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SDSU Agricultural Experiment Station

Winter 1994

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South Dakota State University

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South Dakota Farm & Home RESEARCH

Agricultural Experiment Station • South Dakota State University • Brookings, South Dakota 57007

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About the Cover

He didn't want to be on the cover.

When the *Farm & Home Research* staff approached retiring Experiment Station Director Ray Moore about a story on his years of service to the people of South Dakota, he agreed. But when he was told we wanted to put his picture on the cover, modesty overcame him. He felt there were more important stories of Experiment Station projects and results that deserved that space.

We felt that his 38 years of contributions to South Dakota State University and to the Agricultural Experiment Station as a teacher, as a researcher, and as a leader had to be acknowledged on the cover of this, our annual report. So we chose a photo of him as so many South Dakotans have known him best—out in the field, talking one-on-one with a farmer, keeping in touch with the needs of South Dakota agriculture.

photo: Stuart Melby

South Dakota Farm & Home RESEARCH

Volume 44, number 3—4, winter, 1994

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Director's comments

Looking back to the future

Dr. Ray Moore
Agricultural Experiment Station

Twenty years ago I prepared "Comments" for the first time. I wrote about goals and about involving the users of ag research in setting those goals. At the same time, I told the college faculty we would be productive and accountable—productive in fulfilling the mission of a land-grant university and accountable for the funds we were entrusted with.

After two decades of administering the South Dakota Agricultural Experiment Station, I feel confident and satisfied that we have fulfilled our commitments, with the assistance of faculty and many citizen groups and individuals. We have modified our mission and goals at times, but I am proud that our basic tenet remains: "We help South Dakotans produce safe food and fiber that is profitable to producers and affordable to consumers, and we achieve this production in ways that protect the environment and maintain our natural resources."

The SDAES has made many notable contributions through agricultural research since its beginning in 1887. To continue that record was a challenge; but it's too early to tell, even after a 20-year tenure, if I have measured up to the standards of earlier directors.

The quality of life and the standard of living that we enjoy today does not come from research going on now. They are, instead, the benefits of the work of previous generations. Research often takes that long to "trickle" into production agriculture. Consequently, your children will be assessing the value of what was done here in the past 20 years. I may feel good—and I do—about how I and our project leaders have anticipated the future, but, as with past successes, the real benefits will

not be known until we arrive at that future.

One of the major responsibilities of an experiment station director is to provide an atmosphere and facilities in which scientists can conduct relevant research. Our field stations are important to our mission. In South Dakota we need to provide for the needs of a diverse agriculture in a state of infinite variety.

We have started new stations and we have closed old ones. This has given us opportunities to bring our research "closer to home," but this also explains why we have not recommended or made large investments in facilities at the stations. They are not showplaces. But they are neat and uncluttered. They are places where high-quality research is happening.

Keeping our field stations up requires great effort. I deeply appreciate the assistance of our station advisory boards and the funding from the legislature and the private gifts that have put our field stations into such good condition.

Any director can look good if he has the right people to do the work. I have been particularly fortunate in the quality of scientists, technicians, secretaries, and students who are part of the Experiment Station. Our people are largely recruited from a rural background; they have a Midwest heritage. They possess a work ethic second to none. They are dedicated, loyal, and high achievers. Many of them would have been farmers or ranchers themselves, had there been the opportunity at the right time.

I salute all staff and I add to that my sincere thanks for the many ways they have made my job more rewarding. I have enjoyed working with

commodity groups, various state and federal agencies and commissions, and regental and legislative committees. All have helped to keep us heading in the right direction.

I am an early riser. I have driven to my own farm in Deuel County, parked, and watched the sun come up. I have seen shadows resolve themselves into deer or cattle, heard the chickadees call over the cackle of a pheasant. The beauty of dawn never fails to charge my batteries.

On one such morning I was running late on my way to the farm and was only a few miles from campus. I was playing with the toys my new pickup possesses, many more than I actually needed. To adjust the door mirrors, I had to pull over. Ahead of me I saw fertile fields, modern farms, and the promise of a bright and productive future. Behind me, in the mirrors, I saw the campus and the buildings of the Agricultural Experiment Station. Framed in the center mirror was the Northern Plains Biostress Laboratory.

I made the connection. It was like looking behind me to see the future. I saw the contribution that research has made to a strong and productive agriculture. And I saw how research will continue to meet its many challenges.

I am proud of the contribution of the Experiment Station to South Dakota agriculture, and I envy those who will continue on, particularly those working in the NPBL. The NPBL represents change—a new thrust, another way of achieving those well established goals of Experiment Station research.

But, after 43 years of teaching, research, and administration in high school and at the University, it is a good time to let go, so I will. The best to each of you. □

Ray Moore reflects on changes in farming and in ag research

Jerry Leslie

Dr. Ray Moore, after serving 20 years as director of the South Dakota Agricultural Experiment Station during a total of nearly 38 years as a faculty member at South Dakota State University, is stepping out of the arena, his battles for budgets and political survival over, his laurels garnered.

The end of an era, with Moore's December 31 retirement, provided an opportunity for him to reflect on his years as teacher, founder of SDSU's Pasture Research Center, head of the Plant Science Department, and finally director of the Agricultural Experiment Station.

He also "looked back to the future."

He touched on many subjects: teaching, farm life, loyalty, the farm exodus, technology, responsibility, dealing with people, honesty, state government, food production, and change—what has been and what might be.

From an hour-long interview, some vignettes emerged:

- Moore has always considered himself a teacher first, before researcher or administrator.

- Farming has gone "high tech," more so than many other industries, and machinery in use today is "mind-boggling," even to a scientist with a Ph.D.

- Land-grant universities weren't responsible, in Moore's opinion, for the bigness in farming and farmers leaving the land, at least not as much as tractors and machinery which got bigger and bigger and more expensive, requiring more and more land to pay their keep.

- Moore, too, regrets the passing of the days when many people operated small farms; the days of country schools, of community clubs—the rural life of the 1940s, and wishes he knew how to stop their passing.

- The starvation-predictions from British economist Malthus were unfounded, in the short term. Moore believes: We will be able to produce enough food for the world for 50 years or more, and will continue improving varieties and crop yields and animal production.

- The only posture for a university administrator to maintain with clientele groups and the legislature is one of "honesty."

- Moore thinks his survival is because of a good clientele following, coupled with delivery on promises for productivity and accountability in the Agricultural Experiment Station.

Moore is probably as through-and-through a South Dakotan as any who ever served in administration at SDSU.

Born Nov. 16, 1927, at Britton, S.D., Moore graduated from Kidder High School in 1945 and received bachelor's and master's degrees from SDSU in ag education/economics and agronomy, respectively.

He never left the state for any appreciable time, except to serve in the U.S. Navy and then to get his doctorate from Purdue University.

With his parents still farming in Marshall County, Moore taught vocational agriculture at Martin and then in 1956 joined the agronomy staff at SDSU as a teacher.

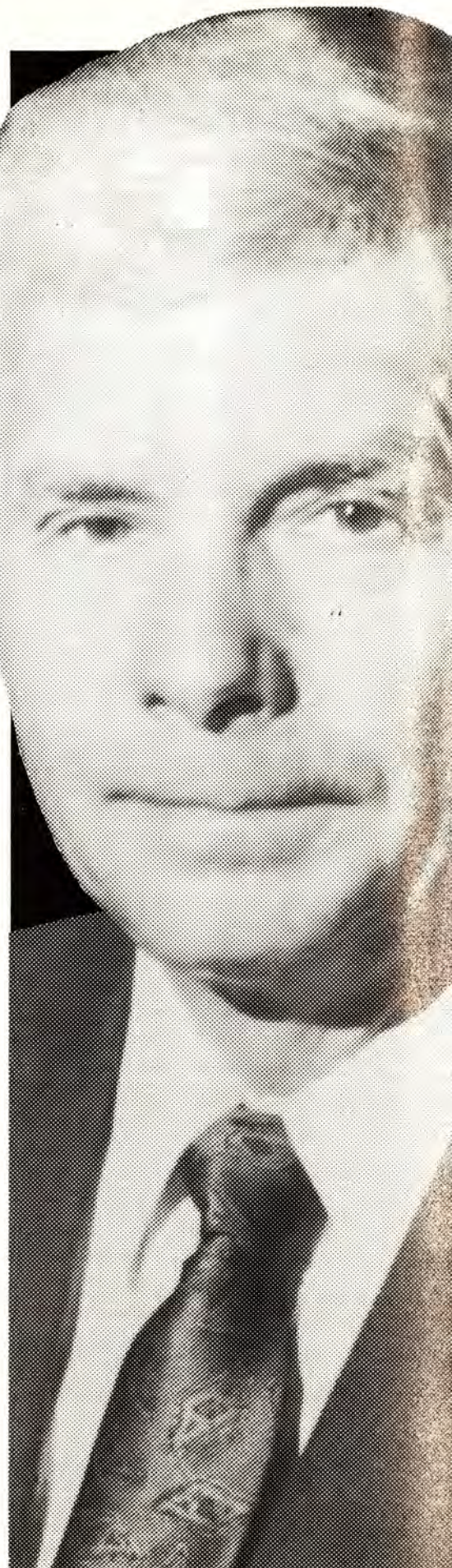


photo: Kevin Schmidt

His parents felt good about what he was doing. "They thought it (SDSU) was a good spot for me to be in," Moore remembers.

While he had a number of opportunities to work in other states, he stayed in South Dakota. Was it roots, loyalty, or something else?

"There was a loyalty here to family, at a time when my folks were alive, and I wanted my kids to be raised here and be close to the family. But now they have grown up and moved away."

But it was also loyalty to the university, to the position.

"It seems there was always something I had started, I was involved in, I wanted to see it through, and it was important enough to me."

Among them was a major grant from the Cooperative States Research Service to start the Pasture Research Station at Norbeck. Or he was starting a new program or working on the Northern Plains Biostress Lab, even before it was called that.

And the NPBL, dedicated September 17, 1993, surely figured in Moore's decision not to take early retirement, which he could have done back in 1988, or even normal retirement at 65, which he could have done a year ago.

Growing up close to the land and never leaving South Dakota, Moore has had a unique perspective from which to observe change.

On the farm exodus and increasing size of farms, Moore said, "I wish that we still had more people living on farms and I wish we could still make a living on smaller farms." He remembers the way things were:

"I grew up in the 1940s hauling bundles. Here was a half-section farm, and another was a quarter and an 80, and over there was a large farm, those folks had three quarters. The rural school and community club—it was all there. I had my time in a rural school. It served me well.

"We had a reunion at the home farm near Kidder. There was the Moore hill, just next to the farm, and I went up on the hill at daybreak and took a picture as the sun came up...



photo: Duane Hanson

The Experiment Station director takes the banner of agricultural research before any number of groups, committees, and organizations, but for Ray Moore, the personal one-to-one contact at a field day was as important, and as rewarding, as any. The key in any of these meetings has always been honesty: "Always tell the truth and don't wonder what you said."

"And I hardly knew where I was, except I could see the farmstead and the elevator my grandad had built and the big house—that's still there.

"All these neighboring farms were gone—the Bundrock farm, the Wolf farm, the Martin farm. They're gone, and so are many others. You wonder who the school bus picks up any more."

Does he regret that?

"Yes, I miss that just as much as anyone else, and I don't really feel that what I've done in my job as a scientist, as a teacher, educator, and administrator has really anything to do with that.

"I haven't made it worse or better. I couldn't stop it. I would like to have stopped it, to a certain extent. But I know that for the neighbors to stay there they had to make a living."

Some have said the land-grant universities were responsible for the bigness in farming today. "It's a fac-

tor, no doubt," Moore said. "We didn't design all the machinery, we didn't lower the prices that made it necessary to farm so many acres."

Moore remembers a coffee gathering on a farm with National Farmers Organization members in the heyday of that organization. Its members were accusing him and Experiment Station people of being responsible for the size of the farm.

"I let them go on, then finally stood up, filled my coffee cup again, and said 'we're not nearly as responsible as you are right here,' and I pointed out the window.

"He'd just bought a new tractor, a big tractor. Because he bought that new tractor he had to have more land, and with the new tractor he had to get bigger machinery to pull. It wasn't us, it was something else.

"Why'd he buy that big tractor? Because it was there, it was available to be bought."

Farm machinery has really gone high tech, even more so than other industries, Moore remarked.

One day while on his Deuel County farm and fixing fence with a manual post hole digger and using a Ford tractor to pull his trailer of fence posts, he was musing over how "low-tech" his operation was in contrast to a "high tech" business he was evaluating, a business that altered DNA in plants.

At that moment his partner drove up in a diesel semi rig pulling 12-row equipment. The semi had water tanks on the back and a computer in the cab; and he was calibrating the various chemicals to go into the tanks, one for weed control, one for fertilizer. The computer saw to it that he'd use the recommended amount of chemical with no wastage, and when he left the farm, the tanks would be empty.

Moore realized then that "farming is probably as high tech as that plant genetics business."

A half hour in the cab of a combine with Dwayne Beck, manager of the Dakota Lakes Research Farm near Pierre, underscores the technological developments in farming, Moore said.

The cab carries an on-board computer that is linked by a small dish to a satellite, enabling the computer to interact with another computer in touch with the satellite. It can compute moisture content of the corn as it comes into the combine hopper.

Researchers at that farm also spray a dye on the corn in the field to calibrate how fast the kernel coming into the hopper affects the metering devices on the machine.

"High tech? You bet."

One major benefit of the new technology in farming is that "we certainly have a better quality product that we deliver to the consumer than we did earlier."

Land-grant universities were involved in developing some of that technology, through basic research from 20 or more years ago that is paying off today, as basic research today will be paying off 10 or 20 years down the road.

Changes in agriculture in the 50 years ahead are as inevitable as were changes in the last 50 years.

"Certainly we're going to see a continuing increase in production," Moore said. "We have the capability to produce corn that will yield a whole lot more than it does now, and the same is true of other commodities."

"I hope that within 50 years we'll see a corn that produces its own nitrogen like alfalfa does. Actually we already have a corn that will do it. When it does, it doesn't produce an ear. That's a major problem."

"I know scientists who say it isn't going to happen, because it takes too much energy. But I think it will."

Moore also thinks SDSU and other land-grant scientists are closer to moving disease resistance from unrelated species—like wild plants, weeds, and forbs—into domesticated crops.

In the corner of his office and on top of a file cabinet, is a bouquet of prairie coneflowers or Black Sampson. "It's kind of a symbol. The plant in itself is not very pretty, so why would I keep it there? It never has any bugs on it. It produces its own insecticides."

A graduate student's research plots on the SDSU Agronomy Farm have been increasing seed from the prairie coneflower for the last 2 years. Meanwhile, other SDSU researchers are using tissue culture to try to transform that capability into sunflower. The attempt is also being made through more standard breeding techniques.

"If we can get that characteristic into sunflowers, we'll have a plant that will be a lot more important in South Dakota. We won't have to spray it several times a year just to control insects. I think something like that is going to happen. I think in much less than 50 years," Moore said.

"I don't think there's any problem at all about this country and other countries having the capability to feed themselves and the world in the near future. Some will

say we can't feed the world now. That's right. If we could get all the food to where it could be used, we wouldn't have much of a surplus, our grain bins would be nearly empty."

The problems of simultaneous abundance, scarcity, and poverty will continue, Moore believes. He thinks that the agricultural community still has the potential to increase production, perhaps even for another century. Further, he believes the environment can be protected and our natural resources can be maintained while doing it.

History is showing that Malthus was wrong, at least in the near term.

Many researchers and ag policy makers during the first three fourths of this century were influenced by Thomas Malthus, the British economist, who in 1879 held that population progressed geometrically while methods of subsistence increased arithmetically—meaning that people would increase faster than the food supply, and that unless population was deliberately held in check, it would be brought to a subsistence level by famines, wars, and plagues.

Moore and the scientists of his era were affected. Talk of famine was common a half century ago. In 1947, Moore attended a lecture in the old Stock Pavilion, now the Ag Heritage Museum at SDSU, by a British scientist talking about raising food on the ocean floor because there was no longer enough land area.

At a conference in the 1960s were George McGovern, then chairman of the Food for Peace Program; Earl Butz, later to be Secretary of Ag; and people from the Ford Foundation, the Rockefeller Foundation, and others. One speaker was Bill Paddock who with his brother had written the book, *Famine—1975*.

"The prediction was one of real gloom, that we couldn't possibly survive past 1975 with any quality of life, because we'd be starving to death," Moore said.

"What happened when 1975 came? We had more food than we ever had. And 1985 was even better. We have

just kept it going." Moore thinks the trend will continue, although Malthus might be right in the long term, at some point in time unknown.

Now that Moore is retired—except for half-time during a transition period for the next 6 months—he will be in a position to show his grandchildren where he has been and what he did.

What will he point to?

"If we see some good grass, some good legumes, a good pasture, a good forage field, I'll say I had a part in that." His contributions to the forage field came from many directions, from being actively involved as project leader to administering or managing research of others, then implementing it on SDSU's research farms.

"If we were to walk up to the Northern Plains Biostress Lab, I'd show them my name on the plaque," even though he contends he's been given more credit for that than he deserves.

"If we're riding across the state or looking at a map, I'll point out that I've been there, at each Experiment Station farm, and say how I was involved, even if in a modest way."

Moore was in the front line during closing of stations at Redfield, Presho, and Norbeck and the starting of Dakota Lakes and Norbeck. He also was involved in the relocation of the Presho station to near Rapid City, which was the start of the West River mobile research program operating out of Boxelder. The university also once had stations at Milbank, Menno, and Garden City during his tenure. The stations at Beresford, Highmore, Watertown, Cottonwood, and Buffalo have been on-going in his term.

Moore was a sought-after public speaker and gave in the neighborhood of a public talk once a week, more or less, around the state and sometimes region. He also went to Washington regularly in support of federal funding for SDSU's agricultural research programs.

Building public support for agricultural research was part of his job as director, and it took him before



photo: Jerry Leslie

Ray Moore sees many changes ahead for agriculture, including taking attractive characteristics from one plant, and moving them into other plants. With this in mind, SDSU has been increasing seed from the prairie coneflower, which produces its own natural insecticide, for the last 2 years. Researchers are using tissue culture in an attempt to transfer that ability into sunflowers.

commodity groups, citizen groups, the Board of Regents, and, at times, state legislative committees. Was there a posture that a university administrator had to maintain before these groups?

"Honesty! That's one word that doesn't take me long to think of. You must be honest. Then you don't have any trouble remembering what you said. And that's not an inconvenience. I think I learned that from my first-grade teacher: Always tell the truth and you don't wonder what you said."

In his career, Moore was witness to several campus political battles, some that went as far as the state capital. He saw a common thread in these tempests:

"I remember the Leinbach-Hixon-Worzella conflict of the 1950s and more recently the Ag College problems of the 1980s. The latter as well as other more minor skirmishes were, in my opinion, rooted in budget cuts.

"But once an opportunity presents itself, we as faculty and administrators are very capable of enhancing a problem by venting personal concerns to a prominent individual, a favorite legislator, or commodity group. Then that person or group might initiate an action that sometimes can grow like a snowball downhill. Often, that creates the perception of a problem much greater than reality. In fact, it often

gives the illusion of a problem where none previously existed."

Looking back on the years, Moore believes those who worked with him may have viewed him as an administrator or as a researcher. However, he always thought of himself as a teacher. He has a degree in education, whereas not many in the ABS College do. "People never see me as a teacher."

His greatest satisfaction in his career came in the 1960s when he was named "Teacher of the Year" for the university, at a time when one such award was given across the university.

He also has taken pride in the young people that went through his courses and went on to be successful.

As Moore is unhooking from the land-grant university system, he has 6 months to share acting director duties with David Benfield, the veterinary science researcher who made headlines with Mystery Swine Disease.

Moore was surprised to see what opportunities surfaced following the announcement of his retirement. So expect to see him continuing using his scientific expertise in agriculture in private consulting or on a volunteer basis. □

The writer is Jerry Leslie, news and features writer in the Department of Agricultural Communications, SDSU.



Once in a lifetime weather

Dr. Larry K. Tennyson

It was the wettest summer on record, and it highpointed a year that left even the most seasoned weather observers scratching their heads in dismay.

According to State Climatologist Al Bender at South Dakota State University, a year like 1993 is not apt to come along even once in a lifetime.

Bender said summertime precipitation for the state as a whole was 13.48 inches—a new record by more than a half-inch and nearly twice the long-term state average of 7.87 inches per summer.

Second only to the summer of 1993 was the summer of 1944, when 12.79 inches of precipitation were received in the state. Third, fourth, and fifth highest amounts were received in 1915, 1992, and 1962, respectively.

“July was the most unusual month of the summer,” Bender commented. “It not only set a new record for South Dakota, but it also was above normal in precipitation in each of the nine climatic districts of the state.

“June also was wet, but it typically is the month when the greatest amount of precipitation is received—not July,” he explained.

“When the months of July 1992 and July 1993 are considered together, they become the wettest period in our history,” Bender continued.

July rainfall totals for many parts of the state were “unprecedented,” the climatologist said. Some weather stations recorded over 10 inches. Webster reported 11.43 inches, in fact. This drove the new July record amount of precipitation almost an inch above the previous record.

South Dakota’s summer of 1993 was not the coolest on record. It was the third coolest in 104 years of record keeping, however.

“Summers that deviate from the normal temperatures as much as this one occur only once in 20 years,” Bender said. “That we’ve had two consecutive summers as cool as those of 1992 and 1993 is without precedent in our record books.”

This weather trend began in June 1992 with widespread, severe weather. This pattern of cool, mostly wet conditions now has persisted for almost a year and a half, Bender said.

“By July 1992, field conditions were incredibly wet, crops were unplanted, and floods were the news story of the day throughout the Midwest,” he went on.

“The western part of South Dakota had July temperatures that were 8 degrees below average, and this too was a new record,” he said.

As of the end of November, South Dakota had experienced below average temperatures for 17 out of 18 months. Only March 1993 was above average in temperature, and then only by .4 degree.

The extreme wet spell first came to a screeching halt, and it then reversed. During the months of August and September, precipitation levels returned to normal. During October, precipitation fell to half of its normal level for that month.

Another unusual aspect on the record-setting year is that many observers were worried early in the



photo: Jerry Leslie

For South Dakota and most other parts of the midwest, 1993 brought rainfall that drowned all previous records. While flooding was a problem many places, the extra moisture allowed many West River areas in South Dakota to record outstanding hay and wheat crops, and filled stock dams to the brim. The conditions that have been cause of the unusual weather the past 2 years still exist, and may bring South Dakota more once-in-a-lifetime weather.

spring about inadequate snowpack in the areas surrounding the headwaters of the Missouri River in Montana.

It looked like there would be less water to feed the Missouri River reservoirs, including the four located in South Dakota. This was viewed as a threat to the amount of electrical power that could be generated, the irrigation water supply, irrigation energy rates, and even recreational opportunities.

"It was hard to imagine a condition like that after a year that also had seen the drought broken in California, flooding in Arizona, and heavy snow for the nation's top winter recreational areas," Bender explained.

The forecasted runoff for the Missouri River in the northern Rocky Mountains was about 80% of normal for the April through September period, and the National Weather Service satellite and the Soil Conservation Service SNOWTEL center both indicated snow pack not only short of normal depth, but also of unusually low water content.

