9-12-2002

Farm and Home Research: 53-3

Mary Brashier
Lance Nixon
Marianne Stein

Follow this and additional works at: http://openprairie.sdstate.edu/agexperimentsta_fhr

Recommended Citation
Brashier, Mary; Nixon, Lance; and Stein, Marianne, "Farm and Home Research: 53-3" (2002). Farm and Home Research. Paper 14.
http://openprairie.sdstate.edu/agexperimentsta_fhr/14

This Magazine is brought to you for free and open access by the South Dakota State University Agricultural Experiment Station at Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in Farm and Home Research by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact michael.biondo@sdstate.edu.
CONTENTS

Director’s comments 3

Go Easy on Grazing the Green 4

Buying BT Seedcorn 10
‘pays ... if there are corn borers’

Buffalograss 12
an answer to watering, mowing, fertilizing

No-Till Benefits 16
‘We no-tillers really make our money in the normal years’

Trimming the Wait 18
Johne’s team reduces test result times from 16 weeks to hours

West Nile Virus Update 22

On the cover:
Through its county Extension educators, press releases, publications, the internet, video conferences with producers, television, and regional public meetings, SDSU has provided South Dakotans the research-based information that will carry them through the short-term effects of the drought and help them continue through its long-term consequences. Assistance has covered crop and livestock production and family and youth stresses. Much of this information can be obtained by visiting the Internet South Dakota Drought Information page, http://sdces.sdstate.edu/drought/
South Dakota history books will remember 2002 as the year of the big drought. But it was also the year that West Nile Virus appeared in the state; it was another bad year for corn borers; and it was a year when SDSU researchers continued fighting crop and livestock diseases. In other words, it was another year when South Dakota’s environment brought us plenty of stress.

Events like drought can help us appreciate what we have in South Dakota. We have some of the best grasslands in the world. They have evolved to endure drought, insects, intermittent intensive grazing, fire, and many other stresses.

South Dakota’s native grasslands are resilient because they had to be, they had to adapt to wild extremes of climate. Decades of SDSU research and extension programs have built on what is known about those native ecosystems to help shape resilient introduced pastures as well.

Some economics models indicate that pastures are among our most valuable resources in South Dakota. It’s critical that drought stressed rangelands and pastures be allowed to recover as this severe drought moves to the history books.

South Dakota’s native grasslands share the landscape with a hardy introduced species, too. We are also renowned as a producer of high quality wheat, particularly the hard red wheats used by the world’s bakers. That’s why SDSU is partnering with other land-grant colleges, as well as with federal and private industry scientists, in the U.S. Wheat and Barley Scab Initiative. The initiative is a joint effort to take on what is currently the single greatest threat to spring wheat producers: a plant disease called Fusarium head blight.

SDSU has a multifaceted approach to ending scab. Wheat breeding, biotechnology, Extension programs, and biological control are a few of the approaches our scientists are using. But what may be best about the project is the teamwork approach to tackling this problem. That’s a hallmark of the land-grant system, for the simple reason that it works.

SDSU agricultural research also is finding a niche in urban areas. Major growth is taking place in the Midwest in “Green Industries” such as landscape architecture, public parks, turf grass, trees. Needed was a low-maintenance turf grass that was also attractive and hardy. Buffalograss is a native warm-season species that fits this bill.

In addition to low-maintenance areas of parks and golf courses, buffalograss is finding its place in private lawns of homeowners. In fact, my neighbors in Brookings have recently included SDSU buffalograss as the major component of their landscaping.

As if drought wasn’t enough, 2002 turned out to be a bad year for corn borer infestations in some parts of South Dakota. Fortunately, the Bt corn that many growers have used in recent years is genetically altered to make it lethal to corn borers—and our ongoing studies show this is one of the years when growing it paid off.

2002 saw the first confirmed cases of West Nile Virus in South Dakota, a disease spread by mosquitoes that can kill some species of birds, horses, and more rarely, humans. The virus is here, we have to learn to live with it and take precautions against it. SDSU has helped collect mosquitoes and our diagnostic lab has tested and confirmed many cases of the virus in area horses. Our scientists, Extension specialists, and educators will continue to play a role in fighting the virus in years to come by giving out information on topics such as mosquito control.

Another project at SDSU is a new diagnostic test with a very practical benefit for producers. It can trim to hours from weeks the time a dairy or beef producer would have to wait before confirming Johne’s disease in the herd. Johne’s is hard to diagnose and has symptoms similar to other diseases. The sooner a producer knows what he or she is up against, the sooner corrective action can be taken. Trimming the wait can mean more dollars in producers’ pockets.

All of these issues are diverse examples of how we’re continuing the biostress commitment. It’s part of why the South Dakota Agricultural Experiment Station exists—using science to help us live in a state that is sometimes bountiful, but often harsh.
Go Easy on Grazing the Green

BY LANCE NIXON
Even now that rains have come and some pastures in South Dakota have turned green again, the effects of the 2002 drought may linger on for a year or more. That is the warning of a team of SDSU animal and range scientists.

Pat Johnson is one of those scientists. Three times each growing season she measures plant growth on representative parcels of grassland in western South Dakota. What she learned early this summer at the Cottonwood Range Livestock Station east of Wall was a vivid lesson in how serious the drought has been in much of South Dakota.

“...plants that are grazed heavily immediately after a drought breaks take much longer to recover. Producers can set themselves back an additional year or two if they’re not careful.” —Pat Johnson, SDSU range scientist

“We just didn’t have as much growing this year,” Johnson says. “Early this summer we probably had 25 to 30% of the cool-season grasses such as western wheatgrass at the Cottonwood station that we normally have.”

Sandy Smart, another member of the team, says he saw much the same thing in his plots where he tracks growth of western wheatgrass in western South Dakota grassland. “It’s amazing how little growth there was early in the year,” Smart says.

