two parent hybrids. This is the way commercial hybrid corn formerly was made. But if seed from this double cross hybrid were saved, it might yield 87½ bushels per acre. That is a loss of 12½ bushels, which is still too high.

The first example was a hybrid between two inbreds, i.e. A X B. The second example was a hybrid between two hybrids, each having two inbred parents, i.e. (A X B) X (C X D). The first example lost half its hybrid vigor; the second example lost only one-fourth of its hybrid vigor. In general, if one combines N inbreds to form an open-pollinated variety (such a variety is called a synthetic variety), he/she loses 1/N of the hybrid vigor. By mixing ten unrelated inbreds to make a synthetic variety, only 10% of the hybrid vigor is lost. That might be only five bushels per acre that are sacrificed. Increased disease resistance might add more than five bushels per acre, if inbreds were chosen correctly.

Other inbreds could be developed and released. These would be added to farmers' seed at rates of up to 10%. Some of these inbreds would be to increase yield directly. Other inbreds would be new sources of disease resistance.

Such a program as I have outlined would not be cheap. We would need many people looking for new genes, maintaining disease cultures, and monitoring wild pathogen genotypes. We would need technicians developing the sublines and extension agents, who understand the system, explaining it to farmers. On the other hand, much less certified seed would be needed per year than is now produced.

The results of this method would be better than the present system (assuming a market for the extra grain, which is a whole different matter). We could reduce the chance of disasters like the southern corn leaf blight, which took 15% of the U.S. corn crop but 50% to 100% in local areas in 1970[13] and Victoria blight, which took nearly all of the oat crop in 1946-47.[14] We could make real progress toward reducing the yearly little outbreaks of diseases that plague all our major crops.

Conclusion

I am not suggesting that breeders stop working on increased yield potential in our crops. I used Newton wheat as an example, not because it is the final word in wheat, but because it was an example of a good wheat that does not meet its current yield potential because pathogens evolved while Newton remained static. Any modern wheat could have been the example. A better yielding wheat could make Newton obsolete. But we need not, must not, make specific resistance genes become obsolete.

J. E. Van der Plank has pointed out that each new resistance to a pathogen has lasted about five years, on the average.[15] The Land Institute is working toward crops that may last five or more years from one planting. Naturally we are concerned about genetic disease resistance that doesn't last from one planting to the next.

We are not suggesting that the use of multilines will be the single final answer to plant diseases. Rather, for the conventional plant breeder, it is a way of recapturing some of the good that was lost (long-term resistance), without sacrificing much of the good that was gained (yield). But there is a more important lesson in this. We must continually study things in the wild. Multilines are just an attempt to copy (and not necessarily to copy closely) a natural population's genetic structure. There are surely other things to be learned from wild populations.

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11. I assume six months per generation, which is generous, and dominant genes for resistance, which are common in wheat. The first generation hybrid between Newton and a resistant wheat would be one-half Newton. The hybrid would be pollinated by Newton, giving 3/4 Newton seed by 1985. The next two generations would give 7/8 and 15/16 Newton seed respectively. Each generation would be innoculated with spores of the pathogen so that plants not carrying the resistance gene would be killed.
12. A dominant male sterile gene, now available, removes the work of emasculating the wheat. If only one variety of wheat and its developing multilines are allowed to bloom at the same time in a greenhouse, fans could be used to spread the pollen, as wind does outside. Mass innoculation techniques, now in use for every major wheat disease, easily kill susceptible plants, leaving only the resistant plants.
13. Cox, George W. and Michael D. Atkins. (1979). Agricultural Ecology: An Analysis of World Food Production Systems, p. 521. W. H. Freeman and Co., San Francisco.
14. Cox and Atkins, p. 520.
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The Soil Conservation Service: Still Needed after 50 Years

Debra Israel

Fifty years ago this December, the Soil Erosion Service began the Limestone Creek Demonstration project in Jewell County, Kansas. (For more details see the Summer 1983 Land Report.) Nationwide, the Civilian Conservation Corps (CCC) helped build about 29,000 miles of terraces, plant nearly 300 million trees, build 3.5 million check dams and over 2,000 impounding and diversion dams, and construct about half a million miles of fencing, according to Soil Conservation Service figures in a Salina Journal article on Sunday, October 30, 1983, "Pioneering Conservation Effort Big Step to Success" by Bob Kelly.

In recognition of the 50th anniversary of major events in the history of soil conservation, we invited two experts to The Land Institute to talk to us about soil conservation. Our guest speakers were John Piskac, district conservationist for Jewell County, and Earl Bondy, a Salina resident, now semi-retired from conservation work. Mr. Bondy is also known as "Mr. Stubble-mulch" because of his work in developing the use of crop residue for soil conservation.

Mr. Piskac presented slides of soil erosion and soil conservation measures in various areas of Kansas. This served to remind us that erosion, which is the basis for the agricultural research being done here at The Land, is not a thing of the past. Slides of conservation work showed that by using methods available now, we can at least curb our erosion problems.

Mr. Piskac and Mr. Bondy talked about specific soil conservation practices. One thing that Mr. Piskac discussed was the problem of farmers cutting down their windbreaks. They do it because they see the negative effects on crop yield in the rows close to the trees, whereas the positive effect of less plant water loss in the other parts of the field is harder to measure.

Although the objectives are the same, our soil conservation practices have changed since the 1930's. Some of the old terraces are still in use, but more commonly found are newer, larger, and more evenly-spaced terraces to accommodate large machinery. Practices also differ from area to area. An example is the use of cement in a waterway. It was used in the early days in Jewell County, whereas Mr. Piskac says that now they are able to establish a waterway with grasses alone. In other counties, cement is still needed. He did stress the importance of establishing waterways before terraces are installed. Native grass mixtures are sometimes used for waterways, although they are harder to establish than the usual grass mixture.

Mr. Bondy explained that to take into account the whole conservation picture, two soil loss equations are used: one assumes water erosion; and the other, wind. In terms of water erosion, practices are usually planned to withstand the every ten year, twenty-four hour

(Continued on page 34)

Photovoltaics: A Solar Alternative

Wayne Halozan

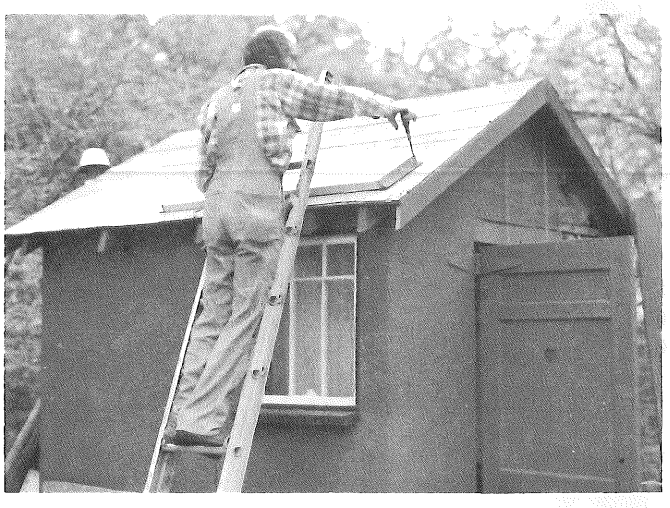
Early in 1983, The Land bought its first photovoltaic panel, an Arco, 1' X 3' class B type. This slightly defective panel consists of 33 solar cells arranged in series to give a power of 25 watts under full sunlight.

The energy is stored in two, six volt golf cart batteries in series to produce twelve volts. We installed a four amp diode to prevent the batteries from discharging into the panel at night. The energy is presently used to light our composting toilet.

Juli Neander and Alex Stone originally installed the photovoltaic panel on the south-facing wall of the classroom to provide light for the greenhouse. We did not turn on the light very often and overcharged the batteries. After much discussion, we installed the panel on the roof of the composting toilet. We may have the same problem there, as the toilet is seldom used at night.

Dependability, low maintenance, and long life-expectancy are the main advantages of photovoltaics. In Worldwatch Paper number 52, "Electricity from Sunlight: The Future of Photovoltaics," the author Christopher Flavin describes how the use of photovoltaics is increasing around the world. Ranchers use them to power remote well pumps for watering livestock. Offshore oil rigs and lighthouses use the electricity to power lights and radios. The most important uses are in the third world, where smallscale applications such as electric lights and refrigerators powered by photovoltaics are more economical than if powered by diesel generators or from an electrical grid system.

The main disadvantage of photovoltaics in the U.S. is cost. Christopher Flavin estimates in the Worldwatch Paper that photovoltaic electricity is still over five times as expensive as conventional power sources. The small panel purchased by The Land for $180 is a type B with a defective solar cell. But that is half the cost of a type A (no defects) panel.



Paul Krumm, operations manager, installs the photovoltaic panel on composting toilet.

The reason for the high cost is the process of manufacturing the cells. Solar cells are made of silicon wafers in separate layers of silicon phosphorus, silicon boron, and an inert layer of silicon to separate the two layers. The layers of silicon are grown as crystals, free of contaminents under high vacuum. The crystals are then sliced to a specified thickness, with material losses of up to one half due to blade thickness. The corresponding layers are then combined to form the photovoltaic cell.

Alternative methods of manufacturing (such as using silicon vapor deposited as a thin film) are being researched to reduce cost and increase efficiency. (See "Photovoltaics Update: A Look at SERI's Amorphous Silicon Research," Sunpaper, January 1983 and "The Department of Energy's New Five Year PV Research Plan," Alternate Sources of Energy, Volume 64.)

Given our experience with the maintenance requirements of wind electric generators, photovoltaics seem to be a very attractive alternative. We have considered incorporating photovoltaic panels in the plans for a new greenhouse, but the cost would be prohibitive. According to Christopher Flavin (Worldwatch Paper 52, page 6), the average cost for one watt of electricity at 1982 prices was $10, so a one kilowatt capacity (enough to light ten, 100 watt bulbs) would cost $10,000. There are federal tax credits and state tax credits in Kansas to be claimed on the installation of solar equipment. But The Land Institute cannot take advantage of them because it is a non-profit organization which pays no income tax.

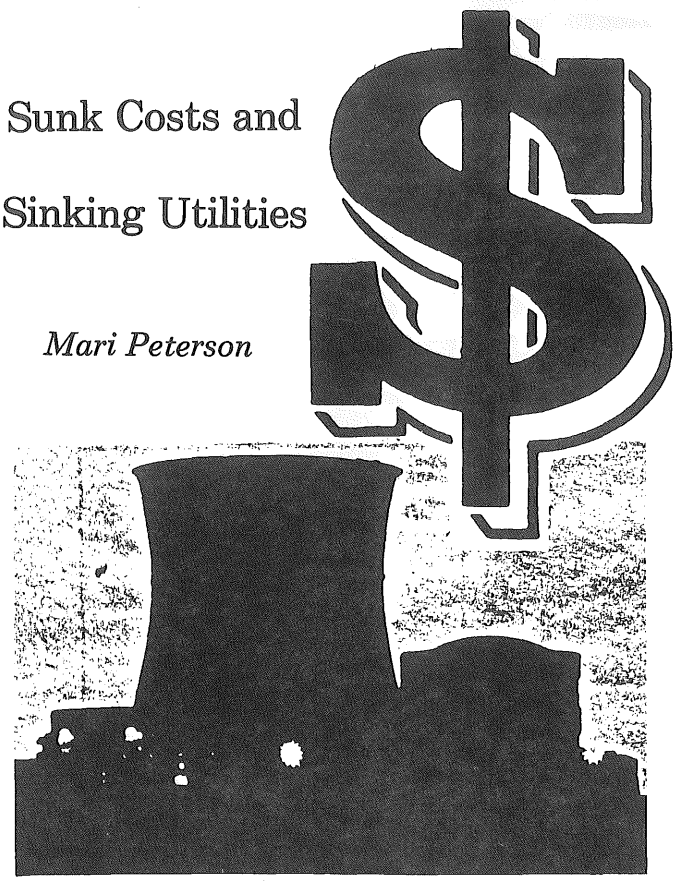
Cost reduction is obviously the key to the future growth of the photovoltaics industry, and certainly to the future of photovoltaics at The Land Institute.

