NEW MEMBER SPOLIGHT—Carlee Elke

The North Dakota SWCS Chapter is pleased to welcome Carlee Elke as their newest member. Carlee graduated from North Dakota State University with a major in Natural Resources Management and an emphasis in Soils and Physical Earth. She also has minors in Anthropology, Soil Science, and coursework in Spanish. Carlee currently works in Beulah, ND as a Soil Conservationist for NRCS. Prior to working in Beulah, she had the opportunity through the NRCS SCEP Program to work in the Minot, Devils Lake, Fargo, and Hillsboro field offices.

Carlee's passion and appreciation for natural resources management and sustainability came from her interest in the outdoors, fishing, bow hunting, and her time spent at her grandparent's farm near Rolette, ND. By joining the ND SWCS chapter, Carlee feels that it will not only help her network and educate herself, but also help her carry out NRCS's mission of "Helping People Help the Land".

NEW MEMBER SPOLIGHT—Dr. Abbey Wick

Dr. Wick is an Assistant Professor of the Soil Health with NDSU Extension and is a member of the NDSU Soil Health Team. Abbey has extensive experience in working with landowners and industry on issues ranging from soil nutrient cycling and physical limitation of soils on crop production to best management practices for reclaimed mine land. Degrees Ph.D Soil Science, University of Wyoming; M.A. Geography, University of Denver; B.A. Geography, University of Denver.
NEW OFFICER SPOLIGHT—Amanda Brandt

Hi, I am Amanda Brandt. I have been a member of ND SWCS chapter for four years and have enjoyed the great workshops put on by SWCS and meeting new people! I have participated on various committees and planned last year’s Annual Meeting. I grew up on a dairy farm near Grand Rapids ND (12 miles NW of LaMoure) and helped extensively with the day to day operations on the farm, which is where I learned to appreciate the outdoors and our natural resources. I attended the University of Minnesota, Crookston majoring in Natural Resources Management and graduated in May of 2007. I then received a job as a Soil Conservationist with the NRCS in July of 2007, my first location was in Forman, then Valley City, next I moved to Minnewaukan, and then Napoleon was my last stop before I took the District Conservationist position in the Valley City Field Office two and a half years ago. Some of my hobbies include deer & pheasant hunting, fishing, playing softball and golfing. Those hobbies are why I am excited about being President-Elect for the ND SWCS Chapter. I feel the ND SWCS chapter has helped producers; conservationist & business men/woman become aware of the new and upcoming technologies and information to help protect our natural resources and I look forward to continuing that success. My husband, daughter and I reside in Litchville ND and love enjoying the outdoors together.

NEW OFFICER SPOLIGHT—Joanie Rau

Hello! I’m Joanie Rau, the newest council representative for North Dakota Chapter of SWCS. I am originally from Streeter, ND where I was raised on a small grain and cattle farm. I was fortunate to grow up a ‘farm kid’ and learned to appreciate Mother Nature early in life. I now own a piece of that farm and NRCS has truly taught me how valuable the land and our natural resources are. I enjoy being outdoors and spending time on the farm on weekends in the summer. I graduated from NDSU with a degree in Animal Science. My career with NRCS started longer ago than I care to admit! I started as a Soil Conservationist in the Jamestown Field Office and also worked in the Mandan and Bismarck Field Offices. I quit NRCS (at that time SCS) to get married, moved to Montana and started a family. I then started back as a Soil Conservationist a few years later in Havre, Montana where I worked for 10 years before moving back to North Dakota to my current location in Wahpeton, ND.

I have been a member of the North Dakota Soil and Water Conservation Society since 2008 and have enjoyed attending the state and regional meetings and opportunities to network with other SWCS members. SWCS provides a great opportunity for sharing new information about conservation and soil health to our farmers and producers through the meetings and workshops.
Greetings, I am Marko Davinic, I graduated from Northwestern State University with a B.Sc. in biology in 2004. He received his M.Sc. in microbiology at the Texas Tech University, where he investigated genetic regulation of Exotoxin A production by human and plant pathogen bacteria (Pseudomonas aeruginosa). At the same institution, he received his Ph.D. in plant and soil science (soil microbiology), where he evaluated a long term impact of integrated crop-livestock agroecosystems on soil microbial community.

Marko currently serves the worldwide scientific community in using PRS™-probes for research to better measure soil nutrient bioavailability as an R & D Coordinator for Western Ag Innovations Inc. In addition, Marko utilizes same technology to provide a deeper understanding of agricultural soils and empowers farmers across North Dakota to optimize both yields and profit as a General Manager of Western Ag Professional Agronomy ND.

Lombard Illinois is this year's conference location. It also happens to be just a short 15 drive from The Morton Arboretum, which contains 1700 acres of woodland prairie. To find out more about this local attraction, visit www.mortonarb.org. Remember, the conference hotel offers the discounted room rate three days pre and post conference. Why not plan for a little extra time to sightsee? Book your room now by visiting www.swcs.org/14ac_hotel.

