## ANNUAL REPORT (2016 to 2017)

Multistate Project NC1181: Enhancing Resiliency of Beef Production Under Shifting Forage Resources

Period the Report Covers: October, 1 2016 to September 30, 2017 Date of Annual Meeting: August 15-16, 2017, Clay Center, NE

### Objectives

*List objective(s) worked on. The objectives listed in the project are:* 

- 1. Optimize the utilization of crop residues by grazing and harvesting and determine the effects on agroecosystems.
- 2. Evaluate strategies to increase efficient use and productivity of range and pasturelands through strategic timing and density of stocking and shifting species composition to more productive species.
- 3. Evaluate effects of integrating annual forage crops into year-round forage systems for beef production.
- 4. Develop innovative beef systems that match shifting forage resources.
- 5. Conduct multi-faceted education/extension program to disseminate research results, to include extension papers as well as regional conferences on the use of crop residues, annual forages, and range and pastureland by livestock.

### Accomplishments

- *Multi-state collaborations:*
- Objective 2
  - Five site locations have completed two years of replicated research in Kansas and Nebraska where summer annuals were interseeded into perennial cool season forages. All site locations followed the same protocol for treatments and data reporting. Individual locations have presented data in local publications; however, there is discussion to generate a multi-state, multi-location peer-review article.
  - Interseeding summer annuals in cool season perennials data and abstract were presented at National Agronomy meeting.
- Objective 3
  - Drs. Farney and Drewnoski have completed a survey about nitrate issues in cattle operations, with plans to submit a regional SARE grant about nitrates in cover crops (annual forages). Submissions close October 1, 2017.
- Objective 5
  - Planning began in August between Drs. Jenkins, Drewnoski, and Farney to host a 3-part meeting series at the borders of Kansas-Nebraska in 2017 with the overreaching theme "Cattle management in limited perennial pastures". Meetings are scheduled for December 12 in Marysville, KS; December 13 in Blue Hill, NE; and December 14 in Oberlin, KS.

### Short-term outcomes:

- Objective 1
  - Grazing pairs on cornstalks while supplemented DDGS resulted in less ADG for calves and decreased BW for cows compared to pairs limit fed in total confinement. Body condition score was in excess of maintenance for the confined cows. The pairs on the cornstalk residue were more profitable than the confined cows.
  - Displacing distillers grains with corn does not maintain performance of steers grazing corn residue.
  - Providing supplemental urea or bambramycin does not improve the performance of steers grazing corn residue.
- Objective 2
  - After 6 years of treatment application on Sandhills meadow, there is no difference in botanical composition and aboveground plant production among grazing systems (mob grazing, simple rotation grazing, and continuous grazing); and trampling of standing live vegetation is the greatest and harvest efficiency and yearling weight gain are the lowest for mob grazing.
  - Shorter grazing periods improve grazing distribution and reduce utilization at preferred topographical positions. Shorter grazing periods appear to support higher stocking rates without negative impacts to pasture production and species composition.
  - Modified intensive early stocking with cow/calf pairs on native rangeland appears to be viable option for producers and may allow producers to maintain or increase cow numbers on fewer perennial grassland acres. Cow performance appears, after two years of data, to be improved in an intensive early stocking system, where calf removal occurs at mid-season of grazing.
  - In the first year after establishment, legumes in tall fescue pasture for stocker steers did not impact their finishing performance or carcass characteristics
  - Stocker gain and gain per acre is reduced on high-endophyte fescue pastures versus reduced or modified endophyte fescue pastures. This continued through finishing where steers on high endophyte fescue had lower final wight, carcass weight, while having a lower backfat and numberical yield grade.
  - In the first year of establishment, regardless of whether legumes were interseeded in bermudagrass or not, and grazed by gestating beef cows, cow gains and forage availability were similar.
  - Summer annual interseeded into fescue may fill a "gap" in forage production for cattle operations. Corn and fields with fescue only had the lowest yield of forage, and a 1-cut system produced 33% more in fall than those that were cut twice.
  - The summer annuals, sudangrass and sorghum-sudgangrass intreseeded into Western wheat grass yielded the most while a one-cut system of harvesting also yielded the most grass. In Western Kansas rainfall during the summer plays a significant role in summer annual emergence and persistence. During 2015 all the warm-season plants desiccated under continued dry conditions prior to harvest thus mitigating any additional tonnage effects, however, in 2016 there was some warm-season annuals that were harvestable.