New Wind Generator Installed

During Thanksgiving vacation, former Land associate John Craft anchored a new wind electric generator to the top of the 85' tower. It is a research prototype machine which is being used to test some new generator and rotor control techniques. The downwind unit has rotors that are 16 feet in diameter. It is a 240 volt, AC induction generator with a 4 kilowatt capacity that is interconnected to the utility system. Both average wind speed data and power production in kilowatt hours are being recorded on a daily basis. The machine is expected to undergo modifications and tests as results and time permit. More details about the machine will appear in subsequent Land Reports.

Sunk Costs and Sinking Utilities

Mari Peterson



In Kansas, the issue is being raised anew: "Can we afford to complete the Wolf Creek nuclear power plant?" Given a limited to non-existent market for Wolf Creek electricity, it is unlikely that any additional capital in Wolf Creek will ever be fully recovered. Major economic changes have made Wolf Creek obsolete before it has even come on line. Wolf Creek is a bad investment, and I think we should abandon the project now and seek a course of action which will best serve the interests of the state and its citizens.

Shifts in the Economy

Electricity, gas and oil have become an uncompetitive means of providing energy services. In planning for Wolf Creek, Kansas Gas and Electric Company (KG&E) and Kansas City Power and Light Company (KCP&L) assumed that industrial, commercial and residential customers would switch to electricity as oil and gas prices rose at a rate faster than electricity prices. Electricity, oil and gas prices have behaved as predicted, but consumers haven't. Why?

For the consumer, the bottom line is maximizing disposable income or profits, and the consumer has recognized that the best way to improve the bottom line is by decreasing expenses. Consumers benefit by using cheaper energy services.

Consider these facts cited by Amory Lovins in the Critical Mass Bulletin, November 1983:

--Since 1979, the U. S. has gotten 100 times as much new energy from savings as from all expansions of supply put together.

--Since 1979, the U. S. has gotten more new energy from renewable sources than from all of the nonrenewables.

Consumers are investing in energy efficiency and reducing their demand for electricity. Between 1979 and 1982, KG&E's electricity sales have dropped an average of 2.35% a year and KCP&L's have dropped an average of 0.8% a year, according to their 1982 annual reports.

In 1976, the Nuclear Regulatory Commission (NRC), in their Partial Initial Decision on Wolf Creek, predicted a 5.3-6% per year growth in peak demand . Between 1976-1982, KG&E's peak demand increased only 1.8% per year on the average, and KCP&L's increased 2.3%. Clearly, the NRC, KG&E and KCP&L did not envision the erosion of the utilities' mass markets and monopoly control as consumers turned to alternative energy sources, although this was predicted by the Mid-America Coalition for Energy Alternatives, an intervenor in the NRC hearings. The naivete of the NRC is best typified by this quotation from the Limited Construction Authorization decision for Wolf Creek:

> For the most part, industrial and commercial customers have always practiced economical use of energy in order to control costs...The conservation effect is largely a one-time saving, most of which has already occurred.

How could the NRC and the utilities err so badly in their projections of future electricity demand?

Crumbling Assumptions

The utilities' assumptions that per capita income would increase and that interest rates would remain around 7½% were crucial in the decision to build Wolf Creek. In reality, wages are falling, and according to stockholder reports, interest rates on the majority of the Wolf Creek debt range from 8-16%.

Ironically, the rising energy prices which led utilities to believe it was prudent to invest in "competitive" electrical generating capacity have actually induced changes in the economy which now make electricity uncompetitive. Energy price increases have had a direct impact on the cost of capital (interest rates), and as energy and capital have risen in value over the last decade, the relative value of a worker's time has declined. (See Paul Hawken, The Next Economy, 1983, Holt Rinehart and Winston, for a thorough review of these economic changes.)

High energy prices are contracting the economy, and borrowing by all sectors of the economy has escalated to cover up the contraction. The large demand for capital has put upward pressure on interest rates. Real interest rates (discounting inflation) are at an historic fifty year high: 7-8% in 1982 versus a normal 2-3%. (Hawken, page 53)

Meanwhile, labor productivity increased only 2.5% between 1973 and 1979. Then when oil prices doubled in 1980, labor productivity

dropped 3.2%, negating all gains made since the 1973 oil embargo. As a result, wages have declined in real terms. (Hawken, page 31)

The economy has matured, and as individuals adapt and change their economic behavior, so must the utilities. The economic system is no longer achieving growth through pure expansion; instead, it is undergoing internal restructuring and development. All sectors of the economy stand to gain by investing in these productive, internal changes because this is where the potential lies for true economic growth.

KG&E and KCP&L only stand to lose through their misreading of the economy and their misallocation of capital in Wolf Creek. Unfortunately, their actions will bring harm to the ratepayers, investors, and the state as well.

KG&E and KCP&L Could Go Bankrupt

According to the Wolf Creek Nuclear Project Cost Summary, submitted to the Kansas Corporation Commission on September 30, 1983, the utilities have spent $1.8 billion on Wolf Creek, or approximately 67% of their total estimated cost of construction ($2.6 billion). They must now raise a minimum of $870 million more to complete the plant.

With little or no projected demand for Wolf Creek's electricity, KG&E and KCP&L"s massive investment shows little likelihood of translating into real profits. KG&E and KCP&L will be hard pressed to earn the revenue they hope for. If they resort to charging customers for the plant, it is clear that customers will rapidly seek cheaper alternatives, leaving the utilities with a drop in revenue. Should the Kansas Corporation Commission (KCC) decide to withhold a substantial portion of the plant's costs from the rate base, KG&E and KCP&L will lack the necessary revenue to repay stockholders and bondholders.

The implications for the utility investor are grim. Though dividends may seem attractive now, they are largely supported by fancy accounting techniques aimed at generating more borrowing potential. One such form of creative accounting is Allowances for Funds Used During Construction (AFUDC), which is a large, non-cash, income credit related to the investment in the incomplete plant. Without such creative accounting, the utilities' income statements would reflect their poor financial health. Investors should not be deceived. The bottom will fall out; it's only a matter of time.

Important Questions

Would it be wise to stop construction on Wolf Creek now? In addition to the $870 million needed to complete construction, KG&E and KCP&L predict decommissioning costs of $400 million. Do the utilities have the ability to raise the capital to cover all costs of the plant? We should make this determination before the plant is contaminated by operation.

If the capital sunk in Wolf Creek is already, to a significant degree, lost due to the lack of a market for Wolf Creek electricity, does it make sense to continue the borrowing and construction? If it is inevitable that either or both of the utilities will eventually go bankrupt or default on their loans, isn't it better to stop construction on Wolf Creek now and to strike a course for a more productive energy and economic plan for the state? If we don't have Wolf Creek, who suffers?

Winners and Losers

Clearly, winners and losers will emerge from a decision to stop construction on Wolf Creek. The most obvious losers will be stockholders, bondholders, and the contract firms of Bechtel, Daniels, Westinghouse and General Electric. (There may be major problems for the Kansas Electric Power Cooperative customers, too.) The winners will be ratepayers, the renewable energy businesses, the weatherization industry, and the state.

To clarify who wins and who loses, we must remember that the renewable energy businesses and the weatherization industry will be winners whether or not Wolf Creek is completed. Likewise, stockholders are bound to be losers whether or not the plant goes on line. On the losing side, non-Kansans hold a large share of the stocks and bonds which have financed Wolf Creek. Over 50% of KG&E's stock is held by investors in New York, California, Illinois, Texas and Florida, according to the KG&E Financial and Statistical Report, 1977-1982. Most important, regardless of who the investors are, they chose to invest in KG&E and Wolf Creek and have always had the option of withdrawing their investment.

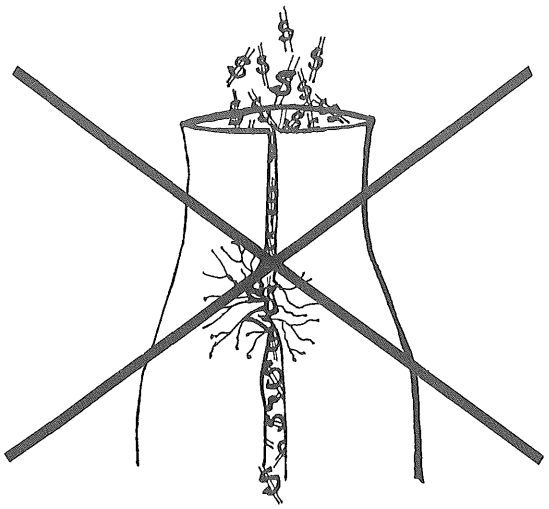
The benefit to ratepayers is obvious. They will not have to face the 50-80% increase in rates predicted by the KCC (Jan. 14, 1984) to occur if Wolf Creek goes into operation.

The lights will not go out for KG&E and KCP&L customers should Wolf Creek be abandoned. In fact, the state and its citizens stand to benefit directly from such a move, through reduced pressure for low-income energy assistance, lower payments for the electricity component of the state budget (universities, medical centers, prisons, and state office buildings), and less pressure on the southeast Kansas water supply as water presently committed to the John Redmond Reservoir for Wolf Creek becomes available. The greatest gains for the state, however, will be indirect. These advantages stem from the potential for growth in the Kansas economy.

Energy Scenarios Without Wolf Creek

Utilities have overlooked an important development in the energy economy. They are essentially in the business of providing an energy service, and they have sold electricity as their means of providing that service. As consumers search for cheaper energy services, the utilities can capitalize on that change, or they can ignore it and lose out altogether.

The current generating capacity of KG&E and KCP&L is basically adequate to meet current demand. Should there be a small shortfall in supply, electricity can be purchased from one of the power pools to which KG&E and KCP&L belong.



Beyond this, the utilities can capitalize on demand management by selling energy services, waste steam from power plants, and capital for efficiency improvements. For example, if management loans money for solar water heater investments, it will gain, because most back-up water heaters for solar systems are electric, thereby increasing the utility's base load while reducing peak demand. The utility will be able to use its generating capacity more efficiently while experiencing a quick turnover on invested funds through customer repayment of the principle and interest. Both the utility and the customer benefit.

State energy policy could further these developments and their benefits to the overall economy. There would be no conflict, with Wolf Creek absent, in instituting conservation rates, time-of-day and seasonal rates. With the state and the utilities emphasizing energy efficiency and reduced overall energy costs, new industries could take off in areas such as the application of microprocessors to industrial equipment, the development of new residential, commercial and industrial energy management services, and the promotion of solar, cogeneration, and wind technologies. New, productive capital will be generated within the state, improving the tax base and the economy.

Without Wolf Creek, residential ratepayers will have more disposable income available for other purchases, and businesses and industries will have improved profits through reduced expenses, freeing capital for reinvestment in a more productive manner.

Conclusion

Accurately serving the needs of customers is the most important business for the utilities to be in. KG&E and KCP&L are operating in a way contrary to the needs of their customers. KCP&L recently abandoned its conservation program for the time being, choosing instead to promote electricity consumption. This will not work. The first rate shock will likely erase all the benefits of the promotional campaigns.

Wolf Creek is an unnecessary and costly investment which will create undue hardship for the ratepayers and possible bankruptcy for the utilities. If the Wolf Creek project is discontinued, nearly all parties will minimize their losses, and the utilities and ratepayers will be free to devote their full attention to profitable energy investments.

Mari Peterson, executive director of the Kansas Natural Resource Council, is a former Land Institute research associate in energy.

