

### **National Wind Erosion Research Network**

David Toledo, USDA-ARS Research Rangeland Management Specialist

The National Wind **Erosion Research** Network (Fig. 1) was established in 2014 as a collaborative effort led by the USDA-ARS, NRCS, and the BLM to improve wind erosion research and management in the United States.

The Network currently consists of thirteen intensively instrumented sites providing measurements of wind sediment transport rates, meteorological

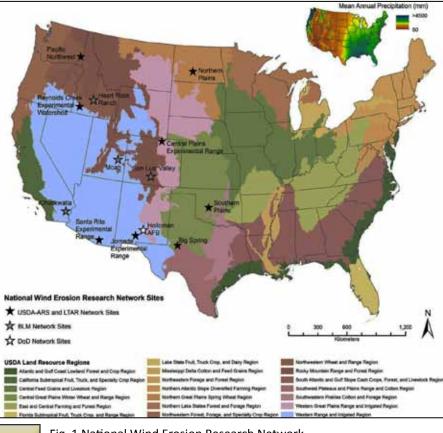


Fig. 1 National Wind Erosion Research Network

In this issue: National Wind Erosion Research Network Message from Matt Forage and Grasslands as Pollinator Habitat in North Dakota Friends & Neighbors Day Effects of Dietary Tannins on Total and Extractable Nutrients from Experimental Site Network with Linkage to NGPRL has Global Reach Toledo Receives Outstanding Young Range Professional Award **New Faces** 

conditions, and soil and vegetation properties that influence wind erosion.

The Mandan National Wind Erosion Research Network site is managed by the USDA Northern Great Plains Research

western US. The Mandan Network site is located within a lease of 380 acres leased by the Area 4 Soil Conservation District (SCD). All crop production is under no-till management, and a broad portfolio of crop diversity treatments are investigated varying in scale (.024 to 27 acres) and duration (6 to 27 years).

The Network has three aims: (1) provide data to support understanding of basic wind impact across land use types, land cover types, and management

located across rangelands, croplands, and deserts of the

Laboratory

(NGPRL) and

is part of the

Agro-ecosystem

Research (LTAR)

network. The

site is located

on the Missouri

Plateau within

the Temperate

approximately

**Steppe Ecoregion** of North Dakota,

3.7 miles south of

Mandan. The site

is at an elevation

sea level.

of 1946 feet above

Network sites are

Long Term

continued on page 3



## **Message from Matt**

Welcome to the 2016 summer issue of the Integrator. This time of year finds the NGPRL staff busy with field research and preparing for our annual Friends and Neighbors day on July 28. We also have our Customer Focus Group meeting the morning of July 28.

The Focus Group meeting gives us a chance to inform our stakeholders and customers of our research progress and plans and provide the opportunity to them about their research needs. Keeping in touch with farmers, ranchers, and the community is critical to our mission and success.

In this issue you will find updates and results from

National Wind Erosion Research Network, the Managing Agricultural Greenhouse Gas Network, phenolic compounds impact on natural fertilizer, and information on new projects on pollinators.

We hope you can join us on July 28 to learn more about these items in person.

Dr. Matt Sanderson Research Leader

## Forage and Grasslands as Pollinator Habitat in North Dakota

Matt Sanderson, USDA-ARS Research Leader

The northern Great Plains has significant perennial grassland, which in addition to supporting livestock, provides critical habitat to both native and domestic pollinators.

According to large scale analyses, crop diversity in the northern Great Plains has increased during the past 35 years. The increase in crop diversity, however, has been accompanied by a significant change in land use from perennial crops to annual crops. Thus, it is important to understand immediate land use around bee yards (apiaries) to accurately gauge potential pollinator resources.

In 2014 and 2015 the land use around 320 bee yards in North Dakota was documented in roadside surveys and site visits.

The number of crops or land uses surrounding the bee yards ranged from 1 to 5 with hay crops the most common followed by wheat and pasture.