- Objective 3
  - Scanning images of blood and analyzing for red, green, and blue values shows potential as an inexpensive, chute-side test for methemoglobin as a diagnosis for nitrate toxicity. Nitrates are high in cover crops and have potential for toxicity issues in ruminant species.
- Objective 4
  - Field peas were evaluated relative to distillers grains as a protein supplement for grazing cattle. Two levels (0.4 and 0.8% BW) of field peas or dried distillers grains were fed to assist in the establishment of price structure for cull peas when they are unacceptable for human consumption or the pet food market is saturated. Preliminary results indicate supplementing field peas does not result in as much daily gain as feeding distillers grains.
  - Horn fly control and growth implants are effective strategies for heifers grazing Flint Hills pasture.
- Objective 5
  - Producer publications have been written, approximately two consultations with producers per week regarding feeding and managing confinement cows have been conducted, 6 conference or extension meeting presentations have been conducted.

## Outputs:

- 7 peer-reviewed journal articles
- 16 scientific abstracts
- 29 research reports or proceedings
- 32 popular press article
- 16 audio recordings
- 4 theses

## Activities

- Objective 1
  - Master's student reported on year 1 data at the Nebraska and National Society for range management meetings and at the UNL Barta Brothers Ranch Field Day.
  - Two studies evaluating the effects of ammoniation of corn residue on feeding value were conducted
  - Third year of on-farm research in Nebraska at 6 sites evaluating the impacts of grazing and baling of corn residue on crop yields and soil ecosystem services were completed.
  - An experiment evaluating supplementation of urea to calves grazing corn residue supplemented with distillers grains was conducted.
- Objective 2
  - The 2nd year of data was collected evaluating intensive early stocking of native mixed-grass rangelands with cow/calf pairs in Kansas at two sites.

- The second year of no-till interseeding of annual warm-season grasses into perennial cool-season grass pastures (smooth bromegrass, tall fescue, and Western wheatgrass) and annual cool-season grasses into warm-season grass pastures (native rangeland and bermudagrass) was conducted in Nebraska and Kansas.
- Experiments evaluating perennial legumes in tall fescue pastures and annual and perennial legumes in bermudagrass pastures was continued in Kansas.
- Interseeding warm-season annuals into cool-season perennials were continued for the second year at five locations in Kansas and Nebraska.
- Objective 3
  - An on-farm research experiment evaluating the profitability of grazing rye with growing calves within an integrated production system was initiated.
  - Completed a summer scholars event with undergraduate student to determine the feasibility of using blood and color via images to determine methemoglobin concentrations as a measure of nitrate toxicity.
  - Collected one year data from producer ranches and began research evaluating a cool-season annual forage within a wheat rotation. A Master's student was recruited.
  - The second year of data evaluating the use of oats planted after corn silage or high moisture corn for background calves and the subsequent impact on summer cash crop productivity was conducted.
  - An on-farm research experiment evaluating the profitability of grazing rye with growing calves within an integrated production system was conducted.
  - The second year of data evaluating the use of oats planted after corn silage or high moisture corn for background calves and the subsequent impact on summer cash crop productivity was conducted.
- Objective 4
  - Complete sugar beets will be evaluated for growing and finishing cattle as an energy source replacing some corn.
  - Field peas will be evaluated for relative value to more traditional supplementation
  - An experiment evaluating a traditional cow-calf production system to one utilizing confinement, crop residue, and annual forages was initiated.
- Objective 5
  - Producer publications will continue to be written, one on one consults for feeding and managing confinement cows will be conducted, extension meetings are being planned, specifically a series of joint extension meetings with the members from Kansas are being planned to address results from objectives 1,3,4, and 5.
  - Over 375 participants in 7 extension presentations received information about horn fly control for pasture animals.
  - At KSU Beef Stocker Field Day and Cattlemen's Day, were nearly 1,250 participants were exposed to information about grazing cover crops, pasture management, and animal management for improvement production.
  - Delivered 15 extension presentations to approximately 750 participants on

objectives 1 and 2.