More than one factor is at work, Johnson says. A dry fall in 2001 resulted in very little growth of cool-season grasses. An open winter left plants with little insulation from snow so that winterkill was a problem. And a dry, very cold spring made it difficult for plants to grow. Those that did found very little moisture in the soil. Many became dormant as their way of dealing with the familiar South Dakota phenomenon of drought.

“By summer, ranchers were grazing plants that were already dormant,” Johnson says.

MANAGE FOR LONG-TERM RECOVERY

Rains in late summer were the first signs the drought may be easing. The added moisture is bringing new growth to cool-season grasses this fall in parts of South Dakota. But Johnson cautions that ranchers managing rangeland for long-term recovery from drought are better off if they don’t graze off any flush of new growth this fall.
“Even though those cool-season grasses are green and growing in parts of South Dakota, they are very vulnerable to the effects of grazing,” Johnson says.

“Plants are spending precious reserves that need to be replaced if the plants are to survive. Grazing, especially heavy grazing, now can damage or even kill many of those plants and reduce production potential for next year.

“There is a considerable amount of work that shows that plants that are grazed heavily immediately after a drought breaks take much longer to recover. Producers can set themselves back an additional year or two if they’re not careful.”

If possible, it is best to keep livestock out of those pastures, giving them a valuable period for recovery, Johnson says. Given the short feed supplies most producers face, however, that will be difficult to do.

In that case, Johnson recommends that producers limit their grazing to just a few pastures, giving the majority of their rangeland a chance to recover.

Once green growth goes dormant in winter, it can be grazed conservatively, Johnson adds.

“If animals graze too hard, if they graze too close, the plants won’t have any thermal protection for any new buds,” Johnson says. “To get them to come back quickly you have to be much more conservative with your use of pastures this fall and winter.”

LOWER STOCKING RATES “LIGHTEN THE LOAD”

Think also about the year to come, advises Barry Dunn, Extension range livestock production specialist. What ranchers do now will play a huge role in the health of their range next year.

“The main thing is still to de-stock and lighten the load as much as you can this year,” Dunn says. “The literature would say the stocking rate the year after the drought is actually more important than what’s going on this year. The year of recovery is the time for extremely good management.”

Johnson and Dunn say animals native to the Great Plains allowed range to recover because they naturally avoided drought-stricken areas. While ranchers can’t pick up the ranch and migrate, Dunn says, selling off a share of the herd in drought years is essentially mimicking nature’s response by lightening the load on pastures.

“One of the good things about de-stocking is that it sets you up for recovery,” Dunn says. “South Dakota’s prairies have been through this many, many times. It isn’t that these plants can’t take a drought. They can take it pretty well. But it’s our response that’s going to make a difference in how soon they recover.”

The drought varies widely in intensity across South Dakota. In some parts of the northeast, Dunn says farmers and ranchers may be able to use a normal stocking rate if they get normal rainfall next year.

But producers in a wide belt of country from Mobridge to Bison and Faith and some locations elsewhere may want to use a stocking rate that is 50 to 75% of normal, Dunn says, even with normal rainfall. That’s because it will take a year or more after drought ends for the plants to recover enough to be able to produce at pre-drought levels.

A lower stocking rate allows plants to build up greater carbohydrate reserves in the roots so that they’re prepared for winter and set to begin growing the following spring.

“... the stocking rate the year after the drought is actually more important than what's going on this year. The year of recovery is the time for extremely good management.”

—BARRY DUNN, EXTENSION RANGE LIVESTOCK SPECIALIST

Smart adds that, ideally, producers would keep the number of cows in their herds at a level that anticipates drought, holding back steers to graze excess grass in summers when pastures are lush and grazing is abundant.

But producers by nature are optimists and often carry more cows than their land can support when drought sets in, Smart adds.

He agrees with Johnson and Dunn that next year’s management, even with normal rainfall, will be crucial as producers steer their way out of drought.

“This drought isn’t over just because it’s started raining in some places,” Dunn says. “Herds will have to be rebuilt, financial positions will have to be rebuilt, and rangeland will have to recover.” to recover.”
A succession of wet years starting in 1993 left South Dakota and much of the upper Midwest vulnerable to scab epidemics. In South Dakota, spring wheat epidemics in 1993 alone cost producers an estimated $80 million.

The next epidemic doesn’t even need a wet “year.” One rainy day at the wrong time could do it.

“Scab development doesn’t take nearly as long a wet period during flowering as we once thought,” says Marty

If next summer’s rainfall returns to “normal,” South Dakota farmers could have another problem—a disease on wheat and barley that farmers call scab and scientists call Fusarium head blight.

Nichole Baye, graduate research assistant, and Bruce Bleakley, SDSU microbiologist: Can bacteria become biocontrol agents against the scab fungus?

‘Scab-watch’ will be early warning system

BY LANCE NIXON
Draper, Extension plant pathologist. “If you went back and
looked at what we said 10 years ago, it would have been
based on what was in the literature, which said it needed to
be wet for 3 days during flowering to get significant scab.
“We know that that’s not true anymore. It’s a much
shorter period. If we have a single rainfall event, a single
day of showers, we can have a lot of scab if the crop is at
full flower.”
He adds that under such conditions he has seen South
Dakota fields with as high as 50% damage.

“SCAB-WATCH” NETWORK BEING PREPARED
Federal, state, and private sector scientists have been
working with the wheat and barley industries to get on top
of scab problems. The USDA Agricultural Research
Service-led U.S. Wheat and Barley Scab Initiative includes:
• use of resistant crop varieties developed through
  conventional plant breeding or biotechnology,
• alternative residue and rotation management
  schemes,
• crop protection through chemical and biological
  controls, and
• detoxification or alternative processing of grain
  contaminated with toxins, since the disease also
  causes problems for the food industry in handling
  the mycotoxin-contaminated grain that is often
  the result of scab infection.

Draper says the Initiative is perhaps the best example he
has seen of land-grant institutions such as SDSU working
together and cooperating with federal scientists and private
industry to solve a common problem.