"The winter storm track had sent storm systems roaring across the nation far to the south." This condition produced snow that was less

dense than normal and that contained only about 70% of the water that it should.

But Mother Nature had yet another surprise up her sleeve. Runoff into the Missouri River from totally unexpected sources—such as the plains streams—swelled the main-stream dam pools to near normal levels.

Incredibly, electrical generation lagged as though none of this water supply had even occurred. Downstream states were experiencing such severe flooding that water release through the electrical generators had to be curtailed.

As a result, only about half of the normal amount of electricity was generated.

"With all its foibles, and with all the havoc it raised in the corn, hog, and soybean production areas of the state, there have been some bright spots in the weather picture for 1993," Bender said.

"Any time you take 'cornbelt moisture' and move it into the drier, western areas of South Dakota, you turn it into a garden," he said. "And that's a fair description of what hap-

pened. Outstanding hay and wheat crops were the rule in many West River areas. This weather pattern also filled many stock dams to the brim to bring vital water supplies to the livestock being raised in that end of the state."

What's ahead? Bender says extremes in weather are often the result of El Niño winds. The conditions that produce the El Niño first appeared in the fall of 1991. Now, 2 years later, the conditions—such as warmer ocean water surface temperatures—still persist.

"We've never seen this last so long in the history of modern weather observation," Bender said.

"I'm not certain just how this will affect the weather in South Dakota, but one thing is certain: whatever results will be a great departure from normal. That's a key characteristic of the change that occurs when El Niño winds alter upper air currents and normal storm tracks on a worldwide basis." □

Dr. Larry Tennyson is communications specialist in the Department of Agricultural Communications, SDSU.

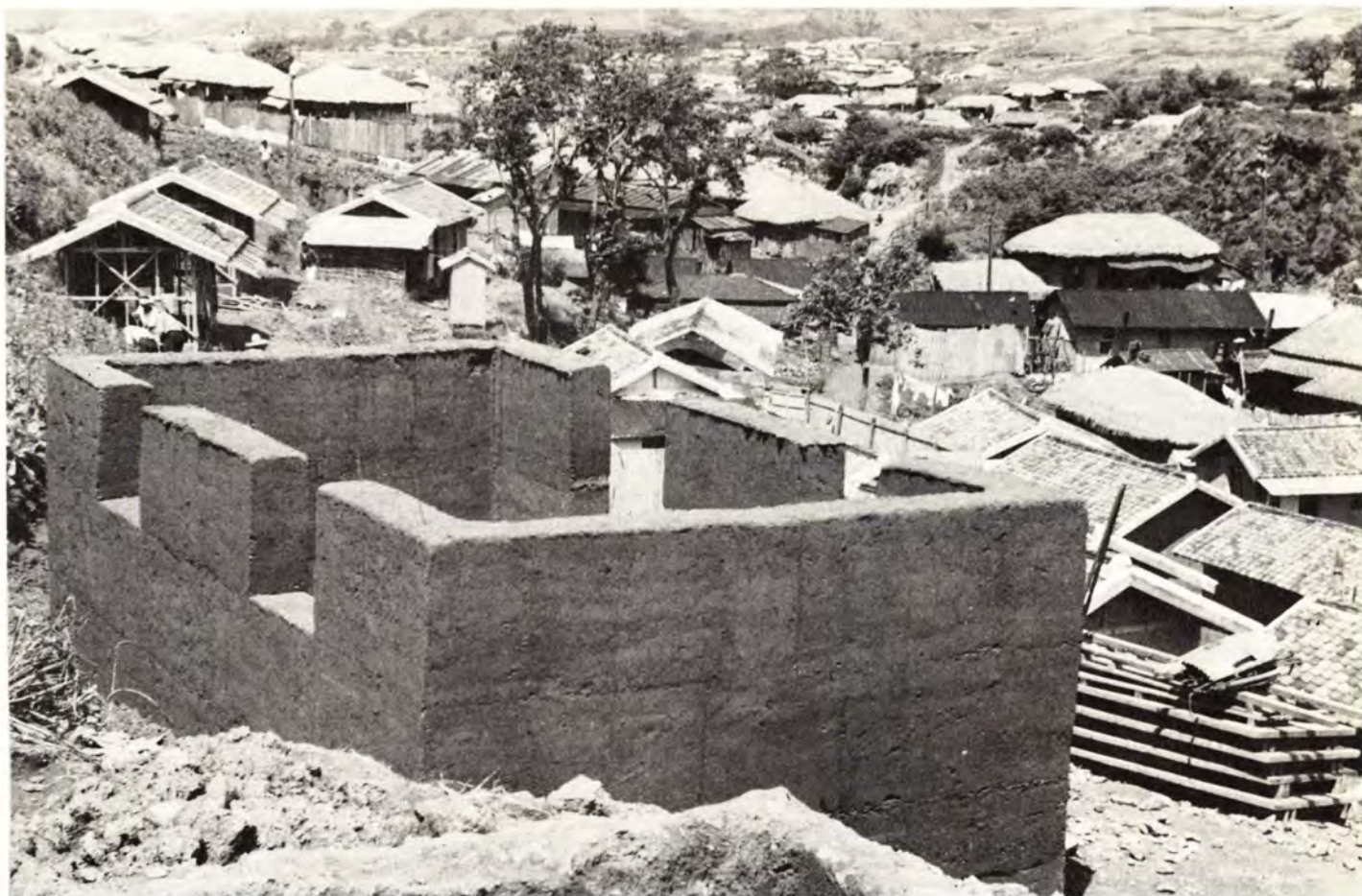


photo: SDSU

Rammed earth revisited

Dr. Larry Tennyson

Worldwide interest in SDSU rammed earth construction research is like a certain pink rabbit we see in television commercials: it just keeps on going, and going, and going.

Even now, some 64 years after the research began and 53 years after it ended, about one request for information is received each month from builders, architects, researchers, and humanitarian agencies worldwide.

Looming shortages of fossil fuel energy, widespread poverty in third-world countries, earthquakes, and other factors all work to keep the research useful, contemporary, and vital.

Rammed earth construction—often referred to by its French name, *pise' de terre*—is a centuries-old method for constructing buildings with mechanically compacted soil. It is one of several methods of building structures from soil, including the adobe brick method often used in the southwest and the sod house method common in our own pioneer era.

Rammed earth construction involves the use of slightly moistened earth which is shoveled into forms and then tamped and hammered into rock-like hardness.

For use in the upper midwest, the other two methods have certain limitations. For instance, adobe does not

satisfactorily withstand our climatic conditions, and the usefulness of sod construction was limited to only certain types of buildings. Properly protected rammed earth construction, however, works well in a state like South Dakota.

The potential usefulness of rammed earth construction is what inspired the late Ralph Patty, former head of the South Dakota State University Department of Agricultural Engineering, to do more than any other man to bring scientific research and development to rammed earth construction—which previously had been mostly a

trial-and-error construction method.

Patty's work began in 1929 and continued over an 11-year period to 1940. Evidence of the work is still visible today on the SDSU campus as garden walls that partially surround the residences of the university president and the dean of agriculture and as the 26 x 72 machine shed adjacent to the SDSU motor pool.

Rammed earth construction research at SDSU sought answers to questions such as how the walls could be made to withstand the rigors of the snows, winds, and bitter cold of the upper midwest.

Experiments included measuring the effects of various combinations of soil types and particle sizes, amounts of moisture included in the mix, compaction methods, the use of reinforcing steel, the use of blocks vs. monolithic walls, and the properties of various protective coatings such as stucco.

Patty found that a soil as near to 75 percent sand content as possible improved the weathering capabilities of the material. He also recommended that the soil mix contain a binder of 15 percent portland cement, which nearly doubled the strength of the wall.

In short, Patty and his colleagues tested just about every conceivable variable and variation in rammed earth construction in order to perfect the technique for use in South Dakota, and this earned a worldwide reputation for the institution in this field.

At one time, there were several other rammed earth buildings on the SDSU campus and in the Brookings vicinity. Poultry houses were constructed on the eastern side of campus in 1932, 1936, and 1939. These were razed to make room for new student dormitories during the early 1970s.

A rammed earth dwelling house located east of Flandreau, S.D., was



photos: Larry Tennyson

Rammed earth construction has been popular in developing nations for many years, because materials are cheap and labor is plentiful (facing page). But most rammed earth structures in South Dakota have fallen into disrepair. Several years ago the machine shed pictured here was deteriorating badly (top), but has now been fully restored (bottom), and is used as a workshop and storage area for the South Dakota Agricultural Heritage Museum.

based on the same plan Patty used for the poultry houses. Lightning struck the building in 1974, and the roof structure was completely destroyed by fire. Although the remaining walls were still in excellent shape, they were bulldozed.

Another nearby earthen building is a poultry house located on a farm east of Trent, S.D. It now has deteriorated to the point where it probably is impossible to save.

Elsewhere, a rammed earth structure was erected as a museum in

Bison, S.D. A poultry house and also a Boy Scout club house were built at Eureka, S.D. Yet another poultry house was built at Cottonwood, S.D. Rammed-earth building blocks were used for a school at Wanblee, S.D., and a barn at Pine Ridge, S.D.

Little is known of the present existence or condition of most of these structures. It is known that the Bison museum deteriorated because an unmaintained roof allowed water to soak into the rammed earth.

The machine shed is now the one remaining rammed earth building on the SDSU campus, and it may be the only fully restored building of its type in the entire state.

As recently as 1981, the late Henry DeLong, an Agricultural Engineering Professor Emeritus, warned that the deteriorating stucco covering on the outside of this machine shed could allow moisture to enter the walls and ruin the entire building.

DeLong, an early associate of Patty's, helped him with much of the rammed earth research, and he spent a part of his retirement answering dozens of inquiries annually from researchers and others.

The machine shed continued to deteriorate because of the scarcity of maintenance funds at SDSU. In fact, serious consideration was given to demolishing the building.

But at that point, John Awald, director of the Agricultural Heritage Museum on the SDSU campus, accepted custodianship of the building and set to work to restore and remodel it as a workshop and storage area for the museum.

The poultry house located east of Trent was not so fortunate, however. When it was first photographed by the author in 1981, it was found in remarkable condition, considering that it never had been stuccoed. Existing damage was most severe in the northwest corner and probably



photos: Larry Tennyson

Rammed earth structures are energy efficient, cheap to build, easy on natural resources, and have been known to withstand cyclones with little or no damage. But if they are not maintained they will eventually crumble, like this poultry house. Unrepaired damage (top) allowed moisture to seep into the interior of the walls, and a dozen years of rain and melting snow reduced the walls to piles of dirt.

resulted from moisture supplied by melting snow drifts.

During the dozen years that followed, the building deteriorated to a point that probably now makes restoration impossible. About half of the total perimeter walls have been reduced to piles of uncompacted earth and collapsed earth masses in various stages of compaction.

The author estimates that a dramatic increase in brush and undergrowth associated with the adjacent shelterbelt served to capture and hold vastly larger amounts of snow against the north and west walls during that 12-year period. When thawed, these snow drifts provided a source of moisture that eventually saturated large sections of the compacted earth, and they simply turned back into loose soil.

Although the landmark rammed earth research at SDSU has long since been concluded, it still commands a steady amount of worldwide interest.

As recently as last summer, a researcher came here from Australia to review the SDSU rammed earth data now housed in the Agricultural Heritage Museum and the H.M. Briggs Library.

Steve Burroughs of Canberra, Australia, had built dozens of rammed earth luxury homes and even an entire elementary school in his 25-year career as a contractor, and he now is a doctoral student at the University of New South Wales in Sydney.

He said rammed earth construction in Australia even is used in larger structures such as four-story hotels, churches, and other types of commercial structures as well as family homes.

He said the method has enjoyed a rising amount of popularity with Australians over the past 15 years not only because of its inherent potential for cooling and heating efficiency, but also because of its low impact on

natural resources and its safety during natural disasters.

Burroughs pointed out that rammed earth structures require three to five times less energy to build than a timber-framed building and almost ten times less energy to build than a steel-framed building. "In this era of rapidly diminishing energy supplies, this is an important consideration," he remarked.

He said that rammed earth dwelling houses in Australia have averaged inside temperatures of 64 F year around, so they furthermore require very little supplemental heating or cooling. "With just a little bit of study, we could warm and cool your South Dakota houses by 15 degrees compared to ambient air temperatures just by determining the proper rammed earth wall thickness," he said.

Burroughs also referred to damage caused when Cyclone Tracey hit Darwin, Australia, in 1974. "Darwin was virtually blown down, but the rammed earth structures were the only ones left standing."

As an architectural graduate student, Burroughs is writing his doctoral dissertation on rammed earth construction, but his current interest in rammed earth is even more humanitarian than commercial.

His future plans are to work for one of the United Nations agencies that focus on housing for the extremely poor peoples of the world. Rammed earth construction provides an ideal type of structure for that purpose because it's quite literally "dirt cheap" to erect as well as being energy efficient.

He also suggests that with about 1,000 foreign students at SDSU—the vast majority of which are majoring in engineering—the relatively low-tech field of rammed earth construction might be a useful addition to the other, high-tech areas of their study, especially for students from so-called

third-world or developing nations where housing is often scarce or substandard.

Burroughs was led to South Dakota in his search for information after checking with a United Nations agency in Nairobi, Kenya. There, he discovered a bibliography that made several references to the work of Ralph Patty and his colleagues at SDSU.

Earlier, Burroughs had tested the walls of an older, rammed earth, four-stall garage in Sydney that was to be bulldozed. The building had been constructed in 1943 by G.S. Middleton on the basis of technical information he had obtained from Ralph Patty.

Burroughs discovered that some of Patty's buildings and rammed earth walls still stood on the campus, and this convinced him to travel here to examine them.

From his perspective, the two most important areas of remaining rammed-earth research are to further improve its strength and its resistance to erosion. These efforts could lead to worldwide standards for soil types, moisture, compaction, and the addition of various types of stabilizers.

The high labor costs of rammed earth construction mainly accounted for the discontinuance of the research at SDSU, but this problem has been solved, Burroughs said. "With the use of mechanical soil mixers and pneumatic tamps, labor has been cut to 6 man-hours per square meter of wall—and 4 of those hours are required for setting the forms alone."

The Australian suggested that study into faster forming methods could further enhance the economic advantages of rammed earth construction. □

Dr. Larry Tennyson is communications specialist in the Department of Agricultural Communications, SDSU.

Construction begins on new vet science and dairy facilities

Dr. Larry K. Tennyson

How's your German? Can you understand: *Alle guten dinge sind drei*? You're right! "All good things are three."

And, in terms of the 1993 building and expansion efforts for research, Extension, and teaching in the College of Agriculture and Biological Sciences here at South Dakota State University, this old proverb is right on the mark.

First off, of course, SDSU completed and dedicated the new, \$12.6 million Northern Plains Biostress Laboratory. Next, officials began a \$5.9 million project to expand, renovate, and remodel the Animal Disease Research and Diagnostic Lab. And finally, ground was broken for a \$1 million Dairy Research and Training Facility.

The Biostress Lab has been described extensively, but some readers probably are not fully aware of the nature of the other two facilities and the promise they hold for improving the economy of this state.

Work began in September for the Animal Disease Research and Diagnostic Lab project located across the street just north of the Biostress Lab.

One unusual aspect of the project is the short amount of time that it took

to get it planned, approved, and funded. All this was done in just 4 years, and that's nearly a record.

The expansion, remodeling, and renovation project actually is part of the new SDSU biostress research and service complex.

Main reason for the project is that the case load for the lab had simply outstripped the capabilities of the present 27-year-old facility. As recently as 1987, the work load was about 15,000 cases and 200,000 tests. In just the past 6 years, it grew to more than 25,000 cases and 450,000 tests.

About 18,000 square feet of space will be added in four phases of construction over the next 2 years. The addition will more than double the total size of the facility.

Included in the plans are total remodeling of the existing facility. In fact, little more than the outside walls will be spared in the work.

The idea is to move staff into the addition before starting the remodeling of the original portion of the building. This will enable service to the livestock industry to continue unabated despite the construction.

Funding includes \$5.4 million in state funds and \$500,000 in federal funding for biostress facilities. Gener-

al contractor is Henry Carlson Construction of Sioux Falls. Target date for completion is November 1995.

On October 4, a crowd of about 100 watched a team of oxen pull a walking plow through ground located north of campus to officially begin construction of a million-dollar dairy research and training facility.

It will replace a facility built in 1964 when the average South Dakota dairy had 25 cows producing about 7,000 pounds of milk annually. Today, dairy farms here average a 60-cow herd producing about 14,000 pounds of milk.

The need for the new facility was evident in the fact that most progressive dairymen now have newer and better facilities themselves than the existing ones at SDSU—a school with a national reputation for having the top dairy manufacturing program as well as an outstanding track record of training students.

The new research and training facility will incorporate a double-eight milking parlor which will accommodate a total herd of 160 head, with 80 head in a research wing and another 80 head in a teaching and demonstration wing. The design reflects state-of-the-art thinking in the Upper Midwest, and it emphasizes labor and capital efficiency.

The new facility also will expand the SDSU capacity for offering additional short courses, workshops, and management seminars for those in the dairy industry.

Financing includes \$350,000 in fund raising from the dairy industry, \$150,000 through the SDSU College of Agriculture and Biological Sciences, and \$500,000 in state funds.

Completion date is June 1994. □



photo: Larry Tennyson

After the groundbreaking, these oxen were replaced by bulldozers and construction crews, building a new dairy research and training facility, due to replace current facilities next year. The dairy facility is one of three new building projects on SDSU's campus, along with the expansion and renovation of the Animal Disease Research and Diagnostic Lab and the recently completed Biostress Lab.

Dr. Larry Tennyson is writer and communications specialist in the Department of Agricultural Communications, SDSU.

106th Annual Report

July 1, 1992, to June 30, 1993

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 D.C. Hilderbrand, PhD, professor and head (resigned 8/93)
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Projects

Agricultural Engineering

H-160, Studies on interior conditions and technical considerations for livestock housing; Anderson, Pohl
 H-179, Crop harvesters (combines) and soil compaction; Alcock, Durland
 H-189, Applying and recording ag chemicals simultaneously via computer control; Klosterman, Alcock, Durland, Stange
 H-190, High temperature short time extrusion processing of renewable agricultural materials; Julson, Krishnan
 H-192, Root growth and soil impedance; Alcock, Myers
 H-200, Water management of glacial till soils to sustain profitable crop production and minimize adverse environmental impacts; DeBoer, Stange, Chu, Werner
 H-210, Design and performance of agricultural structures; Anderson, Schipull
 R-239, Variables in agricultural weather information systems; DeBoer, Stange, Chu, Werner
 H-261, End effector design for automated handling of biological materials; Humburg
 H-271, Machine vision applied as a sensor for automation in agriculture; Humburg
 H-310, Modeling contaminants movement in unsaturated soil with a new water flow network; Chu, Kohl, Carlson

Animal and Range Sciences

H-049, Nutritional management to minimize costs and improve reproductive performance of beef cows; Pruitt
 R-079, Genetics of body composition in beef cattle; Marshall
 H-090, Overstory, understory, and soil water relationships of hydrologic units in the Black Hills; Gartner, Sowell
 H-101, Physiological and nutritional interactions that affect growing pigs; Hamilton, Libal
 H-120, Patterns of defoliation and plant response to grazing; P. Johnson
 H-128, Reducing breeding seasonality in the ewe; Slyter
 H-141, Low fat meat snack food: procedures, shelf life and raw materials; Costello, Romans, Crews
 H-151, Beef cow production efficiency and the interaction of plane of nutrition and genotype; Birkelo, Marshall, Miller
 H-220, Effects of prepubertal rBST exposure and energy intake on development of beef cows; Pritchard
 H-232, Metabolizable protein requirements of cattle during rapid growth; Pritchard
 H-251, Improving the composition and location of animal fat to make meat more healthful; Romans
 H-289, Influence of gonadotropin releasing hormone implants on reproductive performance in beef cattle; Miller, Goehring
 H-290, Effects of balance and level of indispensable amino acid on daily feed intake by swine; Hamilton, Libal
 H-292, Development of a field guide to the vascular plants of the Black Hills; J. Johnson
 H-301, Nutrition and management influencing reproductive efficiency of swine; Libal, Hamilton
 H-319, Managing corn grain, corn silage and alfalfa hay in cattle feeding and farming operations; Wagner
 H-321, Effect of antibody and toxin on mulberry heart disease complex in the weaned pig; Libal, Hamilton

- H-340, Cattle and sheep grazing alone and in combination on the Northern Great Plains; Sowell
R-342, Increased efficiency of sheep production; Slyter
R-390, Factors regulating protein synthesis, degradation and growth in skeletal muscle; McFarland

Biology/Microbiology

- H-162, Enhanced growth and reproductive efficiency; Granholm
H-170, Development and optimization of a calcium magnesium acetate (CMA) production process; Gibbons
H-221, Rapid fixation and selection for agronomic characters through another culture of spring wheat hybrids; Chen, Cholic, Bucheneau
H-222, Nitrite reductase gene of *Azospirillum brasilense* and nitrite assimilation; Westby
H-231, Molecular biology of a mammalian gene which regulates carcass size, fertility, and obesity; Westby
H-311, Echinacea: a potentially new oils crop for the Great Plains; Reese

Dairy Science

- H-020, Application of milk concentration techniques in dairy processing; Mistry
H-080, Composition, quality, and consumer acceptance of milk and dairy products; Baer
H-100, Analysis of dairy products; Parsons, Kelley
H-130, Improving quality and microbial safety of dairy products; Henning
R-142, Genetic improvement of dairy cattle using molecular markers; Foster
R-172, Dairy herd management strategies for improved decision making and profitability; Foster
R-202, Metabolic relationships in supply of nutrients for lactating cows; Schingoethe
H-212, Whey utilization by dairy cattle; Schingoethe
H-258, Optimizing the nutritional utilization of forages for dairy cattle; Harrison

Economics

- H-011, Sustainability of "organic" versus "conventional" beef production in South Dakota; Taylor, Feuz
H-050, The economics of alternative marketing/management strategies for South Dakota beef cattle producers; Feuz
H-081, Analysis of seasonal patterns in grain prices and evaluation of alternative grain marketing strategies; Qasmi
H-152, Crop production functions: economic implications for South Dakota; Franklin
H-181, Economic and environmental implications of conservation reserve program contract expiration in South Dakota; Janssen
H-191, Policy and economic aspects of sustainable cropping systems; Dobbs
H-241, Farm financial management of successful family farms in South Dakota; Janssen
R-291, Regulatory, efficiency, and management issues affecting rural financial markets; Lamberton
H-302, Acreage supply response for major crops for South Dakota; Ellingson
R-348, Impacts of transportation changes on agricultural marketing and local communities; Lamberton
H-370, Economics of rangeland improvement; Beutler

Home Economics

- R-122, Enhancing health and safety through personal protective equipment; Scholten
H-140, Near-infrared reflectance spectroscopy in the measurement of total dietary fiber and beta-glucan; Krishnan, Kephart, Reeves
H-211, Adipose tissue composition and chronic disease patterns; Crews, Simmons
H-282, Effect of ground flaxseed as Omega-3 source on insulin receptor binding; Bohannon