- Co-hosted 4 extension outreach events including the Barta Brother Open House and cover crop field days that were attended by nearly 200 participants.
- Developed online Crop Residue Exchange (http://cropresidueexchange.unl.edu) for crop producers to list cropland available for grazing using an interactive map and entering information about the type of residue, fencing situation, water availability, and dates available. Also, livestock producers can search the database for cropland available for grazing.

## Milestones:

- Objective 1
  - A journal article describing the effect of corn residue harvest methods was submitted to the Journal of Animal Science for publication.
  - The multi-year experiment evaluating the effect of grazing or baling of corn residue on crop yields and soil ecosystems services at multiple site in NE was completed.
- Objective 2
  - The multi-year experiments evaluating grazing strategies and their effects on native rangeland and meadows were continued in NE.
  - A new multi-year experiments to evaluate the impacts of early intensive stocking was continued in KS.
  - The multi-year experiment evaluating interseeding of annual into perennial pastures at multiple locations in KS and NE was continued
  - A multi-year experiment evaluating interseeding legumes into cool season perennials in KS was continued.
  - Serecia lespedeza control and pasture restoration in heavily infested areas has completed year one of two data collection and working on analysis.
  - A multi-year study evaluating continuous and rotational grazing in cool season grasses was completed.
- Objective 3
  - Experiments evaluating forage quality, biomass production, calf gains and economics of annual forages and cover crops planted in KS and NE were conducted.
  - First test to determine if a chute-side test for methemglobin as a measure of nitrate toxicity was completed and data presented at BCI Summer Scholars meeting.
- Objective 5
  - Information related to the outcomes of objectives 1 through 4 were disseminated through UNL Beef online through the beef.unl.edu website which had 5,000 repeat visitors and 650,000 views in 2016. The BeefWatch electronic newsletter which had 46,000 views in 2016.
  - Research results studies in objective 1, 3 and 4 were presented at 16 events, educating 1,130 cattle and/or crop producers.

- A survey of cattle producers was conducted to gauge current management and perceptions regarding nitrates in annual forages to allowing more targeted and informed educational programming.
- A presentation was made at the Nebraska Cattlemen's Convention and four workshops were held at four locations in Nebraska focused on risk management tools for forage and livestock producers educating 54 producers on using annual forage and pasture insurance tools. A recorded webinar presentation titled Annual Forage Insurance Plan for Precipitation was posted online at http://beef.unl.edu/annual-forage-insurance-plan-precipitation.

## Impacts

- Using management practices that mimic modified early intensive stocking to increase beef cattle stocking density for breeding herds may allow producers to maintain or increase cow numbers for beef production on fewer perennial grassland resources.
- Tall fescue is grown on at least 37 million acres in the U.S., supporting roughly 20% of the beef cattle in the so-called transition zone. Most of its production occurs in spring, and less in fall, leaving a summer "gap" in forage availability and quality. Annual warmseason grasses could supply some much-needed forage during that period. If they could be successfully interseeded prior to fescue's summer dormancy, some high-quality forage would be produced with no increase in pasture area.
- Annual forage usage in the Nebraska Panhandle was estimated to be a management practice that will be implemented, based on evaluation responses.
- Feeding lactating cows with calves in confinement when perennial pastures are unavailable in 2017 could result in a feed cost of \$2.22/pair/d when using alfalfa hay of the quality and quantity needed to provide 15 lb TDN per day to maintain performance. Substituting ground cornstalk residue, sugar beets, and wet distillers at the same nutrient content, could result in a feed cost of \$0.94/pair/d. This is a \$1.28 savings/pair/d which is substantial for a cattle producer.
- Reaching an audience with research based information is critical for effecting change. The BeefWatch newsletter in 2016 had 970 subscribers. The 80 podcasts were created from these articles in 2016. The beef.unl.edu website had 82,000 repeat visitors in 2016.
- Distillers grains appears to be the best nutritional option for growing calves grazing corn residue. The addition of feed additives or urea does not appear beneficial. Corn supplementation does not provide the same animal performance as distillers grains.