At SDSU and other land-grant universities, scientists are
designing models that, if they work, will warn producers
about conditions right for scab.
“We can take a look at weather data and eventually factor
in the spore load in the air, much like we look at mold and
pollen counts for allergy sufferers, and give producers in a
specific area of the state an idea of whether they’re at a
higher or lower risk of the disease,” Draper says. “That’s
being piloted this summer.”
Draper adds that at least two other factors—no-till
farming and the expansion of the corn-producing region
northward—call for producers to be on guard against scab.

“If we have a single rainfall event,
a single day of showers, we can
have a lot of scab if the crop is
at full flower.”

—MARTY DRAPER, EXTENSION
PLANT PATHOLOGIST

In the lab in a Petri dish, certain strains of bacteria (yellow)
will stop the growth of the scab fungus (red). Some antibi-
otics and enzymes are probably involved. Will the bacteria
show an economically worthwhile antagonism to the scab
organism in the field?

The pathogen survives well in stubble, Draper says, and
corn stubble is ideal. Similarly, no-till farming, because it
keeps more stubble on the land, may require some addi-
tional management practices.
“It’s probably going to increase your use of fungicides,”
Draper says. “It should force you to extend the period of
time between like or susceptible crops. It may change how
many years you allow to pass before you come back to
wheat following corn or wheat.”

NEW SOURCES OF RESISTANCE
The testing of new fungicides that could offer better
control than the products now available to farmers and the
development of new varieties of scab-resistant spring and
winter wheats are projects at SDSU, other land-grant uni-
versities, and federal research facilities.

Among the entities funding South Dakota State
University’s ongoing scab research are the South Dakota
Wheat Commission, USDA-ARS National Wheat & Barley
Scab Initiative, and the Minnesota Wheat & Barley Research &
Promotion Council.

Plant pathologist Yue Jin says some of his work at SDSU
involves looking for new sources of resistance from exotic
materials. Jin coordinates a regional program for germplasm
evaluation. Each year he evaluates 1,000 to 1,500 wheat
varieties and landraces from around the world in search
of scab resistance.
“We are trying to find out how many genes are control-
ling resistance and how easily we can incorporate that
resistance into breeding materials,” Jin says. His team also
evaluates some 5,000 to 6,000 breeding lines of wheat each
year for scab resistance.
NEED FOR OPEN BORDERS
The fight against scab vividly illustrates the need for open borders and the free flow of scientific information, Jin says. Partly because scab is most persistent in rice and wheat rotations in places such as India, Nepal, China, and Japan, some of the best scab resistant sources in wheat are found in germplasm from China, where breeders have been addressing the problem longer.

Similarly, scab resistance in barley is coming from germplasm from China, Japan, Korea, and Europe—and virtually none from U.S. lines of barley.

Ravindra Devkota, research associate, says although the Chinese sources of resistance in spring wheat have given a moderate response—especially through a wheat called Sumai 3 or its derivatives—scientists still have a long way to go.

“There is nothing like a very high level of resistance or immunity. The best that we have right now is an intermediate level of resistance,” he said.

Devkota says the search for scab resistance at SDSU, as elsewhere, involves close cooperation between plant pathologists and plant breeders. Plant pathologists such as Yue Jin evaluate materials for scab resistance and pass on the best materials to the breeders.

“I make crosses using those sources,” Devkota says. “Once we make those crosses, it takes 8 to 10 years to make a variety.”

A BIGGER THREAT
Amir Ibrahim, a winter wheat breeder at SDSU, also puts a lot of time and effort into breeding for scab resistance, even though diseases such as stem rust, leaf rust, and wheat streak mosaic virus have been a greater problem historically for growers of winter wheat in South Dakota.

“We cannot ignore a single disease,” Ibrahim says, adding that scab could become a bigger threat to South Dakota producers in the future if weather patterns change or if the use of winter wheat in rotations increases.

In addition, Ibrahim says, SDSU has a responsibility to breed for the region, just as breeders in other states can expect some of their wheats to be grown in South Dakota.

In fact, one South Dakota winter wheat, ‘Harding,’ has shown scab resistance in some tests in other states. However, SDSU scientists are not yet convinced that what they are seeing is true resistance.

“Harding is a late-maturing winter wheat. It could escape the disease pressure,” Ibrahim says. “It might be just missing the scab.”

HELP FROM BACTERIA
Ongoing research at SDSU also looks at biocontrol agents that potentially can fight scab.

Several years ago SDSU microbiologist Bruce Bleakley, with the help of George Buchenau, retired SDSU plant pathologist, isolated bacteria from wheat foliage and residues from several South Dakota wheat fields. About six of those strains of bacteria showed what Bleakley describes as “antagonism” to scab and to another wheat disease caused by a fungus, tan spot.

“We’re not 100% sure yet how the antagonism happens. It might be some antibiotic that the bacteria produce, it might be an enzyme, it might be nutrient competition, or it could be a combination,” Bleakley says. “We’re pretty sure that some antibiotics are involved, and perhaps some enzymes.”

It would be a big step forward, Bleakley says, if science and industry could put bacteria to work fighting scab. And, adds Draper, such research could yield biocontrol agents that may be acceptable to organic producers.

As part of the scab initiative, Bleakley and Draper will field test bacteria from locations such as Illinois and Nebraska, while SDSU will provide its bacteria for testing in other states. Bleakley says such cooperation is important because location makes a difference, and some strains may be more effective in one state than another.

More about the U.S. Wheat and Barley Scab Initiative can be found online at www.scabusa.org.
South Dakota producers are putting biotechnology to work for them in their fields in ever higher numbers.

Last year, they devoted a higher percentage (47%) of their corn acres to biotech corn than any other state in the nation. Approximately 30% of the planting was in Bt corn. That is corn altered to enable the plant to produce its own insecticide lethal to European corn borers.
This year, according to the South Dakota Agricultural Statistics Service, farmers planted 66% of their corn acres to biotech hybrids that offer insect resistance, herbicide tolerance, or both. Some 33% of the total acreage was Bt corn. An additional 10% of corn acres was seeded to Bt corn that also was genetically modified for tolerance to herbicide.