The reconnaissance of bee yards in 2014 and 2015 demonstrated that forage and grazingland in North Dakota provides an essential ecosystem service in providing landscapes that support diverse floral resources for both native pollinators and commercial apiaries.

Understanding the links among agroecosystem diversity, management intensity, land use, and pollinators will enable better decisions to be made on where pollinator habitat is best enhanced on the landscape and inform government programs designed to assist farmers with developing better habitat.



### National Wind Erosion Research Network continued

practices, (2) support development and application of models to assess wind erosion and dust emission and their impacts on human and environmental systems, and (3) encourage collaboration among the wind erosion research community and resource managers for the transfer of wind erosion technologies.

Examples of the diverse research questions currently being addressed through the National Wind Erosion Research Network include: 1. What is the spatial variability in aeolian sediment transport and what are appropriate sampling resolutions for measuring and monitoring wind erosion across land use and land cover types? 2. How can remote sensing technologies (airborne and space-borne) be applied in new ways to measure land surface aerodynamic properties for integration into monitoring programs and models?

3. How can the effects of land management on wind sediment transport be captured in physically-based and generalizable numerical models that have application across land cover types?

4. How can the accessibility of wind erosion/dust emission models to resource managers be improved to inform decision making, planning and policy?



National Wind Erosion Research Network site on the Area 4 SCD Cooperative Research Farm in Mandan.

It is anticipated that the National Wind Erosion Research Network will raise public and policy awareness regarding the significance of wind erosion processes for Earth systems and society.

By using an intensive and standardized sampling design, and receiving ongoing input from collaborating partners as to projected management

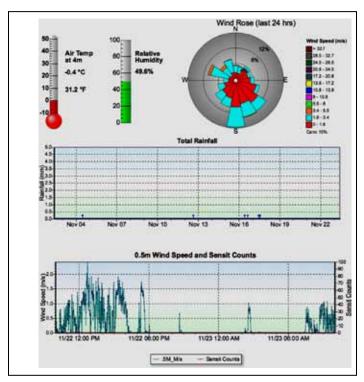


Fig. 2. Example data visualization tools provided online for each National Wind Erosion Research Network site. Meteorological data are updated hourly by direct transmission from the Network sites to a serve. The graphs are interactive, allowing users to explore in detail the latest observations, while raw data from all meteorological sensors are publicly available through the Network Data Portal (http://winderosionnetwork.org/dataportal/access-data).

and research needs, the Network will produce novel outcomes for basic and applied wind erosion research across land use systems and across scales.

This impact is particularly relevant today during a time of global environmental uncertainty arising from intensifying land use pressures, land degradation, and increasing climatic variability and climate change.

### In support of Network activities,

http://winderosionnetwork.org was developed as a portal for information about the Network, providing site descriptions, measurement protocols, and data visualization tools to enable teamwork with scientists and managers interested in the Network and accessing Network products.

Webb, Nicholas P., et al. "The National Wind Erosion Research Network: Building a standardized long-term data resource for aeolian research, modeling and land management." Aeolian Research 22 (2016): 23-36. http://www.sciencedirect.com/ science/article/pii/S1875963716300568

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Enjoy the park-like campus

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exhibits, demonstrations,

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tours, children's activities,

& all afternoon barbecue



# Friends & Neighbors Day



South of the Heart River on Highway 6

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Mandan

July 28, 2016 2:00 - 5:30 PM CDT

Learn about:

- How Ag research is done
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- Integrated crop-livestock
- Cover Crops
- · New USDA Climate Hub
- Honeybees 101
- Digital imaging monitoring crop growth
- Organic foods
- What USDA agencies do for you: NRCS, FSA, RD, FS, APHIS
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## **Effects of Dietary Tannins on Total and Extractable Nutrients from Manure**

Jonathan Halvorson, USDA-ARS Reseach Soil Scientist and Scott Kronberg, USDA-ARS Research Animal Scientist

If you drink wine or wear leather shoes, you've probably heard of tannins, but you may not know what they are or why they matter to ARS scientists.