# Abstracts/Posters/Professional Presentations

- 1. Sweeney, D. W., J. L. Moyer, and J. K. Farney. 2016. N, P, and K fertilization for newly established tall fescue. Poster, ASA-CSSA-SSSA Annual Meeting, Phoenix, AZ. 6-9 Nov.
- 2. Moyer, J. L., R. R. Price, and L. W. Lomas. 2016. Estimating crude protein concentration of smooth bromegrass pasture using NDVI data. Poster, ASA-CSSA-SSSA Annual Meeting, Phoenix, AZ. 6-9 Nov.
- Guretzky, J. A., J. Volesky, M. Stephenson, J. L. Moyer, W. H. Fick, and K. R. Harmoney. 2016. Establishment of annual warm-season grasses in cool-season grass pastures. Poster, ASA-CSSA-SSSA Annual Meeting, Phoenix, AZ. 6-9 Nov.\*

- 4. Trehal, S.S, J.L. Talley, K.D. Sherrill, T.J. Spore, R.N. Wahl, W.R. Hollenbeck and D.A. Blasi. 2017. Horn fly control and growth implants are effective strategies for heifers grazing Flint Hills pasture. 2017 Cattlemen's Day poster.
- 5. C.S. Weibert, T.J.Spore, M.A. Johnson, F.K. Brazle, G.L. Kuhl, W.R. Hollenbeck, R.N. Wahl and D.A. Blasi. 2017. Salt and trace mineral sources and growth implants on performance of stocker cattle grazing native Flint Hills pastures. 2018 Cattlemen's Day poster (to be presented).
- 6. Stephenson, M. B., B. Schiltz, and R. Bolze. 2017. Evaluation of the Nebraska Grazing Land Coalition Rangeland Monitoring Program. Abstracts of the 70<sup>th</sup> Annual Meeting of the Society for Range Management. St. George, UT.
- Stott, J., and M. B. Stephenson. 2017. Grazing distribution on Nebraska Sandhills. Abstracts of the 70<sup>th</sup> Annual Meetings of the Society for Range Management. St. George, UT.
- Sprinkle, J., M. B. Stephenson, and K. Olsen. 2017. Grazing behavior in-service. Workshop organized in conjunction with the 70<sup>th</sup> Annual Meeting of the Society for Range Management. Springdale, UT. 35 participants
- 9. Stephenson, M. B., and D. W. Bailey. 2017. Methodologies to determine if independence exists among individuals grazing within the same pasture. Grazing Behavior In-service. Springdale, UT, January 27, 2017.
- Cox, J.L., K. E. Hales, K. M. Ulmer, R. J. Rasby, S.D. Shackelford, H. C. Freetly and M. E. Drewnoski. 2017. Two-Year Study: Effect of Backgrounding System on Growing and Finishing Performance and Carcass Characteristics of Beef Steers. ASAS Midwest
- 11. Drewnoski, M. E., J. Parsons, D. Redfearn, H. Blanco-Canqui and J. C. MacDonald. 2017. Can cover crops pull double duty: Conservation and profitable forage production? ASAS Annual Meeting.
- 12. Redfearn, D., and R. Mitchell, M. Schmer, and V. Jin. A model integrated croplivestock system for eastern Nebraska. In meeting abstracts of Prairie and Native Grass International Conference; Switchgrass IV, August 7-11, 2017, Lincoln, NE.
- Redfearn, D.D., R.B. Mitchell, A. Hassebrook, and S. Masterson. 2016. Yield and nutritive value trends for stockpiled small grains in the western Corn Belt. In 2016 Annual Meetings Abstracts ASA, CSSA, SSSA, Madison, WI. Online: https://scisoc.confex.com/scisoc/2016am/webprogram/Paper100980.html
- 14. Schmer, M.R., R.M. Brown, V.L. Jin, R.B. Mitchell, and D.D. Redfearn. Corn residue utilization in the USA. In 2016 Annual Meetings Abstracts ASA, CSSA, SSSA, Madison, WI. Online: <u>https://scisoc.confex.com/scisoc/2016am/webprogram/Paper100118.html</u>
- Welchons, C. A., V. B. Ferrari, R. G. Bondurant, F. H. Hilscher, G. E.Erickson, T. J. Klopfenstein, and J. C. MacDonald. 2017. Supplementing varying ratios of modified distillers grains and corn to growing beef steers. J. Anim. Sci. 95 (Suppl. 1): 168 (Abstr.).
- Welchons, C. A., R. G. Bondurant, F. H. Hilscher, J. C. MacDonald, T. J. Klopfenstein, and A. K. Watson. 2017. Effect on continuous or rotational grazing on growing steer performance and land production. J. Anim. Sci. 95 (Suppl. 1): 170 (Abstr.).