Chicago, which is just a short commute from Lombard, is home to 237 square miles of land and 26 miles of lakefront. What a perfect setting for this year's conference theme - Our Life on Land & its Impact on Water!
## February 2014

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**Schedule of Events**

- **February 2**
  Ground Hog Day

- **February 4**
  SWCS Teleconference @ 6:00pm CT

- **February 11 & 12**
  Agri International Civic Center
  Bismarck, ND

- **February 12**
  SWCS Award Due

- **February 17**
  George Washington Birthday

- **February 18**
  National Broadcast Forum on
  Cover Crops and Soil Health,
  *Harvesting the Potential*

- **February 24 & 25**
  NDSU Reclamation Workshop
  Dickinson, ND

## March 2014

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**Schedule of Events**

- **March 3**
  ARS Winter Results Workshop
  Mandan, ND
  Sevens Seas
  Conference Center
In excessively wet years farmers who are unable to plant their intended crop acres in a timely manner may choose to take the “prevented plant” option for fields that go unplanted. To maintain fields have been fallowed under prevented plant, producers should consider the option of growing a full-season cover crop as a viable agronomic alternative that will benefit the health of the soil resource.

The most apparent resource concerns addressed by cover crop are excessive soil water and soil erosion. Typically, about one-half inch of water will be lost to evaporation when a prevented plant field is tilled or has a bare soil surface. More soil moisture is evaporated from the soil surface whenever the soil is tilled. Tillage of wet soil increases the potential for compaction below the tilled zone and makes the soil more susceptible to erosion. When cover crops are grown they transpire (or draw water from the soil) in excess of what would be lost by evaporation alone. For example, a cover crop seeded on July 1 in Grant County will typically use in excess of 13.18 inches of soil water before killing frost in late September (See Graph). The cover crop will reduce wind and water erosion by providing protective residue or armor on the surface and roots to hold soil in place.

A producer in Grant County west of Elgin “Kevin Roth” planted a cover crop “cocktail” this year on his prevented plant acres. In 2012 the field was in wheat and harvested, the next year the field was supposed to be planted to sunflowers, but weather and field conditions did not allow him to get the crop in. Roth needed to get a crop in to use some moisture and shield the soil. The cocktail mix of cover crop used was Sorghum-Sudan, millet, radish, sunflowers, pea and soybean that was developed by the NRCS, based on his resources concerns. The Sudan and millet was added to the mix for ground cover, the radish and sunflowers was used for breaking the hard pan, capturing nutrient loss, and to use up excess moisture. The pea and soybean was used to add a legume to the crop rotation and produce nutrients for the next growing season. When you pass by the field, the field is still green. The radishes will continue growing until the middle of December or until it gets down to 15 degrees for more than seven consecutive days. Roth is very happy on the turn out of the field; he is planning on adding the cover crop mix to his rotation in the future to diversify is crop rotation to include all four plant types, Cool Season Grass, Warm Season Grass, Cool Season Broadleaf and Warm Season Broadleaf. Roth said it will still be hard to get in next spring to this field because of the excess moisture that we received in October, but is still going to try to get Sunflowers planted in 2014 to start using the excess water and nutrients in the field.

Positive Soil Health and Agronomic Benefits of Cover Crop Include

* Harvesting Excess Water  
* Controlling Erosion  
* Building soil organic matter  
* Controlling Soil Stalinization  
* Fixing and sequestering nitrogen
Soils should be managed to increase soil organic matter (SOM) content. Soil organic matter provides many physical benefits to the soil, such as improved water holding capacity, action exchange capacity (CEC), and pH buffering, while reducing the soils bulk density. A bare soil surface in a prevented plant situation negatively impacts the SOM. Cover crops will benefit the soil by fixing carbon from the atmosphere through photosynthesis. Growing a full-season cover crop can add 5,000 to 8,000 lbs./acre of carbon into the soil on prevented plant acres as compared to summer fallow or tillage. Cover crops also uptake nitrogen, phosphorus and other important crop nutrients, then releasing those nutrients as the cover crop decomposes the following year.

Nitrogen, when applied as an inorganic fertilizer, can be lost through leaching as water moves down through the soil or as a gas through denitrification when the soil is saturated or where water is ponded. Cover crops are an excellent option for producers to manage or minimize nitrogen losses. Cover crop mixtures can be designed to hold nutrients in plant residue for various periods of time based on the carbon to nitrogen ratio (C:N) of the crop species grown. Cover crop species with a low C:N ratio (below 20:1) will release nutrients faster than a cover crop with a high C:N ratio (above 40:1). Cover crop mixes that include legumes will fix and add nitrogen to prevented plant acres. The nitrogen added into a cropping system by cover crop mixes containing legumes and seeded by mid-summer can easily pay for the cost of the seed. Generally, legumes add 50-100 lbs. of nitrogen when grown until killed by frost. When planting cover crop mixes with low C:N ratios, producers can expect at least half of the nitrogen in the plant residue to become available the next growing season.