Bt gets its name because it contains genes from *Bacillus thuringiensis*, a bacterium that occurs naturally in soil. Bt corn produces crystalline proteins (known as Cry proteins) that kill specific insects that can’t digest the protein—a digestive enzyme makes it toxic to them.

**DOES BT CORN PAY OFF?**

Farmers typically have paid a standard industry technology fee of about $24 a bag to plant Bt corn. In South Dakota that works out to be about $9 an acre. Is it worth the money?

Data collected by Mike Catangui, Extension entomologist, says yes—provided there are corn borers around.

“1996 and 1997 were outbreak years and Bt corn on average had an advantage of 13 to 14 bushels per acre. There was a clear benefit in growing Bt corn over a conventional, unsprayed hybrid,” Catangui said. “But since then there hasn’t been any significant outbreak of corn borers.

“Bt will not pay for itself if there are no corn borers. And there are only 3 out of 7 years when we know it significantly improved the yield.“

**INSECT CONTROL OPTIONS**

Catangui notes that year 2002 might end up being another good one to have grown Bt corn, since the mild winter may have allowed many corn borer larvae to survive. On the other hand, he said, there’s no need for farmers to grow Bt corn as an insurance policy against corn borers if they’re willing to do the work of scouting their fields and hiring a pesticide applicator to deal with an infestation.

“You really don’t need to grow Bt corn to control insects,” he said. “There are sprays available. It’s not like if you don’t grow Bt corn, you’re just going to give it away to the insects.”

Catangui adds that the Bt product most familiar to South Dakota farmers, YieldGard®, controls only one insect in South Dakota: the European corn borer. But a new Bt product that Catangui has been testing targets more insects.

“The new Bt product, Herculex I, will also work on cutworms and western bean cutworms.”

Even though Herculex I offers only partial control over the western bean cutworm, Catangui said producers may soon want that extra edge as the western bean cutworm becomes more of a problem in South Dakota. Western bean cutworm feeds in the ears of corn, not the stalks as corn borers do.

**CUTWORM ON THE RISE**

Marlin Rice, a professor of entomology at Iowa State University reports that crops in Iowa, too, have been suffering from the western bean cutworm only recently.

“Western bean cutworm has become a problem during the last 2 summers. Rarely was it a pest prior to 2000,” Rice said.

“It’s not that the western bean cutworm would move in to fill the exact niche vacated by the corn borer,” Catangui said. “The cutworm feeds directly on the ears, not the stalks, as corn borers do.”

He speculates one of two things could be happening.

“If the number-one insect is put out of commission, the number-two insect moves up to become number one. In this case, it’s simply an insect replacing another insect on the top of the list.”

Or, he adds, it could be that the corn industry is using less pesticides.

“It’s not like if you don’t grow Bt corn, you’re just going to give it away to the insects.”

—Mike Catangui, Extension Entomologist

South Dakota Agricultural Experiment Station Director Kevin Kephart adds that spraying for corn borer before the advent of Bt corn may have helped keep the western bean cutworm in check.

Ron Seymour, an entomologist and University of Nebraska Extension educator in Adams County, says that theory is very plausible.

“Western bean cutworm is very susceptible to insecticides,” Seymour says. “It may be surviving better because there is less pressure from spraying for other insects.”

Seymour add that although the insect is a problem each year in southwest Nebraska and northeast Colorado, it also can become a problem in other areas—particularly during drought conditions that reduce disease pressure on the insects and in sandy soils that favor its overwintering.

Like Catangui, Seymour believes Herculex I will be an effective control tool for both corn borers and western bean cutworm.

**THE CYCLE OF INSECT CONTROL**

Catangui said the new Bt product, like those now in use, will not be the final answer to all problem insects.

“Herculex I will work for a long time, until another insect shows up that it doesn’t control. Basically there’s no way we can really eliminate insects, we just want to be one step ahead of them in terms of controlling them.”

Herculex I already is labeled in the U.S. both for human use and for livestock. Its manufacturers have been seeking to get it labeled for use in Europe and Asia, Catangui said.◆
Buffalograss proved its worth during summer 2002, Schleicher says. “Our buffalograss research plots have been green and lush all season, and we haven’t watered them in 3 years!”

Buffalograss is a hardy warm-season grass species native to Plains states from North Dakota to Texas. It was grazed by buffalo and has been primarily studied for its grazing and forage properties. In recent years, however, scientists have focused on buffalograss as a turfgrass, and new cultivars specifically useful for that purpose have been developed, says Paula Loewe, graduate student in agronomy at SDSU.

“Buffalograss has been called the most energy efficient turfgrass we have,” says Schleicher, and he recommends it for anything from golf course roughs to cemeteries, parks, and private lawns. “Cool-season grasses such as Kentucky bluegrass are not as adapted to South Dakota soils and climate as you might think. Buffalograss might be a better alternative in most areas of the state.”

Buffalograss requires very little maintenance compared to Kentucky bluegrass or perennial ryegrass, Schleicher adds.

“Once the lawn is established you can usually get by without watering at all. If it is a dry year, watering about once a month is all it takes to keep the lawn green. Buffalograss needs only about half the amount of nitrogen fertilizer that Kentucky bluegrass does. Once established, it is very competitive against weeds, and it has basically no serious insect or disease pests, which is very different from most of the cool-season grasses. Buffalograss only gets between 5 and 7 inches tall, so you don’t need to mow it at all, or perhaps just a few times each season,” Schleicher says.

BUFFALOGRASS

Schleicher’s buffalograss research program at SDSU focuses on evaluating cultivars and developing more efficient ways to establish and manage turf. “The University of Nebraska is the major breeder of buffalograss. We don’t have a buffalograss breeding program at SDSU; instead, we focus on evaluating which types will do well in South Dakota,” he explains.

The turfgrasses Schleicher evaluates are located at the N.E. Hansen Research Center just east of the SDSU campus. “I am now able to recommend certain cultivars and have moved on to focus on ways to improve establishment of the turf,” Schleicher says.