#### Journal Articles

- 1. Moyer, J. L., and D. W. Sweeney. 2016. Growth and forage quality responses of smooth bromegrass to nitrogen placement and timing. Agron. J. 108:1-9. doi:10.2134/agronj2015.0503.
- 2. Stephenson, M. B., H. Wilmer, R. Bolze, and B. Schiltz. 2017. Evaluating an onranch rangeland monitoring program in Nebraska. *Rangelands* accepted
- 3. Stephenson, M. B., and D. W. Bailey. 2017. Do movement patterns of GPStracked cattle on extensive rangelands suggest independence among individuals? *Agriculture* 7(58):1-17.
- 4. Stephenson, M. B., D. W. Bailey, R. Bruegger, and L. Howery. 2017. Factors affecting the efficacy of low-stress herding and supplement placement to target cattle grazing locations. *Rangeland Ecology and Management* 70:202-209.
- 5. Rakkar, M., M. E. Drewnoski, J. C. MacDonald, T. K. Klopfenstein, R. Driber, and H. Blanco. 2016 (accepted). Impacts of Cattle Grazing of Corn Residues on Soil Properties after 16 years. Soil Sci. Soc. of America J.
- Cox, J., K. M. Ulmer, M. Rakkar, L. Franzen-Castle, H. Blanco-Canqui, M. E. Drewnoski, J. C. MacDonlad and R. J. Rasby.2017. Perceptions of Crop Consultants and Crop Producers on Grazing Corn Residue in Nebraska. Journal of Extension. (accepted)
- Mitchell, R.B., D.D. Redfearn, K.P. Vogel, T.J. Klopfenstein, S. Baenziger, and B.E. Anderson. 2017. Beef cattle grazing gains on wheat, cereal rye, and triticale cover crops following soybean in eastern Nebraska. Agronomy Journal (submitted September 13, 2017).

#### Extension Reports/Publications

- Lomas, L. W.; Farney, J. K.; and Moyer, J. L. (2017) "Evaluation of Supplemental Energy Source for Grazing Stocker Cattle," *Kansas Agricultural Experiment Station Research Reports*: Vol. 3: Iss. 2. <u>https://doi.org/10.4148/2378-5977.1371</u>
- Lomas, L. W. and Moyer, J. L. (2017) "Effects of Interseeding Ladino Clover into Tall Fescue Pastures of Varying Endophyte Status on Grazing Performance of Stocker Steers," *Kansas Agricultural Experiment Station Research Reports*: Vol. 3: Iss. 2. <u>https://doi.org/10.4148/2378-5977.1372</u>
- Lomas, L. W. and Moyer, J. L. (2017) "Effects of Supplementation with Corn or Dried Distillers Grains on Gains of Heifer Calves Grazing Smooth Bromegrass Pastures," *Kansas Agricultural Experiment Station Research Reports*: Vol. 3: Iss. 2. https://doi.org/10.4148/2378-5977.1370
- Lomas, L. W. and Moyer, J. L. (2017) "Effects of Various Grazing Systems on Grazing and Subsequent Finishing Performance," *Kansas Agricultural Experiment Station Research Reports*: Vol. 3: Iss. 2. <u>https://doi.org/10.4148/2378-5977.1373</u>
- Moyer, J. L. and Lomas, L. W. (2017) "Including Legumes in Bermudagrass Pastures," *Kansas Agricultural Experiment Station Research Reports*: Vol. 3: Iss. 2. https://doi.org/10.4148/2378-5977.1375