A critical issue facing farmers across North Dakota is the loss of soil productivity and crop production due to soil salinization. In many cases, saline soils are included in prevented plant acres. If prevented plant fields are tilled and left bare, water is removed from the soil through evaporation. The evaporating water leaves behind dissolved salts carried by upward water movement in the soil, accumulating at the soil surface. Increasing salt levels in the planting zone can be very damaging to seed germination and plant productivity. Integrating cover crops into a diverse crop rotation is an important tool for managing soil salinity. Cover crops transpire additional water from the soil, removing excess soil water and lowering the water table in the soil, reducing evaporation that brings salts to the surface.

Prevented planting provides an excellent opportunity to use cover crop species and crop types that are not typically grown in the rotation. This added diversity results in agronomic as well as soil sustaining benefits. For those operators with cattle it can provide harvested forage and late season grazing opportunities. Final commodity planting dates for insurance purposes vary by crop and location within the state. Producers are advised to check with your crop insurance agent to determine when cover crops can be seeded, grazed or hayed. Cover crops should be seeded as early as practical to ensure adequate time for growth and to meet your resource objective.
The theme of the conference was focusing on climate change and making our soils and systems both resilient and resistant to changing weather patterns. The big focus was on soil health and how improving soil health helps systems function better in all weather conditions.

Delegates meeting:

- State of Society talked about supporting research, sponsoring 3 workshops with EPA/NRCS to focus on the hypoxia in the gulf. was a good talk but missed out on concept of soil health practices addressing the water quality concerns.

- BOD reorganization cannot occur without 2/3 votes of members; as it requires a bylaws change. They want the reorganization to help the society leverage with other entities. They are not chasing dollars, they're chasing like minded people/organizations, Jim Guilford stated many times that "first and foremost, these invited BOD members have to share our core values". When asked about the potential for another entity to "take over" SWCS via these appointments, Jim pointed out that first of all there will always be more elected BOD members than invited; but the bylaws change may need some additional clauses to allow an invited member to be removed. When asked about the large regions and having meetings and such, Jim stated that the regions would be strictly to assure all areas of the country have a rep on the BOD. These lines should mean nothing for having regionally significant meetings (hence we could have our 6 state NP March meeting if we wanted).
The North Dakota Chapter of the Soil and Water Society held a pollinator conservation planning and design workshop, "The Birds & the Bees Too: What Else Dad Forgot to Tell You" at the Burleigh County Soil Conservation District Menoken Soil Health Demonstration Farm on July 16, 2013. With a dedicated planning committee, generous donations and sponsors, along with a great turn out, the workshop was a huge success even though it was record-breaking heat that day. Speakers included: Dr. Eric Mader, Xerces Society, who gave several educational lectures on pollinators, designing pollinator habitat enhancements and pollinator friendly farming practices, and the economic importance of them; Jay Fuhrer, NRCS, gave an very informative overview of building the habitat for pollinators; Dr. Janet Knodel, NDSU Entomologist, provided information about protecting pollinators for pesticides; and Lena Bohm, NRCS, presented information about native flowers, design, and importance for pollinators. Mary Podoll, ND NRCS State Conservationist, was the moderator for the event. The event concluded with a BBQ and buzz session and a tour of the Menoken No-till garden. Approximately 90 people attended which surpassed expectations by the planning committee which illustrates the interest in and importance of pollinators in agriculture and gardening today.
Greetings! My name is Lance Loken, and I’m the new President of the North Dakota Chapter of the Soil and Water Conservation Society. I would like to thank you all for this opportunity to serve you for the next two years. I hope we can work together to have educational, yet fun, annual meetings, and perhaps some extra activities that will help us all in our jobs and our understanding of the environment we all work with in our daily jobs.

Many of you know me, but I am guessing that many of you do not, so I’ll start with a little history about myself. I grew up on a dairy/small grain farm in west-central Benson County. We milked until 1977, then converted to small grains, predominantly durum, barley, oats, and sunflowers. My first two years of school were in a 2-room school in Fillmore, and after that closed, the long days of bus rides to Rugby began. I graduated from high school in Rugby, and had been active in 4-H and FFA, at least early on. After high school, I attended NDSU in Fargo, and earned a BS degree in Earth Science (Geology), with minors in soil science and anthropology. I had picked geology, partially due to the oil boom here in North Dakota in the early 1980s. But, by 1983 that boom busted. After I graduated in 1985 (3 days later actually), I started work on a MS degree in wetland soil genesis under JL Richardson in the NDSU Soils Department. I learned a lot from Allan and Don in the Geology Department, and of course from Jimmie in the Soils Department, as well as many other professors and instructors in the Soils and Geology Departments.

