



NDSU EXTENSION SERVICE

Photo courtesy: Tim Schroeder

OLD WEATHER, NEW FACES, AND SOIL HEALTH

Greetings!

Three months went by in the blink of an eye and here we are hoping and wondering if weather to match the season is on the way. Despite the inches of snow that has covered much of the state this week, it is hard not to be hopeful that Spring will make its appearance soon with the extra hours of sunlight we are experiencing and new calves on the ground.

The miserable cold we have been enduring sometimes brings inevitable mortalities to ranchers. Though it has been covered previously in LEM News, you will find information regarding mortality composting in this issue. I strongly encourage you to consider this as a means of carcass disposal. On the other side of the coin, there may be concerns about containment pond effluent levels when the sun does decide to stick around. Find information in this issue from the North Dakota Dept. of Health (NDDH), Division of Water Quality about managing your containment pond.

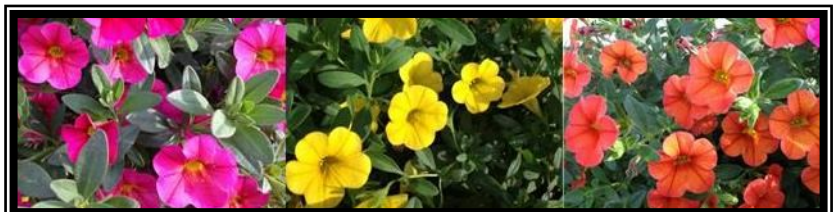
Aside from the weather, the past quarter has been busy in other ways as well. The LEM program, CREC and NDSU are saying good-

bye and congratulations to a long-time program supporter and colleague, Vern Anderson. We also welcome the new nutrient management specialist to the CREC and a new regulator with the NDDH CAFO program.

Finally, this issue of LEM News will cover the importance of soil health. This is a topic that pertains to both livestock and crop producers and I think you will find valuable information in the articles from the guest authors.

As always, I welcome and appreciate your comments. Please feel free to give me a call (701.652.2951), stop by the office, or send me an email (mary.berg@ndsu.edu). Also, don't forget to check out the website (www.ag.ndsu.edu/lem), LEM Facebook page (www.facebook.com/ndsu.lem) and follow LEM on Twitter ([@ndsulem](https://twitter.com/ndsulem)) for the latest nutrient management news.

Here's to May flowers, healthy calves and an early planting date!



COMPOSTING MORTALITIES

Mary Berg, LEM Spec., CREC

Rendering, incineration, burial and composting are approved methods of carcass disposal in North Dakota.

Composting is a naturally occurring process that breaks the carcass into basic elements via microorganisms and heat generated during composting. Composting is a simple process that requires few materials and minimal maintenance.

Here are tips on how to build a successful mortality compost pile or windrow:

- ⇒ If composting one animal, build a pile.
- ⇒ If composting several animals, build a windrow.
- ⇒ You'll need base material such as straw or old hay, bulking material such as manure or spoiled silage, and cover material such as straw, old hay or sawdust.

Use this process for composting:

- ⇒ Start with 2 feet of base material in a windrow or circle, depending on how many carcasses will be composted.
- ⇒ Lay the carcass on top of the base. Lance the rumen of mature cattle to ensure eruption does not occur. Have at least 1 foot of base material between the perimeter of the carcass and the edge of the base.
- ⇒ Cover the carcass with 8 to 10 inches of bulking material.
- ⇒ Cover the entire pile or windrow with 2 feet of cover material. The cover material should be placed on the top and sides, with no part of the carcass showing. The pile needs a good cap to keep predators out and seal in heat.

To maintain the compost site:

- ⇒ Leave the pile or windrow undisturbed to keep heat sealed in during the very cold winter months.
- ⇒ Aerate the pile every two months using a loader from early spring until late fall.
- ⇒ Make sure sufficient cover material always is present.



On January 31, 2014 the air temperature was 1 degree F while the internal pile temperature was 120 degree F!