Alternatives in Shelter

A New Greenhouse

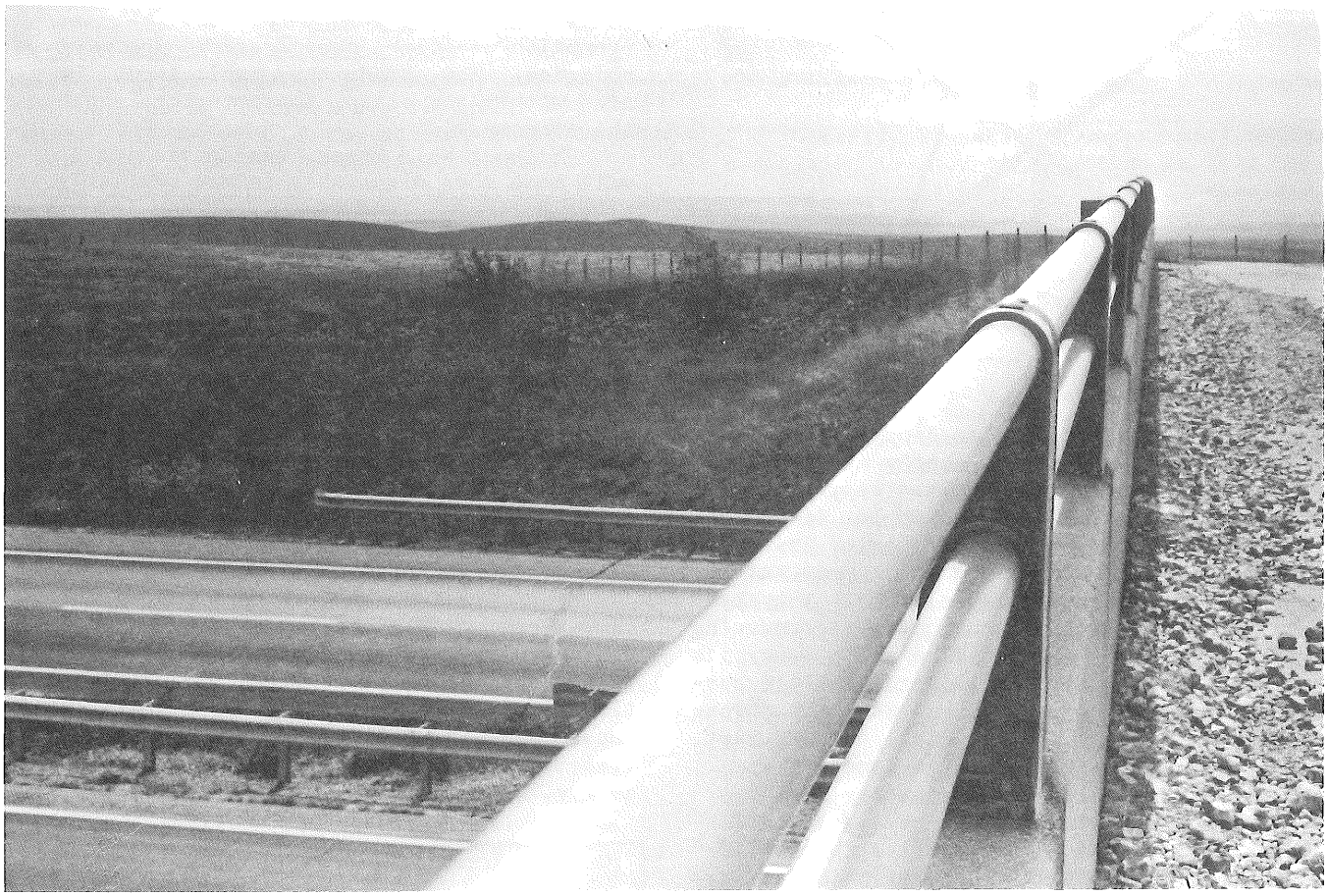
The small solar greenhouse attached to the building serves The Land Institute well, but it is not large enough. Research Associate Walter Pickett needs to produce two or three extra generations in the greenhouse each year to speed up the plant breeding process. So we have decided to build a greenhouse on the 160 acres somewhere near the research plots.

We began serious discussion about this project on November 5-6, when we consulted Ralph (Chip) Rorem, an architect from Essex, Illinois. Chip walked over the potential building sites on the 160 acres with Land people, and we talked about the merits and problems of each. Should the north wall be banked by dirt, or would it be better at the base of a north-facing slope with a shelter of trees to the north? The greenhouse should be located where there is a suitable "fal "fall" from the spring so we can bring water in by gravity flow. But it should be easily accessible from the road and fit quietly into the landscape.

Discussions continued with Chip in the classroom where we talked about design. The size and shape must allow space for a potting shed and tool storage, as well as classroom or conference room and toilet facilities. We discussed how to capture and keep the sun's heat and considered the merits of outside shutters versus inside movable insulation. How to bring in maximum light without losing too much heat through glass at night is an important problem. We talked about the use of reflectors in front of the greenhouse and the optimum ceiling height, considering plants more important than people.

Chip has drawn some preliminary sketches, but we still have to think about it much more before we can choose the final plans. The bitter cold spell around Christmas when there was little sunshine and sub-zero weather several days in a row made us concentrate on back-up heat systems and the need to baby-sit plants during such weather. We hope to make decisions in 1984 and then set out to raise money to build the greenhouse..

Prairie Images



Iversen, Earl
Flint Hills South of Emporia, Cattle Pens Area, Interstate 35, 1979

silver gelatin print. 218 X 328mm.

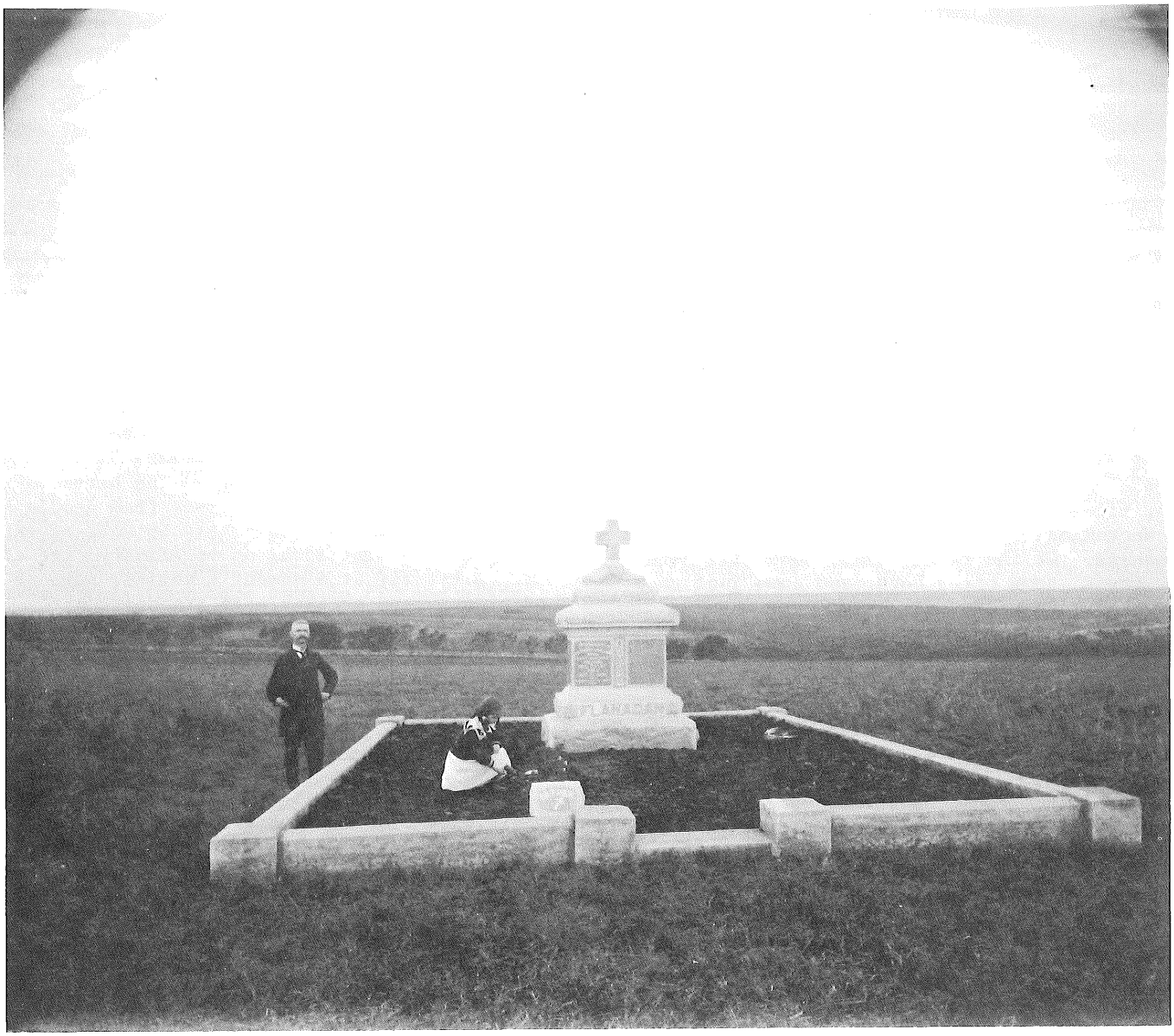
An Open Land: Photographs of the Midwest, 1952-1982

Terry Evans

On June 10, 1983, a significant exhibition of photographs opened at the Art Institute of Chicago. The Open Lands Project, a Chicago land conservation organization, originated the show to increase public awareness of the esthetic value of the Midwest landscape. The organization hopes that a greater appreciation of the land by Midwesterners will lead to a greater interest in preserving it.

This is the first survey of landscape photography in the Midwest, and the 100 photographs included in the exhibition are both historical and contemporary. Most of the images show the effects of human involvement with the land, a reminder of the vulnerability of the prairie ecosystem, so easy to manipulate for human purposes.

The two photographs reproduced here were chosen as strong examples from both the historical and contemporary selections and are of special interest for The Land Report because they are about Kansas. In the contemporary photograph by Earl Iversen, we see the integration of natural landscape and human constructs into a disciplined expression of line and space, which conveys a rich sense of design. Joseph Pennell, on the other hand, was less interested in the esthetics of the scene than he was in documenting an event in 1898. The viewer is moved by the austerity of the landscape and the isolated burial site, as well as the memorial observation of the two people.

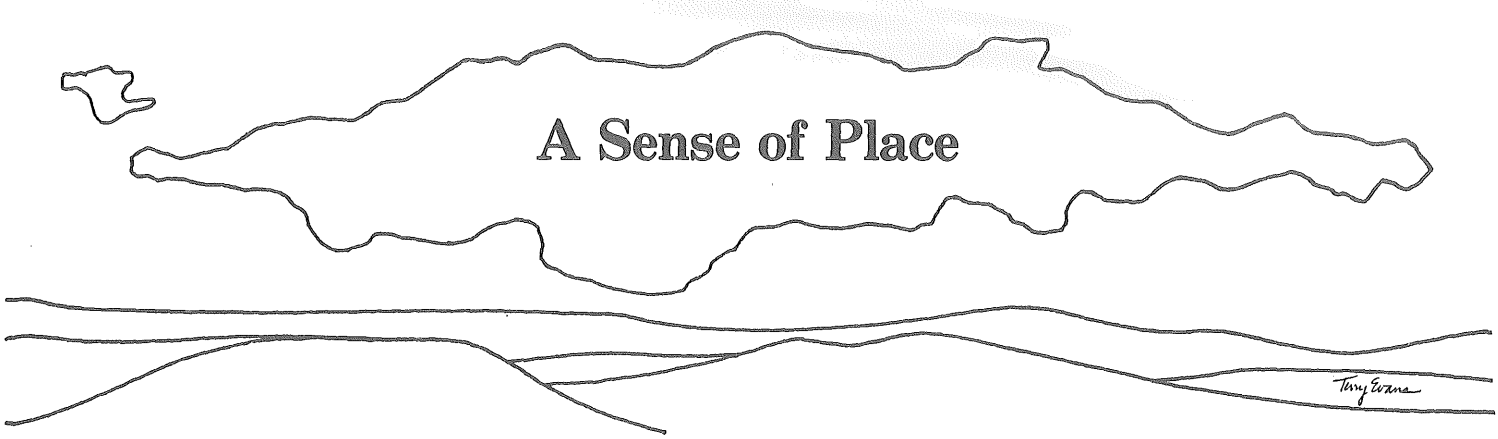


Pennell, Joseph Judd
Tom Flannagan's Monument, 1898

silver gelatin print, 183 X 224mm
Modern print by Jon Blumb
from a negative in the Kansas Collection,
University of Kansas, Lawrence, Kansas.

The exhibition is now at the Illinois State Museum at Springfield and will open in early January at the University of North Dakota, Grand Forks. From there it will travel to Illinois State University, Normal, and be displayed from March 8 to April 11. It will be shown at Bard College, Annandale on Hudson, New York, from July to September, and finally will be featured in the Nelson Gallery of Art, Kansas City, Mo., from October 28 to December 4, 1984.

Terry Evans is The Land Institute's Arts Associate. Three of her photographs are included in this exhibit.