Horticulture, Forestry, Landscape and Parks

- MS-022, Strategies of resolving forest production vs. forest recreation conflicts in the Black Hills of South Dakota and Wyoming; Stubbles
R-042, Rootstock & interstem effects on pome and stone fruit trees; Fennell
H-052, Environmental stress and fruit production in South Dakota; Fennell
H-069, Vegetable breeding, evaluation, production, and cultural practices to increase yield; Prashar
MS-088, Genetic improvement of tall tree species for protective forestry applications in South Dakota; Schaefer

- H-169, Micropropagation of herbaceous plants; Spinski
MS-299, Evaluation and propagation of superior selections of native and introduced trees and shrubs for South Dakota; Evers
MS-387, Factors associated with the success/failure of ponderosa pine regeneration in the Black Hills, South Dakota; Schaefer

Plant Science

- G-013, SDAES Participation in NAPIAP; S. Clay.
H-021, Soybean breeding and genetics; Scott
H-030, Crop rotation system influence on earthworm population in a no-till environment; Beck, Venner
H-031, Etiology and epidemiology of plant viruses in South Dakota; Langham
G-041, Tillage induced microrelief impacts on NO₃⁻ and atrazine movement in soils; Clay, D. Schumacher, S. Clay.
H-058, Spring wheat breeding and genetics; Cholic, Buchenau
H-060, Molecular genetics of lipid and protein biosynthesis in oilseed crops; Carter
G-061, Mapping quantitative trait loci (QTL) using molecular markers in cultivated oats; Reeves, Kahler, Butler
H-062, Phosphate buffering capacity in select South Dakota soils; Doolittle, Gelderman
H-070, Soil survey information, soil productivity relationship, and environmental protection in South Dakota; Malo
R-078, Interaction of nematode-host variability and abiotic factors on crop losses; Smolik
H-091, Soybean in vitro; Espinasse-Gellner
H-092, Development and utilization of oats and rye adapted in South Dakota; Reeves
H-102, Correlation, calibration, and interpretation of soil and plant tests; Gelderman
H-111, Agricultural management impacts on wetlands; Rickerl, Bleakley, Hubbard
H-118, Amelioration of claypan or formerly cultivated clay-rich soils to increase range forage production; White
H-132, Management of northern and western corn rootworms in South Dakota; Fuller, Sutter, Boetel
H-138, Corn genetics, physiology, and breeding; Wicks
R-148, Soil productivity and erosion; Schumacher, Lindstrom
H-150, Biological factors contributing to rehydration of winter wheat tissue; Kenefick, Schumacher, Gellner
R-161, Introduction, multiplication, evaluation, preservation, documentation, enhancement, distribution, and utilization of plant germplasm; Wicks
H-180, Modeling and verifying chemical transport within and through the root zone; Carlson
H-199, Frozen soil effects of herbicide movement and weed ecology in conventional and alternative management systems; S. Clay.
H-201, Abscissic acid regulated genes in freeze resistance of barley; Kenefick, Sutton, Cheesbrough
H-229, Expert systems for scheduling fungicide applications for wheat disease control; Buchenau, Gallenberg
H-230, Tillage and crop rotations for eastern South Dakota; Sorensen
H-240, Breeding perennial grasses for forage, wildlife habitat, and resistance to insect-related stresses; Boe
H-250, Root systems responses to stress: soil compaction in conservation tillage systems; Schumacher
H-260, Management options for groundwater quality protection within a biostress environment; Kohl, Rickerl, S. Clay.
H-269, Alternative farming systems; Smolik
H-270, Morphological aspects of growth, quality, and stress endurance of forage crops; Kephart, Boe, Twidwell
H-280, Environmental and biological stress in wheat; Gellner
R-287, Seed production or breeding lines of insect-pollinated forage legumes; Boe
H-309, Oilseed breeding and genetics; Grady
R-312, Forage crop genetics and breeding to improve yield and quality; Boe
H-320, Reduced tillage crop rotation systems; Stymiest, Geise, Gellner
H-330, Genetics of host-pathogen interactions on row crops in South Dakota; Chase
H-341, Isolation and uses of actinomycetes associated with roots of grasses; Bleakley, Rickerl, Schumacher
H-380, Fertilizer nitrogen management of wheat under soil moisture stress; Woodward
H-388, Biological control of insects affecting seed production of forage legumes and grasses; McDaniel
R-398, Forage characterization and utilization for beef cattle; Kephart
R-400, Biological and ecological basis for weed model to reduce herbicide use in corn; S. Clay.
S-401, Foundation Seed Stock; Ingemansen

- S-402, Seed certification; Pollmann
S-403, Seed testing; Turnipseed
S-404, Variety testing; Bonnemann
S-406, Survey entomologist; Fuller
R-410, Nutrient management to sustain productivity while protecting surface and ground water quality; Gelderman

Rural Sociology

- H-112, Census data center; Satterlee

Station Biochemistry

- H-099, Mineral nutrition and metabolism in animals; Emerick, Kayongo-Male, Pritchard
H-110, Flow cytometry; Evenson
H-149, Analysis of selected herbicides and fungal metabolism; Matthees
H-171, Corn-based fungal polysaccharide production; West
H-209, Biochemistry of selenium; Palmer, Olson
S-407, Analytical services; Thies

Veterinary Science

- R-082, Prevention and control of enteric diseases of swine; Francis, Benfield
AH-131, Epidemiology and control of John's disease in South Dakota livestock; Johnson, Fawcett, Bjordahl
AH-182, *Chlamydia* infection in the intestine of pigs; Niefeld, Leslie-Steen
AH-242, Identification of the respiratory epithelial cell receptor for bovine herpesvirus 1; Chase
AH-262, Identifying pigs that are inherently resistant or susceptible to colibacillosis; Francis
H-272, Role of boar semen in the transmission of swine infertility and respiratory syndrome (SIRS); Yeager, Hennings, Benfield
R-281, Bovine respiratory disease: risk factors, pathogens, diagnosis, and management; Miskimins, Thomson, Leslie-Steen
H-300, Bacterial toxins and leukocytes in activation and regulation of porcine lymphocytes; Hurley
AH-360, Identification and characterization of cellular receptors to bovine coronavirus; Benfield, Nelson

Wildlife and Fisheries Sciences

- H-012, Assessment of movements, density, and depredation patterns of white-tailed deer at Sand Lake National Wildlife Refuge, South Dakota; Jenks
MS-051, Wood ducks and prairie woodlands: artificial nesting structures, brood survival, and habitat in South Dakota; Flake
H-071, Northern pike management in South Dakota ponds and small lakes; Scalet
H-072, Assessment of fisheries management options for South Dakota ponds; Willis
S-492, South Dakota Cooperative Fish and Wildlife Research Unit; Berry, Higgins

Articles, publications

If you are interested in any of these articles or publications and cannot reach the author listed, contact the department under which the reference appears. Some of the authors may be graduate students who have completed their studies and left SDSU. The department will be able to assist you.

Agricultural Engineering

- Journal articles:
Alcock, R. and V. Wittig. 1992. Empirical method of predicting traction. *J. Terramechanics* 29(4/5):381.
Anderson, G.A. and D.S. Bundy. 1992. Stiffness and strength data from diaphragm test panels. P 65 IN (J.N. Walker and F.E. Woeste, eds) Post-frame building design. ASAE Monograph 11.
Anderson, G.A. and D.S. Bundy. 1992. Estimating the stiffness and strength of roof panels from test panels. P 83 IN (J.N. Walker and F.E. Woeste, eds) Post-frame building design. ASAE Monograph #11.
Anderson, G.A. and D.S. Bundy. 1992. Diaphragm structural data determined by testing. P 241 IN (J.N. Walker and F.E. Woeste, eds) Post-frame building design. ASAE Monograph #11.
Chu, S.T. 1993. Capillary-tube infiltration model. *J. Irrig. and Drain. Engr.* ASCE 119(3):514.
DeBoer, D.W., D.L. Beck, and A.R. Bender. 1992. Field evaluation of low, medium and high pressure sprinklers. *Trans ASAE* 35(4):1185.

- DeBoer, D.W., M.J. Monnens, and R.A. Kohl. 1992. Operational characteristics of two rotating-plate sprinklers. P 339 IN (J. Feyen, ed) Proc of advances in planning, design and management of irrigation systems as related to sustainable land use. Leuven, Belgium: Center for Irrig Engr, Katholieke Universiteit.
- Publications, reports:**
- Alcock, R. and R. Godbole. 1992. New approach to the traction prediction equation. ASAE Paper SD92-111.
- Anderson, G.A. 1993. Impact of environmental factors on pig health and production. P 76 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Cai, S. 1993. Design capacity and stiffness of pro-panel II sheeting diaphragm. MS thesis, SDSU.
- Chu, S.T. 1993. Soil macropore infiltration model during rain. ASAE Paper 932066.
- DeBoer, D.W. 1993. Water stress and dynamics of corn and soybean growth. P 44 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- DeBoer, D.W. and H. D. Werner. 1993. Recent developments in plant stress measurement techniques. P 45 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Humburg, D.S. 1993. Response of mushrooms to vacuum used for handling. ASAE Paper 936014.
- Hegde, V., G.A. Anderson, and H.S. Ghazi. 1992. Dust in swine confinement buildings. ASAE Paper SD92-105.
- Julson, J., P. Krishnan, and S. Sharma. 1992. Characterization of a corn flour-polystyrene foam plastic. Proc, Corn Util Conf IV Paper 53. St. Louis, MO.
- Julson, J., T. West, and P. Krishnan. 1992. Laboratory investigation of microorganism specific degradation of corn starch-polyethylene plastic film. Proc, Corn Util Conf IV Paper 52. St. Louis, MO.
- Julson, J., S. Narayanan, and T. West. 1992. Environmental effects on the degradation of corn based foam plastic. P 107 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Krishnan P., Y. Pathak, and J. Julson. 1992. Erodibility and in vitro dyed release foam starch polyethylene extrusion products. IN Abstracts, Am Assoc Pharm Sci 14. San Antonio, TX.
- Li, Y. and S.T. Chu. 1993. Estimate aquifer recharge with vadose zone composite hydraulic conductivity. NCC-ASAE, Moorhead, MN. ASAE Paper RRV 93-404.
- Li, Y. and D.S. Humburg. 1992. Selection of mushrooms for harvest using machine vision. ASAE Paper 923587.
- Pradyumna, I. and G.A. Anderson. 1992. Sandwich panels. ASAE Paper SD92-104.
- Sharma, S., J. Julson, and C. Remond. 1992. Line heat source technique for determination of thermal conductivity of a corn based foam plastic. ASAE Paper SD92-117.
- Skonard, C.J., D.W. DeBoer, and H.D. Werner. 1993. Water table management evaluation on glacial till soils. ASAE Paper 932124.
- Animal and Range Sciences**
- Journal articles:**
- Collins, R.M. and R.H. Pritchard. 1992. Alternate day supplementation of corn stalk diets with soybean meal or corn gluten meal fed to ruminants. J Anim Sci 70:3899.
- Cromwell, G.L., T.R. Cline, J.D. Crenshaw, T.D. Crenshaw, R.C. Ewan, C.R. Hamilton, A.J. Lewis, D.C. Mahan, E.R. Miller, J.E. Pettigrew, L.F. Tribble, and T.L. Veum (NCR-42 Committee on Swine Nutrition). 1993. Dietary protein and/or lysine requirements of barrows and gilts. J Anim Sci 71(6):1510.
- Dinkel, C.A., D.M. Marshall, and W.L. Tucker. 1992. Breed of dam by sex of calf interaction effect on beef cattle weaning weight and cow efficiency. Can J Anim Sci 72:981.
- Loesche, J.A., R.H. Pritchard, J.M. Reedy, and Z.W. Wicks III. 1992. Feeding value of frost-damaged soybeans for lambs. J Anim Sci 70:2221.
- McFarland, D.C., N.H. Ferrin, K.K. Gilkerson, and J.E. Pesall. 1992. Tissue distribution of insulin-like growth factor receptors in the turkey. Comp Biochem Physiol 103B(3):601.
- McFarland, D.C., J.E. Pesall, and K.K. Gilkerson. 1993. Influence of growth factors on turkey embryonic myoblasts and satellite cells in vitro. Gen Comp Endocrinol 89:415.
- McFarland, D.C., J.E. Pesall, K.K. Gilkerson, and T.A. Swenning. 1993. Comparison of the proliferation and differentiation of myogenic satellite cells derived from Merriam's and commercial varieties of turkeys. Comp Biochem Physiol 104A(3):455.
- Momont, P.A., R.J. Pruitt, and P.S. Johnson. 1993. Effect of methionine addition to a urea-grain supplement on intake and digestibility of mature, dormant grasses and performance of cows grazing winter range. J Anim Sci 71(2):515.
- NCR-89 Committee on Confinement Management of Swine. 1992. Response of finishing pigs sorted by previous growth rate to a dietary antibiotic. Prof Anim Scientist 8:21.
- NCR-89 Committee on Confinement Management of Swine. 1993. Space requirements of barrows and gilts penned together from 54 to 113 kilograms. J Anim Sci 71(5):1088.
- Slyter, A.L. and K. Weiskircher. 1993. Lambing performance of ewes treated with melatonin or artificial photoperiod. Sheep Res J 9(1):21.
- Specht-Overholt, S. and J. Romans. 1992. Pork liver: the forgotten variety meat in the U.S. Proc 38th Internatl Congress of Meat Sci and Tech 2:297.
- Sun, S.S. and D.C. McFarland. 1993. Interaction of fibroblast growth factor with turkey embryonic myoblasts and myogenic satellite cells. Comp Biochem Physiol 105A(1):85.
- White, E.M. and F.R. Gartner. 1991. Blue grama herbage yield in relation to available soil and herbage zinc contents. Soil Sci Soc of America J 55:833.
- White, E.M. and F.R. Gartner. 1991. Blue grama growth and use of surface layer and subsoil water. Proc SD Acad Sci 70:49.
- White, E.M. and F.R. Gartner. 1992. Claypan soil factors favoring shortgrass domination in western South Dakota. Proc SD Acad Sci 71:67.
- Publications, reports:**
- Ayree-Bohannon, F.O., D.C. McFarland, M.G. Crews, N.H. Ferrin, and B. Patzlaff. 1993. Corrective effect of ground flax seed or oat bran on insulin receptor binding. FASEB J 7(4):A848.
- Ayree-Bohannon, F.O., D.C. McFarland, N.H. Ferrin, and B. Patzlaff. 1993. Corrective effect of ground flax seed or oatbran on insulin receptor binding. P 15 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Birkelo, C.P. and D.E. Johnson. 1993. Seasonal environment, performance and energy metabolism of feedlot cattle in the High Plains (USA). P 78 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Birkelo, C.P. and J. Lounsbury. 1992. Effect of straw and newspaper bedding on cold season feedlot performance in two housing systems. SDAES SE Farm Rpt Animal Science 92-25:120.
- Birkelo, C.P. and J. Lounsbury. 1992. Limiting intake of finishing diets by restricting access time to feed and the interaction with monensin. SDAES SE Farm Rpt Animal Science 92-26:125.
- Birkelo, C.P. and J. Lounsbury. 1992. Limiting intake of finishing diets by restricting access time to feed and the interaction with monensin. SDAES Beef Report CATTLE 92-10:38.
- Birkelo, C.P. and J. Lounsbury. 1992. Effect of straw and newspaper bedding on cold season feedlot performance in two housing systems. SDAES Beef Report CATTLE 92-11:42.
- Boggs, D.L. 1992. Chaps summary for South Dakota 1991. SDAES Beef Report CATTLE 92-2:2.
- Carlson, M.S., C.R. Hamilton, and G.W. Libal. 1993. Effects of added lysine to starter diets containing primarily zein protein and formulated to provide .14% tryptophan. J Anim Sci 71(Suppl 1):59.
- Feuz, D.M., D.C. Taylor, and H.L. Miller. 1993. Beef cattle stress management in South Dakota. P 84 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Gartner, F.R. 1992. Why not more prescribed burning? Soc for Range Mgmt SD Section n/ 92-1.
- Gartner, F.R. 1993. Notes from yesteryear. Soc for Range Mgmt SD Section n/ 93-1.
- Gartner, F.R., W.W. Thompson, and K.J. Wrage. 1993. Bison, pine and environmental stress. P 48 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Gartner, F.R. and K.J. Wrage. 1993. Pine canopy effects on biotic and abiotic parameters in the Black Hills. P 49 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Gartner, F.R. and K.J. Wrage. 1993. Overstory, understory and soil water relationships of a Black Hills hydrologic unit. Annual prog rpt, SDSU, USDA, SCS, and USDA, Forest Service.
- Gartner, F.R., K.J. Wrage, and B. Sowell. 1993. Ponderosa pine canopy effects on microclimate and understory vegetation in the Black Hills. Proc, Soc Range Mgmt (abstr 005).
- Goehring, T.B. and D.M. Marshall. 1992. Effect of lutalyse or bovine on conception rate to artificial insemination of heifers. SDAES Beef Report CATTLE 92-13:48.
- Goehring, T.B., H.L. Miller, C.R. Quinn, and R.L. Quinn. 1992. Effect of bull exposure on reproductive performance of first-calf heifers bred by natural service. SDAES Beef Report CATTLE 92-12:46.
- Hamilton, C.R. and G.W. Libal. 1992. Effects of added L-tryptophan in the presence of different lysine levels fed to grower pigs for 28 days. SDAES SWINE 92-14:49.
- Hamilton, C.R. and G.W. Libal. 1992. Optimal level of tryptophan in diets containing three different levels of lysine when fed to 60-lb pigs. SDAES SWINE 92-15:54.
- Hamilton, C.R. and G.W. Libal. 1992. Importance of dietary tryptophan level for gilts and barrows fed separately during the finishing stage. SDAES SWINE 92-16:61.
- Held, J. 1993. South Dakota performance ram testing program final reports: 1991-92 and 1992-93. SDAES SHEEP 93-5:14.
- Held, J. 1993. How the new grading standards fit industry needs. P 28 IN Proc, SDAES Sheep Day.
- Held, J.E., B. Read, and A.L. Slyter. 1993. Lamb preference for commercial and grain-soybean meal based creep diets during the preweaning season. SDAES SHEEP 93-6:22.
- Hildreth, M.B., J.U. Thomson, R.H. Pritchard, D.J. Hurley, and D.H. Francis. 1993. Coccidiosis and cryptosporidiosis: stress-facilitated diseases of production animals. P 22 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Hymes, U.C., J.R. Romans, and N.K. Sinha. 1992. Inability of consumers to differentiate among frankfurters made with beef, chicken, lamb and pork. J Anim Sci 70(Suppl 1):222.
- Iman, N.Y. and A.L. Slyter. 1993. Lifetime productivity of Targhee or Finn-Dorset-Targhee ewes managed as a farm or range flock. J Anim Sci 71(Suppl 1):44.
- Iman, N., A.L. Slyter, R. Swan, and B. Read. 1993. Lifetime productivity of Targhee vs Finn-Dorset-Targhee ewes managed as farm vs range flock. SDAES SHEEP 93-2:4.
- Johnson, J.R. 1992. Coordinated resource management in South Dakota, focus on mediation training, training manual.
- Johnson, J.R., G.E. Larson, and A.L. Leighton. 1993. Field techniques for successful plant photography. Proc, Soc Range Mgmt (abstr 307).
- Johnson, P.S. 1993. Grazing and drought tolerance of grazing ecotypes. P 53 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Johnson, P.S. 1993. Changing directions in range condition assessment. Proc, Soc Range Mgmt (abstr 283).
- Johnson, P.S. and C.A. Tusler. 1993. Patterns of native grass utilization by cattle. P 54 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Libal, G.W., C.R. Hamilton, E.M. Weaver, and D.J. Uttecht. 1992. Effects of weaning management on weaning pig performance. SDAES SWINE 92-9:33.
- Libal, G.W., C.R. Hamilton, E.M. Weaver, and D.J. Uttecht. 1992. Efficacy of tryptophan in mediating diet choice by weaned pigs. SDAES SWINE 92-10:35.
- Marshall, D.M. 1992. Interpreting experimental results. SDAES Beef Report CATTLE 92-1:1.
- Marshall, D.M. 1992. Breeding system effects on production efficiency through weaning—preliminary results. SDAES Beef Report CATTLE 92-6:20.
- Marshall, D.M. 1992. Update on retained ownership: case study of calves born at the Antelope Range Livestock Station. SDAES Beef Report CATTLE 92-14:50.
- Marshall, D.M., C.P. Birkelo, H.L. Miller, and R.J. Pruitt. 1993. Beef cow productivity and efficiency under normal and restricted feed energy levels. P 89 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- McFarland, D.C., J.E. Pesall, and K.K. Gilkerson. 1992. Influence of growth factors on turkey embryonic myoblasts and satellite cells in vitro. Proc, 8th ann EPSCoR Conf.
- McFarland, D.C., J.E. Pesall, and K.K. Gilkerson. 1993. Muscle cell culture: a model system to study skeletal muscle growth and regeneration. P 25 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- McFarland, D.C., J.E. Pesall, and K.K. Gilkerson. 1993. Influence of growth factors on turkey embryonic myoblasts and satellite cells in vitro. FASEB J 7(4):A644.
- McFarland, D.C., J.E. Pesall, K.K. Gilkerson, and T.A. Swenning. 1992. Comparison of the proliferation and differentiation of myogenic satellite cells derived from Merriam's and commercial varieties of turkeys. J Anim Sci 70(Suppl 1):197.
- McLeod, M. and D. Zalesky. 1993. Control of horn flies and face flies. SDCEs Extra 8092.
- Namminga, M.C. and R.J. Pruitt. 1992. Effect of source and level of supplemental protein on performance of postpartum range cows. SDAES Beef Report CATTLE 92-5:16.