For more information:

- ⇒ Check out the the eXtension Livestock and Poultry Environmental Learning Center's video series at <http://tinyurl.com/ktghhlw>.
- ⇒ Contact Mary at (701) 652-2951 or by email at mary.berg@ndsu.edu.
- ⇒ Visit NDSU's livestock environmental management website at www.ag.ndsu.edu/lem/resources/animal-mortality-management.
- ⇒ See NDSU's "Animal Carcass Disposal Options" publication at <http://tinyurl.com/carcassdisposal>.

COMMENTARY FROM THE CAFO CORRAL CONTAINMENT POND MANAGEMENT

Jeremy Lang, NDDH

Although it still feels a lot like winter, the calendar tells us that the spring thaw can't be too far away. With the new snow out there, we could be facing some runoff and flooding events again this spring. Now is the time to prevent potential flood-related problems by performing some simple maintenance on parts of your manure management system.

1. Clear snow and ice from pipes, culverts and the solids separator. It is best to remove the snow and ice prior to melting. Salt may be useful to melt ice in structures that are difficult to clear by mechanical means.
2. Remove snow drifts from open diversion ditches to ensure they will flow freely when the first melting occurs.
3. Review your operations and maintenance (O/M) plan for any maintenance items unique to your system.

During the spring melt, monitor your pond and record its level regularly. Inspect the diversions and dikes for erosion, particularly those areas that did not have established vegetation last year. In springs past, the most common cause of overflows was clean water entering the containment area due to overtopping of clean-water diversion dikes. Recently completed projects with bare earthwork sustained the most damage.

If your runoff pond does fill up, it is best to wait to pump it until the water can be applied to dry cropland, hay land or pasture. When possible, a sample of the runoff water should be tested prior to application. Contact your local extension agent for a list of laboratories that can analyze manure samples. Runoff water can often be applied up to the infiltration rate of the soil.

If the runoff pond is in immediate danger of overflowing, it is still preferable to control that overflow by pumping, siphoning, or using the designed

spillway. An uncontrolled overflow can damage the pond structure. If pumping a runoff pond is needed to prevent an immediate overflow, steps can still be taken to minimize the impact, including:

1. Don't pump from the very top or bottom of the pond; pull water from the middle.
2. Direct the discharge to an area where it will have the least environmental impact, preferably away from any defined drainage.
3. Spread the runoff water out over as much area as possible, preferably on grass or hay land with vegetation.

Extraordinary measures should be taken to prevent liquid manure storage ponds from overflowing; such discharges can cause severe environmental impacts.

In the event of an overflow or damage from excessive runoff, notify the North Dakota Department of Health, Division of Water Quality, at 701.328.5210. Keep track of the volume and duration of overflow. (The flow rate over a dike can be estimated if you know the depth and width of the overflow.) If you have any questions or concerns, please call the number above or contact us at www.ndhealth.gov/WQ.