After college I worked for the USDA-SCS as a soil scientist stationed in Bottineau, but I worked with the Rolette County Soil Survey Party, under Lynn DesLauriers. The “once over” was nearing completion in those days, and the pressure to map was quite intense. I found I liked soils, but I didn’t care for day after day after day of digging holes. So, later I was also was a Soil Conservationist in Bottineau County field office for a few months. I worked at Braun Intersect for a few years, first as an Industrial Hygienist Technician, but most of my time there I was an environmental geologist/soil scientist. At Braun I was exposed to the world of environmental impacts, assessments, cleanups, wetland delineations and the like. But, like so many firms can do, Braun grew too fast. They had discovered I could “talk” (apparently a rarity among scientists and engineers) and was doing a lot of marketing. When the economy soured in the early 1990s changes came, and when the entire marketing division of Braun was let go, I got a sick feeling in my stomach, and a few weeks later I was let go, which was part of a general downsizing that ended a year or so later as Braun went from over 40 people in Bismarck, down to two.

Not wanting to leave North Dakota, and not finding much for other job opportunities here, I gave into pressure from clients that were calling me at home, and teamed up with some other folks, and started in business for myself. That’s now over 20 years ago, and we are still going.

Here at Western Plains we perform a wide variety of environmental services, from indoor air quality and asbestos surveys, to botanical and wildlife surveys, environmental assessments, subsurface and groundwater assessments, spill/release cleanups, order 1 soil surveys, wetland projects, and much more. Additionally, we have become quite busy in the oil patch in western North Dakota the last few years. I am a registered Professional Soil Classifier, a Certified Environmental Manager, and a Certified Mold Inspector, so I wear a lot of hats when you throw management of the company into the mix.

I bring a different background than most to the ND Chapter of the SWCS, and maybe a little different perspective as well. I am looking forward to the next couple of years being your President. I am always looking for feedback and guidance. If you have an idea or a request, please let myself or one of the other officers know. After all, we are here to represent the desires of the membership, and we most definitely want your input into this organization.

Thank you!
A terrific meeting in Fargo last November in conjunction with your ND-SWCS members and the Professional Soil Classifiers Association of ND exhibiting a true partnership. What I saw was leadership upon leadership at the meeting pulling off one of the better technical meetings ever. What’s nice about today’s technology others can join in and see the proof themselves with the below links. We all benefit from these meetings and the only question I raise is why there weren’t more folks? Meetings this well thought out and organized with many moving parts doesn’t happen on its own, or with only one or two, it takes lots of dedicated folks. I want to express my appreciation for the leadership in ND for pulling off some excellent training. Which brings up a question and a subject dear to me and something all human beings need to practice constantly and that is LEADERSHIP? The leadership topic has tons of information and definitions all over the web, but what does that mean? It means nothing if you’re not practicing it by what you read or a recent training on leadership, nor remind yourself of what it really means to YOU, in your situation. You should be able to recite your top 3 to top 5 leadership skills/traits that you believe work best for you. Personally I try and practice 3 elements, don’t be afraid to compliment, ask others of their opinion and don’t be afraid to make a mistake. You need to find out what is best for you definition of what leadership is. See the following on what other leaders are talking about during the meeting.

**Dr. Mark Liebig** from USDA-ARS did an outstanding job of moderating the session and wrapping up the program with some Q and A.

**Dr. Abbey Wick** – ND Soil Health Specialist with NDSU did a great job of opening the session. Highlights included a simulated video on how water travels thru the soil and actual video of a worm eating some soil particles, check out the video it’s well worth it. [http://www.youtube.com/watch?v=9i7GTNW08hQ](http://www.youtube.com/watch?v=9i7GTNW08hQ)

**Dr. Will Brinton** – Developed the Solvita soil health test. Details about how the Solvita test was developed and how to apply it today.  [http://www.youtube.com/watch?v=R11f3ZjpRG0](http://www.youtube.com/watch?v=R11f3ZjpRG0)

**Lee Briese** – Discussed how salinity and soil health connects with this troubling soil chemistry. [http://www.youtube.com/watch?v=lhsGzzrWuRM](http://www.youtube.com/watch?v=lhsGzzrWuRM)

**Brendon Rockey** – Presentation focused on the system of soil health treatments and how it fits with potatoes, hoping for some of the sugar beet/potato farmers in the area would embrace this system in the Red River Valley area in Fargo, ND. [http://www.youtube.com/watch?v=jo6jt7bs_3g](http://www.youtube.com/watch?v=jo6jt7bs_3g)

**Andy and Mitch Hoenhause**, no-till producers from Eastern ND talk on how no-till has helped their cropping system improve the health of the soil. [http://www.youtube.com/watch?v=GRQkv6m_F0](http://www.youtube.com/watch?v=GRQkv6m_F0)
GOT SOIL QUALITY!!