He is measuring how much he can reduce inputs—water, fertilizer, and mowing that the grass needs. His other
Leo Schleicher, horticulture professor: Buffalograss may be the perfect choice for South Dakota lawns, golf course roughs, wherever turf grows.
emphasis is to find grasses that tolerate environmental stress, both winter and summer, because “we have pretty severe climate in South Dakota for growing turfgrass.”

Buffalograss fits the program well, Schleicher says. As a native grass, it tolerates cold weather and lack of water very well, and it requires much less maintenance than the common turfgrasses.

**PLANTING OPTIONS**

Buffalograss is dioecious, meaning that an individual plant will have either male or female flowers but not both. This is unusual for turfgrasses, and it allows a choice in the look of the turf. A homeowner may choose to plant all male or all female clones for a uniform looking turf.

“The female plant produces a bur, containing one or two seeds, which is located lower in the canopy. This creates a lawn with a more traditional look. The male plant produces an inflorescence above the canopy, so the male plants have a whitish texture across the top. If you use a seeded variety, you get a mix of male and female plants with some white texture above the canopy,” Schleicher says.

The turf is established either by seed, sod, or vegetative plugs. “Seed is cheaper, but if you want the cloned plants, you have to use vegetative plugs, which are plugged in the ground on 1- to 2-foot centers,” he says.

A turf usually establishes in one growing season, due to aggressive growth habit.

**USES AND TRADE-OFFS**

Schleicher recommends buffalograss for most turf areas in the state, including lawns, rural areas, acreages, commercial and industrial sites, cemeteries, and parks—“anywhere we could find savings in watering, mowing, and fertilizing.”

And golf courses, he adds. “We’ve got approximately 120 golf courses in the state, most of them small 9-hole golf courses, and it would be great for those.”

Despite all its benefits, Schleicher realizes that not everyone is going to want buffalograss. For one thing, it has a more bluish-gray color than the dark green of Kentucky bluegrass. Which one is favored is a matter of aesthetic preference and perhaps habit. “Personally, I love it. I think it is a great color, but some people are not going to accept it.”

Another potential stumbling block is that buffalograss goes dormant in mid-to-late September and remains golden-brown until mid-to-late May, when it turns green again.

“I realize that some people will never want anything other than a perfect Kentucky bluegrass lawn like back east. But the fact is that Kentucky bluegrass and perennial ryegrass and the other cool-season grasses we use for our lawns are actually not well adapted to this part of the country. Consequently, we have to put a lot of maintenance into them,” Schleicher says.
“Compared to the traditional lawn grasses, buffalograss will save us time and money and cut down on the use of pesticides and fertilizers,” he adds.

A GREAT CHOICE

Steve Harrar, golf course superintendent at the Minnehaha Country Club in Sioux Falls, agrees that buffalograss can be a great choice for a turf. “We have about 2 acres of buffalograss. It’s on a steep hill which is tough to mow,” he says.

“I’m very pleased with it. It is different and unique, and it is very easy to take care of. I mow it only about once a month and we’ve never had to irrigate it, except for the first 2 years when it was a young turf.”

The buffalograss at Minnehaha Country Club consists of female clones, giving the lawn a uniform green look without the white canopy from male plants. “We planted the vegetative plugs in a subsoil of clay and sand and they filled in very quickly. A different turfgrass would have required new topsoil, so this was a lot more cost-efficient,” he says.

“I admit that I get mixed reviews from our members, as some people object to the long period of dormancy. But I also get lots of inquiries from people who are interested in growing buffalograss themselves. Personally, I like it a lot and I would definitely recommend it for some locations, especially slopes and hills that are difficult to work on,” Harrar says.

THE PERFECT CHOICE

Schleicher contends that buffalograss is the perfect choice for most of South Dakota. “It might not do well in the Black Hills, where the soil doesn’t get warmed up enough, but in the rest of the state—particularly the western two thirds—conditions are ideal for buffalograss. It grows very well in well-drained heavy soils, which are common in South Dakota. Most of our soil is on the alkaline side, and buffalograss grows much better in alkaline soils than the typical cool-season grasses.”

SDSU’s buffalograss research has received funding from the SDSU Agricultural Experiment Station and the South Dakota Turf Foundation. Plant material has been provided by Stock Seed Co., Sharps Bros. Seed Co., Todd Valley Farms, and the University of Nebraska-Lincoln.

Guide to establishing a buffalograss turf:

First, decide if you will plant vegetative plugs or use seed. Plugs are more expensive but provide the option of all female or all male plants. Seed is a mix of male and female plants.

If buying seed, make sure it is certified. Use only improved cultivars and check that the seed has been pre-treated to interrupt dormancy; otherwise it may not germinate. Recommended seed cultivars for South Dakota are ‘Cody,’ ‘Tatanka,’ ‘Bowie,’ and ‘Sharpshooter.’

Before planting, dispose of any old vegetation in the area. The best method is to apply a non-selective herbicide such as glyphosate.

Vegetative plugs can be planted without much preparation of the soil. The distance between them determines how quickly the lawn is covered. Generally, plugs should be spaced no more than 24 inches apart.

If planting seed, work the soil to a garden-like condition. Deep tilling or chiseling may be useful. Seed can be planted by drilling or broadcasting. After broadcasting, the area should be lightly raked in two directions to work the seed into the soil. Firming the seed bed using a roller helps keep the seed in place until germination, which may take 1 to 2 weeks after soil temperatures reach 60 degrees.

Weed control can be a challenge during establishment. Remove all weeds before you start planting. During establishment of the turf, remove weeds either by hand or with a herbicide approved for use with buffalograss.

The turf should be lightly watered frequently during establishment to keep the seedbed moist. Vegetative plugs initially require more extensive watering than seed.

Once the lawn is established, very little management is required.

Basic weed control includes spraying with a non-selective herbicide in the fall after the buffalograss goes dormant or in the springtime before it comes out of dormancy.

Fertilizer should be applied at the rate of one pound nitrogen per 1,000 square feet in late June and again in late July to stimulate new tissue growth.