Tannins are naturally occurring phenolic compounds, produced by plants, that are widely distributed in the plant kingdom including crops and forages.

Tannins may act as a defense mechanism in plants against pathogens, herbivores, and hostile environmental conditions. The antimicrobial activities of tannins are well documented. The growth of many fungi, yeasts, bacteria, and viruses are inhibited by tannins.

Moderate amounts of tannins in forage legumes have been shown to have

beneficial responses in ruminants, resulting in higher growth rates and milk yield. In sheep and cattle, higher retention of nitrogen has been found in sheep and cattle with low to moderate levels of tannins in forages.

While plant tannins are known to influence ruminant nutrition less is known about their influence on manure quality. The objective of this research was to examine the effects of dietary tannins on the composition and the total outputs of nutrients in manure.

We conducted a feeding trial with sheep to determine if intake of Sericea lespedeza (Lespedeza cuneate, a condensed tannin source), at 0, 10, 20, or 40% of the ration, would affect concentrations of total carbon, nitrogen, phosphorus, boron, and other nutrients in manure, and patterns of total excretion when fed with alfalfa.

When sericea was added to the animal's rations, average daily manure production increased from 0.4 to 0.5 of the ration dry weight. The concentrations of total carbon, nitrogen, and boron in manure, daily manure outputs, and manure/feed ratios for each element also increased.

Concentrations of water-extractable nitrogen decreased with added sericea, and thus accounted for a smaller proportion of the total nitrogen in manure, but with greater manure outputs, no significant variations of daily outputs occurred.

Variations in concentrations of extractable boron in manure were small, and daily outputs increased together with manure mass, but the proportion of soluble boron in manure decreased.

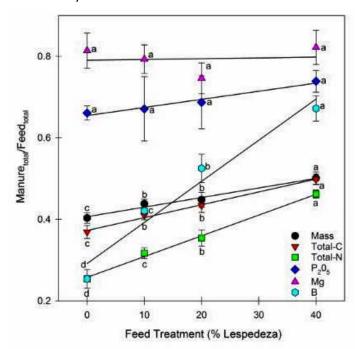


Lespedeza cuneate

Manure concentrations, daily outputs, and manure/feed ratios for total phosphorus ( $P_2O_5$ ) were not significantly affected by different rations, although highest outputs and ratios coincided with 40% sericea additions. Conversely, concentrations, daily outputs, and proportions of water-extractable phosphorus were all significantly increased by sericea.

This study provides useful baseline information about the nutrient content of sheep manure and indicates that dietary tannins can significantly alter the concentrations, total excretion rates and throughput efficiency of other important macro and micro nutrients, and the concentration and proportion of soluble nutrients in manure proportion.

Grazing ruminants on different cover crops, or crop residues can result in significant differences in organic matter and nutrients in the soil. The effects of tannins on the soluble fractions of nutrients in manure are important because they can rapidly affect the supply of plant available nutrients or alternatively, be leached from the soil and lost or become a source of pollutants. Evidence for increasing fiber-bound nitrogen suggests it will mineralize more slowly.



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## **Experimental Site Network with Linkage to NGPRL has Global Reach**

Mark Liebig, USDA-ARS Research Soil Scientist

Since 2012 NGPRL has played a central role coordinating an international network to identify management practices that keep carbon and nitrogen in the soil and out of the atmosphere. The network, referred to as MAGGnet (Managing Agricultural Greenhouse Gas Network) seeks to provide a platform for the inventory and analysis of agricultural greenhouse gas mitigation research throughout the world.

MAGGnet was initiated as a multi-national research effort facilitated by the Global Research Alliance on Agricultural Greenhouse Gases (http://globalresearchalliance.org). The network currently includes experimental site information for 315 studies across 20 countries, many of which have similar site conditions and management practices as NGPRL.