- 6. Trehal, S.S, J.L. Talley, K.D. Sherrill, T.J. Spore, R.N. Wahl, W.R. Hollenbeck and D.A. Blasi. 2017. Horn fly control and growth implants are effective strategies for heifers grazing Flint Hills pasture. 2017 Cattlemen's Day
- 7. C.S. Weibert, T.J.Spore, M.A. Johnson, F.K. Brazle, G.L. Kuhl, W.R. Hollenbeck, R.N. Wahl and D.A. Blasi. 2017. Salt and trace mineral sources and growth implants on performance of stocker cattle grazing native Flint Hills pastures. 2018 Cattlemen's Day poster (to be presented).
- Dunn, C. D., M. B. Stephenson, J. Stubbendieck. 2017. Common Forbs and Shrubs of Nebraska: Rangeland, Prairie, Pasture (Revision). University of Nebraska-Lincoln Extension Circular EC1180. 260 p.
- Dunn, C. D., M. B. Stephenson, J. Stubbendieck. 2017. Common grasses of Nebraska: Rangeland, Prairie, Pasture (Revision). University of Nebraska-Lincoln Extension Circular EC170. 178 p.
- Groskopf, J., C. Creech, G. Hergert, M. Luebbe, D. Santra, M. Stephenson, G. Stone. Agriculture in the Nebraska Panhandle. University of Nebraska-Lincoln Extension Circular EC864. 6 p.
- 11. Stephenson, M. B. 2017. Module 11: Livestock grazing management on range and pasture. UNL Beef Cow Basics-Plus Online Course. 7 p.
- 12. Gardine, S. E., J.M. Warner, C.J. Bittner, R. G. Bondurant, K.H. Jenkins, R.J. Rasby, M.K. Luebbe, G.E. Erickson, and T.J. Klopfenstein. 2017. Wintering System on Cow and Calf Performance in a Summer- Calving Intensive Production System. Nebraska Beef Report. MP104:19-21.
- Greenwell, H.L., J.L. Gramkow, M.L. Jolly-Breithaupt, J.C. MacDonald, K.H. Jenkins. 2017 Effects of Field Pea Supplementation on Digestibility and Rumen Volatile Fatty Acid Concentration of Diets Containing High and Low Quality Forages. Nebraska Beef Report MP104:38-39.
- 14. Jenkins, K.H., C. Creech, R. Higgins, J. Buttle. 2017. Summer Cocktail Forage Research in the Nebraska Panhandle. Nebraska Beef Report MP104:55-56.
- 15. Greenwell, H.L., K.H. Jenkins, J.C. MacDonald, M.K. Luebbe. 2017. Evaluating the Impacts of Field Peas in Growing and Finishing Diets on Performance and Carcass Characteristics. Nebraska Beef Report MP104:36-37.
- Voegele, H.R., K.I. Domenech, E.K. Kunze, F.A. Ribeiro, K.H. Jenkins, J.C. MacDonald, C.R. Calkins. 2017. Effect of Feeding Field Peas on Fresh Beef Quality. Nebraska Beef Report MP104:101-103.
- Conway, A. C., T. M. King. M. L. Jolly-Breithaupt, J. C. MacDonald, T. J. Klopfenstein and M. E. Drewnoski. 2017. Effect of Harvest Method and Ammoniation on Digestibility and Intake of Corn Residue. Nebraska Beef Report. MP104:62-63.
- Ulmer, K. M., J. L. Cox, M. K. Rakkar, R. G. Bonderant, H. Blanco, M. E. Drewnoski, K. H. Jenkins, J. C. MacDonald, and R. J. Rasby. 2017. Effect of Corn Residue Grazing or Baling on Subsequent Crop Yield and Nutrient Removal. Nebraska Beef Report. MP104: 46-49.
- Ulmer, K. M., R. G. Bondurant, J. L. Gramkow, M. E. Drewnoski and J. C. MacDonald. 2017. Nutrient Content of Summer-Planted Oats after Corn Harvest and Grazing Performance. Nebraska Beef Report. MP104: 43-45.