The Prairie Raptor Project

Juli Neander

A raptor is a bird that preys on other animals for its food. Hawks, owls, eagles, falcons, kites and vultures are all raptors. There are approximately twenty-nine species of raptors in Kansas. Of the twenty-nine, some live here year round, some breed here, and some just pass through during migration.

The Prairie Raptor Project is a special project of the Smoky Hills Audubon Society. Maure Weigel started the project five years ago after he found two great horned owls, one young that had fallen from the nest and one adult that had been badly soaked by a heavy downpour. He brought them home, built a cage and cared for them until they could be released. He asked the Audubon Society if anyone were doing this and found that no one was. It took too much time and too much money.

In April 1979, Maure invested his time and money and started the Raptor Project. With Audubon Society's help, he obtained the necessary federal and state permits and a banding permit. During the first year, the project rehabilitated fourteen birds. After five years, it has grown to ten times that size and will care for approximately 150 birds this year. Birds come from all over Kansas, and stay at the facility an average of three months. In 1981, Maure, Theresa, Marie and Aaron Weigel moved to the country northwest of Salina. In town there was a holding capacity of only ten birds; the project can now handle approximately 75 birds at one time.

Money is a problem, and the project is growing faster than the ability to fund it. Currently, funding comes from the Smoky Hills Audubon Society, the Kansas Fish and Game Commission through the nongame division "chickadee checkoff," and the Wild Trust Fund. Taxpayers can donate one dollar to non-game species protection by marking a special box on state income tax forms, the "chickadee checkoff." The Wild Trust Fund is administered by the Kansas Fish and Game Commission, and donors can specify how their contributions are to be used. There are also a number of individual sponsors who help pay for project costs.

The Kansas State University School of Veterinary Medicine donates its services for short-term medical and surgical care. There are about thirty veterinarians and students who work with birds from Maure. Ten members of the Smoky Hills Audubon Society transport the birds to and from KSU and often pick up birds from people who have found them. Without these volunteers, there would be very limited or no veterinary care at all. Literally at a moment's notice, someone has always been available to transport an injured bird.

Having enough food has often been a problem, as almost all the food is donated. There are now three deep freezers to store deer meat, rats, mice and whatever other types of food arrive on the doorstep. Kansas Fish and Game has been a major contributor to the food supply. Mike Little, the local game protector, brings road-killed deer and helps clean it for storing. This summer, Hays Fish and Game sent several hundred jack rabbits that were causing problems. Before they shot them, they changed from lead to steel shot to insure that there would be no problem of lead poisoning. Hatcheries supply day-old male chicks that are not sold, and the Salina animal shelter sends over rabbits, squirrels, and raccoons (not dogs or cats). Last year, Maure drove to Lincoln, Nebraska, to pick up 750 pounds of rats and mice from a cancer research institute there. A feeding schedule is kept for each bird for its entire stay.

In order to train the birds to hunt, the program spends $500 a year on live rats and mice. This year from April 1 to July, there were over fifty birds on hand at all times. It takes an incredible amount of food for fifty birds every day.

Building cages is another way that both the local Audubon chapter members and Fish and Game have assisted. Steve Sorensen, the regional supervisor of Fish and Game, and his crew in Concordia, Kansas, worked with Audubon members building the foster parent cage and the eagle cage. Fish and Game is now planting 10' and 15' trees to landscape the area and create a more natural environment for the birds. The trees will act as visual barriers between cages, attract smaller wildlife, and modify extreme summer temperatures by shading the cages.

This past summer, I began to work with the project after going out to see the birds with Terry Evans. I was amazed; it was hard for me to stop staring at the raptors, to stop watching them watch me. Since then, other Salinans (Willow, Eric Nash, Terry Evans, and Bill Howell) have gone out fairly regularly with me to help build cages, and to feed and process birds.

When a bird comes in, it is weighed, checked for broken bones or other injuries, measured for size, and checked for emaciation. When injured birds come back from KSU, we provide convalescent care and rehabilitation. The birds are kept until they can fly and hunt live prey, and then they are released. Before each bird is released, Maure repeats the measuring and bands the birds for identification.

A new bird is usually kept in a small intensive care cage for close observation, then moved to an intermediate-sized cage so that it can begin to stretch its wings. Finally it is moved to a large flight cage or flight-training cage, where it can fly and hunt. The flight-training cage is used for young, immature birds that have not flown before. The cage is large enough that they have room to fly and glide. It has a plastic liner buried into the ground around the entire perimeter to keep live mice and rats inside. After the birds have successfully hunted for approximately thirty days, Maure releases them.

Last year, the U. S. Fish and Wildlife Service asked the program to build a cage large enough to house eagles. The cage is one of the few eagle-flight cages, located at a rehabilitation project, in the state. Zoos have cages that large, but most do not rehabilitate birds for release.

The foster parent cage is a large cage used to raise nestling-fledgling great horned owls. The "foster parents" are mature owls, not releaseable due to injuries which prevent them from being able to survive in the wild. There is a nest in the cage where the infants are placed when they are received. The adults feed the young, and the chicks imprint off the adults, solving two rehabilitation problems at once.

Improper imprinting is as serious as any injury. There have been many instances where birds have imprinted on humans. If a bird does not imprint properly, it will never know how to behave in the wild. The second through the sixth week seems to be the most critical time in a young bird's life. At two weeks, its eyes are just beginning to focus, and for the next month or maybe longer, it mirror reflects whoever is taking care of it.

If only one adult can be used in foster parenting, it must be the male. The female great horned owl must be in the breeding mood to take care of young, and she must have created a "pair bond" with a male to get into a breeding mood. The male will usually care for the young anytime.

The project will get its first research student from Bethany College this December. This is a big step. For five years, records have been kept on every bird in the program, but there has never been time to do anything with them.

Maure Weigel trying to catch a barn owl.

Measuring a Red-tailed Hawk (in light phase).

Records on the types of birds that have come in, on the time of year they are received, the length of stay, the type of injury incurred, and whether or not the injury was healable will all be valuable in helping make decisions in the future. For example, during migration seasons, there may be more birds needing care than at other times during the year. Knowing this in advance will allow planning for adequate space, food and help to get the work done. The birds are measured and weighed to help determine their sex. Wing cord length seems to help indicate whether they are male or female. Females are generally larger, but there is an overlap of large males and small females in some species.

Two artists, Terry Evans and Richard Courter, now work with the Prairie Raptor project. Terry Evans, a professional photographer for fifteen years who is also the arts associate at The Land, is a natural at handling the birds as well as at photographing them. Terry has taken colored slides of the different raptors and the tasks involved in the rehabilitation process. These will be a major part of the educational aspect of the program. Terry is also working on a calendar illustrated with photographs of the raptors. Richard Courter has sketched raptors of Kansas. Fifteen different prints that he has made will be given to people who sponsor the project, and will also appear on an educational brochure that Maure will hand out on his talks across the state.

One of the main aspects of the program is education. Maure gives thirty to forty talks per year to different groups. He always brings Swanee, a Swainson's hawk that can never be released because he was imprinted on humans when he was very young. Maure also gives tours of the facility one or two times a week. He feels that someone who has seen the raptors and learned about their place in the ecosystem will be more interested in the birds' welfare and in preserving their habitats. Someone who knows the name of a bird and can remember having seen it will be less likely to harm one like it. No matter how many birds are handled and successfully released, the rehabilitation program alone is actually doing very little to preserve these species. But the educational and research opportunities associated with raptor rehabilitation are of enormous value to society.

After releasing a bird, one knows the rehabilitation effort was worth it because the bird is again free and wild. When I had the opportunity to release a barn owl, there was an instant just before I let go that we were both looking intently at each other with a special understanding. Perhaps I created this in my mind, but I did have an incredible feeling. When I spoke with Maure about releasing birds, he told me that it was the first time in his life that he had ever felt he was giving something back to nature. "Usually we just take, take, take from nature, but giving that bird a second chance is a way of giving back to nature."

"Usually we just take, take, take from nature, but giving that bird a second chance is a way of giving back to nature."

Maure Weigel releasing a Sharp-shinned Hawk.

Prairie Appreciation Weekend

Marty Bender

The first Prairie Appreciation Weekend, sponsored by the Prairie Plains Resource Institute (P/PRI), was held September 23-25 in Aurora, Nebraska. It was a part of the third annual Nebraska Prairie Appreciation Week sponsored by the P/PRI, the Nebraska Audubon Chapters, and other conservation organizations. The purpose of this event was to educate people about the preservation and restoration of grassland communities and to present cultural perspectives of the prairies and the plains. About fifty participants attended several fine presentations, went on field trips of Nebraska prairies, and enjoyed the country-bluegrass music of the New High Flyers.

In addition to the Prairie Appreciation Weekend, there were presentations and field trips at various locations throughout Nebraska the entire week. In accordance with this year's theme, "Prairie as Classroom," teachers' packets were made available free. The packets contained information on Nebraska prairies, suggestions for activities for the week, instructions for establishing mini-prairies on school grounds for outdoor classrooms, and sample modules from "A Prairie Curriculum." Many of the modules were written by Dr. Dwight Platt who is a board member of The Land Institute.

The Prairie Appreciation Weekend began Friday with an historical, cultural perspective of how pioneers and native Indians perceived and interacted with the prairies. This slide presentation was given by Ann Sigford and David Johnson, two naturalists from Minneapolis, Minn. (The western half of Minnesota was mostly prairie, but is now cropland.) On Saturday evening, an Aurora artist, Ernest Ochsner, presented an audio-visual program with a modern, cultural perspective.

Education about the cultural and natural heritage of Nebraska is just one of the goals of the P/PRI. Founded in the spring of 1980 by Bill and Jan Whitney of Aurora, Nebraska, the P/PRI is also dedicated to the inventory, preservation, and restoration of native prairie and other unique native habitats of Nebraska. On Saturday, there were two field trips to see some of P/PRI's work. One group visited the Willa Cather Memorial Prairie near Route 281 by the Kansas-Nebraska border, where they saw the result of a May 1983 prairie burn. I went on the other field trip to visit natural and restored prairie sites in Hamilton, Merrick, and Hall Counties. In the Platte River Valley, we saw natural tallgrass prairie and wetlands at the Bader Memorial Park Natural Area and the Mormon Island Crane Meadows. At Bader Natural Area, we had the unique experience of smelling the fragrance of colonies of Nodding Ladies Tresses, a rare orchid. At the Crane Meadows, which is a protected habitat for migratory sandhill and whooping cranes, we observed the effects of pasture burning and

Winter prairie flowers sketched by Iralee Barnard.

enclosures (areas fenced to prevent cattle grazing). In the loess hills of the Platte River, we saw extensive tree encroachment on the pastures, which showed us that in addition to grazing, fire is also needed to maintain prairie. In Aurora, we viewed some impressive prairie restorations, which are part of an ongoing effort by P/PRI to restore Lincoln Creek as a community resource. By scraping off unwanted Kentucky Bluegrass and Smooth Brome sods with a bulldozer to create a hardpan suitable for planting prairie species, P/PRI was able to turn plant succession on its head and quickly establish climax prairie species with fewer early succession weeds than one would expect.

All in all, Prairie Appreciation Week was as memorable as the North American Prairie Conferences that are held biennially. More information on this Weekend will be found in the Prairie/Plains Journal, published twice a year. Membership in P/PRI is $10 for individuals and $50 for corporations. For more information or to send membership checks, their address is P/PRI, 1219 16th Street, Aurora, Nebraska 68818.

Your Money or Your Life: The Hazardous Waste Dilemma in America

Ivy Marsh

Many years ago, in a radio comedy skit, Jack Benny was counting his money in his creaky underground vault when a burglar suddenly appeared and demanded, "Your money or your life!" The silence grew longer and longer. Finally the burglar snapped, "Well?" "......I'm thinking.....I'm thinking," said Benny.

There has always been a cost vs. benefits dilemma. "Cost-effective controls" is marketplace lingo for the question, "How safe is safe enough?" In the area of hazardous waste, a choice may be superfluous--in a "worst case" scenario, it may cost both money and lives. Conversely, some industries are turning the "costs" into a benefit; there are huge profits in the hazardous waste disposal business.