- Namminga, M.C., R.J. Pruitt, C.A. Tusler, and P.S. Johnson. 1992. Effects of level of concentrate and forage availability on the performance of beef cows grazing winter range. SDAES Beef Report CATTLE 92-4:9.
- Namminga, M.C., R.J. Pruitt, C.A. Tusler, and P.S. Johnson. 1992. Effects of level of concentrate and forage availability on the performance of beef cows grazing winter range. J Anim Sci 70(Suppl 1):187.
- Pritchard, R.H. 1993. Strategies for implanting feedlot cattle. P 82 IN MNAES Beef Cattle Res Rpt B-407.
- Pritchard, R.H. and R.L. Preston. 1992. Comparison of production efficiencies when calves are fed in South Dakota or Texas. SDAES Beef Report CATTLE 92-16:62.
- Pritchard, R.H., M.A. Robbins, and D.G. Gee. 1992. Implant combinations and reimplanting strategies for yearling steers fed high concentrate diets. SDAES Beef Report CATTLE 92-7:24.
- Pritchard, R.H. and J.U. Thomson. 1992. Optimum monensin levels in receiving diets for newly weaned calves. SDAES Beef Report CATTLE 92-9:33.
- Shuey, S.A. 1991. Relationship of the maintenance energy requirement of beef female production efficiency. MS thesis, SDSU.
- Slyter, A.L., N. Iman, R. Swan, and B. Read. 1993. Effect of breed of ewe and management system on lamb and wool production (prog rpt). SDAES SHEEP 93-1:1.
- Slyter, A.L., B. Read, and R. Swan. 1993. A comparison of fall lambing vs. spring lambing performance of purebred and crossbred ewes. SDAES SHEEP 93-3:8.
- Slyter, A.L., B. Read, and R. Swan. 1993. Accelerated lambing performance of mature Hampshire cross ewes. SDAES SHEEP 93-4:12.
- Sun, S. 1993. Interaction of growth factors with cellular receptors and their metabolic effects on avian skeletal muscle. PhD thesis, SDSU.
- Tembei, J.N., G.W. Libal, and C.R. Hamilton. 1993. Growth performance of finishing pigs fed two diets with different protein levels. J Anim Sci 71(Suppl 1):60.
- Thaler, R.C. 1992. Effect of corn particle size on finishing pig performance. SDAES SE Farm Rpt Animal Science 92-27:130.
- Thaler, R.C. 1992. Feeding value of frost-damaged soybeans for growing-finishing pigs. SDAES SWINE 92-1:1.
- Thaler, R.C. 1992. Effect of corn particle size on finishing pig performance. SDAES SWINE 92-2:5.
- Thaler, R.C. 1992. Feeding value of light test-weight oats for finishing swine. SDAES SWINE 92-3:7.
- Thaler, R.C. and E.M. Weaver. 1992. Efficacy of two commercially available antibiotics in swine grow-finish diets. SDAES SWINE 92-4:9.
- Thaler, R.C., R.L. Woerman, and D.B. Britzman. 1992. Effect of lysine level in lactation diets on sow performance and milk composition. J Anim Sci 70(Suppl 1):238.
- Thomson, D.U. and R.H. Pritchard. 1992. In vitro analysis of drought stressed, chopped sunflower heads as a protein supplement for cattle grazing corn crop residues. SDAES Beef Report CATTLE 92-3:5.
- Twidwell, E.K., J.R. Johnson, C.E. Stymiest, and K.D. Kephart. 1993. Techniques for establishing alfalfa in South Dakota. SDCES EC 896.
- Uttech, D.J. 1992. Tryptophan needs of lactating sows fed high lysine diets. MS thesis, SDSU.
- Uttech, D.J., C.R. Hamilton, and G.W. Libal. 1993. Effects of tryptophan on the performance of sows fed high-lysine diets during lactation. J Anim Sci 71(Suppl 1):67.
- Uttech, D.J., C.R. Hamilton, G.W. Libal, and E.M. Weaver. 1992. Effects of added dietary tryptophan and isoleucine for growing swine. SDAES SWINE 92-13:46.
- Uttech, D.J., C.R. Hamilton, E.M. Weaver, and G.W. Libal. 1992. Interaction between dietary levels of neutral amino acids and tryptophan fed to 22 lb (10 kg) pigs. SDAES SWINE 92-11:39.
- Uttech, D.J., C.R. Hamilton, E.M. Weaver, and G.W. Libal. 1992. Relationship between dietary tryptophan and other large neutral amino acids for finishing swine. SDAES SWINE 92-12:43.
- Wagner, J.J. and D.M. Feuz. 1993. Effect of slaughter cattle marketing method on the production signals sent to beef producers. J Anim Sci 71(Suppl 1):48.
- Wagner, J.J., T.B. Goehring, D.L. Boggs, L.W. Insley, D.M. Feuz, G.E. Murra, D.E. Moore, and B. Knutson. 1992. South Dakota retained ownership demonstration. SDAES Beef Report CATTLE 92-15:53.
- Wagner, J.J. and R.H. Pritchard. 1992. Combination of Synovex-S and Finaplix-S for yearling steers. SDAES Beef Report CATTLE 92-8:29.
- Weaver, E.M. 1992. Re-evaluation of the etiology of mulberry heart disease. PhD dissertation, SDSU.
- Weaver, E.M., G.W. Libal, C.R. Hamilton, D. Patten, and I.S. Palmer. 1992. Dietary supplementation of weaned pigs with soybean oil and high levels of vitamin E: effects on tissue and plasma α -tocopherol and tissue malondialdehyde concentration. SDAES SWINE 92-6:16.
- Weaver, E.M., G.W. Libal, C.R. Hamilton, and R.C. Thaler. 1992. Evaluation of common means of vitamin E administration in the weanling pig. SDAES SWINE 92-5:12.
- Weaver, E.M., C.R. Hamilton, G.W. Libal, and D.J. Uttech. 1992. Effects of weaning weight and soybean oil on weaned pig performance. SDAES SWINE 92-7:26.
- Weaver, E.M., C.R. Hamilton, G.W. Libal, and D.J. Uttech. 1992. Importance of lysine to calorie ratio for weaned pigs fed diets containing dried skim milk with or without added soybean oil. SDAES SWINE 92-8:29.
- Wulf, D.M. 1993. Composition and industry utilization of the beef wholesale rib. MS thesis, SDSU.

Biology/Microbiology

Journal articles:

- Christopher-Hennings, J., J.A. Willgohs, D.H. Francis, U.A.K. Raman, R. Moxley, and D.J. Hurley. 1993. Immunocompromise in gnotobiotic pigs induced by verotoxin-producing *Escherichia coli* (O111:NM). Infection and Immunity 61(6):2304.
- Gibbons, W.R., N. Pulscher, and E. Ringquist. 1992. Sodium meta bisulfite and pH tolerance of *Pleurotus sajor caju* under submerged cultivation. Appl Biochem Biotechnol 37:177.
- Yu, R., C.H. Chen, F.A. Cholic, and G.W. Buchenau. 1992. Responses of wheat anther culture to the tan spot pathogen *Pyrenophora tritici-repentis* culture filtrate. Proc. SD Acad Sci (in press).

Publications, reports:

- Benfield, D.A., E.A. Nelson, J. Hennings, M. Minehart, D.J. Hurley, and P. Steen. 1993. Update on porcine respiratory and reproduction syndrome (PRRS) virus. Proc. Livestock and Conserv Inst mtg.
- Bury, Q.C. and D.J. Hurley. 1993. Colostrum inhibits pathogen binding in vitro. J Immunol 150(8):313A (abstr).
- Cutler, T.D. and D.J. Hurley. 1992. Mitogenic effects of superantigen staphylococcal exotoxins on bovine and porcine peripheral blood lymphocytes. NC reg ASM mtg. Oshkosh, WI.
- Gibbons, W.R., N.S. Pulscher, and S.A. Bock. 1992. Reducing acetate production costs from *Clostridium thermoaceticum*. Biobased Products Expo '92 (abstr). St. Louis, MO.
- Gibbons, W.R. 1993. Bacterial contamination during fermentation of corn for ethanol production: effects and prevention/control. P 50 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Granholm, N.H., D.J. Hurley, E.A. Larson, U. Seetharaman, and K. Carter. 1992. Bioassay for ASP - a putative gene product of the murine agouti locus. 3rd ann SD EPSCoR Conf. Vermillion, SD.
- Granholm, N.H., M. Bien, K. Carter-Lund, G.A. Dickens, M.R. Diggins, D.J. Hurley, E.A. Larson, D. Monroe, P. Ramasastry, U. Seetharaman, C.A. Westby, and L.D. Wipf. 1993. Causes of metabolic stress in yellow mice: a model for animal productivity and human health. IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Hagen, S.I., C.A. Westby, and N.H. Granholm. 1993. Agouti locus modulation of tyrosinase transcription. Abstr SD Acad Sci.
- Hildreth, M.B., J.U. Thomson, R.H. Pritchard, D.J. Hurley, and D.H. Francis. 1993. Coccidiosis and cryptosporidiosis: stress-facilitated diseases of production animals. IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Hurley, D.J. 1993. Comparison of activation induced changes in bovine lymphocyte markers after treatment with lectins, bacterial toxins and phorbol esters. Cytology S6:78 (abstr).
- Hurley, D.J. 1993. Overview of veterinary immunology and the immunology of the neonate. Western Vet Med Assn. Rapid City, SD.
- Hurley, D.J. 1992. Immunology and infectious diseases for veterinarians: a short course. Sponsored by SDSU ADRL and SKB. Brookings, SD.
- Hurley, E.M., T. Watzel, Q.C. Bury, and D.J. Hurley. 1992. Comparison of fluorescent and radio-tracer methods for assessing the binding of diarrheogenic *Escherichia coli* to HEp-2 cells. NC reg ASM mtg. Oshkosh, WI.
- Hurley, D.J., R.S.K. Majerle, and B.K. Walker. 1992. Membrane packing state and organization: measurement of its role in signalling through transmembrane glycoproteins. 3rd ann SD EPSCoR Conf. Vermillion, SD.
- Hurley, D.J. and S. Talib. 1992. Bovine colostrum whey inhibits in vitro enterovirus infection. NC reg ASM mtg. Oshkosh, WI.
- Izumi-Hagen, S., C.A. Westby, and N.H. Granholm. 1993. Agouti locus modulation of tyrosinase transcription. Proc. SD Acad Sci 72 (abstr, in press).

- Lockert, S.L., B.K. Walker, and D.J. Hurley. 1992. Assessment of PHA-P and PHA-M induced IL-2 production by the murine lymphocyte LBRM-33 clone 4A2. NC reg ASM mtg. Oshkosh, WI.
- Minehart, M., E.A. Nelson, D.J. Hurley, and D.A. Benfield. 1992. Comparison of virus neutralization (VN) and indirect immunofluorescence (IFA) for detection of antibodies to porcine reproductive and respiratory syndrome (PRRS) virus. 73rd Conf Res Workers Ani Dis, #P56 (abstr).
- Monroe, D.G., M.R. Diggins, and N.H. Granholm. 1993. Concentration of melanocyte stimulating hormone (MSH) in serum, hairbulbs, and pituitaries of lethal yellow (Aya/a) and control black (a/a) mice. Proc. SD Acad Sci 72 (abstr, in press).
- Newton, J.A., S.A. Dykstra, and D.J. Hurley. 1992. Effects of dexamethasone on the interaction between epidermal growth factor (EGF), staphylococcal enterotoxin B (SEB) and tumor necrosis factor (TNF) on the physiology of HEp-2 cells. Cent Soc for Clin Res mtg. Chicago, IL.
- Raman, U.A.K. 1992. Characterization of shiga-like toxin 1 mitogenic activity on porcine lymphocytes. Thesis, SDSU.
- Ramasastry, P., D.G. Monroe, M.A. Dvoracek, D.E. Granholm, D.J. Hurley, and N.H. Granholm. 1993. Effects of the lethal yellow allele on tyrosinase activity in vitro and in vivo. Proc. SD Acad Sci 72 (abstr, in press).
- Ramasastry, P., D. Monroe, S. Hagen, M.A. Dvoracek, D.E. Granholm, C.A. Westby, and N.H. Granholm. 1993. Effects of Ay on tyrosinase activity. Pigment Cell Res 6(Part 2):300 (abstr PA25).
- Rudd, J.C., G.W. Buchenau, C.H. Chen, B.G. Farber, H.K. Shin, R. Yu, and I.A. Del Blanco. 1993. Progress report on spring wheat breeding. IN SD Ann Wheat n/1 39:349.
- Sailer, B.L., B.K. Walker, and D.J. Hurley. 1993. Loading calcium sensitive fluorescent ion probes by non-detergent methods. Cytology S6:29 (abstr).
- Seetharaman, U. 1992. Does the lethal yellow allele (Ay) cause a defect in lymphocytes? Thesis, SDSU.
- Seetharaman, U., D.J. Hurley, and N.H. Granholm. 1993. Effects of Ay and alpha-MSH on lectin-induced lymphocyte proliferation - agouti locus. Pigment Cell Res 6(Part 2):311 (abstr PE15).
- Shin, H.K., C.H. Chen, and F.A. Cholic. 1992. Enhancement of dihaploid plant regeneration by colchicine-treatment of anther calli of spring wheat F1 hybrids. Agron Abstr.
- Van't Hul, J. and W.R. Gibbons. 1992. Optimizing conditions for ethanol production from solid and liquid potato waste. North Central Branch, Amer Soc for Microbiol (abstr).
- Van't Hul, J. and W.R. Gibbons. 1993. Optimizing production of the bacteriocin nisin by lactic *Streptococcus*. SD Acad Sci ann mtg. Rapid City.
- Walker, B.K. 1992. Fluorescent and biophysical characterization of resting and activated lymphocytes. Thesis, SDSU.
- Walker, B.K. and D.J. Hurley. 1993. Plasma membrane liquid crystalline phase domain role in cell activation. Cytology S6:9 (abstr).
- Walker, B.K., S.R. Lockert, and D.J. Hurley. 1992. Improved method for loading fluorescent intracellular ion probes. 3rd ann SD EPSCoR Conf. Vermillion, SD.
- Watzel, T., Q.C. Bury, T.L. Fraser, and D.J. Hurley. 1992. Effects of bovine colostrum whey on the growth and binding of *Escherichia coli* O157:H7. NC reg ASM mtg. Oshkosh, WI.
- Westby, C.A. and Y. Zhang. 1993. Progress towards cloning pullulan biosynthetic gene from *Aureobasidium pullulans*. Abstr Amer Soc for Micro:23.
- Westby, C.A. 1993. Physiological and gene engineering studies on an important soil bacterium to create strains useful in removing toxic levels of nitrate and nitrite in the environment. IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Wipf, L.D., D.G. Monroe, M.L. Diggins, D.P. Matthees, and N.H. Granholm. 1993. Melanotropin imbalance in yellow mice (Ay - agouti locus). Pigment Cell Res 6(Part 2):311 (abstr PE14).

Dairy Science

Journal articles:

- Kim, Y.K., D.J. Schingoethe, D.P. Casper, and F.C. Ludens. 1993. Supplemental fat from extruded soybeans and calcium soaps of fatty acids for lactating dairy cows. J Dairy Sci 76:197.
- Lightfield, K.D., R.J. Baer, D.J. Schingoethe, K.M. Kasperon, and M.J. Brouk. 1993. Composition and flavor of milk and Cheddar cheese higher in unsaturated fatty acids. J Dairy Sci 76:1221.

- Stegeman, G.A., R.J. Baer, D.J. Schingoethe, and D.P. Casper. 1992. Composition and flavor of milk and butter from cows fed unsaturated dietary fat and receiving bovine somatotropin. *J Dairy Sci* 75:962.
- Stegeman, G.A., D.P. Casper, D.J. Schingoethe, and R.J. Baer. 1992. Lactational responses of dairy cows fed unsaturated dietary fat and receiving bovine somatotropin. *J Dairy Sci* 75:1936.
- Stegeman, G.A., D.P. Casper, D.J. Schingoethe, and R.J. Baer. 1992. Lactational responses of dairy cows fed unsaturated dietary fat and receiving bovine somatotropin. *J Dairy Sci* 76:1926.
- Ventling, B.V. and V.V. Mistry. 1993. Growth characteristics of bifidobacteria in ultrafiltered milk. *J Dairy Sci* 76:962.
- Publications, reports:**
- Anderson, D.L. 1992. Reduced-fat Cheddar cheese from condensed milk. MS thesis, SDSU.
- Bowen, D.A. and D.R. Henning. 1993. Levels of certain coliform bacteria and thermotolerant-positive *Staphylococcus aureus* in retail natural cheeses. *J Dairy Sci* 76(Suppl 1):131 (abstr).
- Brandsma, R.L. 1992. Accelerated ripening of reduced-fat Cheddar cheese from condensed milk. MS thesis, SDSU.
- Brouk, M.J., D.J. Schingoethe, and F.C. Ludens. 1993. Production responses of lactating dairy cattle receiving a 7-day sustained release recombinant bovine somatotropin product. *J Dairy Sci* 76(Suppl 1):186 (abstr).
- Brouk, M.J., D.J. Schingoethe, K.D. Lightfield, and R.J. Baer. 1993. Lactational responses of dairy cows fed supplemental unsaturated fat from extruded soybeans or sunflower seeds. *J Animal Sci* 71(Suppl 1):84 (abstr).
- Casper, D.P., D.J. Schingoethe, M.J. Brouk, and H.A. Maiga. 1993. Synchronization of dietary nonstructural carbohydrate and protein degradability for lactating dairy cows. *J Dairy Sci* 76(Suppl 1):301 (abstr).
- Dinakar, P. 1992. Growth and viability of *Bifidobacterium bifidum* in Cheddar cheese. MS thesis, SDSU.
- Dinakar, P. and V.V. Mistry. 1993. Morphological variability and metabolism in *Bifidobacterium bifidum*. *J Dairy Sci* 76(Suppl 1):121 (abstr).
- Fisher, R.J. 1992. Influence of oils on ruminal microbial populations and fermentation patterns in vivo and in rumen-simulating fermenters. MS thesis, SDSU.
- Lightfield, K.D. 1992. Composition and flavor of milk and Cheddar cheese from cows fed unsaturated dietary fat. MS thesis, SDSU.
- Lightfield, K.D., R.J. Baer, and D.J. Schingoethe. 1992. Characteristics of milk and Cheddar cheese from cows fed unsaturated dietary fat. *J Dairy Sci* 75(Suppl 1):92 (abstr).
- Maiga, H.A., D.J. Schingoethe, and F.C. Ludens. 1993. Evaluation of diets containing supplemental fat with different sources of ruminally degradable carbohydrates for lactating cows. *J Dairy Sci* 76(Suppl 1):185 (abstr).
- Metzger, L.E. and V.V. Mistry. 1993. Effect of homogenization on quality of reduced-fat Cheddar cheese. 1. manufacture, composition and yield. *J Dairy Sci* 76(Suppl 1):100 (abstr).
- Metzger, L.E. and V.V. Mistry. 1993. Effect of homogenization on quality of reduced-fat Cheddar cheese. 2. rheology and microstructure. *J Dairy Sci* 76(Suppl 1):145 (abstr).
- Mistry, V.V. 1992. Bifidobacteria in dairy products. Ann mtg, Internat Assoc Milk Foods and Environmental Sanitarians. Toronto, Canada.
- Mistry, V.V. 1993. Reduced-fat Cheddar cheeses: manufacture, flavor and texture characteristics. 4th ann fat and cholesterol reduced foods forum, Internat Business Communications. Orlando, FL.
- Mistry, V.V. and D.L. Anderson. 1993. Composition and microstructure of commercial full-fat and reduced-fat natural and processed cheese. *J Dairy Sci* 76(Suppl 1):145 (abstr).
- Mistry, V.V. and J.-L. Maubois. 1993. Application of membrane separation technology to cheese production. Chapter 13 IN (P.F. Fox, ed) Cheese: chemistry, physics and microbiology, vol 1, 2nd ed. London, UK: Chapman and Hall.
- Pulgar, J.B. and V.V. Mistry. 1993. Suitability of high milk protein powder as a medium for growth and lactic acid bacteria and for production of bulk starters for cheese making. *J Dairy Sci* 76(Suppl 1):130 (abstr).
- Schingoethe, D.J. 1992. Sunflower seeds in dairy cattle rations. SDCES ExExtra 4003.
- Schingoethe, D.J. 1992. Sunflower seeds in dairy cattle rations may boost production. SD DHIA News, October, pp 3-4.
- Schingoethe, D.J. 1993. Nutritional management of the dairy herd. P 57 IN Proc Internat Ag Tech Schools, vol 4, Kiev, Ukraine, and Stavropol, Russia.
- Schingoethe, D.J. 1993. Utilization of by-products in animal feeds. P 92 IN Proc Internat Ag Tech School, vol 4, Kiev, Ukraine, and Stavropol, Russia.
- Schingoethe, D.J. 1993. Feeding and management of dairy calves and heifers. P 101 IN Proc Internat Ag Tech Schools, vol 4, Kiev, Ukraine, and Stavropol, Russia.
- Schingoethe, D.J., W.W. Foster, E.K. Cassel, and R.J. Baer. 1993. Management of nutritional and environmental stress confronting dairy cattle. P 93 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Economics**
- Journal articles:**
- Feuz, D.M., S.W. Fausti, and J.J. Wagner. 1993. Empirical analysis of the efficiency of four alternative marketing methods for slaughter cattle. *Agribusiness: An Internat J* 9(5):453.
- Godfrey, E.D. and M.K. Beutler. 1993. Economic multipliers: a comment. *Rangelands* 15(3).
- Held, L.J., D.M. Feuz, and E.R. Edens. 1993. Risk evaluation of alternative western ranching systems. *J Amer Soc Farm Mgrs Rural App* 57(1):63.
- Mohamed, Z.A., M.G. Mohayidin, D.C. Taylor, M.N. Shamsudin, and E.F.C. Chiew. 1993. Adoption of sustainable production practices: English cabbage farmers in Malaysia. *J Sust Agric* (in press).
- Plueger, B., D.R. Franklin, and R. Lafferty. 1993. Factors affecting women's contribution to farm and ranch management. *J of Amer Soc Farm Mgrs Rur App* 57(1):99.
- Taylor, D.C. 1994. Agricultural diversification: an overview and challenges in ASEAN in the 1990s. *ASEAN Econ Bul* 10(3) (in press).
- Taylor, D.C., Z.A. Mohamed, M.N. Shamsudin, M.G. Mohayidin, and E.F.C. Chiew. 1993. Creating a farmer sustainability index: a Malaysian case study. *Amer J of Altern Agric* 8(4) (in press).
- Wagner, J.J. and D.M. Feuz. 1993. Effect of slaughter cattle marketing method on the production signals sent to beef producers. *Professional Animal Scientist* 9:53.
- Publications, reports:**
- Beutler, M.K. 1992. Agriculture is more than farming. Horizons. Brookings: ABS. Reprinted S. Dak. Section Soc for Range Mgmt 1/9203.
- Beutler, M.K. 1992. Controlling MSD could put \$16.2 million per year in pockets of South Dakota swine producers. AG/BIO 1/1. Brookings: ABS.
- Beutler, M.K. 1993. CENDAK and South Dakota, an economic impact study. Brookings: ABS.
- Bleakley, B.H., D.E. Hubbard, L.L. Janssen, C. Johnke, C. Johnson, T.R. Kirschenmann, K.K. Lewis, T.A. Machacek, D.H. Rickerl, L. Saathoff, P.K. Wieland, and T. Wolles. 1993. Impacts of agricultural management systems on economic, environmental, and wildlife values of altered and unaltered wetland areas. Progress rpt, USDA in Concert with Environment.
- Clark, V.L., L.L. Janssen, and R.G. Stover. 1993. Farm wives: work and decision-making. Encyclopedia of Women and Work. New York: Garland Pub, Inc (in press).
- Cole, J.L., L.L. Janssen, and M.K. Beutler. 1993. Rangeland leasing markets in South Dakota. SDAES B 716.
- Dobbs, T.L. 1993. Agricultural systems in the context of sustainable development: the case of low-input sustainable agriculture. Study mtg, sustainable agriculture, Asian Productivity Organiz, Tokyo.
- Dobbs, T.L. 1992. Comments on paper by J.I. Ikerd entitled "Marketing activities in sustainable agricultural systems: another piece of the profitability puzzle." Symposium on Agricultural Industrialization and Family Farms: The Role of Federal Policy, Joint Econ Com, U.S. Cong, Washington, DC.
- Dobbs, T.L. 1993. Enhancing agricultural sustainability through changes in Federal commodity policy: marginal versus radical change. Policy Studies Program rpt 2. Greenbelt, MD: Wallace Inst for Alter Agric (in press).
- Dobbs, T.L. 1993. Implications of sustainable farming systems in the Northern Great Plains for farm profitability and size. Am Agric Econ Assoc Annual mtg, Orlando, FL. Abstr in Amer J Agric Econ 75 (5).
- Dobbs, T.L. 1992. Testimony before Subcommittee on Agricultural Research and General Legislation, Committee on Agriculture, Nutrition, and Forestry of the U.S. Senate at hearing on research and education provisions of Food, Agriculture, Conservation, and Trade Act of 1990, Washington, DC.
- Edens, E.R., L.J. Held, and D.M. Feuz. 1992. Stochastic dominance evaluation of alternative western ranching systems. Proc. WAEA mtg:130. West J Agric & Res Econ 18(2) (abstr).
- Feuz, D.M. 1993. Determining a "fair" beef cow lease agreement when risk is considered. Econ Staff Pap 93-1.
- Feuz, D.M. and J.J. Wagner. 1993. Beef producers may benefit from value based marketing system. Dakota Grower and Rancher, Mid March, p 30.
- Feuz, D.M. and J.J. Wagner. 1993. Value based marketing in the beef industry. Econ Commentator 319.
- Feuz, D.M., J.J. Wagner, and L.J. Held. 1992. Retained ownership revisited: the economic significance of genetic variability. Proc WAEA mtg:123. West J Agric & Res Econ 18(2) (abstr).
- Franklin, D.R. 1993. Skills and training needed by farm management researchers in the future: discussion. Econ Staff Pap 93-4.
- Franklin, D.R. and A. Ahmed. 1992. Farm management innovators: characteristics of eastern South Dakota farm operators. Econ Commentator 311.
- Henning, L.D. 1993. Analysis of effects of machinery costs on relative profitability of different farming systems. Econ Pamph 93-2.
- Henning, L.D. and T.L. Dobbs. 1993. Contribution of alfalfa to whole-farm profitability of farming systems in Northeast South Dakota. Econ Res Rpt 93-3.
- Henning, L.D. and T.L. Dobbs. 1993. Economic performance of different farming systems at SDSU's Northeast Station in the 1992 crop year. PI Sci Pamph 70:47.
- Janssen, L.L., T.A. Machacek, D.H. Rickerl, L. Saathoff, and P.K. Wieland. 1993. Groundwater quality and economic impacts of farm practices in wetland areas. 1993 annual report submitted to South Dakota Groundwater Research and Pub Educ Prog, Pierre.
- Janssen, L.L. and B. Plueger. 1993. South Dakota agricultural land values, cash rental rates, and cropshare rental practices: 1993. SDAES C 256.
- Janssen, L.L. and B. Plueger. 1993. South Dakota agricultural land values and rental practices: 1993. Econ Commentator 321.
- Janssen, L.L., R.G. Stover, and V.L. Clark. 1993. Farm financial stress and farm management decisions. P 87 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Karunakaran, P. 1993. Analysis and forecasting of seasonal changes in cash prices for corn, wheat, and oats grown in South Dakota. MS thesis, SDSU.
- Law, H.K. 1992. Evaluation of alternative marketing strategies for cull cows. MS thesis, SDSU.
- Lundeau, A.A. 1993. Economics Department alumni survey. Econ Commentator 322.
- Qasmi, B.A. 1993. Evaluation of stress on yields of major grains in South Dakota: analysis of historical yield records. P 60 IN Abstracts, Biostress Symposia, Brookings: SDAES.
- Qasmi, B.A. 1992. Grain basis in South Dakota. Econ Commentator 313.
- Qasmi, B.A. 1993. Seasonality in corn and soybean prices received by South Dakota farmers. Econ Commentator 327.
- Qasmi, B.A. and A.A. Bender. 1993. Impacts of weather on small grain yields in north-central and central South Dakota: a county level analysis. P 60 IN Abstracts, Biostress Symposia, Brookings: SDAES.
- Smolik, J.D. and T.L. Dobbs. 1993. Energy relationships in alternative, conventional, and reduced-till farming systems. SD Acad of Sci mtg (abstr).
- Smolik, J.D. (ed), T.L. Dobbs, D.H. Rickerl, L.J. Wrage, G. Buchenau, and T.A. Machacek. 1993. Agronomic, economic, and ecological relationships in alternative (organic), conventional, and reduced-till farming systems. SDAES B 718.
- Smolik, J.D., D.H. Rickerl, and T.L. Dobbs. 1993. Influence of biological and environmental stress on the long-term agronomic and economic performance of alternative, conventional, and reduced-till farming systems. P 95 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Stover, R.G., L.L. Janssen, and V.L. Clark. 1993. Quality of farm family life as a function of farm family stress. P 96 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Taylor, D.C. 1993. Agricultural diversification in Southeast Asia. Paper, study mt, Agricultural Diversification in Monsoon Areas, Asia Productivity Organiz in association with Japan Assoc for Intern'l Coop of Agric and Forestry, Tokyo.
- Taylor, D.C. 1993. ASEAN-4: Agricultural diversification in the 1990s. Econ Staff Pap 93-2.