NITROGEN MINERALIZATION AND AVAILABILITY FROM MANURE

Jasper M. Teboh, Soil Scientist, CREC

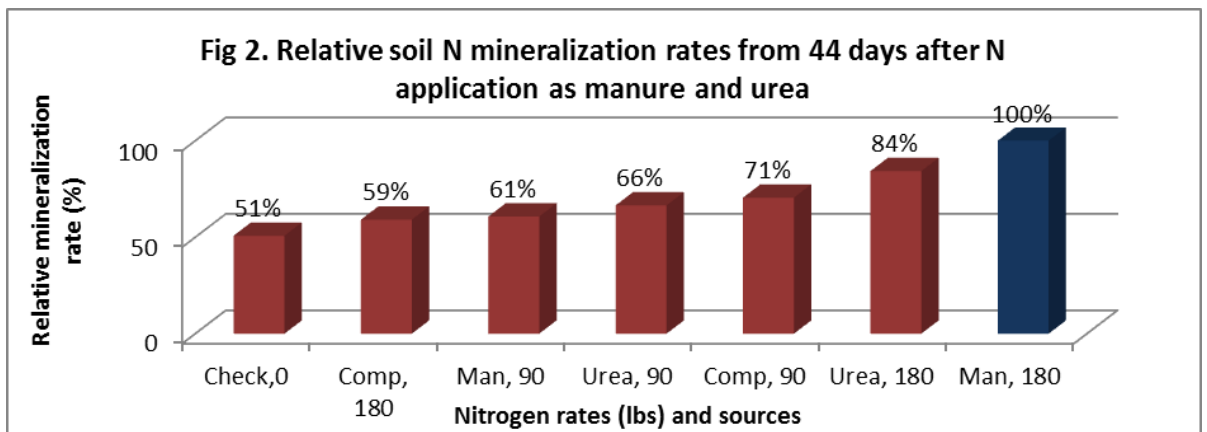


Figure 1. Fresh (L) and composted (R) manure.

within a few weeks of application. However, the higher supply rate may not be consistent throughout the growing season. A study conducted in 2012 at the Carrington REC assessed the relative mineralization rates (RMR) of N, 44 days after planting in field plots treated with urea, fresh manure or composted manure (Figure 1).

Application of manure and conservation tillage practices are two common approaches that build and stabilize soil organic matter (SOM) in farmers' fields. On average, about 50% of the nitrogen (N) in fresh manure is supplied in the first year of application, while composted manure may supply about 20%. Though the amount of N supply is vital, the timing of N release for plant uptake is a key determinant in evaluating the effectiveness of manure or any other N source in field crop production. Nitrogen use is optimized when high N release coincides with greatest needs by plants, thereby minimizing N loss. Application of conventional fertilizer for example, would normally supply N to plants at a higher rate than manure

Results (Figure 2) showed that the RMR was highest for fresh manure applied at 180 lbs. N compared to the urea treatments. Plots treated with 180 lbs. manure mineralized more N at 16% and 41% higher rates than the corresponding rate for urea and compost, respectively. Corn yields (not reported) were not significantly different but highest numerical means were observed at the 180 lbs. manure rate, while grain protein was highest for the 180 lbs. urea N rate.



MARK YOUR CALENDAR

The North Dakota Stockmen's Association Feedlot Tour will be held on **Tuesday, June 17** in the Morton County area. Contact Scott Ressler for more information; sressler@ndstockmen.org or 701-223-2522.



WELCOME!

Paulo Flores—Nutrient Management Specialist



Paulo grew up in a small town (Cacequi, Rio Grande do Sul State) in Southern Brazil, where he helped his family grow a variety of crops (watermelon, melons, pumpkins, yucca, corn, and rice,

among others). Watermelon was the main crop. His hometown was known for a long time as the biggest watermelon producer in the state. This is no longer true, but the watermelons produced in Cacequi are still considered some of the best ones in the state and the nation.

Raised working with livestock and crops, Paulo followed his passion for Agriculture and attended college at the Federal University of Santa Maria, where he received a degree in Agronomy (2002). During his time in college, Paulo worked as an undergraduate research assistant for the Soils Department for 4.5 years, developing field and lab activities related to several research trials carried out by his research team.

After graduation, Paulo went to graduate school at the Federal University of Rio Grande do Sul (Porto Alegre, Rio Grande do Sul), where he continued his studies in soil chemistry and fertility and earned his

Master's (2004) and Doctorate (2008) degrees. During that time, Paulo carried out studies to evaluate the effect of cattle trampling on soil physical and chemical characteristics and their effect on soybean yield in an integrated crop-livestock system. During his Ph.D., Paulo was awarded a grant to carry out part of his research at the University of Illinois at Urbana-Champaign (UIUC), where he expended one year working on some aspects of carbon and nitrogen in the soil on an integrated crop-livestock system. After that, Paulo went back to Brazil to finish his Ph.D.