Despite these warnings, America is wasting away. In March, 1983, the U.S. Office of Technology Assessment estimated that one ton of hazardous waste for every person in the country is generated annually--over 255 million metric tons.[1] Hazardous wastes are defined as ignitable, corrosive, reactive and/or toxic substances that can harm, contaminate or kill living organisms by means of ground and surface waters, air, fire and explosion, the food chain, or direct contact through spills or mishandling. Though the hazardous wastes created by the military and by the private sector have the same chemical properties and attendant dangers, the monitoring of and rules for handling each are quite different.

Military

Until recently, on-site wastes were handled by the Department of Defense (DOD), more or less on the "honor" system, but when increasingly frequent instances of pollution, leakage and contamination were reported off-site (especially in drinking water supplies), both the Environmental Protection Agency (EPA) and Congress tried to step in. During televised public hearings of a House Public Works Sub-committee in August, 1983, a Department of Justice (DOJ) spokesman explained that their standard operating procedure was to write a letter of protest to the military about these complaints since it wasn't seemly for the DOJ to use more stern measures when two governmental entities (EPA and DOD) were involved in differences. Congressmen pointed out that in one case, five letters on the same topic had gone unanswered. Then an EPA official testified that there was a measure of rapport and cooperation between EPA investigators and the waste-managers of military installations. "When did this cooperation start?", a surprised chairman, Rep. Elliott Levitas (D-GA), asked. "About the time your committee started investigating," was the candid reply.

On August 16, 1983, EPA and DOD announced an agreement on procedures to be used on cleaning up some of the 265 military facilities that treat or store hazardous waste. The military will be responsible for the cleanup and costs while EPA will provide technical assistance.[2] While these kinds of improvements are welcome, military on-site wastes are still handled in a closed-shop atmosphere for the most part.

To dispose of hazardous waste off-site, the military gives "low-bidder" contracts to private haulers, who use a manifest tracking system which lays a paper trail that can be followed to ensure that wastes are being disposed of. At a recent House sub-committee hearing, Chairman Mike Synar (D-OK) cited several cases of mishandling.[3] For example, in 1981 the Pentagon hired a contractor to remove electric transformers containing PCBs from military installations. Later 646 could not be accounted for, and 133 other PCB-laden items could not be traced. When a DOD spokesman said they did not do business with that firm any longer, Synar advised that a new company had been formed with the same officers and is now bidding on Pentagon contracts.

Synar believes the DOD's procedures invite fraud and could endanger public health, for they simply take the word of private haulers that wastes are being properly handled. Two of the companies that did considerable business with the military are under criminal investigation and two are under federal indictment for improper disposal practices. The manifest system which sounds so great is not working. Some members of Congress plan to introduce legislation to require the military to follow the more restrictive (but still inadequate) procedures the private sector must observe.

"Civilian" Wastes

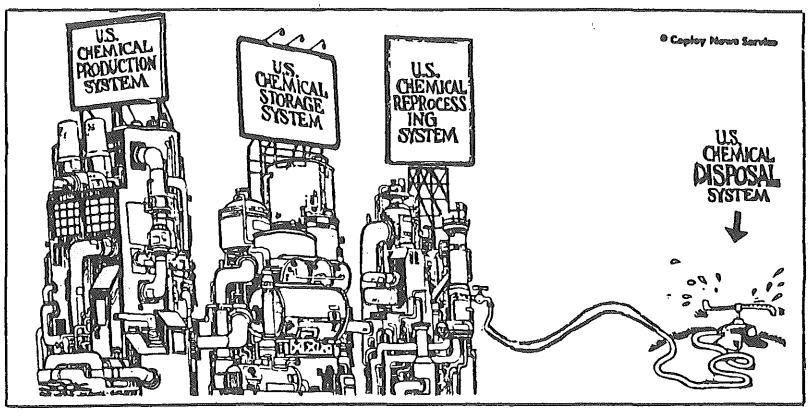
Space constraints forbid more than a cursory look at this crucial, complex subject. There are an estimated 50,000 landfill dumps which contain hazardous wastes. There is no way to ascertain how many have been abandoned.[4] The average individual Kansan throws away 1,400 pounds of municipal waste each year, over 3.5 pounds per day.[5] It is ironic that in our pursuit of health, wealth and happiness--a "better" life--we have fouled our own nest. "Progress" in chemical and engineering processes produced synthetic fibers, fertilizers, pesticides, plastics, detergents, food additives..a long

list of new products which also had unwanted byproducts--hazardous wastes. A second irony is that environmental victories like the Clean Air and Clean Water Acts, with their more stringent emission and residue standards, left industries with greater amounts of hazardous wastes which now, instead of being released into the air, water, and soil, must be stored, treated, and disposed of.

In December, 1980, Congress passed the Comprehensive Environmental Response, Compensation and Liability Act, fiscal 1981-85 (PL 96-510). Dubbed "Superfund," it is designed to clean up the worst abandoned chemical waste dumps. The bill was opposed by the Chemical Manufacturers Association (CMA), whose individual member PACs contributed $2 million to the campaign funds of 32 senators and 55 representatives, with mixed results. The bill passed, but was considerably weakened.[6] The final version provided for a $1.6 billion fund over a period of five years (1981-1985). Industry will pay 87½%, with 12½% funds appropriated by Congress. In cases where owners of abandoned dumps can be located, EPA will try to recover the money. In 1982, EPA identified 418 of the worst sites. During the Anne Gorsuch/Rita LaVelle era of "sweetheart deals" widely described by the news media, only five were cleaned up, at a cost of $88 million. Although new EPA director William Ruckelshaus ordered a speedup of this process, comparatively few of the targeted sites will have been cleaned up by the time Superfund expires in 1985.

Tar Creek in southeast Kansas/northeast Oklahoma has been called the nation's most dangerous abandoned site. This 40-square mile area with underground tunnels from abandoned lead and zinc mines is filled with water that is slowly coming to the surface. EPA called it "a 10-billion-gallon vat of subterranean poisons."[7]

Documented horror stories of Love Canal, NY; Times Beach, Mo.; Colorado's Rocky Mountain Arsenal; of kepone, acid rain, asbestos, Agent Orange, PCBs, and dioxin abound. There is growing concern about water contamination. Aquifers provide about half of the nation's drinking water, and 20% of the U.S. population relies on domestic wells that draw from groundwater. There are reports of leakage from landfills (often "secure" ones) contaminating underground water. Once an aquifer is contaminated, it can take centuries for it to cleanse itself.



Transporting and Tracking

An estimated 250,000 shipments of hazardous wastes travel U.S. roads, railways and barges each day. The 1975 Hazardous Materials Transportation Act made the Department of Transportation (DOT) responsible for monitoring radioactive waste, toxic chemicals, and other explosive and flammable materials. Transporters of hazardous waste (both radioactive and non-radioactive) may use interstate highways, but routes bypass major population centers where possible.[8] The Resource, Conservation and Recovery Act (RCRA) (PL 94-580) regulates the generation, storage, and disposal of solid wastes of all kinds--hazardous and non-hazardous. (With typical bureaucratic logic, RCRA defines "solid wastes" as any that are disposed of on or in the land, including liquids, semisolids, or contained gaseous material.) RCRA established the manifest "tracking" system which must be used by generators, transporters, and those who store, bury, or dispose of hazardous wastes. It's often called the "cradle to grave" act because it made a generator of hazardous waste responsible for its safe ultimate disposal--every step of the way--and designated EPA as the regulatory agency.[9]

Furley

The only licensed Kansas hazardous waste dump is located at Furley, near Wichita. It was closed for cleanup in January, 1982, after it was confirmed that chemicals had leaked into underground water off-site. The facility opened in 1977, and was purchased in 1979 by Waste Management, Inc. (WMI). The company has applied to reopen the 80-acre site and to expand it by another 80 acres. A bare-bones look at the Furley story is worthwhile, for it does show that public participation and perseverance in the face of formidable odds can win out over corporate and bureaucratic stupidity.

The history of the site is a sad story of incredibly negligent work on the part of the original owners, WMI, and the Kansas Department of Health and Environment (KDHE)--the agency responsible for protecting the health and safety of Kansans, a job which includes oversight of Furley. There are numerous documented stories of evasions, cover-ups, manipulations and intransigency which led to a loss of public confidence in the environmental department of KDHE.[10]

The original planners of Furley did a shoddy job. An inadequate study recommended an unsuitable site for an operation that used unacceptable technology. Furley residents had long maintained there was water under the site and that the sandy soil made it unfit for a hazardous waste disposal facility, but no one would listen.

"The state was terribly negligent in allowing the Furley site to open."

KDHE accepted studies and assurances, with no independent investigation, and on the basis of the company's self-evaluation, granted a permit to operate. The site was poorly monitored, both by the company and by the KDHE. When the company applied for an expansion permit, KDHE once again, using only company-provided studies, was on the verge of granting the permit when determined, outside intervention prevented this. Only because of the persistence of concerned groups and individuals (in particular Sharilyn Dienst, Furley resident; Attorney-General Robert Stephan; and Frank Wilson of the Kansas Geological Survey) did the site flaws, leakage, and extent of groundwater contamination come to light and force state officials to close the plant and delay the expansion permit, pending cleanup and further testing. WMI has spent over $3 million in cleanup operations, but this is in no way linked to reopening. State law (KSA, 1981, 65-3430 to 65-3448) requires the company to clean up contamination caused by its operation, even if the facility is shut down permanently.

Throughout 1982, as information about Furley gradually came to light, there was growing concern that some KDHE key personnel had behaved more as advocates for the facility than as watchdogs. Observers also objected to the considerable leverage WMI was having in the decision-making process. The company's close working relationship with the KDHE's environmental department made the lines of authority almost indistinguishable. In January, 1983, Governor John Carlin appointed Barbara Sabol Secretary of KDHE. Sabol is a tough, fair-minded professional whose reputation for efficiency and independence seems well-deserved. She promised hearings on Furley and fair treatment for all interested parties. One of her first acts was to appoint a new project director for Furley and to instruct the KDHE staff to develop its own cleanup plan rather than simply react to the company-bought one.

The accusations against the KDHE were confirmed by an audit of the EPA's Region #7 office, which charged the KDHE with having conducted its work on Furley in secret, sometimes keeping information from its own staff and other governmental officials. KDHE was criticized for its failure to set up enforceable cleanup programs, for withholding documents from the EPA, for sloppy and incomplete record-keeping on Furley, and for failure to require WMI to document its work. It singled out the former project director for special criticism, saying he "did not share information inside or outside KDHE nor seek the advice of competent personnel routinely or expeditiously."

At a September 9, 1983, hearing conducted by the Kansas legislature's Special Committee on Furley and Strother Field, a number of groups including the Kansas Natural Resource Council, the League of Women Voters of Kansas, the Kansas Engineering Society, and the Kansas Chapter of the Sierra Club, urged strengthening the Kansas hazardous waste statutes to require independent testing and adequate funding for monitoring. A Kansas City Times article September 10, 1983, reports that "the groups basically opposed use of all burial ditches or injection wells for disposal of hazardous waste and called for strict oversight by the state of all dumps." Attorney-General Robert Stephan told the committee that the KDHE should conduct independent tests of all hazardous waste sites rather than depending upon the word of consultants hired by the operators; he said the state should never have licensed a hazardous waste dump in the sandy soil of south-central Kansas, adding, "I think there's definitely a question as to whether that dump should ever be re-opened." In October, Stephan told a Kansas Legislative Interim Committee studying Furley, "The state was terribly negligent in allowing the Furley site to open. I'd have been ashamed to have participated in that decision."

The EPA announced in October, 1983, that tests of samples taken from Well #220 at Furley showed 1.79 parts per billion of dioxin (TCDD--the most deadly type); it was found in an oily substance, 35 feet below the surface. (At Times Beach, Mo., a finding of only one part per billion caused EPA to evacuate the residents, buy the properties, and undertake cleanup of the site.) Barbara Sabol had asked the EPA to conduct the tests after being advised in March, 1983, by Sharilyn Dienst that potentially dioxin-contaminated materials may have been disposed of at Furley near Well #220. When EPA Region #7 chief Bob Morby and KDHE director Jim Aiken arrived to take samples, Mel Gray, KDHE employee and former project director, would not allow Well #220 to be tested, saying it was not on his list. When Barbara Sabol learned what had happened, she ordered dioxin tests of Well #220. At October hearings of the Special Committee on Furley and Strother Field, Rep. Jack Shriver, D-Arkansas City, a committee member, called the failure to test the well a deliberate "cover-up."