By: Cody J. Hatzenbuhler

What are some features of good soil? Any farmer will tell you that a good soil drains well and warms up quickly in the spring, does not crust after planting, soaks up heavy rains with little runoff, stores moisture for drought periods, has few clods and no hardpan, resists erosion and nutrient loss, supports high populations of soil organisms, does not require increasing fertilizer for high yields, has that rich, earthy smell, and produces healthy high quality crops. All these criteria indicate a soil that functions effectively today and will continue to produce long into the future. Creating soils with these characteristics can be accomplished by utilizing management practices that optimize the processes found in native soils.

So why are we introducing tillage equipment (iron) to the management practices in a No-Till system. One of the brochures says a ripper will “manage residue and compaction while improving soil tilth all in a single pass.”

So let’s get the definition off the sentence above:

**Soil Tilth**: Soil tilth refers to the soil’s general suitability to support plant growth, or more specifically to support root growth. Tilth is technically defined as the physical condition of soil as related to its ease of tillage, fitness of seedbed, and impedance to seedling emergence and root penetration. Soil that drains well, does not crust, takes in water rapidly, and does not make clods is said to have good tilth. Tilth is the physical condition of the soil as it relates to tillage ease, seedbed quality, easy seedling emergence, and deep root penetration. Good tilth is dependent on aggregation—the process whereby individual soil particles are joined into clusters or “aggregates.”

Aggregates form in soils when individual soil particles are oriented and brought together through wetting and drying, freezing and thawing, and by plant growth and earthworm activity. The weak electrical forces from calcium and magnesium hold the soil particles together when the soil dries. When the aggregates become wet again, however, their stability is challenged and they may break apart once again. In the case of earthworm-created aggregates, they are stable once they come out of the worm. An aggregate formed by physical forces becomes stabilized (will remain intact when wet) through microbial processes involving organic matter decomposition and its by-products—chiefly gums, waxes, and other glue-like substances. These by-products cement the soil particles together forming water-stable aggregates. The aggregate is then strong enough to hold together when wet—hence the name “water-stable.”

Soil that drains well, does not crust, takes in water rapidly, and does not make clods is said to have good tilth. Tilth is the physical condition of the soil as it relates to tillage ease, seedbed quality, easy seedling emergence, and deep root penetration. Good tilth is dependent on aggregation—the process whereby individual soil particles are joined into clusters or “aggregates.” Aggregates form in soils when individual soil particles are oriented and brought together through wetting and drying, freezing and thawing, and by plant growth and earthworm activity. The weak electrical forces from calcium and magnesium hold the soil particles together when the soil dries. When the aggregates become wet again, however, their stability is challenged and they may break apart once again. In the case of earthworm-created aggregates, they are stable once they come out of the worm. An aggregate formed by physical forces becomes stabilized (will remain intact when wet) through microbial processes involving organic matter decomposition and its by-products—chiefly gums, waxes, and other glue-like substances. These by-products cement the soil particles together forming water-stable aggregates. The aggregate is then strong enough to hold together when wet—hence the name “water-stable.”

**Soil Compaction**: Reduces total pore space of a soil. More importantly it significantly reduces the amount of large pore space, restricting air and water movement into and through the soil. Low soil oxygen levels caused by soil compaction are the primary factor limiting plant growth in landscape soils. Soil conditions, primarily soil compaction, contribute to 80% of the plant disorders in the landscape setting. Figure 1 illustrates comparison in large pore space in a non-compacted and compacted soil. Soil compaction can change a block or aggregate structure (with good infiltration and drainage) into a massive structure (with poor infiltration and drainage)

**Manage Residue**: Farming with higher residue levels means less time spent on the tractor, but more time spent on management tasks. Here are some general tips for getting started successfully. Crop rotation and diversity, prepare and test the soil, manage fertilizer and manure, prepare for weed control, insect and disease control. Crop residues slow runoff and allow water to soak into the soil and recharge groundwater. Reducing field runoff also keeps sediment and the chemicals attached to soil particles out of streams and lakes. Crop residues can provide critical shelter and food for wildlife such as game birds and small animals. Finally, crop residues contribute to cleaner air by reducing wind-blown soil and dust. Fewer trips across the field also reduce fossil fuel emissions.

Because farming with crop residues is different than farming in clean-tilled ground, the key is to develop a residue management system that fits into your total operation. That’s where neighbors experienced with reduced tillage, crop consultants and staff at your local NRCS office, USDA Service Center, or county Extension office can help with more specific information and assistance. Talk with them when you start to develop a residue management plan for your farm.
Upcoming Meeting in the Area (SWCS-ND)

**ND SWCS Annual Meeting**
*(The link between soil & plant/animal/human health)*
Best Western Plus Seven Seas Hotel
Mandan, North Dakota 58554
November 4&5, 2014

**Oil Field Trip on Economics & Impacts on the Environment**
Medora, North Dakota
Date will be announced soon

Website to check out on Soil Health!!

Biotic systems nurture all living things

In their never-ending quest for higher yields, farmers years ago left behind successful soil-supporting practices and adopted inorganic fertilizers, bare ground fallow and monocultures. They were sold on the idea that complex chemistry would solve the problems created by other misguided farming practices.