- Taylor, D.C. 1993. Current status and future prospects for sustainable agriculture in South Dakota. Testimony, hearing on rural economy and family farming, U.S. Senate Small Bus Com. Washington, DC.
- Taylor, D.C. 1993. Roles and limitations of enterprise diversification. *Econ Commentator* 317.
- Taylor, D.C. 1993. Sustainable beef cattle production. *Econ Commentator* 324.
- Taylor, D.C. 1992. The 21st century: world to be dominated by "modern science" or "sustainable development?" Annual Phi Kappa Phi lecture, SDSU.
- Taylor, D.C. 1992. Underlying values and beliefs: "modern science" versus "sustainable development". *Econ Staff Pap* 92-11.
- Taylor, D.C. and D.M. Feuz. 1993. Beef cattle producer "sustainability" and "organic" indices. *Econ Staff Pap* 93-6.
- Taylor, D.C. and D.M. Feuz. 1992. Focus on herd size: South Dakota beef cattle. *Econ Commentator* 315.
- Taylor, D.C. and D.M. Feuz. 1992. South Dakota beef cow-calf producer management practices. *Econ Res Rpt* 92-7.
- Taylor, D.C., D.M. Feuz, and H.L. Miller. 1993. Beef cattle stress management in South Dakota. P 84 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Wagner, J.J. and D.M. Feuz. 1993. Effect of slaughter cattle marketing method on production signals sent to beef producers. 1993 South Dakota beef rpt CATTLE 93-19-92.
- Wagner, J.J., D.M. Feuz, and B. Knutson. 1993. South Dakota retained ownership demonstration. 1993 South Dakota beef rpt CATTLE 93-18-81.
- Yu, Z. and A.A. Lundeen. 1993. Results of Economics Department alumni survey. *Econ Staff Pap* 93-3.
- College of Home Economics**
- Journal articles:**
- Krishnan, P.G., J.L. Julson, D.J. Robison, and U.V. Pathak. 1994. Polyethylene-starch extrudates as erodible carriers for bioactive materials: I. erodibility and in vitro dye release studies. *J Bio Materials Application* 8(3) (in press).
- Krishnan, P.G., W.-J. Park, K.D. Kephart, D.L. Reeves, and G.L. Yarrow. 1993. Use of near infrared reflectance spectroscopy in the measurement of protein and oil content in oats. *J Cereal Chem.*
- Publications, reports:**
- Clark, V., L. Scholten, G.D. Tidemann, and J. Dickerson. 1993. Use and care of clothing by private pesticide applicators. College of Nursing/Home Ec research poster session.
- Krishnan, P.G. 1993. Effect of growing year on durum wheat characteristics. P 57 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Krishnan, P.G., J.L. Julson, and C.A. Pitts. 1993. Using distiller's dried grain from corn in baked goods. *SDCES Ex Extra* 14030.
- Krishnan, P.G., W.-J. Park, K.D. Kephart, D.L. Reeves, and G.L. Yarrow. 1992. Use of near infrared reflectance spectroscopy in the measurement of protein, fat and beta-glucan of oats. P 109 IN Proc, 77th mtg, Amer Assoc of Cereal Chemists.
- Scholten, L., J. Dickerson, V.L. Clark, and G.D. Tidemann. 1993. Launder's practices regarding care of protective clothing worn for pesticide application: a South Dakota study. In press.
- Scholten, L. 1993. Life with pesticides? Proc, Sewry Faculty Colloquium. Brookings: SDSU.
- Scholten, L. 1993. Laundering as decontamination of apparel fabrics: residues and redeposition of pesticide. College of Nursing/home Ec research poster session.
- Horticulture, Forestry, Landscape and Parks**
- Journal articles:**
- Fennell, A. and R. Hauptmann. 1992. Electroporation and PEG delivery of DNA into maize microspores. *Plant Cell Reports* 11:567.
- Johnson, W.C. 1992. Dams and riparian forests: case study from the upper Missouri river. *Rivers* 3(4):229.
- Johnson, W.C. 1993. Woodland expansion in the Platte River, Nebraska: patterns and causes. *Ecological Monographs* (in press).
- Johnson, W.C., L. Thomas, and C.S. Adkisson. 1993. Dietary circumvention of tannins by blue jays: implications for oak demography. *Oecologia* (Berlin) 94:159.
- Poiani, K.P. and W.C. Johnson. 1993. Potential effects of climate change on a semi-permanent prairie wetland. *Climate Change* 24:213.
- Poiani, K.P. and W.C. Johnson. 1993. A climate-based spatial simulation model of the vegetation dynamics in prairie wetlands. *Ecological Applications* 3(2):279.
- Williams, C.E. and W.C. Johnson. 1992. Factors affecting recruitment of *Pinus pungens* in the southern Appalachian mountains. *Can J For Res* 22:878.
- Publications, reports:**
- Ball, J., M.J. McLeod, A. Fennell, and D. Graper. 1993. Tree health management: a conceptual framework. IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Bratton, G.F., P.R. Schaefer, and J.R. Brandle. 1993. Conservation forestry for sustainable Great Plains ecosystems. IN Conservation of Great Plains ecosystems: current science, future options. Kansas City, MO (in press).
- Evers, N.P., D.B. Healy, and M.N. Maca. 1993. Dealing with man-made stress in the landscape. IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Fennell, A. 1993. Evaluating woody fruit crops for the ability to survive stresses encountered during northern winters. IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Fennell, A. and D. Graper. 1992. Fruit cultivars for South Dakota. *SDCES ExExtra* 6011.
- Fennell, A. and D. Graper. 1993. Raspberry culture. *SDCES ExExtra* 6022.
- Fennell, A. and D. Graper. 1993. Fruit tree culture. *SDCES ExExtra* 6023.
- Johnson, W.C. 1993. Divergent response of riparian vegetation to flow regulation on the Missouri and Platte rivers. IN Proc, Symp Am Fisheries Soc on large rivers. U.S. Fish and Wildlife Service biological report (in press).
- Johnson, W.C. and K. Poiani. Modeling the response of prairie wetlands to climatic stress. IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Prashar, P. 1992. Growing asparagus. *SDCES ExExtra* 6009.
- Prashar, P. and D. Graper. 1993. Growing cabbage in the home garden. *SDCES ExExtra* 6015.
- Prashar, P. and D. Graper. 1993. Growing beans in the home garden. *SDCES ExExtra* 6024.
- Prashar, P. and D. Graper. 1993. Growing tomatoes in the home garden. *SDCES ExExtra* 6024.
- Prashar, P. and M. Enevoldsen. 1992. New hybrid tomato 'Super Chief'. *SDAES B714*.
- Prashar, P. and M. Enevoldsen. 1992. Vegetable cultivar trials research report no. 7. Department of Horticulture, Forestry, Landscape and Parks.
- Schaefer, P.R. 1993. Genetic diversity and stress resistance: some concerns regarding artificially established trees in the Great Plains. IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Wake, C.M., P.R. Schaefer, L.M. Jost, and D.P. Evenson. 1993. Analysis of intraspecific nuclear DNA content variation in *Gleditsia triacanthos* L., (Honeylocust) by flow cytometry. *Cytometry Supp* 6:41 (abstr).
- Plant Science**
- Journal articles:**
- Boe, A. and K. Fluharty. 1993. Reproductive biology of a Canada milk-vetch population from eastern South Dakota. *Prairie Nat* 25:65.
- Dara, S.T., P.E. Fixen, and R.H. Gelderman. 1992. Sufficiency level and diagnosis and recommendation integrated system approaches for evaluating the nitrogen status of corn. *Agron J* 84:1006.
- Clay, S.A. and K.A. Scholes. 1992. Characterization of seed bank composition and seedling emergence. *SD Acad Sci* 71:53.
- Clay, S.A., D.E. Clay, and G.L. Malzer. 1992. Surface microrelief impact on agrichemical movement. *J Environ Sci Health Part B* 27:125.
- Helms, T.C., J.H. Orf, and R.A. Scott. 1993. Predicted and actual yield advance in a bi-parental and backcross-derived soybean population. *Can J Plant Sci* (in press).
- Kohl, R.A., C.G. Carlson, and S.G. Wangemann. 1993. Herbicide leaching potential in road right-of-ways. *ASAE Paper* 93-2078.
- Khakural, B.R., G.D. Lemme, T.E. Schumacher, and M.J. Lindstrom. 1992. Tillage systems and landscape position: effects on soil properties. *Soil Tillage Res* 25:43.
- Lindstrom, M.J., T.E. Schumacher, A. Jones, and C.J. Gantzer. 1992. Productivity index model comparison for selected north central region soils. *J Soil Water Cons* 47:491.
- Lindstrom, M.J., W.W. Nelson, T.E. Schumacher. 1992. Quantifying tillage erosion rates due to moldboard plowing. *Soil Tillage Res* 24:243.
- Scott, R.A. and G.A. Milliken. 1993. SAS program for analyzing augmented randomized complete block designs. *Crop Sci* 33:865.
- Scott, R.A., M. Champoux, and W.T. Schapaugh, Jr. 1993. Influence of environmental productivity levels and yield stability on selection strategies in soybean. *Euphytica* (in press).
- Sutton, F. and D.G. Kenefick. 1993. Nucleotide sequence of a cDNA encoding an elongation factor (EF1alpha) from barley primary leaf. *Plant Physiol* (in press).
- Taylor, D.C., T.L. Dobbs, and J.D. Smolik. 1992. Beliefs and practices of sustainable farmers in South Dakota. *J Prod Agric* 54:545.
- Tomah, E. and R. Gelderman. 1993. Required number of corn and soybean plants sampled necessary to determine the elemental content of their leaves at specific accuracy and confidence levels. *Comm Soil Sci Plant Anal*, 24(11&12):1281.
- Publications, reports:**
- Anderson, J.L., R.H. Dowdy, G.N. Delin, R. Knighton, D.E. Clay, and B. Lowery. 1993. Northern cornbelt sandplain management system evaluation area. Proc, Soil Water Cons Soc, water quality mtg. Minneapolis, MN.
- Austin, C.L., N.J. Thiex, E.K. Twidwell, and K.D. Kephart. 1993. Variability of hay samples obtained using four hay probe types. P 85 IN Proc, Am Forage Grassl Coun. Des Moines, IA.
- Bleakley, B.H., D.E. Hubbard, L.L. Janssen, C. Johnke, C. Johnson, T.R. Kirschenmann, K.K. Lewis, T.A. Machacek, D.H. Ricker, L. Saathoff, P.K. Wieland, and T. Wolles. 1993. Impacts of agricultural management systems on economic, environmental, and wildlife values of altered and unaltered wetland areas. *ACE ann rpt*.
- Bly, A.G., T.E. Schumacher, and M.J. Lindstrom. 1992. Soil productivity of an eroded landscape after no-tilling corn into sod. *Agron Abstr* 84:319.
- Bly, A.G. 1992. Effects of tillage system on soil properties and productivity across an eroded landscape after long-term grass management. MS thesis, SDSU.
- Boe, A., R. Bortnem, K. Higgins, and A. Kruse. 1993. Variability in morphological, phenological, and forage quality characteristics of sweetclover accessions. P 83 IN SRM Abstr.
- Boe, A., K. Fluharty, and R. Bortnem. 1993. Variability for seed traits in a green needlegrass population. P 206 IN Proc, Forage and Grassland Conf. Georgetown, TX: American Forage and Grassland Council.
- Boe, A. and K. Fluharty. 1992. Effect of pedicellate spikelet removal on caryopses set and weight in hermaphroditic *Andropogon gerardii*. *Am J Bot* 79(6):73 (abstr).
- Bortnem, R. and A. Boe. 1993. Variability for seed weight among and within three switchgrass cultivars. P 208 IN Proc, Forage and Grassland Conf. Georgetown, TX: American Forage and Grassland Council.
- Bortnem, R., A. Boe, K. Higgins, and A. Kruse. 1993. Evaluation of alfalfa germplasm for combined wildlife habitat and forage purposes. P 60 IN SRM Abstr.
- Brix-Davis, K., D.E. Clay, and S.A. Clay. 1993. Nitrate movement affected by agrichemical placement in a ridge tillage system. 4th ann Groundwater Coordination Symposium. Vermillion, SD.
- Brix-Davis, K., Clay, S.A., D.E. Clay, T. Moorman, K.A. Scholes, and B. Laurus. 1993. Alachlor degradation in soil surface and aquifer material. 4th ann Groundwater Coordination Symposium. Vermillion, SD.
- Brix-Davis, K., D.E. Clay, S.A. Clay, and T.E. Schumacher. 1993. Impact of crop rotation and the capability of a chlorophyll meter in determining corn nitrogen concentration. P 29 IN (W.D. Woodson, ed) Eastern South Dakota Soil and Water Research Farm 1992 ann rpt. Brookings: USDA-ARS Northern Grain Insect Research Laboratory.
- Brix-Davis, K., S.A. Clay, D.E. Clay, T.E. Schumacher, D.R. Sorensen. 1993. Tillage induced microrelief impacts on nitrate and herbicide movement in soil above the Parker Centerville Aquifer. P 51 IN SESD Exp Farm prog rpt.
- Brix-Davis, K., D.E. Clay, and S.A. Clay. 1993. Nitrate movement affected by agrichemical placement in a ridgetillage system. 5th ann Annual Groundwater Conference. Pierre.
- Brix-Davis, K., D.E. Clay, and S.A. Clay. 1992. Nitrate movement affected by agrichemical placement in a ridge tillage system. *Agron Abstr* 1992.
- Drymalski, S., N. Rossi, and R. Gelderman. 1992. Comparison of wet digestion methods for plant analysis. *Soil PR* 92-11. SDAES TB 99 (rev 1993).
- Clay, D.E., S.A. Clay, K. Scholes, and K. Brix-Davis. 1992. Influence of fertilizer placement on nitrate movement within a ridge tillage system. *Soil Science Res ann rpt*.