As more information about the potential dangers of Furley surfaced, public opposition to its reopening grew. On November 9, 1983, during a televised live coverage of the commission meeting, the Sedgwick County commissioners voted unanimously to urge the state to keep the dump closed permanently. On November 10, the KDHE advised WMI that its application to reopen and expand was incomplete and gave the company until January 6, 1984, to amend it. After reviewing and approving the revised application, the department then has 240 days to make a decision. This decision will be reviewed by the Kansas Hazardous Waste Disposal Facility Approval Board and the EPA. If all three agree that the site should be reopened and/or expanded, WMI could be back in business at Furley. However, on December 9, 1983, Governor Carlin announced that

he will ask the 1984 Kansas legislature to prohibit land burial of hazardous waste in Kansas, and to create a $5 million fund earmarked primarily for the cleanup of an estimated 201 hazardous waste sites in the state. If the legislature approves this plan, it would mean Furley could neither reopen nor expand in the manner WMI detailed in its application to the KDHE.

The purpose of this account is not to find scapegoats, but to analyze and learn from past mistakes. Neither the company nor the KDHE kept the public informed when outside tests (EPA and the Kansas Geological Survey) turned up contamination. Few avenues were provided for public input. A paternalistic "you don't really have the background to understand this so just leave it to the experts" attitude existed. Persistent citizen intervention forced needed changes in the way Furley was being monitored at a time when KDHE channels of communication--both internal and external--were sadly lacking.

Public participation and governmental accountability should be two sides of the same coin. One won't work without the other.

Public Health

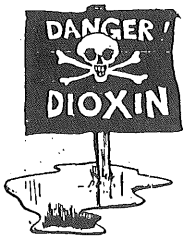
An absolute, conclusive link between environmental contamination and dangers to health is hard to establish. Cancer/heart/liver/kidney diseases, metabolic disorders, respiratory ailments, hypertension, infertility, anemia, arteriorsclerosis, skin lesions, tumors, brain damage, birth defects, gene mutation--all of these have been associated with water/air/soil pollution. Even "non-hazardous" well-run dumps often have flies, rodents, blowing trash, noxious odors, and decaying organic materials that generate toxic gases and harmful bacteria.

While the correlation between high levels of toxic chemicals and health problems may seem obvious, statistical probabilities do not constitute scientific proof. At Love Canal, N.Y., following the discovery of chemicals that seeped from an underground abandoned dump into residential basements and yards, there was a high incidence of illness, miscarriages, and birth defects--children were born with extra fingers and toes, and other physiological mutations. There are hundreds of other Love Canals in the U.S. waiting to be discovered. Yet whenever

The Marsh Mother Goose

Jack Sprat could eat no fat;
DDT got into that.
His wife could eat no lean, indeed,
PBBs got in the feed.

"Pussycat, pussycat, where have you been?"
"I've been to Washington, city of sin."
"What did you see there in all of your roaming?"
"I saw James Watt go back to Wyoming.
EPA sacked Rita LaVelle,
and Gorsuch-Burford fell as well.
I saw Congress in debate;
Watched the Senate legislate;
Paid a visit to the Mint;
Heard our movie-President
Reading scripts his aides provide,
Adoring Nancy by his side;
Heard a panel on world trade;
Joined an anti-war parade....."



"Pussycat, Pussycat, what a vacation!
You must be filled with a sense of elation.
All of that work--all of those actions--
All of that input by so many factions.
What was accomplished in all of those days?"
"Nothing has changed--the policy stays."

Sing a song of poisons;
a nation full of waste.
Rain that's full of acids;
water with bad taste.
Soil laced with dioxin;
money on the skids,
Isn't this a dainty world
we're leaving for our kids?

Execs were in the board room,
counting out the money,
The smog was in the city,
making eyes and noses runny;
The plants were in the garden,
gasping for a breath.
Along came the EPA
and studied us to death.

Mary had a little lamb,
Its fleece fell out one season.
The Army said its nearby tests
Could not have been the reason.

Mary, Mary, quite contrary,
How does your garden grow?
Nothing grows now in my soil--
The road's sprayed with dioxin oil.

"No liner on the market can stand up to the full range of chemicals which might be found in a hazardous waste landfill."

contamination is discovered, the announcement is usually accompanied by an official assurance that "there is no danger to the public."

It is difficult to pinpoint the actual cause of diseases linked to environmental pollution. Scientific evidence is inconclusive and ambiguous; "experts" often disagree. The problem is compounded by the fact that poisonous substances like PCBs and dioxin can remain dormant in the body and health problems may not appear for many years after exposure or contamination has occurred. The cost vs. benefits dilemma arises again when trying to measure the risks of exposure to toxic substances against the costs involved in prevention measures. There are obvious political and legal ramifications as well as social and economic ones.

Technical Fixes

On July 14, 1982, EPA released new, more strict rules for hazardous waste landfills, specifically aimed at keeping contamination out of groundwater. Assuming, of course, that a land burial facility is located on a geologically suitable site, the regulations call for "impermeable" synthetic liners to be installed at most facilities, to prevent leaching of contaminants into the groundwater.[11] Some of the things which cause liners to leak are improper installation, punctures and tears, cracking due to freeze/thaw/wind-drying, thermal stress, settling, exposure to light or ozone, exposure to chemicals that dissolve plastics or other synthetics, and attacks by microbes or by burrowing animals.

Kirk Brown, professor at Texas A&M University, told a House Sub-committee on Natural Resources, Agricultural Research and the Environment on November 30, 1982, that his research shows "no liner on the market can stand up to the full range of chemicals which might be found in a hazardous waste landfill." Brown told of one study indicating all three synthetic "state-of-the-art" liners used in New Jersey's hazardous waste landfills were leaking, and that a study of one particular brand used nationwide showed failure in 11 or 12 instances.[12]

Even EMI vice-president Peter Vardy testified to Rep. Scheuer's committee in Wichita July 30, 1983, "Everything leaks," then proceeded to explain how WMI would minimize leaks if allowed to reopen the landfill. Rep. Scheurer said, "Virtually every witness we've had at our hearings has made the statement that all landfills eventually will leak."[13]

The author, Ivy Marsh, is on the Boards of Directors of The Land Institute and the Kansas Natural Resources Council.

Better Choices

So what's the solution? Alternatives to burial. No more chemical cemetaries where ghosts rise up to haunt us. California has begun phasing out ground burial of hazardous waste. Industries are required to burn, recycle or detoxify their wastes. This is expensive up-front, but cheaper and safer in the long run.

Both Kansas and Colorado have discovered that when their waste facilities closed, industries coped by (a) finding production methods that generated far less waste, (b) detoxifying wastes to render them harmless, (c) using incineration or other methods to reduce waste, and (d) employing waste exchanges with other industries. One man's trash is another man's treasure. Several national waste exchange clearing houses have been established. Much of the waste volume was solved for Kansas when Furley closed, for two-thirds of its wastes came from out of state.[14]

The General Accounting Office estimates that more than ten million tons of minerals--iron, copper, aluminum, chromium, and nickel--are lost annually. Resource recovery plants could retrieve minerals from industrial waste. Both Japan and West Germany do this successfully.[15] When U.S. industries find it profitable or mandatory, they too will find processes to reduce or eliminate hazardous waste.

Of course, the best solution is to reduce the volume of hazardous waste by changing industrial processes, by recycling, and by adopting simpler lifestyles. The mountains of waste are a symbol of our self-centered consumer society. Industries could pre-treat wastes before disposal by neutralizing, detoxifying, encapsulating, or carefully-controlled incineration which would break down wastes into less toxic substances. The Office of Technology Assessment (OTA) suggests a number of ways to reduce quantities of wastes, including reduction at the source, pre-treatment, separation/segregation/concentration of wastes, and material and energy recovery and recycling.[16] OTA recommends economic incentives for research and development of alternatives-to-burial methods to reduce and dispose of waste. Negative social and economic aspects which have slowed implementation of these solutions include energy shortages, inflation, and recession. Burying wastes is many times cheaper than any of the alternatives initially; the big costs come later, when cleanup begins.[17]

One danger in concluding by listing "alternatives to burial" is that it may tend to diminish perception of the magnitude of the problem; after all, Pollyanna, cock-eyed optimist, technology-can-solve-the-problem attitudes were responsible for many of the problems we're facing. Perhaps it would have been better to focus on some small, specific aspect of hazardous waste. It seems somehow more manageable that way. A broad look makes it so large, so overpowering that it becomes impossible to define or discuss. The problems are endless. We

have an incomprehensibly enormous bulk of hazardous waste to deal with right now, at the same time that we are on the verge of drowning in an ocean of national debt.

Our money or our lives.

Well.....we're thinking.....we're thinking.

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A Purification

by Wendell Berry

At start of spring I open a trench
in the ground. I put into it
the winter's accumulation of paper,
pages I do not want to read
again, useless words, fragments,
errors. And I put into it
the contents of the outhouse:
light of the sun, growth of the ground,
finished with one of their journeys.
To the sky, to the wind, then,
and to the faithful trees, I confess
my sins: that I have not been happy
enough, considering my good luck;
have listened to too much noise;
have been inattentive to wonders;
have lusted after praise.
And then upon the gathered refuse
of mind and body, I close the trench,
folding shut again the dark,
the deathless earth. Beneath that seal
the old escapes into the new.

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A Place on Earth, 1983	(a novel)
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FmHA-Financed Rural Water Districts: The Sabotage of City and County Planning

Dana Jackson

Plastic pipe and trenching machines are changing rural America. Formerly, people chose homesites in locations where there was good water. This meant that every beautiful hillside could not have a house on it, even if it fit someone's dreams. With the formation of rural water districts, good water can be pumped underground through plastic pipe to service people many miles from the water source. For farmers who have extremely hard water in their wells, or water too high in nitrates to be safe to drink, or wells with a low gallons-per-minute pumping capacity, the opportunity to hook up to a water line and tap into good, soft well water is a dream come true. No more hauling drinking water in bottles. No more scrimping on showers or lawn watering.

Besides plastic pipe and trenching machines, another boon to rural water development is the U. S. Department of Agriculture agency called the Farmers Home Administration. In addition to making loans for farm homes, this agency was authorized by the Rural Development Act of 1972 to finance water and sewer systems, subdivision development, recreational facilities, industrial parks, and other community infrastructure. The agency's main role is no longer to assist farmers, but to promote rural development, which is actually suburban development, in rural areas.

The Farmers Home Administration has been very successful. Urban sprawl creeps relentlessly through rural areas. First comes the water district to "help the farmers." Of course, the main organizers of the water district are often housing developers, who must have the water in order to sell lots for housing. They are the ones who buy thirty hook-ups at a time.

The farmer certainly benefits initially, but within a decade he begins to experience unpleasant changes in his life. Before he knows it, on late afternoons he is driving his tractor out of the field onto a black-topped road, where a school bus passes him on its route from the new school. He meets many four-wheeled drive vehicles, not driven by farmers, but by rural residents on their way home from work in town. Cars line up behind him, the drivers impatient to get around him and into town for shopping or social engagements. He passes the fire station, the corner QWIK BUY store and filling station and the dog kennel before he finally reaches his own driveway. In his mail box he finds a letter informing him that a formal complaint has been filed about the odors coming from his hog pen. He chases several stray dogs out of his yard as he approaches his house. Compared to the houses in "Country Heights" or "Misty Acres" down the road, his house looks shabby, badly in need of paint. But his property taxes are consuming his income, and he just can't afford to fix it up. In fact, he can't afford to farm. So on the forty acres just north of his house, there is a sign advertising lots for sale. Maybe if he can sell off a few housing sites, he can afford to fix up his own house and park his old tractor for good.

The farmer's plight is caused by what environmental impact statements call "growth-related secondary impacts." These are problems which result when population increases, or shifts, which is more often the case when rural water districts are formed. The Farmers Home Administration (FmHA) denies that it has any responsibility for these secondary impacts. It is a bureaucracy with the authority to spend money on water projects, and it still espouses the myth that it is helping farmers. But not only does the FmHA promote urban sprawl and cause the loss of agricultural land, it contributes to the decline in the number of farmers.