Despite its recent emergence as a research network, MAGGnet has served to leverage limited resource investments within individual countries to produce an inclusive, shared meta-database for international use. MAGGnet has contributed to modeling efforts and has spurred other research groups in the Global Research Alliance to compile experimental site metadata for experiments focused on rice production.

Details about MAGGnet may be found in a recent article published by *Carbon Management*.

Adapted from Liebig, M.A., etal. 2016. *MAGGnet: An international network to foster mitigation of agricultural greenhouse gases*. Carbon Management. Available at: http://dx.doi.org/10.1080/17583004.2016.1180586

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Fig. 1 Experimental sites included in MAGGnet.

Feel free to pass on this issue of Northern Great Plains Integrator to others interested in agricultural research in the northern Great Plains. Northern Great Plains Integrator is published and distributed by the USDA-ARS, Northern Great Plains Research Laboratory, PO Box 459, Mandan, ND 58554. Use of material in this publication may only be allowed with the consent of the author. The United States Department of Agriculture prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital and family status. Mention of trade or manufacturer names is provided for information only and does not constitute endorsement by USDA-ARS. To be added to our mailing list, request a copy through our website or contact editor: Cal Thorson, Technical Information Specialist, USDA-ARS Northern Great Plains Research Laboratory, PO Box 459, Mandan, ND 58554. Office:701 667-3018 FAX:701 667-3077 Email: cal.thorson@ars.usda.gov

### **Toledo Receives Outstanding Young Range Professional Award**

Dr. David Toledo has been awarded the Outstanding Young Range Professional Award at the Society for Range Management's 69th Annual International Meeting in Corpus Christi, Texas. The Outstanding Young Range Professional Award recognizes SRM members who exhibit superior performance and leadership potential in any range-related area.

Dr. Toledo completed his Ph. D. and was a trainee of the NSF-IGERT Applied Biodiversity Science Program at Texas A&M University. He has 14 years of research experience, including 7 years as a technician with the USDA-ARS Jornada Experimental Range, 5 years doctoral research, and 3 years as a post-doctoral researcher with the USDA-ARS Northern Great

Plains Research Laboratory, where he is now a full time Research Rangeland Management Specialist.

David has contributed to ecosystem health projects in the USA, Mexico, Peru, Chile, and Colombia.

Currently his research focuses on finding ways to optimize land management

practices under changing climate and land-use scenarios.

He has been involved in the development and application of indicators for monitoring soil and vegetation attributes and evaluating the social dimensions of using extreme fire as a rangeland restoration tool.

David's work has resulted in breakthroughs in improved efficiency and data quality in sampling techniques used in National Resources Inventories; integration of grazingland monitoring and assessment methods; and determination of factors affecting the use of prescribed fire.

His accomplishments have led to several awards including the Judges Choice Award for the NSF-IGERT poster and video competition; the Texas Section of The Society for Ecological Restoration Award for best graduate student research presentation; and the Texas A&M Distinguished Award for Excellence in Research.

David is president of the North Dakota Chapter of the Northern Great Plains Section of the SRM.



2016 Outstanding Young Range Professional Dr. David Toledo with SRM President Pat Shaver

#### **New Faces**



Sher Afzal is a Visiting Researcher from Pakistan. He came to NGPRL in June. He is a Ph.D. Scholar in the Department of Agronomy, University of Agriculture, Faisalabad, Pakistan. His Ph.D. research was about assessment of agronomic benefits of mixed cropping system (30 cropping experiments) and soil health. His M.Sc. (Honors) research was on the evaluation of the role of seed priming with zinc. He likes to play cricket and table tennis.

Sher Afzal



Travis Gregurek has joined our USDA-ARS team in Mandan as our IT Administrator. Shortly after retiring from the Air Force as an Aircraft Armament Systems Specialist in 2005, he began pursuing a career managing information systems and helping others. His education includes a BS and MISM from Minot State University. This summer in his off-time, besides watching a movie or two at The Grand, he's been busy camping and spending time with friends and family.

Travis Gregurek