Most seasons, irrigation other than precipitation is not necessary, though occasional watering may give the lawn a more lush green look. In a very dry season, the turf should be watered once a month.

Since the grass only grows to a height of 5 to 7 inches, regular mowing may not be necessary. If the turf contains male plants, which create a whitish canopy, mowing once or twice a month may be desired for a more uniform looking lawn.
No-Till Benefits

We no-tillers really make our money in the normal years’

BY LANCE NIXON

One of the benefits of no-till farming became apparent in 2002 as drought baked much of South Dakota, including the Dakota Lakes Research Farm near Pierre, managed by Dwayne Beck, SDSU plant science professor.

It’s common knowledge with producers that no-till saves moisture, Beck says. But he adds that the advantage dwindles in a year like 2002, a historic drought in many parts of South Dakota and neighboring states for which no-till practices don’t offer a solution.

“To no-till because you want to be able to deal with this extraordinary drought is the wrong reason,” Beck says. “We no-tillers really make our money in the normal years or those that are a little dry or a little wet. We’ve never attempted to design rotations for extraordinarily dry or extraordinarily wet years. That’s what crop insurance is for.”

Though it might be possible to design rotations that would fare better in more severe drought, Beck says that would make no sense: A farmer would then be sacrificing the additional yields he would have received in normal years.

What no-till farmers should do, ideally, Beck says, is design crop rotations with enough diversity and enough intensity, or water usage, to use the moisture that is available in a typical year. Probably 80% of years are fairly normal, Beck says, and those are the years no-tillers should keep in mind.

“If you’re doing it right, no-till will not protect you against this extraordinarily dry year,” Beck says. “If that’s what you’re doing it for, you’re not taking advantage of all the other years.”

For example, Beck notes that some of the winter wheat he harvested at Dakota Lakes this year yielded 28 bushels to the acre in a continuous cropping rotation where wheat followed chickpeas or canola. If that land had been left fallow last year, as some conventional-till farmers in central South Dakota do, the wheat might have yielded 38 or 45 bushels,
Beck says. But for those extra few bushels this year, he would have sacrificed last year’s yield—$288/acre of chickpeas.

“In a more normal season, leaving the land fallow would have very little or no advantage in a no-till system. In a wet year, leaving it fallow would cause problems with excess moisture,” Beck says.

Beck adds that just as certainly as there are droughts, wet years like the 1990s also will show up again—and then farmers who got into no-till because of drought will be up a creek.

“No-till saves moisture. Period. But that’s only a benefit if you figure out a way to use that moisture to your advantage,” Beck says. “The problem is that some farmers became no-tillers without thinking about the intensity. When they get a wet year, they want to be conventional tillers again.”

Ron Gelderman, manager of the SDSU Soil Testing Lab, says studies show that the soil loses from one-half inch to 1 inch of moisture from each tillage operation, depending on how wet the soil is and the conditions afterward. If a rain follows soon after a tillage operation, the soil might not lose much moisture at all.

On the other hand, since many conventional producers use a tillage operation in the fall and one in the spring, they could lose 1 to 2 inches total under certain conditions.

NOTES FROM A NO-TILLER

Farmers in South Dakota, too, have embraced no-till, come drought or high water. Gene Stehly and his brother, Craig, began converting their Mitchell area farm to a no-till system in 1986, partly because no-till helped them with two critical tasks: saving time and saving moisture.

“I don’t know which benefit would be greater if someone were to ask the main reason why we do it,” Gene Stehly says.

The switch to no-till is part of what has made it possible for Stehly Farms to farm 11,000 acres, Gene says. But in a drought year like 2002 the moisture savings is probably the benefit the Stehlys think of first.

“I took on some new ground that the owner disked last fall before renting it to me. That’s my worst crop,” he says. “I have some land that hasn’t been tilled since 1987 and that’s doing much better.”

Stehly says the higher level of decaying organic material in no-till fields, as well as the greater activity by earthworms, makes the soil able to absorb and hold more water.

And the stalks and other plant debris on the surface acts as “microdams” to help hold runoff when rain does come—allowing more moisture to be absorbed into the soil preventing soil erosion.

Stehly’s experience has been that soil structure on his no-till fields takes a long time to build up, making no-till farming a long-term management tool. Although the brothers remain committed to no-till, he notes that the drought of 1988 may have persuaded some farmers to get into no-till farming and the wet years of the 1990s persuaded many of them to get out just as quickly.

“The 1990s were hard on no-tillers,” Stehly says. “People lost faith in it because they couldn’t get to the field.”

The Stehlys consider themselves “no-till purists” and stayed with it through the 1990s, partly due to the influence of Beck.

“Dr. Beck has proven to us over time that if you work your ground one year to get a crop in, you will pay for it in years when it’s dry because your soil will not have the structure to hold the moisture,” Stehly says.

But with all that said, Stehly notes that no-till farmers, too, lose crops in drought years like 1988 and 2002.

“There’s nothing magic about this. No-till is not a replacement for moisture,” Stehly says. “If it doesn’t rain, it isn’t going to matter. It’s simply a question of what’s going to die first.”

“Where’s nothing magic about this. No-till is not a replacement for moisture.”
—Gene Stehly, Mitchell area farmer
Because the symptoms are so commonplace, Johne’s is often overlooked, says Jane Christopher-Hennings, veterinary microbiologist of the Veterinary Science Department. The disease also has a very long incubation time, meaning that sometimes weeks and months must pass between time of infection and diagnosis.

Christopher-Hennings and her research team are attacking the disease on this front, finding new ways of testing for Johne’s disease that may enable faster and earlier identification.

Johne’s team reduces test result times from 16 weeks to hours

BY MARIANNE STEIN

Johne’s disease affects about 20% of dairy herds and 8% of beef herds in the U.S. Symptoms include chronic diarrhea and severe weight loss. The sick animal continues to eat but does not gain weight and eventually wastes away. There is no effective treatment, and infected cattle must be culled and slaughtered.