Urban Sprawl

Rural water districts create havoc with city and county planning. A city may have planned its future residential growth to coincide with water availability, good arterial roads, and proximity to shopping centers and city services, but the developers who own land in another direction out from the city can get a water district funded and pull development their way. Or developers can leap-frog areas that are contiguous to the city and establish subdivisions that are ten miles out. Orderly, well-planned growth is then impossible. Once people move out of town to live in these country developments, they begin wanting urban services. Eventually the city or county is forced to stretch school bus routes, fire protection, police protection, and trash hauling out beyond planned city limits, and at great expense.

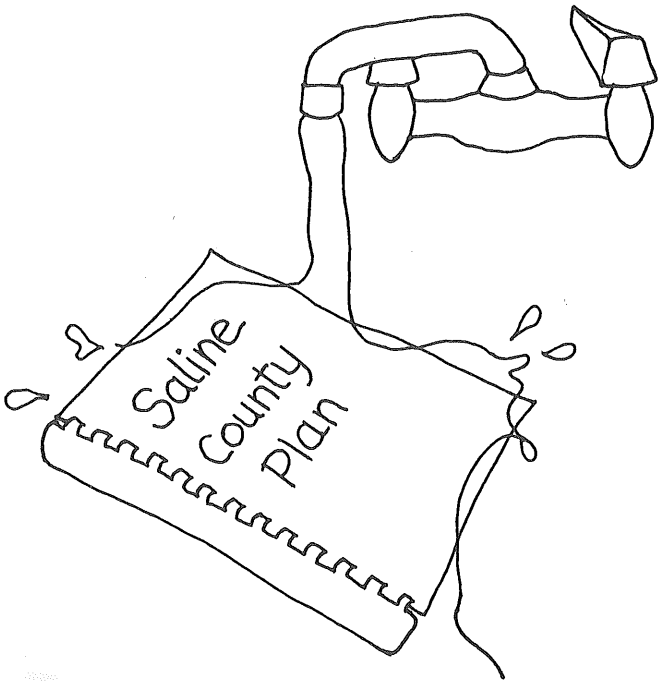
The growth-inducing impact of a water district is usually denied by the instigators and the FmHA. But as soon as the formation of a water district is announced, people who own blocks of land which could be serviced by the district, begin filing plats with the County for subdivision development. Initially, the size of the district appears to be limited by the capacity of the wells to provide for a certain number of taps. However, the rural water district can drill additional wells and expand services. Increasing the number of subscribers may enable it to lower the cost per subscriber. The incentive to promote expansion and growth is additionally encouraged by the availability of FmHA loans and grants. The FmHA, according to the Catalogue of Federal Domestic Assistance (No. 10.418, 5-80, pg. 31), has been charged "to provide basic human amenities, alleviate health hazards, and promote the orderly growth of the rural areas of the nation by meeting

the need for new and improved rural water... facilities." FmHA has taken the charge to promote rural growth seriously, but the results are not "orderly."

In an article in Planning, October 1978, called "How Farmers Home Encourages Urban Sprawl," the author, Tom Jacobson, cites several examples of counties in North and South Dakota which experienced increased subdivision growth as a result of rural water districts. In Minnehaha County, South Dakota, non-farm housing starts increased more than 300 percent over their previous levels after the formation of a rural water district. Meanwhile, housing starts in the nearby city of Sioux Falls, South Dakota, increased by only ten percent. About half of the Minnehaha Rural Water District subscribers were non-farm users, and 400 taps were purchased by developers for ten future subdivisions. When the problem of urban sprawl in Minnehaha County became obvious, the local officials responded by strengthening their zoning ordinance, and they limited the number of residences to one per forty acres. But local developers and farmers would not stand for this; they forced the ordinance to a general vote in the county and it was soundly defeated.

Tom Jacobson points out in this article that historically, the construction of infrastructure dictates development and land use. Zoning and other land management techniques cannot regulate land use contrary to the development of water, sewer and highway projects. Land use regulations are unable to withstand strong economic pressure, plus the emotional issue of government regulation of private property.

The FmHA disregards the claim that water supply infrastructure causes an increase in rural housing developments and assumes that cities and counties can pass regulations to control growth if they want to. Printed alongside Jacobson's charges in the Planning article was a statement by Gordon Cavanaugh, administrator of the FmHA:



> "FmHA strives to work with local and state governments to assure that FmHA financed facilities will be consistent with any development plans of the state, region, county or munincipality in which the proposed facility will be located."

But counties have made plans for future housing developments based on the availability of water, and the FmHA renders these plans obsolete by making water available anywhere.

The Loss of Prime Agricultural Land

While the countryside gains urban sprawl, it loses agricultural land. The National Agricultural Lands Study published a booklet in 1979 and 1980 entitled, "Where Have the Farmlands Gone?" This widely-distributed publication made many people aware that one million acres of prime farmland is lost each year to houses, airports, shopping centers, highways, motels, etc. Another two million acres, of lesser quality yet still productive land. is also urbanized. All losses total up to a half section of farmland converted every hour. When good farmland is gone, marginal land will be used for crop production. It requires more expensive, energy-intensive inputs in the form of water and fertilizer to produce what prime farmland can produce much more cheaply. This irrational procedure of putting houses and accompanying urban infrastructure on prime farmland will result in a struggle by future generations to raise enough food on inferior agricultural land.

The promotion of rural water districts by the FmHA contributes to the loss of prime agricultural lands, even though the Environmental Program developed for FmHA by the USDA and published in the Federal Register, January 12, 1981, explicitly states:

> "FmHA recognizes that its specific mission of assisting rural areas, composed of farms and rural towns, goes hand in hand with protecting the environmental resources upon which these systems are dependent. Basic resources necessary to both farms and rural settlements include important farmlands and forestlands, prime rangelands, wetlands and floodplains.... It is FmHA's policy not to approve or fund any proposals that as a result of their identifiable impacts, direct or indirect, would lead to or accommodate either the conversion of these land uses or encroachment upon them."

This position was reinforced by a memorandum statement on Land Use Policy (Memorandum 9500-2) by Secretary of Agriculture, John Block, dated March 10, 1982. Under Policy (3, b), he stated:

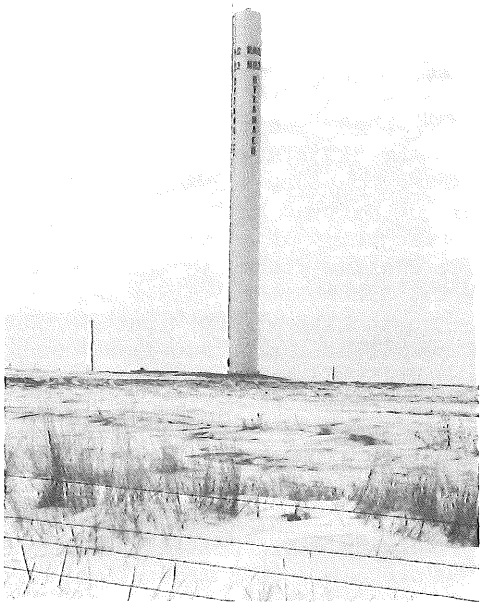
> "The department will assure that programs of the agencies within the Department discourage the unwarranted

conversion to other uses of prime and unique farmlands, farmlands of statewide or local importance, prime forest lands and those of statewide or local importance, and prime rangelands..."

The memorandum also states that the Department will advocate among Federal agencies

"the retention of important farmlands, rangelands, forest lands, and wetlands, whenever proposed conversions to other uses (a) are caused or encouraged by actions or programs of a Federal agency or (b) require licensing or approval by a Federal agency, unless other needs clearly override the benefits derived from retention of such lands..."

The last part of this is the escape clause for FmHA. Water districts are formed (supposedly) because people need water, and since FmHA is in the business of supplying funds to take care of water needs, benefits of the rural water districts override the importance of retaining agricultural lands. The FmHA, like the Army Corps of Engineers, has to keep water projects going in order to keep its budget and staff and justify its existence. The future agricultural land base of this nation be damned!



Standpipe for Ottawa County Rural Water District.

The Ottawa County Rural Water District #2

This spring The Land Institute was approached with a request that it sign a right of easement for Ottawa County Rural Water District #2 to build its lines across the east side of the 160 acres owned by The Land Institute. This forced us to look closely at the history of the Ottawa County water project and all the controversy surrounding it. We found that it epitomized the problems and consequences of FmHA financed rural water districts as discussed above. On principle, we refused to sign the right of easement. Our statement of refusal was printed in the summer Land Report (# 19).

The project began in 1976 as the Elm Creek Water District, and the organizers planned to request a 1.7 million dollar loan from FmHA to finance it. A year before it was incorporated, a few residents of Saline County became aware of its organization and the rate at which it was already growing. Joyce Fent, a member of the City Planning Commission, and a resident within the proposed water district, opposed its formation. She contended that the water district would increase the conversion of agricultural land to residential use, making it difficult for farmers to purchase land for farming use, and it would foster leap-frog housing development in the county. The city and county planners had been discouraging housing development north of Salina, where water was scarce and distances to services were great. The formation of the water district meant that the recently-completed, long-range plans for orderly development in the county would be ignored.

The water district was sloppily organized, and the opponents discovered that the organizers had not gathered a sufficient number of names within the district to make the original petition valid. When this was brought to the attention of the Kansas Attorney General, Robert Stephen, he chastized the district organizers for perpetrating a fraud, but then he gave them thirty days to deliver a proper petition. The second petition was approved.

Since funding by a federal agency was involved, Joyce Fent asked to see the environmental impact assessment required by the National Environmental Protection Act. The purpose of an environmental assessment is to determine whether a more complete document, the environmental impact statement, is needed. The FmHA did not produce an assessment until two weeks after Mrs. Fent's request. It was a standard two page form, with a skimpy explanation attached, concluding that no environmental impact statement was necessary. The inadequacy of the assessment was called to the attention of the Environmental Protection Agency (EPA), in Kansas City, Missouri. EPA told the FmHA to take no action in processing the loan until inadequacies, such as failure to seriously analyze secondary growth impacts, had been addressed in a new environmental assessment. The FmHA then hired a consulting firm, EcolSciences, Environmental Group (ESEI) from South Bend, Indiana, to prepare a more thorough environmental impact assessment, and the loan for the water district was delayed.

The FmHA seemed to consider the initial impact assessment just a formality and a nuisance. When Congressman Keith Sebelius inquired about the district, the state director of FmHA, John T. Denyer, assured him in a letter dated June 6, 1979, that their environmental assessment was

sufficient, and that an impact statement was not needed.

Mr. Denyer also deliberately misled the Congressman by stating, "The 460 families who signed up for water are in need of a good source of water for domestic and livestock use." What he did not say was that the 460 sign-ups included several developers with twenty or thirty taps each, and numerous smaller developers with three or five or ten. The attorney for the district, Ken Wassermann, owned twenty taps. Denyer used the old myth of "helping the farmer."

City and County Planners are Critics

ESEI submitted a draft environmental impact assessment in the spring of 1981. In commenting on the weaknesses of the assessment to the FmHA, Keith Rawlings, Director of Planning and Community Development for the city of Salina, wrote:

> "...it appears that FmHA has assumed the role of planning the future of the City of Salina and Saline County.
>
> I have no opposition to the development of rural water districts which are designed and constructed to serve agricultural purposes and existing scattered site rural housing.... But when they foster unwanted and unplanned growth on local units of government, they most certainly are overstepping their original purpose. Therefore, please note that I oppose the presently proposed rural water district and object to the conclusions of the EIA (Environmental Impact Assessment)."

Saline County Planner, Dana Morse, expressed similar concerns in his comments on the draft EIA.

> "There is no opposition to the formation of any water district which intends only to serve existing development with a small percentage of available future hookups, such as ten percent or less. However, past experience shows that the dependence of future housing developments upon rural water districts is a major problem for those involved in preserving prime agricultural land and the aesthetic appearance of their communities."