- Clay, D.E., S.A. Clay, and K. Brix-Davis. 1993. Nitrate movement affected by agrichemical placement in a ridge tillage system. *Proc. Soil Water Cons Soc, water quality mtg.* Minneapolis, MN.
- Clay, D.E., G.L. Malzer, and J.A.E. Molina. 1992. Residual N fertilizer mineralization kinetics derived from experimental and simulated experiments. *Agron Abstr* 1992.
- Clay, S.A., D.E. Clay, K. Scholes, and K. Brix-Davis. 1992. Influence of fertilizer placement on atrazine movement within a ridge tillage system. *Soil Science Res ann rpt.*
- Clay, S.A., K. Scholes, and P. Reiger. 1992. 1992 weed science update. *ESD Soil and Water Res Farm Rpt.*
- Clay, S.A. and D.E. Clay. 1992. South Dakota ground water quality. Video shown by PBS.
- Clay S.A., K.A. Scholes, D.E. Clay. 1993. Herbicide movement affected by agrichemical placement in a ridge tillage system. *Proc. Soil Water Cons Soc, water quality mtg.* Minneapolis, MN.
- Clay, S.A., D.E. Clay, T. Moorman, K.A. Scholes, and B. Laurus. 1993. Alachlor degradation in soil surface and aquifer material. *Weed science ann mtg.*
- Clay, S.A., D.E. Clay, T. Moorman, K. Scholes, and B. Laurus. 1993. Degradation of alachlor in soil and aquifer material. *WSSA ann mtg.* Denver, CO.
- Clay, S.A., K. Scholes, D. Clay. 1993. Fertilizer shank placement impact on atrazine movement in a ridge tillage system. *Ag Research to Protect Water Quality.* Minneapolis, MN.
- Clay, S.A., K.A. Scholes, D.E. Clay. 1993. Herbicide movement affected by agrichemical placement in a ridge tillage system. *Soil Water Cons Soc, water quality mtg.* Minneapolis, MN.
- Clay, S.A., K.A. Scholes, D.E. Clay. 1992. Herbicide movement affected by agrichemical placement in a ridge tillage system. *Agron Abstr* 1992.
- Clay, D.E., P. Holman, S.A. Clay, T.E. Schumacher, and K. Scholes. 1993. Agrichemical contamination detection in a shallow unconfined aquifer as influenced by groundwater sampling system. *Proc. Ag Research to Protect Water Quality.* Minneapolis, MN.
- Farber, B.G. 1993. Evaluation of SEED PROD and CROP PROD on spring wheat and barley. *SOIL PR 92-1.* SDAES TB 99.
- Farber, B.G. 1993. Progress Report 1992 Central Crops and Soils Research Station, Highmore, South Dakota. *Plant Science Pamph* 72.
- Gaffney, J.F. 1993. Spring wheat varietal differences to trifluralin as influenced by several postemergence herbicides. *MS thesis, SDSU.*
- Gaffney, J.F., S.A. Clay, and L.J. Wrage. 1992. Varietal differences to trifluralin as influenced by several postemergence herbicides. *NC Weed Sci Soc.* Chicago, IL.
- Gana, A., F. Sutton, and D. Kenefick. 1993. Effect of ABA and cold treatment on the expression of cold-regulated genes in wheat callus cultures. *SD EPSCoR*
- Gelderman, R., J. Gerwing, and G. Erickson. 1992. Correlation and interpretation of phosphorus soil tests for winter wheat in central South Dakota. *Soil PR 92-13 IN Soil/Water Science Research.* SDAES TB 99.
- Gelderman, R. and J. Gerwing. 1992. Influence of applied water treatment lime sludge on crop yields and soil pH for 1992 and four year summary. *Soil PR 92-12 IN Soil/Water Science Research.* SDAES TB 99.
- Gelderman, R., S. Drymalski, and J. Gerwing. 1992. Influence of cement kiln dust on crop yield and soil pH. *Soil PR 92-14 IN Soil/Water Science Research.* SDAES TB 99.
- Gelderman, R. and J. Gerwing. 1992. Influence of phosphorus soil test level on the probability of corn yield response. *Soil PR 92-8 IN Soil/Water Science Research* TB 99.
- Gelderman, R. and J. Gerwing. 1992. Influence of seed-placed fertilizer on corn and soybean emergence and yield. *Soil PR 92-10 IN Soil/Water Science Research.* SDAES TB 99.
- Gelderman, R., J. Gerwing, S. Drymalski, and L. Evjen. 1992. Soil tests to predict fertilizer nitrogen needs of corn. *Soil PR 92-16 IN Soil/Water Science Research.* SDAES TB 99.
- Gelderman, R., J. Gerwing, and G. Carlson. 1992. Summary of soil test results (July 1991 - June 1992). *Soil PR 92-15 IN Soil/Water Science Research.* SDAES TB 99.
- Gelderman, R., J. Gerwing, and S. Drymalski. 1992. Use of soil tests to predict fertilizer nitrogen needs of corn. *Soil PR 92-9 IN Soil/Water Science Research.* SDAES TB 99.
- Gerwing, J. and R. Gelderman. 1992. Influence of elemental sulfur on soil pH. *Soil PR 92-5 IN Soil/Water Science Research.* SDAES TB 99.
- Gerwing, J., R. Gelderman, and D. Sorensen. 1992. Influence of fertilizer and lime on corn yield on high testing soil. *Soil PR 92-3 IN Soil/Water Science Research.* SDAES TB 99.
- Gerwing, J., R. Gelderman, and D. Sorensen. 1992. Nitrogen management in a corn soybean rotation. *Soil PR 92-4 IN Soil/Water Science Research.* SDAES TB 99.
- Gerwing, J., R. Gelderman, G. Erickson, and K. Miller. 1992. Phosphorus fertilization of grain sorghum. *Soil PR 92-7 IN Soil/Water Science Research.* SDAES TB 99.
- Gerwing, J., R. Gelderman, R. Hillestad, and R. Hillestad. 1992. Preplant banded fertilizer effects on ridge till corn. *Soil PR 92-6 IN Soil/Water Science Research.* SDAES TB 99.
- Gelderman, R., D. Sorensen, and J. Gerwing. 1993. Placement and timing of nitrogen for no-till corn. *SE South Dakota Research Farm ann rpt* 23:35.
- Gelderman, R., S. Drymalski, and D. Sorensen. 1993. Use of soil tests to predict fertilizer nitrogen needs of corn. *SE South Dakota Research Farm ann rpt* 32:37.
- Gerwing, J., R. Gelderman, and D. Sorensen. 1993. Influence of fertilizer and lime on corn yield on high testing soil. *SE South Dakota Research Farm ann rpt* 32:39.
- Gerwing, F., R. Gelderman, and D. Sorensen. 1993. Nitrogen management in a corn soybean rotation. *SE South Dakota Research Farm ann rpt* 32:43.
- Gollany, H.T. and T.E. Schumacher. 1992. Combined use of colorimetric and microelectrode methods for evaluating genetic variation in rhizosphere pH. *Agron Abstr* 84:325.
- Gollany, H.M. 1992. Rhizosphere variation in rCO_2 , pH and pe in relation to nutrient uptake. *PhD dissertation, SDSU.*
- Holman, P.W., D.E. Clay, A.R. Bender, S.A. Clay, and T.E. Schumacher. 1992. Aquifer sampling with a surface skimming device. *Agron Abstr* 84:43.
- Holman, P.W., D.E. Clay, A.R. Bender, S.A. Clay, and T.E. Schumacher. 1993. Aquifer sampling with a surface skimming device. *Soil Water Cons Soc, water quality meeting.* Minneapolis, MN.
- Huang, Y. and D.H. Rickerl. 1993. Conservation management of lands overlying vulnerable aquifers. *Agron Abstr* 317.
- Janssen, L.L., T.A. Machacek, D.H. Rickerl, L. Saathoff, and P.K. Wieland. 1993. Groundwater quality and economic impacts of farm practices in wetland areas. *GREP final rpt.*
- Kephart, K.D. and A. Boe. 1992. Branching effects on forage quality of alfalfa stems. *Agron Abstr* 182.
- Kephart, K.D. 1993. Alfalfa in the Mount Rushmore state. *Haymaker* n/l.
- Kephart, K.D. and E.K. Twidwell. 1993. Autumn harvest management effects on spring growth of two modern alfalfa cultivars. *P 104 IN (E.K. Twidwell, ed) Proc, Am Forage Grass Coun.*
- Kephart, K.D. and E.K. Twidwell. 1993. Autumn harvest effects on spring growth of alfalfa in South Dakota. *P 5 IN (E.K. Twidwell, ed) Proc, SD Forage Grass Coun.*
- Kohl, R.A., C.G. Carlson, and J.R. Gerwing. 1993. Road ditch spraying can contaminate shallow ground water. *SDAES C 254.*
- Koskinen, W.C. and S.A. Clay. 1992. Atrazine fate in soils and water. *NC Weed Sci Soc.*
- Krishnan, P.G., W.J. Park, K.D. Kephart, D.L. Reeves, and G. Yarrow. 1992. Use of NIRS in the measurement of protein, fat and beta-glucan content of oats. *Amer Assoc of Cereal Chemists.* Minneapolis MN.
- Liu, Z., S.A. Clay, D.E. Clay, and S.S. Harper. 1993. Anhydrous ammonia influence on atrazine adsorption to soil. *Proc. Ag Research to Protect Water Quality.* Minneapolis, MN.
- Malo, D.D. 1992. Particle size analysis and aggregate stability determination on SCS soil samples, Stanley County, South Dakota. *Pedology Report 92-6.* Plant Sci Dept.
- Malo, D.D. 1992. Introductory soils laboratory manual, 17th Edition. *Plant Sci Dept.*
- Malo, D.D. 1992. Introductory soils. *Plant Sci Dept.*
- Malo, D.D. 1992. Guidebook for the 1992 Region Five collegiate soil judging contest. *Plant Sci Pamph* 69.
- Malo, D.D. 1993. Particle size analysis of MSEA plots, Crop Improvement Association Farm - Aurora, South Dakota. *Pedology Report 93-1.* Plant Sci Dept.
- Malo, D.D. 1993. South Dakota geological highway map. *Plant Sci Pamph* 49. *Plant Sci Dept.*
- Malo, D.D. 1993. Revised assessment plan and instruments approval. *Plant Sci Dept.*
- Malo, D.D. 1993. Particle size and aggregate stability analyses of SCS samples, Bad River Basin Study Stanley County, South Dakota. *Pedology Report 93-6.* Plant Sci Dept.
- Malo, D.D. 1993. Soil particle size analysis methods. *Pedology Report 93-5.* Plant Sci Dept.
- Malo, D.D. 1993. Particle size analysis of SCS samples for Brookings County, South Dakota (Strayhoss Series). *Pedology Report 93-4.* Plant Sci Dept.
- Malo, D.D. 1993. Particle size analysis of SCS samples for Brookings County, South Dakota (Buse, Barnes Series). *Pedology Report 93-3.* Plant Sci Dept.
- Malo, D.D. 1993. Sand particle size analysis of SCS samples for Brookings County, South Dakota. *Pedology Report 93-2.* Plant Sci Dept.
- Malo, D.D. and J.R. Gerwing (ed). 1993. *Soil/Water Science Research, ann rpt.* SDAES TB 99.
- Malo, D.D. 1993. South Dakota crop adaptation areas revision. *SOIL PR 92-37 IN Soil/Water Science Research.* SDAES TB 99.
- Malo, D.D. 1993. Soil productivity ratings development using SCS-SOILS 5 data. *ASA Abstr* 85:301.
- Maursetter, J.M., T.E. Schumacher, M.J. Lindstrom, and G.D. Lemme. 1992. Relationships between soil series and soil nitrate accumulation within a cultivated landscape. *Agron Abstr* 84:331.
- Maursetter, J.M. 1992. Spatial variability of soil nitrate on an eastern South Dakota landscape. *MS thesis, SDSU.*
- Pollmann, R.J. 1992-93. South Dakota preliminary certified seed grower directory, certification service. *Brookings: South Dakota Crop Improvement Assoc.*
- Reese, R.N. and C.D. Dybing. 1992. Induction of soybean vegetative storage proteins in raceme tissues in response to flower set. *Agron Abstr.*
- Rickerl, D.H., D.E. Hubbard, L.L. Janssen, and B.H. Bleakley. 1993. Impacts of agricultural management systems on economic, environmental, and wildlife values of altered and unaltered wetland areas. *P 172 IN NC Region 1993 SARE/ACE rpt to Congress.*
- Rickerl, D.H., W.B. Gordon, and Y. Huang. 1993. Nitrogen management for agricultural lands overlying surficial aquifers. *P 23 IN Ag Research to Protect Water Quality.* Minneapolis, MN.
- Rickerl, D.H. and J.D. Smolik. 1993. Conservation management effects on nutrient cycling. *Agron Abstr* 327.
- Rickerl, D.H., W.B. Gordon, and Y. Huang. 1993. Nitrogen management for agricultural lands overlying surficial aquifers *Soil PR 92-2 IN Soil/Water Science Research.* SDAES TB 99.
- Rickerl, D.H., J.D. Smolik, T.A. Machacek, and S.A. Clay. 1993. Weed ecology in northern plains farming systems. *PR 92-30 IN Soil/Water Science Research.* SDAES TB 99.
- Rickerl, D.H. 1993. Agricultural management impacts on wetlands. *PD00111 IN 1992 ann rpt.*
- Rickerl, D.H., W.B. Gordon, Y. Huang. 1993. Nitrogen management for agricultural lands overlying surficial aquifers. *P 416 IN Proc, Ag Research to Protect Water Quality.* Minneapolis, MN.
- Rickerl, D.H., J.D. Smolik, T.A. Machacek, and S.A. Clay. 1993. Weed ecology in northern plains farming systems. *P 39 IN Proc, Ag Research to Protect Water Quality.* Minneapolis, MN.
- Ruden, B.E., F.A. Cholic, T.E. Schumacher, and W. Riedell. 1992. Measurement of osmoregulation on the coleoptiles of spring wheat as a screening technique for drought tolerance potential. *Agron Abstr* 84:113.
- Scholes, K.A., S.A. Clay, and D.E. Clay. 1993. Herbicide movement affected by agrichemical placement in a ridge tillage system. *4th ann Groundwater Coordination Symposium.* Vermillion, SD.
- Scholes, K.A., S.A. Clay, and D.E. Clay. 1993. Herbicide movement affected by agrichemical placement in a ridge tillage system. *5th ann Groundwater Conference.* Pierre, SD.
- Scholes, K.A., Clay, S.A., D.E. Clay, T. Moorman, K. Brix-Davis, and B. Laurus. 1993. Alachlor degradation in soil surface and aquifer material. *5th ann Groundwater Conference.* Pierre, SD.
- Scott, R.A. 1992. Relationships among flower abortion, growth stages, protein, and oil content in soybeans. *P 131 IN Agron Abstr.*
- Scott, R.A. 1993. Effects of environmental stress on soybean composition and quality. *P 102 IN Agron Abstr.*
- Smolik, J.D., J. Gerwing, D. Rickerl, H. Woodard, and L. Wrage. 1993. Farming systems studies. *P 36 IN 1992 ann prog rpt, Northeast Research Station.* Plant Sci Pamph 70.
- Smolik, J.E. 1993. 1992 Annual Progress Report, Northeast Research Station, (ed). *Plant Sci Pamph* 70.

- Smolik, J.D., L. Evjen, and A. Heuer. 1993. Soybean row space study. P 15 IN 1992 ann prog rpt, Northeast Research Station. Plant Sci Pamph 70.
- Smolik, J.D., L. Evjen, and A. Heuer. 1993. Influence of fertilizer on corn yield following alfalfa. P 16 IN 1992 ann prog rpt, Northeast Research Station. Plant Sci Pamph 70.
- Smolik, J.E., T. Machacek, and L. Evjen. 1993. Effect of mechanical and chemical weed control treatments on corn yield. P 21 IN 1992 ann prog rpt, Northeast Research Station. Plant Sci Pamph 70.
- Smolik, J.E., T. Machacek, L. Evjen, and A. Heuer. 1993. Effects of mechanical and chemical weed control treatments on soybean yield, weed populations, and economic returns. P 22 IN 1992 ann prog rpt, Northeast Research Station. Plant Sci Pamph 70.
- Sorensen, D.R. 1993. Date of planting corn. SE Farm ann rpt 32:4.
- Sorensen, D.R. 1993. Date of planting soybeans. SE Farm ann rpt 32:7.
- Sorensen, D.R. 1993. Drilled and triple row soybeans on corn ridges. SE Farm ann rpt 32:9.
- Sorensen, D.R. 1993. Broadcast planting of soybeans. SE Farm ann rpt 32:9.
- Sorensen, D.R. 1993. Cultivation effects on no-till corn and soybeans. SE Farm ann rpt 32:11.
- Sorensen, D.R. 1993. Corn row spacing and population study. SE Farm ann rpt 32:15.
- Sorensen, D.R. 1993. Effect of simulated defoliation and stalk breakage on corn. SE Farm ann rpt 32:17.
- Sorensen, D.R. 1993. Rotation study. SE Farm ann rpt 32:20.
- Twidwell, E.K., J.R. Johnson, C.E. Stymiest, and K.D. Kephart. 1993. Techniques for establishing alfalfa in South Dakota. SDAES C 896.
- Twidwell, E.K., K.D. Kephart, and R. Bortnem. 1992. Cultivar tests for South Dakota, 1990 report: Alfalfa yield. SDAES C 248.
- Twidwell, E.K., K.D. Kephart, and S.A. Clay. 1992. Quackgrass control in alfalfa as influenced by timing of sethoxymid application. P 158 IN Agron Abstr.
- Woodard, H.J., T.E. Schumacher, and C.G. Carlson. 1992. Field application of the Barber-Cushman model for phosphorus uptake. IN (F. Sikora, ed) Future directions for agricultural phosphorus research. TVA Bulletin Y-224. Muscle Shoals, AL.
- Woodard, H.J. 1993. Literature review of nutrient cycling, effects of whole tree harvesting, burning forest components and soil compaction in conifer forests. U.S. Forest Service, Black Hills National Forest. Custer SD.
- Woodard, H.J. 1993. Timing of Cl applications on hard red spring wheat. P 351 IN National Wheat N/L. Fort Collins: Colorado State University.
- Woodard, H.J., A. Bly, G. Buchenau, B. Byers, R. Gelderman, J. Gerwing, A. Khan, K. Resitsma, F. Schubert, and D. Winther. 1993. Soil fertility research. PR 17-24 IN Soil/Water Research. SDAES TB 99.
- Zhuojing, L., S.A. Clay, D.E. Clay, and S.S. Harper. 1992. Ammonia based fertilizer influence on adsorption of atrazine. Agron Abstr.
- Zhuojing, L., S.A. Clay, D.E. Clay, and S.S. Harper. 1993. Ammonia based fertilizer influence on adsorption of atrazine. Proc. Soil Water Cons Soc, water quality mtg. Minneapolis, MN.
- Zhuojing, L., S.A. Clay, D.E. Clay, and S.S. Harper. 1993. Ammonia based fertilizer influence on adsorption of atrazine. Soil Water Cons Soc, water Quality mtg. Minneapolis, MN.
- Zhang, Y., F. Sutton, and D. Kenefick. 1993. Homologs for the barley cold-regulated genes HVCR8 and HVCR2001 expressed in wheat primary leaf tissue. Rapid City: SD EPSCoR.
- Rural Sociology**
- Publications, reports:
- Arwood, D.E., J.L. Satterlee, P. Joffer, and J. Sowell. 1993. South Dakota population, housing, and farm census facts. Population update series. SDAES C229(27).
- Froelich, P.K., D.E. Arwood, and J.L. Satterlee. 1993. South Dakota sex and age structure 1980-1990. Population update series. SDAES C229(26).
- Satterlee, J.L. 1993. Graphic summary of South Dakota. Department of Rural Sociology CDCR.
- Satterlee, J.L. 1993. New community: a model for community development. Department of Rural Sociology CDCR.
- Satterlee, J.L., D.E. Arwood, and P. Joffer. 1993. North central: resource conservation and development area. Department of Rural Sociology CDCR 2.1.
- Satterlee, J.L., D.E. Arwood, and P. Joffer. 1993. Black Hills: resource conservation and development area. Department of Rural Sociology CDCR 2.3.
- Satterlee, J.L., D.E. Arwood, and P. Joffer. 1993. Badlands: resource conservation and development area. Department of Rural Sociology CDCR 2.1.
- Satterlee, J.L., D.E. Arwood, and P. Joffer. 1993. What do we do? Why do we do it? Department of Rural Sociology CDCR 3.1.
- Satterlee, J.L., D.E. Arwood, and P. Joffer. 1993. American Indians in South Dakota: a report. Department of Rural Sociology CDCR 3.4.
- Satterlee, J.L., D.E. Arwood, and P. Joffer. 1993. South central: resource conservation and development area. Department of Rural Sociology CDCR 4.6.
- Satterlee, J.L., D.E. Arwood, and P. Joffer. 1993. Social conditions in South Dakota. Department of Rural Sociology CDCR 4.20.
- Satterlee, J.L., D.E. Arwood, and P. Joffer. 1993. Soil Conservation Service: administrative area IV. Department of Rural Sociology CDCR 5.0.
- Station Biochemistry**
- Journal articles:
- Estop, A.M., S. Munne, L.K. Jost, and D.P. Evenson. 1993. Alterations in sperm chromatin structure correlates with cytogenetic damage of mouse sperm following in vitro. J Andrology 14:282.
- Evenson, D.P., R.J. Emerick, L.K. Jost, H. Kayongo-Male, and S.R. Stewart. 1993. Zinc-silicon interactions influencing sperm chromatin integrity and testicular cell development in the rat as measured by flow cytometry. J Anim Sci 71:955.
- Evenson, D.P. and L.K. Jost. 1993. Hydroxyurea exposure alters mouse testicular kinetics and sperm chromatin structure. Cell Proliferation 26:147.
- Evenson, D.P., J.E. Parks, M.T. Kaproth, and L.K. Jost. 1993. Rapid determination of sperm cell concentration in bovine semen by flow cytometry. J Dairy Sci 76:86.
- Evenson, D.P., L.K. Jost, and R.K. Baer. 1993. Effects of methyl methanesulfonate on mouse sperm chromatin structure and testicular cell kinetics. Env and Mol Mutagenesis 21(2):144.
- Evenson, D.P., L.K. Jost, and J.G. Gandy. 1993. Glutathione depletion potentiates ethyl methanesulfonate-induced susceptibility of rat sperm DNA denaturation in situ. Reproductive Toxicology 7:297.
- Evenson, D.P., R.J. Emerick, L.K. Jost, H. Kayongo-Male, and S.R. Stewart. 1993. Zinc-silicon interactions influencing sperm chromatin integrity and testicular cell development in the rat as measured by flow cytometry. J Anim Sci 71:955.
- Neve, J., Y. Thomassen, and M. Van Damme. 1992. Cooperative study on measurement of concentrations of selenium in freeze-dried (human whole) blood. Pure & Appl Chem 64:765 (collaborator).
- Spano, M. and D.P. Evenson. 1993. Flow cytometric analysis for reproductive biology. Biology of the Cell 78:53.
- Stewart, S.R., R.J. Emerick, and H. Kayongo-Male. 1993. Silicon-zinc interactions and potential roles for dietary zinc and copper in minimizing silica urolithiasis in rats. J Anim Sci 71:946.
- Twidwell, E.K. and N.J. Thiex. 1992. Forage yield and quality of multifoliate alfalfa. Proc SD Acad Sci 71:45.
- Undersander, D., D.R. Mertens, and N.J. Thiex. 1993. Forage analyses procedures. National Forage Testing Association, Omaha, NE.
- West, T.P. and B. Reed-Hamer. 1993. Effect of pH upon pullulan production relative to carbon source and yeast extract addition to the culture medium. Microbios 75:75.
- West, T.P. and B. Reed-Hamer. 1992. Influence of vitamins and mineral salts upon pullulan synthesis by *Aureobasidium pullulans*. Microbios 71:115.
- West, T.P. 1992. Pyrimidine base and ribonucleoside catabolic enzyme activities of the *Pseudomonas diminuta* group. FEMS Microbiol Lett 99:305.
- Xu, G. and T.P. West. 1992. Protein synthesis during germination of heterothallic yeast ascospores. Experientia 48:786.
- Xu, G. and T.P. West. 1992. Reductive catabolism of pyrimidine bases by *Pseudomonas stutzeri*. J Gen Microbiol 138:2459.
- Xu, G. and T.P. West. 1992. Nutritional and physiological factors affecting germination of heterothallic *Saccharomyces cerevisiae* ascospores. Microbios 72:27.
- Publications, reports:
- Austin, C.L., N.J. Thiex, E.K. Twidwell, and K.P. Kephart. 1993. Variability of results of nutrient analysis on four lots of hay due to hay probe, bale and analytical method. Abstracts, Midwest USA Section, AOAC internal ann mtg (abstr 49).
- Austin, C.L., N.J. Thiex, E.K. Twidwell, K.D. Kephart, and J. Skogberg. 1993. Sampling of large round and large square bales. P 45 IN South Dakota Beef Report.
- Cohen, H.J., N. Avissar, Y. Yagil, C.B. Ornt, D.A. Bushinsky, and I.S. Palmer. 1993. Effect of nephrectomy on renal transplantation on serum glutathione peroxidase activity. FASEB J 6:A1397 (abstr 26174).
- Dwivedi, C., B.S. Hassoun, and I.S. Palmer. 1993. Selenium detoxification by methylation. FASEB J 7:A732 (abstr).
- Emerick, R.J. and H. Kayongo-Male. 1993. Dietary factors influencing urinary calculi formation in livestock and laboratory animals. P 84 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Evenson, D.P., P. De Angelis, L.K. Jost, K. Purvis, and O.P.F. Clausen. 1993. Relationship between sperm chromatin structure and other clinical parameters in men attending an infertility clinic. XVI Congress of the International Society for Analytical Cytology. Colorado Springs, CO.
- Evenson, D., L. Jost, and B. Sailer. 1993. Mammalian testes are an excellent dosimeter of environmental stress. P 19 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Hirsch, I.H., M.B. Chancellor, B. Huang, S. Salzman, and D. Evenson. 1993. Spermatogenesis following experimental spinal cord injury (SCI). American Urological Association, Inc. San Antonio, TX.
- Jost, L.K. and D.P. Evenson. 1993. Measurement of sperm chromatin structure on different flow cytometers. XVI Congress of the International Society for Analytical Cytology. Colorado Springs, CO.
- Karabins, D., C. Vogler, R. Saacke, and D. Evenson. 1993. Scrotal insulation effects on bull sperm chromatin. XVI Congress of the International Society for Analytical Cytology. Colorado Springs, CO.
- Kayongo-Male, H., R.J. Emerick, and Xiujuan Jia. 1993. Nutritional stress factors in cardiovascular aneurysms - a conceptual approach. P 23 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Novotny, L.C. and N.J. Thiex. 1993. Free (physiological) and total (hydrolysate) amino acid analysis on a single system. Abstracts, Midwest USA Section, AOAC internal ann mtg (abstr 47).
- Olson, O.E. and I.S. Palmer. 1993. Ability of rats to discriminate between waters of varying selenium concentration. P 59 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Sachen, R.W. and N.J. Thiex. 1993. Total nitrogen (salicylic acid method) in feeds, forages, and fertilizers by block digestion and steam distillation. Abstracts, Midwest USA Section, AOAC internal ann mtg (abstr 51).
- Thiex, N.J. and E.K. Twidwell. 1993. How to evaluate a forage testing laboratory. SDCES C 255.
- Thiex, N., C. Austin, and E.K. Twidwell. 1992. Using NIRS feed test results. SDCES ExExtra 4002.
- Twidwell, E.K., N.J. Thiex, and J.L. Skogberg. 1992. Forage yield and quality of multifoliate alfalfa. SDCES ExExtra 8073.
- Twidwell, E.K., J.J. Wagner, and N.J. Thiex. 1992. Use a microwave oven to determine moisture content of forages. SDCES ExExtra 8077.
- Van Erem, T.C. and N.J. Thiex. 1993. Use of control charts to monitor analyses and take corrective action in a feed and forage laboratory. Abstracts, Midwest USDA Section, AOAC internal ann mtg (abstr 50).
- Wake, C., P. Schaefer, L. Jost, and D. Evenson. 1993. Analysis of intraspecific nuclear DNA content variation in *Glis glis triacanthos* L. (Honeylocust) by flow cytometry. XVI Congress of International Society for Analytical Cytology. Colorado Springs, CO.
- West, T.P. and B. Reed-Hamer. 1992. Pullulanase activity of *Aureobasidium pullulans*. Abst 9th Internatl Biotechnology Symposium.
- West, T.P. and B. Reed-Hamer. 1993. Reduced pigmentation *Aureobasidium* mutants showing elevated pullulan production. Abst Amer Soc Microbiol.
- West, T.P. 1993. Pyrimidine biosynthesis in *Pseudomonas pseudocataligenes*. FASEB J 7:1084 (abstr).
- West, T.P. 1993. Biostress as an aid in the isolation of fungal gum mutants. P 28 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Wiger, R., J. Hongslo, P.E. Schwarze, D.P. Evenson, P. De Angelis, and J.A. Holme. 1992. Paracetamol interferes with spermatogenesis in laboratory mice. VI Internatl Congress of Toxicology. Rome.
- Wiger, R., J. Hongslo, D.P. Evenson, P. De Angelis, P.E. Schwarze, and J.A. Holme. 1992. Effects of paracetamol on spermatogenesis and spermiogenesis in laboratory mice. NORDTOX-92, 2nd Nordic Toxicology Congress, Humans and the toxic environment. Aland Islands, Finland.
- Wu, C. 1993. Lysine enhancement of corn distillers grains by treatment with fungal mutants. MS thesis, SDSU.
- Xu, G. 1992. Catabolism of pyrimidine bases by *Pseudomonas stutzeri*. PhD thesis, SDSU.