BELOW THE RADAR SCREEN

Johne’s (pronounced yo-nees) disease is named after the German veterinarian who identified it in 1895. The disease, also known as paratuberculosis, is a bacterial infection caused by the organism Mycobacterium paratuberculosis. The bacterium creates an inflammation in the last part of the small intestine (the ileum), which interferes with the absorption of nutrients.

Johne’s disease primarily affects ruminant animals such as cattle, bison, sheep, and goats. Nationwide, it is more
common in dairy than in beef cattle, probably because of different management practices in the two types of operations, says Christopher-Hennings.

The most common source of transmission is through feces that contaminates grazing areas and other food sources and water. Calves may be infected in the uterus or through milk consumption. Animals usually are infected in their first year of life, but the disease can take several years to develop. Many infected animals remain subclinical—below the radar screen—showing no or few symptoms. Infected cows may appear healthy yet be carriers of the bacteria and shed them in feces and milk.

Until recently, awareness of the disease has been fairly low, says Christopher-Hennings.

"Johne's disease has been overlooked in the past since it remains subclinical for a long time," she says. "Now, most states, including South Dakota, are implementing voluntary certification programs.

"Perhaps there has been a stigma to testing for Johne's. Perhaps producers feel that testing for Johne's indicates that the disease has been present in the herd. That's not necessarily true. Testing to certify that a herd is Johne's free is a worthy goal and helps in marketing Johne's-free cattle. Testing is also a proactive approach to preventing a disease problem.

"Testing is gaining in acceptance. Producers are becoming increasingly aware of the economic losses incurred by Johne's, due to reduced milk production and premature slaughter of infected animals," she adds.

Interest in Johne's disease has also accelerated because of concerns that the disease may have the potential to jump species and be transmitted to humans.

A few studies of people with Crohn's disease indicate that *M. paratuberculosis* is present in those patients more frequently than in people without Crohn's. Also, since Crohn's disease results in a chronic diarrhea in humans,
similar to the signs of Johne’s in animals, there is interest to determine if \textit{M. paratuberculosis} infection leads to Crohn’s disease in people.

**REAL-TIME RESULTS**

One of the problems in diagnosing Johne’s disease has been the testing procedure.

The most common test is to culture a fecal sample. That may take up to 16 weeks. “A positive result may show up earlier, but you can’t call it negative earlier,” she says.

As an alternative, SDSU scientists are using PCR (Polymerase Chain Reaction) analysis, which involves extracting DNA from a fecal sample and creating multiple copies of the DNA fragment, enough copies to carry out tests that will reveal the presence of the organism.

Christopher-Hennings and her colleagues have developed a new PCR technique. “We are using real-time PCR, which uses fluorescent probes, and results can be read right off the computer screen. It is the first quantitative PCR with a sensitivity equal to that of fecal culture,” she says. Results can be available in hours.

The technique represents an improvement in speed, reliability, and ease compared to existing PCR analysis, Christopher-Hennings says. The new method is fully developed, but it is not yet commercially available.

Christopher-Hennings and her colleagues are also working on techniques to identify Johne’s disease in younger animals.

“Young calves, less than 9 months of age, are most susceptible. We are looking for a method to detect \textit{M. paratuberculosis} in them. We are also working with cows that have recently calved, to see if we can find the bacteria in the colostrum or the blood. We are trying to find out if \textit{M. paratuberculosis} can be identified through blood samples rather than fecal samples.”

**NEED FOR INSTANT CONTROL**

If untreated, Johne’s disease will continue to spread throughout a herd, Christopher-Hennings explains. “One 4-year study of 10 dairy herds with a total of 954 cattle indicated that less than 10 cattle showed clinical signs of Johne’s disease at the onset of the experiment. In a first test of fecal culture, 8% tested positive.

“After 3.5 years, 22% tested positive. The projection was that if nothing was done, eventually over half of the cattle would test positive.”

If infection is discovered in a herd, it needs to be brought under control immediately, Christopher-Hennings says. Infected animals should be culled and proper management practices instituted to prevent spread of the infection. Sound management practices are also the best way to prevent the disease in the first place.

Since animals are usually infected in the first six months of life, it is especially important to ensure a clean environment in the maternity area. If there is a known infection, calves should not receive colostrum from infected cows.

The bacterium most often enters a herd through introduction of infected animals. The surest way to prevent that is to purchase animals only from herds certified Johne’s free.

**JOHNE’S TESTING PROGRAM VOLUNTARY**

South Dakota has a voluntary certification program, says Animal Industry Board Staff Veterinarian Chris Strang, who oversees the state’s Johne’s program. There are four levels of certification, Strang explains. The first year that a statistical sample of the herd is tested Johne’s free, the herd will be certified at level 1. After additional whole-herd testing, the operation can move up to level 2, and subsequently to levels 3 and 4.

“Currently, 14 South Dakota producers are certified at level 1 and 5 at level 2,” Strang says. Most of them are beef producers with seedstock operations. “If you have bulls and seedstock females to sell, it is important that they are disease free.”

The South Dakota Animal Industry Board helps offset the cost of certification. “We offer to pay qualified producers for testing 30 head, which is required for entry into the certification program,” Strang says.

He notes that many producers have their cattle tested under the program without entering the certification procedure. “We have tested 88 operations with Animal Industry Board assistance, but some people choose not to become certified, either because they have tested positive, or because they don’t want to deal with the restrictiveness of the program,” he says.

**STAY AHEAD OF THE DISEASE**

At Wienk Charolais in Lake Preston, the herd has been tested for Johne’s disease for several years, and the operation is now certified at level 2.
"We never had a problem with Johne's disease. We simply started testing because we wanted to make sure that the breeding stock we are selling didn't have the disease," says Arnold Wienk, part-owner of Wienk Charolais.

Wienk believes that awareness of Johne's disease is still very low. "We mention the certification in our sale catalog, but we don't make a big deal out of it. We find that most people don't know what we're talking about," he says.