Dana Morse concluded his comments on a discouraging note by referring to the potential for unlimited expansion of water districts in the state as a result of an opinion issued by the Kansas Attorney General, Robert Stephan on April 7, 1981. Stephan's opinion was in reply to two questions by Ken Wassermann, the attorney for the Ottawa County Water District #2. The synopsis stated:

> "While it is generally the rule that a municipality may annex only territory which is contiguous or adjacent to it, a rural water district may attach territory which is not so situated. Additionally, the district may employ its powers of eminent domain to obtain easements across property lying between the newly attached land and the existing boundary for the purpose of laying water lines."

The Attorney General's opinion is now guiding the development of the water district. Since The Land Institute denied the request for a right of easement across the 160 acres, the district may decide to employ its right of eminent domain and get the easement anyway. However, a Salina attorney, John Black, pointed out in a letter to Joyce Fent on April 23, 1981, that the Attorney General's opinion is just an opinion.

> "Ken Wassermann has asked the Attorney General to gaze into his crystal ball and decide what would happen if the issue became the subject of litigation. Whether a court would use the same reasoning as the Attorney General is an open question. ...If the district filed a condemnation suit against such a landowner, that landowner would have standing to object on grounds that the district does not have the power of eminent domain in areas outside its boundaries. At that point, there would be a very legal issue which could be decided by the courts."

The organizers of the Ottawa County Rural Water District seem to feel that it is their duty to extend water to anyone who requests it, as long as the system has enough capacity. And if the original wells cannot supply enough, the district can drill new wells within the district or leap out beyond their boundaries to take in new sources of water, exercising their right of eminent domain if necessary. As Dana Morse suggested in a letter to Robert Stephan on April 21, 1981, "Elm Creek (Ottawa Co. Rural Water District) now has the authority to take water from the Snake River if it should become necessary."

Public Opinion

After the draft impact assessment was completed by ESEI, the FmHA scheduled a hearing in Bennington, Kansas to receive public comment before deciding on the loan. By this time, the controversy over the district had heated up. The Salina City Commission ordered the city planning department to withhold any further expressions of their opinions about the rural water district, and the county commissioners "suggested" that the county planning staff should not attend the meeting. Opposition to the formation of the district and FmHA financing was very unpopular.

The Salina Journal reported on the hearing in its July 15 edition. It was ninety degrees in the school gym the night of the hearing, and tempers flared proportionally.

"Elm Creek now has the authority to take water from the Snake River should it become necessary."

Joyce Fent was the main opponent testifying. She pointed out that only 26% of the hook-ups were being reserved for legitimate farmers. She criticized the assessment for not dealing with the secondary impacts of growth and for not considering any alternative action, such as several smaller districts to serve existing houses with need for water.

Most of the 300 people in the audience were upset over delays in the completion of the water district. They were unwilling to consider the larger issues of good land use planning or the need to preserve prime agricultural land. Some people in the audience heckled Mrs. Fent; some told her to "sit down and shut up."

Within the 280 square miles of the proposed water district are people near New Cambria who have hauled drinking water for fifteen to twenty years. They are desperate for an adequate supply of safe water. Sympathy for these people was widespread in the community, although they composed a minority of the approximately 500 hook-ups at the time of the hearing. Somehow, no one heard Joyce Fent's suggestion for an alternative to this large water district encompassing parts of three counties. Joyce Fent did not oppose the formation of a water district to serve those near New Cambria needing water, but her alternative was never considered.

The momentum of the rural water district was evident by the time of the hearing. It was feeding on its own growth, becoming more influential as it encompassed more territory and signed up more people. So it was just a matter of time until the final impact statement was turned in to the FmHA in November, 1981, and the agency gave its approval for a loan.

The Salina Journal reported on September 30, 1982 that Ken Wassermann had been informed by FmHA on the day before that the Ottawa County Rural Water District #2 would receive a $2.1 million loan at 8.375% interest for forty years. Since then, water district development has proceeded at full speed. There were 630 subscribers by July of 1983 when the first notice of a condemnation suit filed to gain an easement across land for water lines under the power of eminent domain appeared in the newspaper.

A petition to attach lands, including the 160 acres owned by The Land Institute, was presented to the Ottawa County Commissioners on October 24, 1983. It seems incredible that commissioners from another county could attach Land Institute property to a water district whose wells are 25 miles away, because one resident east of us asked to be in the district and another south of us wants extra water for his lawn.

Who knows how far beyond The Land's 160 acres the Ottawa County Rural Water District # 2 will expand? Acting in accordance with the Attorney' General's opinion, it has more power to take in new territory than any municipal government.

Conclusion

One cannot blame a homeowner, living in the path of an advancing water district, for purchasing a hook-up. Even at a cost of $2000, plus monthly water bills, an assured supply of good water from a water district is a bargain. And it is appropriate for the FmHA to help bring water to existing, scattered site, rural housing. But it is not appropriate for the FmHA to promote new subdivisions on agricultural land by financing water projects. The speculator who buys farmland without a source of water on it for the lots he plans to sell should not be subsidized by the Federal government. When new subdivisions are not compatible with city and county plans for orderly growth, the FmHA should not encourage them by providing loans for water development.

In a time of excess crop production and low prices, it is difficult to convince people of the importance of preserving agricultural land. During this period of an oil glut and relatively low gasoline prices, few people are concerned that homesites scattered all over rural areas will result in costly energy inefficiencies as world oil supplies dwindle. But times will change, and responsible leaders must promote wiser land use patterns which leave more options for future generations. The Farmers Home Administration should be forced to consider the secondary growth impacts upon farmers and farmland when it finances rural water districts.

Note: The author is indebted to Joyce Fent for the loan of documents and correspondence relating to the Ottawa County Rural Water District # 2. Dana Morse, Saline County Planner, loaned general information on land use. Their help is much appreciated.

Soil Conservation Service

(Continued from page 13)

storm. For example, in Jewell County this is five to six inches of rain.

Someone asked how long terraces last, especially if they are farmed over. If terraces are farmed on the contour they should last about fifteen years, or indeterminately if maintained every other year. However, a terrace that is plowed over will probably only last two or three years. Mr. Bondy brought up the new regulations for spacing between terraces: they can be farther apart if the farmer is also leaving crop residue to control erosion. Mr. Piskac says that his office is still cautious about recommending the

wider spacings. They want to be sure of the farmer's practices first. As George Smith, a retired state conservation engineer told the Salina Journal (see the Oct. 30 article), "When prices go up, they want to plow it up. We need to educate them to apply the needed conservation practices to maintain productivity."

Besides the soil loss equations, Mr. Bondy told us the rule of thumb to measure residue left on a field. For every pound of seed yield in a wheat field, about one hundred pounds of residue is left. Then the first discing will destroy 30-50% of the residue, and undercutting will destroy another 10%. Leaving crop residue on the field protects the soil during February, March and September, which are the prime erosion months because the field is bare of plant growth. However, one of the reasons winter wheat is such a good crop for Kansas is because it protects the soil during heavy rains in June. Since the 1950's, more farmers have been leaving their residues on the surface. Mr. Bondy and Mr. Piskac both also see more farmers trying conservation (minimum) tillage methods.

Mr. Piskac and Mr. Bondy agreed that the dollar value spent on soil conservation has decreased, although the need for soil conservation is not decreasing. With the fiftieth anniversary of the Soil Conservation Service coming up, it is important to evaluate our progress and direction. We need to be open to new and old, but little used, soil conservation methods. The anniversary years can provide a focal point to raise awareness of the need for soil conservation. The SCS and the National Association of Conservation Districts have co-published a pamphlet to help this happen. It is titled: "Fifty Ways to Celebrate the Fiftieth Anniversary of Soil and Water Conservation." Public awareness can also be heightened through newspaper articles, like the one in the Salina Journal on the CCC, and by a new postal stamp saying "Water and Soil Conservation," to be issued in February 1984.

Looking to improve the federal role in soil conservation, Ed Jones, U. S. Congressman from Tennessee, has introduced the Soil Conservation Act of 1983. In this bill he has tried to address the problem of government programs that in effect work against sound conservation practices. Known as the "Sodbuster Bill," this would ban any type of price or income support for crops grown on highly erodible land, if the land were not plowed up prior to the enactment of the bill. This would discourage farmers from cultivating their fragile lands.

Another piece of legislation relevant to soil conservation is the Agricultural Productivity Act, which has been recommended for passage by the House Agriculture Committee (although Pat Roberts of Kansas voted "no"). Its direct pertinence to soil conservation is in starting a cost-share program for practices such as planting erosion-controlling, nitrogen-fixing cover crops.

The anniversary of the Civilian Conservation Corps brings to mind not only conservation, but also the jobs it provided for the unemployed. Similar jobs would be provided by the American Conservation Corps Act of 1983 (HR 999). This bill passed overwhelmingly in the House and should be up for a vote in the Senate during 1984.

The Soil Conservation Service was born out of the Soil Erosion Service, which was created for the dual purpose of providing jobs and preserving our country's resources. Seeing what people like Mr. Bondy and Mr. Piskac and others in the SCS are working toward provides hope that we still have the chance to save our soil. As George Smith said in the Salina Journal article, "Just about every facet of life is directly or indirectly affected by conservation treatment of the land or the lack of it. There has been a lot accomplished, but there still is a lot to be accomplished."

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.

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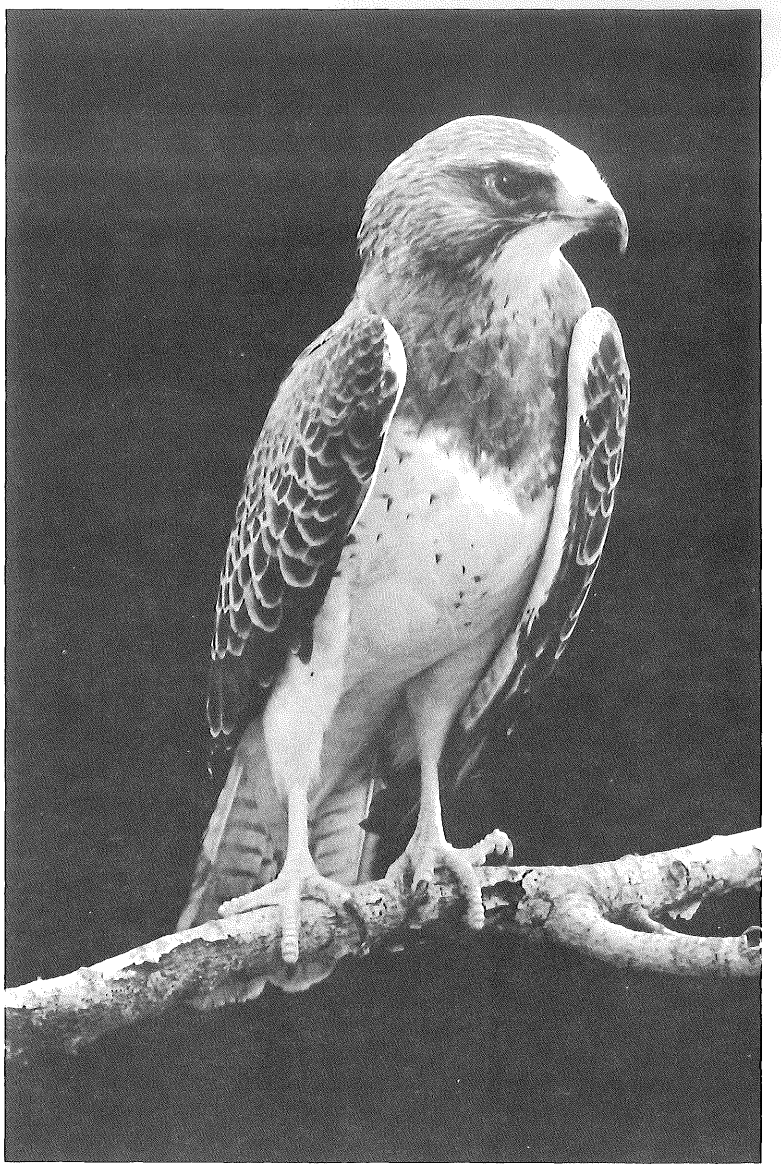

COVER PHOTOS by Terry Evans. On front, Red-tailed Hawk in light phase. On back, Marsh Hawk. More raptor photographs and story on page 20.

THE LAND INSTITUTE is a non-profit, educational-research organization devoted to a search for sustainable alternatives in agriculture, energy, shelter and waste management. See inside of back cover for information on how to support The Land Institute.

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