Quality is a word that is tossed about on a regular basis in our society. Quality is typically defined as “a standard of excellence” and used to compare one thing to another. We can compare the quality of many different aspects of the soil itself, but rarely do we examine the quality of organic matter; the heart of the soil. Standard soil test reports will typically include an analysis of the quantity of organic matter in the soil. While this is an important value to measure and track, the quantity of organic matter in the soil does not tell the whole story of soil health. The majority of agricultural soils in the U.S. with reasonable amounts of organic matter are largely dysfunctional in their capacity to infiltrate water and cycle nitrogen. Witness the floods, soil erosion and nutrient loads of our waterways and their almost total dependence on nitrogen fertilizers to produce acceptable crop yields.

A closer look at soil organic matter reveals its various fractions. Of the carbon returned to the soil as plant residue, about 70 percent is respired by soil organisms as carbon dioxide back to the atmosphere. Of the remaining carbon, 6 percent cycles in the bodies of soil organisms and the remaining 24 percent is made into polysaccharides and acids that may eventually become humus in an undisturbed soil (Brady & Weil, 2002). Once humus is created, it makes up the majority of soil organic matter and is relatively stable. Nearly all of this process is biological; carried out by the organisms of the soil food web.

It is the realm between living organisms and soil humus that defines the quality of the organic part of the soil of most interest to farmers and ranchers. It is all of the sticky sugar and protein “glues” that soil organisms exude and excrete that bind the soil into stable aggregates and provide nutrients to growing plants. Stable soil aggregates allow air and water to infiltrate and permeate the soil. Thus, it is the by products of soil organisms that are responsible for feeding and watering our crops.

Though these biological byproducts are counted as part of total soil organic matter, they are difficult to assess themselves. Rather than attempting to measure all of the biological glues in the soil, we can measure their effects on soil function. A simple soil aggregate stability test can be performed by dropping a dry soil aggregate into water and watching how well it remains intact. If the aggregate retains at least half of its integrity after five minutes in water with an occasional gentle agitation, the soil has good quality glue holding it together. If a soil aggregate disintegrates in less than a minute without any agitation, the biological glues are sorely lacking and the soil will show symptoms of dysfunction. An additional measure of both soil aggregate stability and soil porosity is the water infiltration test. This test is easily performed by driving a solid ring (a section of pipe or a can with top and bottom removed) into the soil and pouring a measure of water into it and watching the rate of infiltration. A soil with good biological glue holding the soil aggregates together should allow water to infiltrate at a rate of six inches per hour or more.

Monitoring changes in total soil organic matter is an excellent measure to track when evaluating improvements in soil health of a given management system. However, producers that have a reasonably good organic matter content (>2%) in their soil should not take that amount for granted and assume that their soil is healthy. It is the sticky biological fraction of that organic matter that is responsible for the majority of functions producers expect their soil to perform. Managing the soil as good biological habitat is the key to keeping soil healthy and possessing enough quality soil organic matter to maintain important soil functions.
Stewardship is a term that has been used by folks in agriculture to describe how they care for the land. Stewardship has been defined as “an ethic that embodies the responsible planning and management of resources” or “the activity or job of protecting and being responsible for something”. Many folks will tell you they are good stewards of the land because they are good farmers (a person who owns or manages a farm), often judged by the amount of crop yield he/she can produce from a given acreage. Most folks equate being a good farmer with being a good steward of the land. By observing the current state of most of our agricultural soils and the water that runs off of them, it appears we have many more good farmers than good stewards of the land.

When compared to their native condition, all agricultural soils in the United States have been degraded, many to the point of minimal capacity to function. Today, erosion of soil by both wind and water continues, as does the existence of a zone of hypoxia caused by nutrient runoff, near the discharge of the Mississippi River in the Gulf of Mexico. Yield trends for corn, soybeans and wheat are all positive while environmental degradation of soil and water continue.

How is it that bountiful production occurred in native ecosystems (such as the prairies of the Great Plains) while simultaneously building fully functional soil, yet bountiful production of corn, soybeans and wheat on those same soils today results in soil degradation in spite of significant inputs and ever improving technology? Clearly we lack an understanding of how soil is supposed to function and how those functions can be restored and maintained.

Most farmers and conservationists know little about how the soil functions and how to improve and maintain a functioning soil. This is the equivalent of medical practitioners knowing very little about how the human body functions and how to improve and maintain those functions. Would you seek advice from a medical practitioner whose only knowledge of the human body was that it consisted of 65% oxygen, 10% hydrogen, 18% carbon, 3% nitrogen and lesser amounts of calcium, phosphorus, potassium, sodium, etc., with no knowledge of how its many systems were supposed end to function? Such a situation would amount to medical quackery (an untrained person who pretends to be a physician and dispenses medical advice and treatment). If we have not educated ourselves on soil health (the capacity of the soil to function) are we indeed conservation quacks? Are we dispensing advice and treatment without a working knowledge of how soil functions? Is the treatment we are dispensing merely bandages and aspirin with no knowledge of a cure? If the honest answer to any or all of these questions is “yes”, then we will not be successful in creating a lasting positive change of our soils or watersheds.