Journal articles:

- Benfield, D.A., L. Harris, E.A. Nelson, J.E. Collins, J. Christopher-Hennings, D.W. Chladek, W. Christianson, R. Morrison, and D. Gorceyca. 1992. Properties of SIRS virus isolate ATCC VR-2332 in the United States and preliminary characterization of a monoclonal antibody to this virus. *Am Assoc Swine Pract* 4:19.
- Benfield, D.A., E. Nelson, J.E. Collins, L. Harris, S.M. Goyal, D. Robinson, W.T. Christianson, R.B. Morrison, D. Gorceyca, and D. Chladek. 1992. Characterization of swine infertility and respiratory syndrome (SIRS) virus (Isolate ATCC VR-2332). *J Vet Diagn Invest* 4:127.
- Bury, Q.C. and D.J. Hurley. 1993. Colostrum inhibits pathogen binding in vitro. *J Immunol* 150(8):313A.
- Chase, C.C.L., C. Lohff, and G.J. Letchworth III. 1993. Resistance and susceptibility of bovine cells expressing herpesviral glycoprotein D homologs to herpesviral infections. *Virol* 194:365.
- Christianson, W.T., J.E. Collins, D.A. Benfield, L. Harris, H.S. Joo, and R.B. Morrison. 1992. Experimental reproduction of swine infertility and respiratory syndrome in pregnant sows. *Am J Vet Res* 53:485.
- Christopher-Hennings, J., J.A. Willgohs, D.H. Francis, U.A.K. Raman, R.A. Moxley, and D.J. Hurley. 1993. Immunocompromise in gnotobiotic pigs induced by verotoxin producing *Escherichia coli* (0111:NM). *Infect Immun* 61(6):2304.
- Collins, J.E., D.A. Benfield, W.T. Christianson, L. Harris, J.C. Hennings, D.P. Shaw, S.M. Goyal, D. Gorceyca, D. Chladek, S. McCullough, R.B. Morrison, and H.S. Joo. 1992. Isolation of swine infertility and respiratory syndrome virus (Isolate ATCC VR-2332) in North America and experimental reproduction of the disease in gnotobiotic pigs. *J Vet Diagn Invest* 4:117.
- Erickson, A.K. and S.D. Killilea. 1992. Effects of fructose 2, 6-bisphosphate and glucose 1,6-bisphosphate on porcine cardiac phosphatase 2A. *Biochem Internat* 27:353.
- Erickson, A.K. and S.D. Killilea. 1992. Purification and characterization of porcine heart type 2A protein phosphatases. *Prepar Biochem* 22:257.
- Erickson, A.K., J.A. Willgohs, S.Y. McFarland, D.A. Benfield, and D.H. Francis. 1992. Identification of two porcine brush border glycoproteins that bind the K88ac adhesion on *Escherichia coli* and correlation of these binding glycoproteins with the adhesive porcine phenotype. *Infect Immun* 60:983.
- Hurley, D.J. 1993. Comparison of activation induced changes in bovine lymphocyte markers after treatment with lectins, bacterial toxins and phorbol esters. *Cytology* 56:78.
- Hurley, D.J., C.L. Baldwin, R.A. Wilson, and A.M. Mastro. 1993. Characterization of bovine lymph node cells with leukocyte specific monoclonal antibodies. *Vet Immunol Immunopathol* (in press).
- Morrison, R.B., J.E. Collins, L. Harris, W. Christianson, D.A. Benfield, D.W. Chladek, D.E. Gorceyca, and H.S. Joo. 1992. Serologic evidence implicating an unidentified virus as the cause of swine infertility and respiratory syndrome (SIRS). *J Vet Diagn Invest* 4:186.
- Nietfeld, J.C., B.H. Janke, P. Leslie-Steen, D.J. Robison, and D.H. Zeman. 1993. Small intestinal *Chlamydia* infection in piglets. *J Vet Diagn Invest* 5:114.
- Pritchard, R.H., J.U. Thomson, S. Sai leela, M.B. Hildreth, and T.E. Lucas. 1993. Performance of chlortetracycline-sulfamethazine combinations in feeder calves with coccidiosis. *Agri-Practice* 14(3):24.
- Rogers, D.G., D.H. Zeman, and E.D. Erickson. 1992. Diarrhea associated with *Enterococcus* (*Streptococcus*) *durans* in four calves. *J Vet Diagn Invest* 4:471.
- Sailer, B.L., B.K. Walker, and D.J. Hurley. 1993. Loading calcium sensitive fluorescent ion probes by non-detergent methods. *Cytology* 56:29.
- Thomson, J.U. 1992. Bovine Respiratory Disease, Part 1, roundtable discussion. *Agri-Practice* 13(2):13.
- Thomson, J.U. 1993. Choosing a herd health vaccination program, part 1 (moderator). *Agri-Practice* 14(2):24.
- Walker, B.K. and D.J. Hurley. 1993. Plasma membrane liquid crystalline phase domain role in cell activation. *Cytology* 56:9.
- Yaeger, M.J., T. Prieve, J. Collins, J. Christopher-Hennings, E. Nelson, and D. Benfield. 1993. Evidence for the transmission of Porcine Reproductive and Respiratory Syndrome (PRRS) virus in boar semen. *Swine Health and Prod* 1(5):7.
- Zeman, D.H., J.P. Dubey, and D. Robison. 1993. Fatal hepatic sarcocystosis in an American black bear. *J Vet Diagn Invest* 5:480.
- Publications, reports:
- Benfield, D.A., L. Harris, E.A. Nelson, J.E. Collins, D.W. Chladek, W.T. Christianson, R. Morrison, and D. Gorceyca. 1992. Characteristics of the porcine epidemic abortion and respiratory syndrome (PEARS) virus (Isolate ATCC VR-2332) in the United States. P 120 IN Proc, 12th Cong Internat Pig Vet Soc, The Hague, The Netherlands.
- Benfield, D.A., E. Nelson, J. Hennings, M. Minehart, D. Hurley, and P. Steen. 1993. Update on porcine respiratory and reproduction syndrome (PRRS) virus and diagnosis. Proc, Livestock Cons Inst Mtg.
- Brevik, A.K., A.K. Erickson, E.A. Nelson, D.M. Coyle, D.H. Francis, D.A. Benfield. 1992. Role of sialic acid in the binding of porcine rotavirus to MA-104 cells. Proc, 73rd Conf Res Workers Ani Dis (abstr 69).
- Brumm, M.C., J.U. Thomson, and G.R. Bodman. 1992. Water—the forgotten nutrient. Improving swine production efficiency (television short course broadcast), P 45, Purdue University and Kansas State University CES.
- Chae, C., R.A. Moxley, J. Christopher-Hennings, D.H. Francis, and M. Wanneumuehler. 1992. Shiga-like toxin-II-producing *Escherichia coli* 0157:H7 infection in gnotobiotic piglets: protection against brain vascular lesions with anti-SLT-II serum. Proc, 73rd Conf Res Workers Ani Dis (abstr 8).
- Christianson, W.T., J.E. Collins, D.A. Benfield, L. Harris, T.W. Molitor, R.B. Morrison, and H.S. Joo. 1992. Pathogenesis of swine infertility and respiratory syndrome virus infection in pregnant sows. P 110 IN Proc, 12th Cong Internat Pig Vet Soc, The Hague, The Netherlands.
- Christianson, W.T., J.E. Collins, D.A. Benfield, T.W. Molitor, and H.S. Joo. 1992. Pathogenesis of reproductive failure caused by swine infertility and respiratory syndrome virus. Proc, 35th Am Assoc Vet Lab Diagn.
- Christopher-Hennings, J., E.A. Nelson, D.A. Benfield. 1992. Evaluation of the antibody response to porcine respiratory and reproductive syndrome (PRRS) virus by indirect immunofluorescence (IFA), virus neutralization (VN) and immuno-blotting. Proc, 73rd Conf Res Workers Ani Dis (abstr P57).
- Erickson, A.K., J.A. Willgohs, S.Y. McFarland, D.R. Baker, D.A. Benfield, and D.H. Francis. 1992. Three variants of K88 adhesion (K88ab, K88ac and K88ad) of *Escherichia coli* bind to the same receptors in adhesive porcine intestinal brush border preparations. Proc, 73rd Conf Res Workers Ani Dis (abstr 59).
- Erickson, A.K. and D.H. Francis. 1993. Purification and characterization of two intestinal receptors for the K88 adhesion of *Escherichia coli*. Proc, 4th Gordon Conf Molecular Mechanisms of Microbial Adhesion.
- Francis, D.H. and A.K. Erickson. 1993. Basis of heritable resistance of some pigs to infection by K88-positive *Escherichia coli*. P 20 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Genetzky, R., D. Miskimins, D. Zeman, T.L. Carlson, K.J. Schwartz, and D.J. Larsen. 1993. Intravenous spectinomycin associated deaths in light-weight stressed feedlot cattle. Proc, North Central Conf Vet Lab Diagn.
- Harris, L.J., D.E. Gorceyca, K.J. Schlesinger, D.W. Chladek, R.H. Shultz, W.T. Christianson, J.E. Collins, and D.A. Benfield. 1992. Development and use of serological assays for the detection of antibody to the porcine epidemic abortion and respiratory syndrome virus (PEARS) virus. P 123 IN Proc, 12th Cong Internat Pig Vet Soc, The Hague, The Netherlands.
- Minehart, M., E.A. Nelson, D.J. Hurley, and D.A. Benfield. 1992. Comparison of virus neutralization (VN) and indirect immunofluorescence (IFA) for detection of antibodies of porcine reproductive and respiratory syndrome (PRRS) virus. Proc, 73rd Conf Res Workers Ani Dis (abstr P56).
- Miskimins, D.W. 1992. Bovine respiratory disease. DVM News 6(4):56. SDCES.
- Miskimins, D.W. 1992. BRD diagnosis—bacterial agents. DVM News 6(5):72. SDCES.
- Miskimins, D.W. 1993. Monensin toxicosis in pigs. DVM News 7(1):1-2. SDCES.
- Miskimins, D.W. 1992. Swift response cooled fears of Potomac Horse Fever epidemic. P 30 IN Horizons. Brookings: ABS.
- Miskimins, D., R. Genetzky, and D.H. Zeman. 1992. Death in SD cattle caused by IV spectinomycin therapy. DVM News 6(5):72. SDCES.
- Miskimins, D.W., P. Leslie-Steen, and S. Shawd. 1993. Antemortem diagnosis of bovine respiratory disease. P 91 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Miskimins, D.W. and R. Neiger. 1993. Monensin toxicosis in nursery pigs. North Central Conf Vet Lab Diagn (abstr).
- Morrison, R.B., J.E. Collins, L. Harris, D.W. Chladek, D.E. Gorceyca, H.S. Joo, W. Christianson, D.A. Benfield, W.E. Marsh, S. Goyal, J.F. Anelli. 1992. Sero-epidemiologic investigation of porcine epidemic abortion and respiratory syndrome (PEARS, PRRS, SIRS). P 114 IN Proc, 12th Cong Internat Pig Vet Soc, The Hague, The Netherlands.
- Nelson, E.A., J. Christopher-Hennings, and D.A. Benfield. 1992. Characterization and diagnostic use of monoclonal antibodies to U.S. isolates of porcine reproductive and respiratory syndrome (PRRS) virus. Proc, 73rd Conf Res Workers Ani Dis (abstr P101).
- Nelson, E.A., J. Christopher-Hennings, and D.A. Benfield. 1992. Characterization and diagnostic use of monoclonal antibodies to U.S. isolates of porcine reproductive and respiratory syndrome (PRRS) virus. P 121 IN Proc, 12th Cong Internat Pig Vet Soc, The Hague, The Netherlands.
- Nelson, E.A., J.C. Hennings, L. Harris, J.E. Collins, D.W. Chladek, D. Gorceyca, D.A. Benfield. 1992. Preliminary characterization of monoclonal antibodies to a United States isolate (ATCC VR-2332) of porcine epidemic abortion and respiratory syndrome virus. P 121 IN Proc, 12th Cong Internat Pig Vet Soc, The Hague, The Netherlands.
- Nietfeld, J.C., B.H. Janke, P. Leslie-Steen, D.J. Robison, and D.H. Zeman. 1993. Small intestinal *Chlamydia* infection in piglets. Proc, 25th Western Conf Vet Diag Pathol, Saskatoon, Saskatchewan, Canada.
- Nietfeld, J.C., B.H. Janke, P. Leslie-Steen, D.J. Robison, and D.H. Zeman. 1993. Small intestinal *Chlamydia* infection in piglets. Proc, 35th Am Assoc Vet Lab Diagn.
- Rosow, K., E. Bautista, S. Goyal, M. Murtaugh, T. Molitor, R. Morrison, D. Benfield, and J. Collins. 1992. Pathogenesis of swine infertility and respiratory syndrome (SIRS) virus infection. Proc, 35th Am Assoc Vet Lab Diagn.
- Shawd, S.J., P. Leslie-Steen, and D. Zeman. 1992. Use of Avidin-biotin complex (ABC) immunoperoxidase procedure on formalinized tissue for evaluating BVD virus associated with neonatal calf scours. Poster and abstr, Proc, 73rd Conf Res Workers Ani Dis.
- Tabachnick, W.J., T.E. Walton, and C.C.L. Chase. 1992. Considerations for developing regulatory policy to prevent importation of arthropod-borne animal diseases: the lessons learned from bluetongue viruses. P 255 IN Proc, XVII World Buiatrics Cong and XXV Am Assoc Bovine Pract Conf.
- Thomson, J.U. 1992. Choosing a disinfectant for swine production. *Porkline, SDPPC* n/1.
- Thomson, J.U. 1992. Cryptosporidiosis in the nursing beef calf. Proc, ann mtg, Iowa Vet Med Assoc.
- Thomson, J.U. 1992. Preconditioning and integrating pre-purchase information. Proc, Am Assoc Bovine Pract and XVII World Buiatrics Cong.
- Thomson, J.U. 1992. PRRS. *Porkline, SDPPC* n/1.
- Thomson, J.U. 1992. Receiving calves this fall: plan ahead. *BEEF Magazine*.
- Thomson, J.U. 1992. Swine herd health management. Proc, SDSU Swine Days.
- Thomson, J.U. 1993. What the veterinary diagnostic laboratory can do for the large animal practitioner. Proc, Am Vet Med Assoc.
- Thomson, J.U., J. Parsons, and J. Males. 1992. Animal stress research tied to "making a living." *SD F&HR* 43(3):5.
- Thomson, J.U. 1993. Career corner. *Ag in the Classroom, SD Treasures*.
- Tidball, B., K. Ringwall, J.U. Thomson, and D. Boggs. 1992. Disease equals suboptimal production: Management techniques provide solution. *Farm and Ranch Guide*.
- Wilson, W.C., and C.C.L. Chase. 1992. Use of RNA detection techniques to identify bluetongue virus and epizootic hemorrhagic disease virus in *Culicoides variipennis*. P 687 IN Proc, 2nd Internat Symp Bluetongue, African Horse Sickness and Related Orbiviruses.
- Zeman, D.H. 1993. Neonatal bovine enteritis. DVM News 7(2):30. SDCES.
- Zeman, D.H., J.P. Dubey, and D. Robison. 1993. Hepatic sarcocystosis in an American black bear. Proc, North Central Conf Vet Lab Diagn.
- Zeman, D., R. Neiger, M. Yaeger, E. Nelson, D. Benfield, J. Thomson, D. Miskimins, and R. Daly. 1992. Diagnosing field cases of SIRS infection: three diagnostic case reports. Proc, 35th Am Assoc Vet Lab Diagn.

Journal articles:

- Berry, C.R. and D.W. Willis. 1992. Index-netting to assess need for fish control on waterfowl refuges. *Res Info Bull* 91:70.
- Berry, C.R., K.F. Higgins, and G. Krull. 1993. Valuation of hay and bait fish harvested from privately-owned South Dakota wetlands. *SD Acad Sci* 71:37.
- Callow, J.M., H.A. Kantrud, and K.F. Higgins. 1992. First flowering dates and flowering periods of prairie plants at Woodworth, North Dakota. *Prairie Nat* 24:57.
- DeVries, D.R., P.E. Ihssen, J. Lyons, and D.W. Willis. 1992. North American journal of fisheries management: current status and outlook. *Fisheries* 17(5):20.
- Duffy, W.G., R.T. Oglesby, and J.A. Reckahn. 1992. Application of biological measures to classification of aquatic habitats in the Laurentian Great Lakes. P 161 IN (W. Dieter, N. Busch, and P. Sly, eds) *Development of an aquatic habitat classification system for lakes*. Ann Arbor, MI: CRC Press.
- Flammang, M.K. and D.W. Willis. 1993. Comparison of electropherograms and external characteristics for distinguishing juvenile walleyes and saugeyes. *Prairie Nat* 25:255.
- Flammang, M.K., D.W. Willis, and B.R. Murphy. 1993. Development of condition and length-categorization standards for saugeye. *J Fresh Ecol* 8:199.
- Gordon, C.C., L.D. Flake, K.F. Higgins, and W.L. Tucker. 1993. Wetland water quality characteristics in the rainwater basin area of Nebraska. *SD Acad Sci* 72 (in press).
- Guy, C.S. and D.W. Willis. Food habits of white crappies in Lake Goldsmith, South Dakota. *SD Acad Sci*, submitted for publication.
- Guy, C.S., D.W. Willis, and J.J. Jackson. Biotelemetry of white crappies in a South Dakota natural lake. *Trans Am Fish Soc* (in press).
- Guy, C.S., R.M. Neumann, and D.W. Willis. 1992. Movement patterns of adult black crappie, *Pomoxis nigromaculatus*, in Brant Lake, South Dakota. *J Fresh Ecol* 7:137.
- Hamilton, S.J. and C.R. Berry. 1992. Native Americans participate in research apprenticeship program. *Fish Wildl News* 19.
- Haworth, M. and K.F. Higgins. 1993. Waterfowl use and production from nesting baskets and bales in South Dakota wetlands. *Prairie Nat* 25:149.
- Higgins, K.F., L.M. Kirsh, A.T. Klett, and H.W. Miller. 1992. Waterfowl production on the Woodworth Station in south-central North Dakota, 1965-1981. *US Fish Wildl Ser Res Pub* 180.
- Higgins, K.F., R. Barta, R.D. Neiger, G. Rottinghaus, and R. Sterry. 1992. Mycotoxin occurrence in waste field corn and ingesta of wild geese in the northern great plains. *Prairie Nat* 24:31.
- Hill, T.D. and D.W. Willis. Influence of water conductivity on AC and DC electrofishing catch rates for largemouth bass. *N Am J Fish Manage* (in press).
- Hill, T.D. and D.W. Willis. Largemouth bass biomass, density, and size structure in small South Dakota impoundments. *SD Acad Sci*, submitted for publication.
- Hill, T.D. and W.G. Duffy. 1993. Proposed minimum lengths for size categories of land locked chinook salmon. *Prairie Nat* 25: 261.
- Isaak, D.J., T.D. Hill, and D.W. Willis. 1992. Comparison of size structure and catch rate for largemouth bass samples collected by electrofishing and angling. *Prairie Nat* 24:89.
- Isaak, L.C., R.M. Neumann, and D.W. Willis. Food habits of walleyes in Lake Thompson, South Dakota. *Prairie Nat* (in press).
- Jackson, J.J. and D.W. Willis. Changes in walleye food habits throughout Lake Oahe, South Dakota in August 1991. *Prairie Nat* (in press).
- Jackson, J.J., D.W. Willis, and D.G. Fielder. 1992. Food habits of young-of-the-year walleyes in Okoboyo Bay of Lake Oahe, South Dakota. *J Fresh Ecol* 7:329.
- Kantrud, H.A. and K.F. Higgins. 1992. Nest and nest site characteristics of some ground-nesting, non-passerine birds of northern grasslands. *Prairie Nat* 24:67.
- Kolander, T.D., D.W. Willis, and B.R. Murphy. 1993. Proposed revision of the standard weight (*W_s*) equation for smallmouth bass. *N Am J Fish Manage* 13:398.
- Kruse, C.G., C.S. Guy, and D.W. Willis. Comparison of otolith and scale age characteristics for black crappies collected from South Dakota waters. *N Am J Fish Manage* (in press).
- Lott, J.P., D.W. Willis, and D.O. Lucchesi. Food habits of yellow perch in South Dakota lakes: relations to population structure and dynamics. *Trans Am Fish Soc*, submitted for publication.
- Luttschwager, K.A. and K.F. Higgins. 1993. Nongame bird, gamebird, and deer use of conservation reserve program fields in eastern South Dakota. *SD Acad Sci* 71:31.
- Mero, S.W. and D.W. Willis. 1992. Seasonal variation in sampling data for walleye and sauger collected with gill nets from Lake Sakakawea, North Dakota. *Prairie Nat* 24:231.
- Mero, S.W., D.W. Willis, and G.J. Power. Walleye and sauger predation on paddlefish in Lake Sakakawea, North Dakota. *N Am J Fish Manage* (in press).
- Murphy, B.R., D.W. Willis, and W.M. Childress. 1992. Proper distinction between relative weight and relative condition factor. *N Am J Fish Manage* 12:665.
- Neumann, R.M., C.S. Guy, and D.W. Willis. Assessment of samples for juvenile percichthyids collected in 13 gears from Lake Texoma. *N Am J Fish Manage*, submitted for publication.
- Simon, D.S., C.G. Scalet, and J.C. Dillon. 1993. Evaluation of triploid and diploid rainbow trout in South Dakota waters. *N Am J Fish Manage* 13:134.
- Solberg, K.L., and K.F. Higgins. 1993. Over-water nesting by ducks in northeastern South Dakota. *Prairie Nat* 25:19.
- Van't Hul, J.T. and J.A. Jenks. 1992. Food habits of mourning doves in east-central South Dakota. *Prairie Nat* 24:251.
- Willis, D.W., B.R. Murphy, and C.S. Guy. 1993. Stock density indices: development, use, and limitations. *Rev Fish Sci* 1:203.
- Willis, D.W., J.P. Lott, C.S. Guy, and D.O. Lucchesi. 1992. Growth of bluegills and yellow perch in South Dakota waters. *Prairie Nat* 24:225.
- Zwank, P.J., J.A. Zeno, and J.A. Jenks. 1992. Birth characteristics and growth comparisons of white-tailed deer fawns. *Louis Acad Sci* 55:15.
- Publications, reports:
- Berry, C.R. 1993. South Dakota research unit gains new data on rare species of the Missouri River. *Endangered Spec Tech Bull XVII*(9-11):10.
- Berry, C.R. and D.W. Willis. 1992. Index-netting to assess need for fish control on waterfowl refuges. *USFWS, Res Inf Bull* 91-70.
- Bierle, S.A., J.A. Jenks, and C.R. Berry, Jr. 1993. International waterfowl banding program: the SDSU connection. *Ann mtg, SD Chap, The Wildl Soc* (abstr).
- Boe, A.A., R.R. Bortner, K.F. Higgins, and A.D. Kruse. 1993. Variability in morphological, phenological, and forage quality characteristics of sweetclover accessions. *Ann mtg, Soc Range Manage*. Albuquerque, NM.
- Boe, A.A., Z.W. Wicks, and K.F. Higgins. 1992. Evaluation of late-maturing alfalfa as both a wildlife habitat and a livestock forage. *Proc, Midwest Fish Wildl Conf* 54:300.
- Bogenschütz, T.R. 1992. Evaluation of corn and sorghum as a winter food source for ring-necked pheasants. *MS thesis*, SDSU.
- Bogenschütz, T.R., D.E. Hubbard, and A.P. Leif. 1992. Evaluation of corn and sorghum as a winter food source for ring-necked pheasants. *Midwest Pheasant Manage Group*. Port Washington, WI.
- Bogenschütz, T.R., D.E. Hubbard, and A.P. Leif. 1992. Evaluation of corn and sorghum as a winter food source for ring-necked pheasants. *Midwest Fish Wildl Conf* (abstr).
- Bortner, R.R., A.A. Boe, K.F. Higgins, and A.D. Kruse. 1993. Evaluation of alfalfa germplasms for combined wildlife habitat and forage purposes. *Ann mtg, Soc Range Manage*. Albuquerque, NM.
- Boyd, C.L., K.F. Higgins, and A.D. Kruse. 1992. Avian and insect community response to grazing and haying on conservation reserve program lands in North Dakota. *Symp Neotropical Migrants*. Estes Park, CO.
- Boyd, C.L., K.F. Higgins, and A.D. Kruse. 1993. Nongame bird and insect response to grazing and haying on conservation reserve program lands in North Dakota. *Ann mtg, Soc Range Manage*. Albuquerque, NM.
- Brinkman, M.A. 1992. Influence of agricultural chemicals on aquatic invertebrate biodiversity and genetic diversity in northern prairie wetlands. *MS thesis*, SDSU.
- Brinkman, M.A. and W.G. Duffy. 1992. Evaluation of four types of gear used to sample wetland aquatic macroinvertebrates and four sorting techniques. *Dakota Chap Amer Fish Soc*. Aberdeen, SD.
- Brinkman, M.A. and W.G. Duffy. 1993. Impact of agricultural chemicals on the biodiversity of wetland aquatic invertebrates. P 43 IN *Abstracts, Biostress Symposia*. Brookings: SDAES.
- Coughlin, P.F. and K.F. Higgins. 1992. Wood duck population and habitat distributions in South Dakota. *Midwest Fish Wildl Conf* 54:298.
- Coughlin, P.F. and K.F. Higgins. 1993. Riparian habitats relative to wood duck management in South Dakota. *SD Acad Sci*.
- Dieter, C.D. 1993. Effects of phorate on ducklings, macroinvertebrates, and microtox in northern prairie wetlands. *PhD dissertation*, SDSU.
- Dieter, C.D. and L.D. Flake. 1992. Effects of a selected insecticide on waterfowl, invertebrates, and the Microtox system. *Midwest Fish Wildl Conf*.
- Dirks, B.J., J. Dinan, M.J. Schwalbach, C.D. Kruse, K.F. Higgins, E.N. McPhillips, E.M. Dowd, and G.M. Vandel. 1993. Surveys of size distribution and fledgling production of piping plover and interior least tern populations along rivers in South Dakota, 1978 - 1991. P 60 IN (K.F. Higgins and M.R. Brashier, eds) *Proc, Missouri River and its tributaries: piping plover and least tern symposium* (abstr). Brookings: SDSU.
- Dirks, B.J., M.J. Schwalbach, K.F. Higgins, and C.D. Kruse. 1993. Soil substrates, objects, and vegetation at piping plover and interior least tern nest sites in South Dakota. P 93 IN (K.F. Higgins and M.R. Brashier, eds) *Proc, Missouri River and its tributaries: piping plover and least tern symposium* (abstr). Brookings: SDSU.
- Duffy, W.G. Influence of environmental variables and prey on growth of chinook salmon in Lake Oahe, South Dakota. *Annual mtg, Dakota Chap Amer Fish Soc*. Aberdeen, SD.
- Duffy, W.G., K.S. Karnitz, and D.A. Conover. 1991. Zooplankton community composition and abundance in Lake Oahe, South Dakota before and after the introduction of rainbow smelt. *Midwest Fish Wildl Conf*. Des Moines, IA.
- Duffy, W.G., and S.A. Birkelo. 1993. Aquatic invertebrate production in northern prairie wetlands. *Prairie Wetlands Symp*. Jamestown, ND.
- Duffy, W.G., and T.D. Hill. 1993. Ecosystem stress and Missouri River fisheries. P 46 IN *Abstracts, Biostress Symposia*. Brookings: SDAES.
- Erickson, J.D. 1992. Habitat selection and movement of pallid sturgeon in Lake Sharpe, South Dakota. *MS thesis*, SDSU.
- Erickson, J.D. and W.G. Duffy. 1992. Pallid sturgeon movement and habitat selection in Lake Sharpe. *Dakota Chap Amer Fish Soc*. Aberdeen, SD.
- Fielder, D.G. and D.W. Willis. 1993. What are Lake Oahe walleyes eating? *SD Cons Dig*. 60(3):8.
- Flake, L.D. and D.E. Ashton. 1992. Wild turkey in South Dakota's prairie woodlands. *Brookings: SDCES*.
- Flake, L.D. and P.J. Bergmann. 1992. Survival and movements of mallard duckling hatched on islands and peninsulas with reduced predator populations. *Midwest Fish and Wildl Conf*. Toronto, Canada (abstr).
- Flammang, M.K., D.W. Willis, and B.R. Murphy. 1993. Development of condition and length-categorization standards for saugeye. *SD Dept Game, Fish Parks, Fish Div Rep* 93-3, Pierre.
- Freiberger, C.E. 1992. Bioenergetics and life history of rainbow smelt in Lake Oahe, South Dakota. *MS thesis*, SDSU.
- Gibbs, M.C. 1993. Big game habitat utilization in noncommercially thinned ponderosa pine in Custer State Park. *MS thesis*, SDSU.
- Gibbs, M.C., J.A. Jenks, and B.F. Sowell. 1992. Pronghorn and agriculture-maintaining a balance. *SDCES FS* 886.
- Gibbs, M.C., J.A. Jenks, B.F. Sowell, and K.J. Jenkins. 1993. Evaluation of big game habitat improvement through pre-commercial thinning of ponderosa pine. *Ann mtg, SD Chap Wildl Soc* (abstr).
- Gibbs, M.C., J.A. Jenks, B.F. Sowell, and K.J. Jenkins. 1993. Effect of precommercial thinning of ponderosa pine on forage utilization by big game. *Ann mtg, Soc Range Manage* (abstr).
- Gordon, C.C., L.D. Flake, K.F. Higgins, and W.L. Tucker. 1993. Wetland water quality characteristics in the Rainwater Basin area of Nebraska. *SD Acad Sci*. Rapid City, SD.
- Guy, C.S. and D.W. Willis. 1993. Effects of physicochemical and biological stressors on black crappie populations in South Dakota waters. P 51 IN *Abstracts, Biostress Symposia*. Brookings: SDAES.
- Guy, C.S. and D.W. Willis. 1993. Statewide summary of sampling data for black and white crappies collected from South Dakota waters. *SD Dep Game, Fish Parks, Fish Div Rep* 93-12, Pierre.
- Guy, C.S., D.W. Willis, and J.J. Jackson. 1993. Biotelemetry of white crappies (*Pomoxis annularis*) in a South Dakota natural lake. *Ann mtg, Amer Fish Soc*. Portland, OR.

- Guy, C.S., R.M. Neumann, and D.W. Willis. 1992. Movement patterns of adult black crappies, *Pomoxis nigromaculatus*, in Brant Lake, South Dakota. Ann mtg, Amer Fish Soc. Rapid City, SD.
- Henry, C.J. and K.F. Higgins. 1992. Effects of rodeo on aquatic invertebrates. Cattail management symposium, Fargo, ND.
- Henry, C.J., K.F. Higgins, and K. Buhl. 1991. Effects of Rodeo herbicide on aquatic invertebrates and fathead minnows. Midwest Fish Wildl Conf. Des Moines, IA.
- Higgins, K.F. 1992. Hunting and game management on private estates in England. Ann mtg, MN Pheasants Forever. Marshall, MN.
- Higgins, K.F. 1992. Nongamebird, gamebird, deer, and pheasant use of CRP fields in eastern South Dakota. SD Acad Sci. Sioux Falls, SD.
- Higgins, K.F. 1992. Wildlife use of CRP. Res Info Bull 56. Washington, DC: U.S. Fish and Wildlife Service.
- Higgins, K.F. and C.R. Berry. 1992. Values of hay and baitfish from South Dakota wetlands. SD Acad Sci. Sioux Falls, SD.
- Higgins, K.F. and M.R. Brashier (eds). Proc, Missouri River and its tributaries: piping plover and least tern symposium. Brookings: SDSU.
- Higgins, K.F., C.R. Berry, D.E. Hubbard, L.D. Flake, M.L. Kjellsen, and R.R. Johnson (presenter). 1993. Valuation, inventory, and biological assessment of prairie wetlands: 15 years of research at South Dakota State University. Prairie Wetlands Symposium. Jamestown, ND.
- Higgins, K.F., J. Dinan, B.J. Dirks, C.D. Kruse, M.J. Schwalbach, E.N. McPhillips, E.M. Dowd, and G.M. Vandel. 1992. Surveys of size, distribution, and fledgling production of piping plover and least tern populations along rivers in South Dakota. 1978-1991. Missouri River and its tributaries - piping plover and least tern symposium/workshop. Lincoln, NE.
- Higgins, K.F., J. Dinan, M.J. Schwalbach, B.J. Dirks, and C.D. Kruse. 1992. Effects of water levels on piping plover and least tern nesting along the Missouri River in South Dakota. Missouri River and its tributaries: piping plover and least tern symposium/workshop. Lincoln, NE.
- Higgins, K.F., C.R. Berry, D.E. Hubbard, L.D. Flake, M.L. Kjellsen, and R.R. Johnson. Valuation, inventory, and biological assessment of prairie wetlands: 15 years of research at South Dakota State University. Symp, Prairie ecosystems: wetland ecology, management and restoration. Jamestown, ND.
- Higgins, K.F., M.J. Schwalbach, B.J. Dirks, and C.D. Kruse. 1992. Soil substrates, objects, and vegetation at nest sites in South Dakota. Missouri River and its tributaries: piping plover and least tern symposium/workshop. Lincoln, NE.
- Hill, T.D. 1992. Feasibility of indexing largemouth bass population density using electrofishing catch rate and water conductivity measurement. MS thesis, SDSU.
- Hill, T.D., and D.W. Willis. 1992. Indexing largemouth bass population density using electrofishing catch rates and water conductivity measurement. Midwest Fish Wildl Conf. Toronto, Canada.
- Hill, T.D. and D.W. Willis. 1992. Influence of water conductivity on voltage gradient of an electrofishing unit. Ann mtg, Amer Fish Soc. Rapid City, SD.
- Hill, T.D. and D.W. Willis. 1993. Feasibility of indexing largemouth bass population density using electrofishing catch rates and water conductivity measurement. SD Dept Game, Fish Parks. Fish Div Rep 93-10, Pierre.
- Hoernemann, T.A. 1992. Fathead minnows, aquatic invertebrates, and mallard duckling interactions in man-made ponds. MS thesis, SDSU.
- Hoernemann, T.A. and D.E. Hubbard. 1992. Competition between fathead minnows and ducklings for invertebrates. Midwest Fish Wildl Conf. Toronto, Canada.
- Jackson, J.J. 1992. Food habits of walleyes in Lake Oahe, South Dakota. MS thesis, SDSU.
- Jackson, J.J., D.W. Willis, and D.G. Fielder. 1992. Food habits of young-of-the-year walleyes in Okoboji Bay of Lake Oahe, South Dakota. Midwest Fish Wildl Conf. Toronto, Canada.
- Jenks, J.A. 1993. Stress effects of cattle on white-tailed deer populations. Stress management in biological systems symp, SDSU.
- Jenks, J.A. 1993. Stress related effects of gut capacity of white-tailed deer. P 53 In Abstracts, Biostress Symposia. Brookings: SDAES.
- Johnson, T., D.J. Hurley, R.D. Neiger, G. Rottinghaus, H. Stahr, and K.F. Higgins. 1991. Physiological effects of aflatoxin and T-2 toxin on mallard ducks. NC mtg, Amer Soc Micro-biology, Brookings, SD.
- Karnitz, K.S., D.A. Conover, and W.G. Duffy. 1992. Zooplankton community composition and abundance in Lake Oahe, South Dakota, before and after the introduction of rainbow smelt. Dak Chap Amer Fish Soc, Aberdeen, SD.
- Karnitz, K.S. 1992. Influence of rainbow smelt predation on zooplankton community composition in Lake Oahe, South Dakota. MS thesis, SDSU.
- Kerner, D.P. and K.F. Higgins. 1993. Response by upland nesting ducks to three rejuvenation treatments applied to two types of seeded nesting cover in eastern South Dakota. SD Acad Sci. Rapid City, SD.
- Kennedy, J.F., J.A. Jenks, and K.J. Jenkins. 1993. White-tailed deer use of mineral licks in the Black Hills of South Dakota. Ann mtg, Amer Soc Mammalogists. (abstr).
- Kruse, C.D., B.A. Vanderlee, and K.F. Higgins. 1993. Successes and failures of piping plover and interior least tern nests while using cages, chick shelters, and strobe lights. P 188 IN (K.F. Higgins and M.R. Brashier, eds) Proc, Missouri River and its tributaries: piping plover and least tern symposium. Brookings: SDSU.
- Kruse, C.D. and K.F. Higgins. 1992. Predator aversion techniques used to increase least tern and piping plover productivity in South Dakota. Midwest Fish Wildl Conf. Toronto, Canada.
- Kruse, C.D., B.J. Dirks, K.F. Higgins, and M.J. Schwalbach. 1992. Effects of predation and recreation on least terns and piping plovers along the Missouri River in South Dakota and what's being done about it. Missouri River and its tributaries: piping plover and least tern symposium/workshop. Lincoln, NE.
- Kruse, C.D., J. Dinan, B.J. Dirks, K.F. Higgins, and M.J. Schwalbach. 1993. Effects of predation and recreation on interior least terns and piping plovers along the Missouri River in South Dakota and what's being done about it. P 135 IN (K.F. Higgins and M.R. Brashier, eds) Proc, Missouri River and its tributaries: piping plover and least tern symposium (abstr). Brookings: SDSU.
- Kruse, C.D., K.F. Higgins, and B.A. Vanderlee. 1992. Successes and failures of nests while using cages, chick shelters, and strobe lights. Missouri River and its tributaries: piping plover and least tern symposium/workshop. Lincoln, Nebraska.
- Larsen, D.T. 1992. Food plot and habitat characteristics associated with ring-necked pheasant use of winter food plots in east-central South Dakota. MS thesis, SDSU.
- Larsen, D.T. and L.D. Flake. 1992. Factors associated with ring-necked pheasant use of winter food plots. Midwest Fish and Wildlife Conf. Toronto, Canada.
- Latka, D., R. Nebel, C.D. Kruse, and K.F. Higgins. 1992. Island clearing: a means of least tern and piping plover habitat creation. Missouri River and its tributaries: piping plover and least tern symposium/workshop. Lincoln, NE.
- Mathison, J., T. Johnson, D.J. Hurley, R.D. Neiger, G. Rottinghaus, H. Stahr and K.F. Higgins. 1991. Sub-acute mycotoxins induce T-cell immunosuppression in mallard ducks. Conf Res Work Animal Disease. Chicago, IL.
- Mero, S.W. 1992. Food habits of walleye and sauger in Lake Sakakawea, North Dakota. MS thesis, SDSU.
- Mero, S.W. and D.W. Willis. 1992. Food habits of walleyes and saugers in Lake Sakakawea, North Dakota. Midwest Fish Wildl Conf. Toronto, Canada.
- Mixon, K.L. 1993. Fish and amphibian occurrence in waterfowl production area wetlands in Minnesota during 1992. MS thesis, SDSU.
- Naugle, D.E., B.J. Kernohan, and J.A. Jenks. 1993. Use of infrared scanning technology to evaluate density estimates of white-tailed deer from spotlight surveys. Ann mtg, Amer Soc Mammalogists.
- Naugle, D.E. and J.A. Jenks. 1993. Landowner attitudes toward management of white-tailed deer at Sand Lake. Ann mtg, SD Chap The Wildl Soc (abstr).
- Neumann, R.M. and D.W. Willis. 1993. Seasonal changes in biological and sampling data for northern pike collected from a shallow prairie lake. Ann mtg, Amer Fish Soc. Portland, OR.
- Neumann, R.M., C.S. Guy, and D.W. Willis. 1992. Assessment of juvenile percichthyid samples collected in 14 years from Lake Texoma. Ann conf, Southeast Assoc Fish Wildl Ag. Corpus Christi, TX.
- Neumann, R.M. and D.W. Willis. 1993. Temperature stress responses of northern pike in eastern South Dakota natural lakes. P 59 IN Abstracts, Biostress Symposia. Brookings: SDAES.
- Peskin, L. and L.D. Flake. 1992. Comparisons of wood duck nesting and cavity temperatures in plastic versus wooden boxes. Midwest Fish and Wildl Conf. Toronto, Canada.
- Power, G.J., S.W. Mero, and D.W. Willis. 1993. What Lake Sakakawea walleye and sauger eat. N Dak Outdoors LV(9):16.
- Quinn, S.P., D.W. Willis, and C.S. Guy. 1993. Ponds: bluegills, bass, and more in your backyard. In-Fisherman 114:42.
- Ray, J.D. and K.F. Higgins. 1993. Waterfowl use and production on artificial nesting structures and the hay bales in South Dakota. Ann mtg, SD Acad Sci. Rapid City, SD.
- Sammons, S.M. 1993. Annual food habits of northern pike in an eastern South Dakota lake. MS thesis, SDSU.
- Sammons, S.M., and C.G. Scalet. 1993. Food habits of northern pike in a midwestern lake. Midwest Fish Wildl Conf. Toronto, Canada.
- Sausville, L.P. 1993. Wood duck use and nesting success in artificial nesting structures in eastern South Dakota. MS thesis, SDSU.
- Schwalbach, M.J., B.J. Dirks, and K.F. Higgins. 1993. Banding and marking of least terns and piping plovers along the Missouri River in South Dakota, 1986-1989. P 192 IN (K.F. Higgins and M.R. Brashier, eds) Proc, Missouri River and its tributaries: piping plover and least tern symposium. Brookings: SDSU.
- Schwalbach, M.J., K.F. Higgins, J. Dinan, B.J. Dirks, and C.D. Kruse. 1993. Effects of water levels on interior least tern and piping plover nesting along the Missouri River in South Dakota. P 75 IN (K.F. Higgins and M.R. Brashier, eds) Proc, Missouri River and its tributaries: piping plover and least tern symposium. Brookings: SDSU.
- Sedivec, K.K., T.A. Messmer, W.T. Barker, D.R. Hertel, and K.F. Higgins. Effects of grazing systems on nongame birds in North Dakota. Ann mtg, Soc Range Management. Spokane, WA.
- Sewell, D.C. 1993. Food habits and distribution of the emerald shiner and the spottail shiner in Lake Oahe. MS thesis, SDSU.
- Sewell, R.W. and K.F. Higgins. 1991. Floral and faunal colonization of restored wetlands in west-central Minnesota and northeastern South Dakota. P 108 IN (J. Webb, ed) Proc, 18th ann conf, Wetlands Restoration and Creation. Tampa, FL.
- Siegwarth, G.L., J. Pitlo, D.W. Willis, and A.L. Thompson. 1993. Walleye and sauger spawning habitat survey in Pool 16 of the upper Mississippi River. Rep of SDSU to COE, USFWS Unit Coop Agree No 14-16-009-1549, Rock Island, IL.
- Solberg, K.L. and K.F. Higgins. 1992. Using rodeo to improve waterfowl habitat in South Dakota. Cattail Management Symp. Fargo, ND.
- Willis, D.W. and C.S. Guy. 1993. Influence of environmental stressors on the biology and management of largemouth bass in South Dakota waters. P 66 IN Abstracts, Biostress Symposia. Brookings: SDAES.

Budget

Agricultural Experiment Station For July 1, 1992, to June 30, 1993

State appropriation	\$5,811,870
Federal appropriation	\$2,445,790 *
Federal restricted	\$2,338,138
Other restricted	4,878,780
Total	\$15,474,578

* Federal FY 92

Calendar of Events

Date	Event	Person to Contact
January		
25	SESD Experiment Farm annual meeting, Beresford	Bob Berg, Southeast Experiment Farm, Beresford
26-29	National Cattlemen's and American National CattleWomen Annual Convention, Reno, Nevada	
28—		
Feb 6	Black Hills Stock Show and Rodeo, Rapid City	
February		
7-8	South Dakota Ridge-Till and No-Till Conference, Sioux Falls	Bob Berg, Southeast Experiment Farm, Beresford
12	Pork and 4-H Clover Classic, SDSU	Rich Howard, 4-H, SDSU
18	South Dakota 4-H Foundation Annual Meeting, Pierre	Nancy Swanson, 4-H Foundation
21-23	South Dakota Crop and Pest Conference, Mitchell	Bob Hall, Plant Science, SDSU
22-24	Agarama, Sioux Falls	Hal Werner, Ag Engineering, SDSU
25	Women in Ag Conference, Huron	Bonnie Huber, Beadle County Extension Office, Huron
March		
2	Dairy Forage Conference, Watertown	Ed Twidwell, Plant Science/Kim Cassel, Dairy Science, SDSU
3	Farm Price Outlook Meeting, Brookings	Dick Shane, Economics, SDSU
25-26	Little International, SDSU, Brookings	Dan Gee, Animal and Range Sciences, SDSU
April		
10-12	State FFA Convention, SDSU	Robert Bell, Ag Education

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