Towards to the end of his graduate work, Paulo's supervisor at UIUC, now working at Virginia Tech University, invited him to come back to the United States to work as a postdoc with him. He arrived at Virginia Tech in January of 2009, where he carried out research on topics related to forage and grazing management for over 4 years.

Paulo joined the NDSU Carrington REC in January of 2014 as a Nutrient Management Specialist. He plans to use his research experience to develop studies in collaboration with other researchers around the state. Paulo's research will support the use of manure as a substitute to synthetic fertilizer for crops grown in North Dakota, without neglecting the possible environmental impacts associated with the application of manure to the land.

Contact Paulo at paulo.flores@ndsu.edu or 701-652-2951.

Rachel Fast—NDDH CAFO Program

There is a new face at the North Dakota Department of Health. Rachel Fast is the new environmental scientist for the Water Quality Division's CAFO program. Along with Brady Espe and Jeremy Lang, Rachel will be permitting animal-feeding operations, inspecting animal-feeding operations to assess environmental compliance and bringing facilities into compliance with environmental laws. Before

coming to work for the NDDH, Rachel was the watershed coordinator for the Morton County Soil Conservation District's 319 program.



A BRIEF HISTORY OF PHOSPHATE EXPORT FROM NORTH DAKOTA

Dave Franzen, Extension Soil Specialist, NDSU

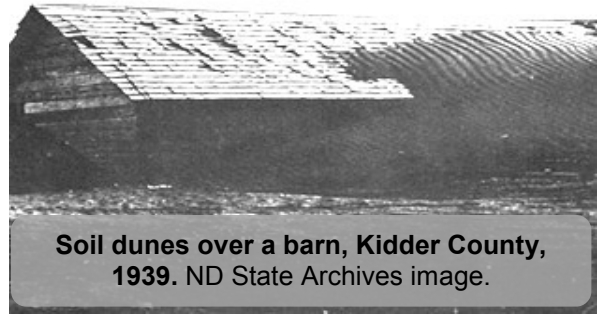
Few people are aware that we have exported phosphate from North Dakota since the 1880's.

When settlers came to North Dakota, many wanted to farm but lacked the skills or tools to do so. Some migrated to the state from the east, where the soils and environment was very different and came to this land in the 1880's that had few roads, no infrastructure, few neighbors and little source of income. Across the prairie were scattered millions of pounds of buffalo bones. Some of these bones came from natural death, while many others came from the slaughter during earlier migration of hunters looking for hides to ship to the east. The bones were gathered by the settlers and taken to railroad depots at Ellendale, Fort Totten and other depots, sold for cash up to \$15 per ton, which was big money in those days, and the settlers used the cash for food to survive or upgrades to their sod houses. From about 1880 to 1892 when the trade all but ended, my estimate is that about 32,000,000 pounds of bones were shipped east for fertilizer and industrial uses from North Dakota. The nutrient content of bone is about 3-15-0, or about 15% phosphate (P). Using these figures, we can estimate that shipped about 2 years phosphate application east at today's historic high present rates.



Buffalo bones being loaded into railroad cars near Krem, ND, Dunn County, 1880's. Photograph permission of the Germans from Russia Heritage Collection, North Dakota State University Libraries, Fargo – www.ndsu.edu/grhc.

The greatest export of P is due to wind erosion. North Dakota is one of the windiest regions on earth. Set-



Soil dunes over a barn, Kidder County, 1939. ND State Archives image.

tlers used techniques from the Old Country or the eastern US which did not consider wind erosion. So when the soil was dry, the soil blew. Dust storms were very common in the 1920's, 1930's up to today. Dust doesn't just settle in the ditch; accounts from the 1930's by aviators describe dust clouds up to 14,000 feet in elevation. Dust travels thousands of miles. The P content of the dust that settled in east coast US states was 19 times that of what remained on the prairie. The wind still blows today. In the 1930's North Dakota lost the equivalent of 40 years of P application at present rates. New data describing soil loss from North Dakota soils since 1960 indicates that we have lost another 30 years of P application. If no new soil was lost, it would take 70 years of P application return to P levels in 1882. No-till and strip till are needed to stop the export. Minimum till is not enough.