But don’t despair, the cure for conservation quackery is simple, we must learn about soil health and how the soil functions, then share that knowledge with fellow conservationists and land managers. Once the capacity of the soil to function is restored (which is neither difficult nor expensive) the symptoms of water runoff, erosion, plant nutrient deficits, etc. will no longer present themselves. Understanding soil health can economically and effectively make land managers both good farmers and good stewards of the land. This understanding can only take place if we as conservationists educate ourselves on how the soil functions and share that understanding with those that make management decisions on the land.
Soil Health and Artificial Drainage

By: Jon Stika (NRCS)

First let me say that I am neither in favor of nor opposed to artificial soil water drainage, aka “tile drainage”. Tile drainage is a tool. As with any tool, its only value comes in what you do with it. Rather than get into the quagmire of wetland preservation, flooding, water pollution, wildlife habitat etc. that might be associated with tile drainage, I would like to examine more practical principles of how soil health (the capacity of the soil to function) determines the effectiveness of an investment in tile drainage.

The producers I have visited with regarding tile drainage have told me their primary objective for installing tile drains is to remove excess water from their fields that prevent them from timely planting in the spring or to prevent saturation of the soil near the surface later in the growing season. The majority of the water that is in excess comes from snowmelt and/or rain. This water is added to the soil from above the soil surface. In order for this excess water to exit the field through a tile drain it must infiltrate and permeate the soil. In many cases, water does not enter or move through the soil in a timely fashion, resulting in little desired benefit from the investment in tile drainage. Tile drainage will not remove excess water from the soil surface if the soil is not performing the functions of water infiltration and permeability. In other words, without healthy, functioning soil, the return on investment of tile drainage will be minimal.

While many soils that are tile drained may have a high percentage of organic matter near the soil surface, they still may be essentially dysfunctional in regard to infiltrating and permeating water. While often used as one indicator of soil health, soil organic matter content does not always equal soil health. For soil to perform all of the functions we expect to produce crops we must examine the quality of soil organic matter, not just the quantity.

Quality soil organic matter is composed of a balanced community of living soil organisms and their many exudates, secretions and excretions. It is these organisms and their sticky byproducts that fix sand, silt and clay into stable soil aggregates that allow water to move into the soil; an essential step in getting excess water on its way to tile drains. Without providing quality habitat for these sticky little organisms, the soil collapses when wet and the water remains on the soil surface whether there are tile drains below or not. In order for tile drains to perform their function, the soil must first perform its function of infiltrating water.

Once the water has infiltrated into the soil surface, it must permeate downward into the soil on its journey to the tile drains. In order for the water to permeate downward, the soil needs continuous pores from plant roots and/or earthworms. These pores will not function if they have been sheared off or collapsed by tillage of the soil above the depth of the tile.

In order to restore soil function and create favorable habitat for the organisms that promote soil function, producers would need to disturb the soil less, increase the diversity of plants (crops) they grow in rotation and/or as cover crops, keep the soil covered with plants and/or plant residues at all times and keep living roots in the soil as much of the time as possible. This approach will allow water to both infiltrate and permeate the soil; with the excess water exiting through drain tiles as intended. Without healthy, fully functioning soil, drainage tile (and any drainage water management conservation practices associated with it) will not perform as desired.
2013—SWCS Chapter Awards

- **Professional Award** - Tim Becker
- **Business Stewardship Award** - Chesak Seed House
- **Service Award** - CCSP Farm
- **Horizon Award** - Amanda Brandt

A Book to Read

40 chances-Finding hope in a *hunger world*

*In life you only have about 40 productive years to make an impact on the world.*

Each of us has about 40 chances to accomplish our goals in life. This is a lesson Howard learned through his passion for farming. All farmers can expect to have about 40 growing seasons, giving them just 40 chances to improve on every harvest. This applies to all of us, however, because we all have about 40 productive years to do the best job we can, whatever our passions or goals may be.
SOIL HEALTH TOOL with Solvita®

The USDA-ARS SOIL HEALTH TOOL is an integrated means to characterize soils biologically and chemically. A component of this Tool is the Solvita CO2-Burst test which measures microbiological functioning. The results of the CO2-Burst test may be read by itself as a biological indicator and combined with other Soil Health Tool tests to provide an overall interpretation of soil nutrient potentials as influenced by biology.

EXAMPLE: shown below are eight soils of differing management (7 are Piedmont, NC, one is a Virginia Prairie, NE*). Note the differences between tilled and no-tilled, top-soil and sub-soil samples. The heavily farmed and tilled vegetable soil exhibited the lowest respiration rates with SLAN depletion while the Nebraska Virginia Prairie showed the highest overall respiration, 2nd highest SLAN and Highest Soil Health Score.