Strang hopes that awareness of the disease will grow, now that the testing assistance program is in place.

"The goal of our program is to increase public awareness of Johne's disease. We want to encourage producers to reduce or prevent Johne's disease in their operations," he explains.

The test methods developed by Christopher-Hennings and her colleagues may be a step in the right direction, Strang says. "Current tests are good, but not perfect." With better, faster, and more reliable testing, it may be easier to identify and manage Johne's disease in the future.

The Johne's disease research at South Dakota State University has received funding from the South Dakota Agricultural Experiment Station. Scientists involved in the research projects include Christopher-Hennings, Eric Nelson and Christopher Chase, microbiologists, and Bill Epperson, Extension veterinarian, of the Veterinary Science Department; and Dave Henning, Alfred Chair of Cheese Technology and Chemistry, of Dairy Science.◆
West Nile Virus

update

BY MARIANNE STEIN

Even before the West Nile virus was discovered in humans in South Dakota in late August, SDSU had become part of a statewide effort to monitor the disease and educate the public.

West Nile virus is an infectious disease transmitted by mosquitoes. It is primarily a bird disease, but it also affects horses, humans, and—less frequently—other mammals. The first U.S. cases were observed in 1999 in New York, and the disease has since spread westward. In 2002, the virus was found in mosquitoes, birds, horses, and humans in South Dakota.

SDSU’s Animal Disease Research and Diagnostic Laboratory assists the state of South Dakota by testing blood samples from live horses or brain tissue from dead horses suspected of having contracted West Nile virus, Dale Miskimins, Extension veterinarian, said.

In addition, SDSU scientists use traps to catch mosquitoes at eight locations in eastern South Dakota, said Mike
Hildreth, professor of biology and microbiology. “The mosquitoes are forwarded to the state Health Department in Pierre to be tested for the virus,” he added.

Mosquitoes become carriers of West Nile virus when feeding on infected birds. The infected mosquito transmits the virus when it bites a bird or a horse, human, or other mammal. The disease does not spread through animal-to-person contact, said Dave Zeman, head of SDSU’s Veterinary Science Department.

**WEST NILE VIRUS AND HUMANS**

Most people who are infected with the virus do not become ill, said Lon Kightlinger, South Dakota state epidemiologist. Others experience flu-like symptoms such as fever, headache, and body aches. In rare cases, West Nile virus may cause encephalitis, an inflammation of the brain. “The elderly and people with weakened immune systems are at greatest risk of severe illness and death,” Kightlinger said.

“This year, we have had more cases nationwide than in the previous years, and more young people have become ill. Previously, the average age of infected humans was over 60, but in 2002, some people in their teens and 20s have developed encephalitis,” Kightlinger said.

However, he points out that the South Dakota climate offers some protection against the spread of West Nile virus. “We have to remember that we are not Louisiana, where the most cases have been recorded in 2002. Their mosquito season starts in January, so the disease just keeps amplifying. We are a windy, dry plains state, which is not as conducive to mosquitoes as a tropical climate. We have a winter here, and that protects us. Most mosquitoes can’t survive the cold weather, and most birds are gone during the winter months.”

That means that the mosquito season when the virus can be actively transferred to humans is shorter in South Dakota. It doesn’t mean that the virus will not reappear in the state next year.

“While there is no need to panic, people should be aware of the disease and exercise caution. As we see more cases of infected animals, the risk to humans increases,” Kightlinger said. “When West Nile virus is in the area, people with severe or unusual headaches should seek medical attention.”

Zeman agreed that while the risk is present, people should use common sense and try to avoid mosquito bites, especially in areas where West Nile virus has been confirmed. “Use insect repellent containing DEET, and make sure your window screens are intact,” he suggested. Other advice includes staying inside during dawn and dusk when mosquitoes are most active and wearing long sleeves and pants while outside.

**WEST NILE VIRUS AND HORSES**

Horses are particularly susceptible to West Nile virus. Not all infected horses become sick, but for those that do, the disease is fatal in 30 to 40% of cases. Symptoms of West Nile virus in horses may include stumbling and tripping, loss of appetite, fever, muscle weakness, and partial paralysis, said Miskimins.

While there is no vaccine for humans, a conditionally licensed vaccine is available for horses, and Miskimins said that horse owners should have had their horses vaccinated by now. The vaccine is given in two doses, 3 to 4 weeks apart, and full immunity does not develop until sometime after the second dose. An annual booster is recommended.

There is no treatment for West Nile virus; veterinarians can only give supportive care, Miskimins said.

**MOSQUITO CONTROL**

People can also try to minimize mosquito breeding grounds on their property, said Mike Catangui, Extension entomologist. “Mosquitoes breed in water, and anything that holds standing water for more than 4 days is a potential breeding ground,” he said.

“You should remove old tires, cans, and containers, and empty water from buckets, wading pools, and so forth. Replace the water in birdbaths and water troughs on a regular basis. You can also watch for the appearance of mosquito larvae in standing water,” Catangui suggested. Ponds may be stocked with larvae-eating fish such as minnows, he said.

Cities should also employ mosquito control programs, according to Catangui. “Mosquitoes can travel several miles to find a host. Thus, all potential breeding areas within a 3-mile radius of the city should be treated.” To eliminate adult mosquitoes quickly over large areas, a truck-mounted ultra low volume sprayer is usually needed. Several South Dakota cities already own ground ultra low volume sprayers and treat for mosquitoes regularly during the summer months, he added.

For more information about West Nile virus, contact your county Extension office or look online at the South Dakota Department of Health webpage http://www.state.sd.us/doh/WestNile/ The SDSU webpage is http://sdces.sdstate.edu/ Of special importance to individuals and to community officials and public agencies is the “mosquito management training” link on that page.◆
South Dakota Drought Information

http://sdces.sdstate.edu/drought

Explore your options.
Set goals.
Ask questions.
Seek reliable answers.
Make informed decisions.

Using science-based knowledge from your land-grant university for Agriculture, Family, & Youth Development/4-H needs and issues.