Dust storm northern Red River Valley about 2005. Image courtesy of A.C. Cattanach, American Crystal Sugar Coop.

SOIL OWNER'S MANUAL

Jon Stika, ND NRCS

Have you ever bought or inherited a piece of farm machinery that did not include the owner's manual? Many of us have been in this position more than once. We put the piece of machinery into service, observe how it works (or doesn't) and make our best guess about how it is supposed to work. We tinker with the machine to get it to serve the purpose, but without knowing exactly how it was designed to operate, we never realize the machine's true capacity to function.

Such has been the case with soil and agriculture. We tinker with the soil and see how it reacts to tillage, crops and inputs and make our best estimate of how to manage it. But without an owner's manual, we don't know the true capacity of the soil to function.



A cover crop demonstration in Slope County, ND.

In recent years, soil biologists have begun to unlock the secrets of the soil and give us the makings of a soil owner's manual. What we are learning is that the soil is a biological system run by billions of microscopic organisms. These organisms do their best to make the soil their home and associate with their partners, green plants, which live in the soil with them. The green plants take energy from the sun and feed the soil organisms, who in turn, build the soil and feed the plants. Knowing this, we now have a completely different paradigm on managing the soil to make agriculture both profitable and sustainable. Without an understanding of how the soil actually functions, agriculture has been profitable, but arguably not sustainable. Now that we have a basic soil owner's manual showing us how to manage the soil as habitat for the soil organisms responsible for the majority of what is necessary for crop production, we can build soil and profitably produce crops at the same time.

The basic principles for managing to improve soil health and profitability are to: disturb the soil less, in-

clude a greater diversity of plants grown in the soil, maintain living roots to feed the soil as much as possible and keep the soil covered with plants and their residues at all times. We now possess the knowledge and technology to make this happen. Tools such as: equipment that can plant into untilled soil, multi-specie cover crops, harvesting equipment that distributes crop residues back over the soil, herbicides, fertilizers, livestock, etc. can all be applied thoughtfully to build soil and feed the underground herd of microscopic livestock that every farmer has living in their soil.

At recent soil health workshops, producers have been asking about soil testing and the recommendations that result from those tests. For fields that have been continuous no-till for at least five years, North Dakota State University suggests a 50 pound per acre per year nitrogen credit (<http://www.ndsu.edu/pubweb/soils/wheat/>). This is in response to the changes in soil biology (and subsequent nutrient cycling) that occur when the soil is not physically disturbed by tillage.

Most of what we know about crop production centers around how plants respond to inputs. We have focused on the plants rather than the soil. As a result, our understanding of crop production consists of how crops grown in dysfunctional soils (that are repeatedly tilled) respond to inputs... not how crops respond to fully functioning soil. Once our focus shifts to the soil, crop production becomes a matter of managing the soil to improve its' capacity to function. The soil can then supply the needs of the plants, which is accomplished in part by using plants and their residues to improve the microbial habitat in the soil.

The most potent tool with which to build healthy soil is a live plant. Photosynthesis is the primary process that feeds the soil. A cropping system that creates favorable soil habitat and maximizes the diversity of plants and the flow of energy from the sun into the soil will build soil health at the fastest rate and greatest extent. A soil food web that is dormant and/or incomplete cannot perform the tasks of building soil or cycling nutrients to feed the plants we grow as crops.

Now that we **know better** regarding how the soil functions...our challenge is to **do better** with what we have learned as we develop a true soil owner's manual.

CREC ANIMAL SCIENTIST RETIRING

Ellen Crawford, Information Spec., NDSU

Vern Anderson would like a little more time to spend at his family's lake cabin, go sailing, tackle projects around the house, visit grandchildren and other relatives, read, and do some volunteer work and consulting.