1. Bare, Tilled Tobacco
   Solvita: 27.7
   WEOC: 189
   WEON: 19
   SLAN: 93
   C:N 14.3
   SHT: 5.2

2. No-Till Subsoil
   Solvita: 41.5
   WEOC: 189
   WEON: 14
   SLAN: 110
   C:N 13.5
   SHT: 6.4

3. No-till Topsoil
   Solvita: 57.2
   WEOC: 373
   WEON: 27
   SLAN: 278
   C:N 13.9
   SHT: 10.5

4. Truck-farm
   Solvita: 12.2
   WEOC: 91
   WEON: 7
   SLAN: 79
   C:N 12.0
   SHT: 2.8

5. No-Till Corn
   Solvita: 47.8
   WEOC: 154
   WEON: 18
   SLAN: 145
   C:N 9.6
   SHT: 8.1

6. Multi-Species Cover Crop
   Solvita: 74.6
   WEOC: 183
   WEON: 14
   SLAN: 155
   C:N 13.4
   SHT: 8.8

7. Rye Cover Crop
   Solvita: 45.5
   WEOC: 152
   WEON: 15
   SLAN: 143
   C:N 10.3
   SHT: 7.4

8. Virgin Prairie NE
   Solvita: 78.4
   WEOC: 422
   WEON: 28
   SLAN: 218
   C:N 15.9
   SHT: 11.8


Virgin Prairie soils from Mike Kucera, NRCS, Nuckolls County, Nebraska.
SLAN – a new test for Labile Amino-Humic N

The increased use of cover crops in farming systems augments soil health and adds to soil a potentially large organic pool of nutrients. This pool is not being measured in soil labs. Solvita has developed a simple new test that appears to measure a pool of organic N present in soil that may be fairly available and relates clearly to soil management. The following set of images from the NC and NE soils shows the NH3-probe’s results of testing these soils. SLAN is not at this time a part of the SHT protocol, but studies are underway to evaluate its additional usefulness. It has not been fully evaluated just how much of SLAN is available to plants in a season, but presently it is believed that results of < 100 ppm indicate a highly depleted soil.

Notes: SLAN is similar in principle to the earlier “ISNT” protocol but eliminates HCl hydrolysis steps, heat extraction and boric trapping. It therefore measures a lighter and potentially more labile (available) fraction of organic amino-groups. It is vastly simpler and quicker to perform than other types of amino-N or amino-sugar tests, and can be read comparatively as a visual test and also quantitatively to milligram level with the Solvita digital reader (DCR) using the nitrogen channel. Due to the extraction reagent and weighing involved, it is intended as a lab test only performed by soil technicians.

Visit: www.solvita.com/soil for more information.
The official nickname for North Dakota is *The Peace Garden State*. The nickname became so popular that it was formally adopted by North Dakota legislature in 1957.

**The Flickertail State:** Another nickname proposed for North Dakota (in 1953) was *The Flickertail State*, referring to the abundant Richardson ground squirrels in the state (known for a characteristic flick or jerk of their tails while running or just before entering their burrows). "Flickertail March" is the official state march of North Dakota.

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**ARTICLES NEEDED!**
Submit to 
hatzco2@gmail.com

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**MEMBERSHIP DRIVE!!**

As Council Representative, I am challenging all of our members to recruit at least one new member. Speak with your colleagues, friends and family about joining the SWCS and the benefits that members enjoy. Remember that the SWCS is an organization that advocates for the conservation of our natural resources on many levels, and the strength of this advocacy is a direct reflection of our member base. SWCS members also enjoy many opportunities to network, and just have fun at our functions throughout the year. Federal employees also have the option to deduct membership dues from their paychecks, which amounts to only a few dollars every pay period. Please take the time to join us in this very important effort to improve our membership trend. Being a member is easy to register online at [http://www.swcs.org/en/join_swcs/](http://www.swcs.org/en/join_swcs/)

Sincerely;

Cody J Hatzenbuhler  North Dakota Council Representative
2014 National Conference on Cover Crops & Soil Health Broadcast Summit

Contact the location you plan to attend to register, which will allow the site to provide adequate accommodations. The following are the contacts for each North Dakota site:

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WHEN: Tuesday, February 18, 2014

8:30 a.m. Coffee
8:45 a.m. Welcome
9:00 a.m. Live Video Feed from Omaha, Nebraska

Tom Vilsack, Secretary of Agriculture
Howard Buffett, Howard G. Buffett Foundation
Jay Gaesser, Iowa Farmer, President, American Soybean Assn.

Famer panel: experiences with cover crops and their impact, and soil health changes

10:45 a.m. BREAK
11:00 a.m. Group discussion on how a focus on improving soil health and integrating cover crops in cropping systems can be advanced in Central and Western North Dakota

12:00 p.m. Summary—Final Remarks

No cost
Public invited

For more information about the conference, visit
www.SARE.org/covercropconference

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