So the animal scientist at North Dakota State University's Carrington Research Extension Center is retiring March 31, following a 35-year career at the center. However, a storied career such as Anderson's cannot end abruptly, so after his formal retirement he will continue on a part time basis. He will work on wrapping up current research and writing projects.

Anderson has focused his research on nutrition and management for beef cows and feedlot animals. He has studied a wide variety of feed ingredients grown and processed in the world's temperate regions and their effects on beef cattle. He also has extensive experience in cattle husbandry and low-stress care and management of livestock.

"The resources are in place in North Dakota for extensive livestock development," he says. "We have lost some of the culture for livestock production in North Dakota, but the practical research and educational activities at the CREC nurture producers and foster the growth of cow numbers and feedlot enterprises."

Some of the highlights of his career are:

- * Developing research facilities at the Carrington center for more scientific studies and expanding the livestock research program to its current high level of productivity
- * Working with the many commodity groups, such as the Northern Pulse Growers Association, North Dakota Barley Council and North Dakota Corn Council, to provide them with sound information on how the livestock industry can best use their products
- * Developing good working relationships with organizations including the North Dakota Stockmen's Association and North Dakota Feeder Council
- * Researching alternative livestock production systems such as the confined or dry lot cow-calf production system

- * Helping start the NDSU Feedlot School and the BBQ Boot Camp program

- * Giving talks about the center's research activities that motivate changes in production practices to improve livestock producers' profitability and quality of life

- * Traveling to other states and 10 countries, as well as

hosting numerous international groups (40 groups in past three years) at the center, to share his knowledge of animal agriculture and NDSU research and Extension Service efforts with animal science faculty, industry professionals and producers

- * Conducting bison research and interacting with bison producers across North America

- * Hearing producers' comments on how the center's projects or ideas make a difference in their operations

"Vern's tenure as animal scientist at the CREC is notable for the significant level of sustained service he provided to North Dakota agriculture," says Blaine Schatz, center director. "His research and outreach contributions not only benefited the cattle industry in the state and region, but his research on utilization of feed grains and crop coproducts greatly benefited the commodity crops grown across the state."

Anderson, who was raised on a livestock farm near Strandburg, S.D., joined the Carrington center in 1979 as an assistant animal husbandman. He became an associate animal scientist in 1983 and the animal scientist in 1987. He also has been an adjunct professor in NDSU's Animal Sciences Department since 1999.



Continued on page 9.

ANDERSON RETIREMENT CONTINUED

Ellen Crawford, Information Spec., NDSU

Continued from page 8.

He received bachelor of science and master's degrees from South Dakota State University before joining the center, and in 2000, he earned a Ph.D. in ruminant nutrition from NDSU.

Anderson is a member of the American Society of Animal Sciences and the American Registry of Professional Animal Scientists. In 2009, the North Dakota Association for Communication Excellence and NDSU Agriculture Communication Department honored him as their communicator of the year.

Colleagues are holding a retirement reception for Anderson at the Carrington center from 2 to 4 p.m. on April 11.

CENTER POINTS

The staff at the NDSU CREC are excited to bring you information about program activities and project progress through our new blog, titled 'Center Points'. [Center Points](#) will be located on the CREC [website](#). Starting Monday, April 7, you will find Center Points in the upper right corner of the homepage as well as in the left side navigation. Center Points will be updated with new information every Monday morning. An email will be sent every Monday morning to inform you about the new post. Other updates may be posted during the week, but you will only receive a reminder email on Mondays. If you are interested in being on the listserv to receive reminders about Center Points, please email mary.berg@ndsu.edu. Find the first entry to Center Points here on Monday: www.tinyurl.com/centerpoints!



NUTRIENT REDUCTION STRATEGY



There is nothing new to report concerning the ND Nutrient Reduction Strategy. Conference calls and face-to-face meetings of the workgroups have started. Check out this website, www.tetrattech-ffx.com/nutrients/nd2013/, to be informed about workgroup reports and dates for future meetings. For specific questions, feel free to contact mary.berg@ndsu.edu or mell@nd.gov.