- 20. Miller, J.J, K. Koehler-Cole, R. Werle, and D.D. Redfearn. Cover crops: A primer. Nebraska Extension, G2284. http://extensionpublications.unl.edu/assets/html/g2284/build/g2284.htm
- Hamilton, H. C., J. L. Gramkow, J. C. MacDonald, G. E. Erickson, A. K. Watson, and T. J. Klopfenstein. Relationship between dietary total digestible nutrients and digestible organic matter in beef cattle finishing and growing diets with or without distillers grains. Nebr. Beef Cattle Rep. MP 104. Pp. 76-78.
- 22. Hamilton, H. C., J. L. Harding, J. C. MacDonald, and T. J. Klopfenstein. 2017. Impact of inoculum source for in vitro and in situ digestion procedures performed on corn residue and grass samples. Nebr. Beef Cattle Rep. MP 104. Pp. 67-68.
- Ferrari, V. B., J. J. Updike, J. L. Harding, K. Glewen, T. J. Klopfenstein, and J. C. MacDonald. 2017. In situ digestibility of residue parts of corn planted in different populations and row widths. Nebr. Beef Cattle Rep. MP 104. Pp. 57-59.
- King, T. M., M. L. Jolly-Breithaupt, J. L. Gramkow, T. J. Klopfenstein, and J. C. MacDonald. 2017. Effect of harvest method on digestibility of corn residue. Nebr. Beef Cattle Rep. MP 104. Pp. 53-54.
- Ulmer, K. M., R. G. Bondurant, J. L. Gramkow, M. E. Drewnoski, and J. C. MacDonald. 2017. Nutrient content of summer-planted oats after corn harvest and grazing performance. Nebr. Beef Cattle Rep. MP 104. Pp. 43-45.
- Welchons, C. A., and J. C. MacDonald. 2017. Pooled gain analysis of steers grazing corn residue and supplemented with distillers grains. Nebr. Beef Cattle Rep. MP 104. Pp. 34-35-26.
- 27. Welchons, C. A., R. G. Bondurant, F. H. Hilscher, J. C. MacDonald, and G. E. Erickson. 2017. Rumen undegradable protein and bambermycins supplementation of calves grazing corn residue. Nebr. Beef Cattle Rep. MP 104. Pp. 32-33.
- Ferrari, V. B., R. G. Bondurant, G. E. Erickson, T. J. Klopfenstein, and J. C. MacDonald. Effects of modified distillers grains and corn ratios as supplements in diets varying in forage quality on performance of growing beef steers. Nebr. Beef Cattle Rep. MP 104. Pp. 29-31.
- Bondurant, R. G., G. E. Erickson, T. J. Klopfenstein, and J. C. MacDonald. 2017. Effect of crude glycerin concentration on growing steer performance in forage diets. Nebr. Beef Cattle Rep. MP 104. Pp. 25-26.

Articles in the Popular Press (non-peer reviewed)

- 1. Trehal, S.S, J.L. Talley, K.D. Sherrill, T.J. Spore, R.N. Wahl, W.R. Hollenbeck and D.A. Blasi. 2017. Horn fly tags, implants effective for stockers. Bottom Line of Nutrition: Beef. Feedstuffs magazine. May 8, 2017.
- 2. Stephenson, M. B. 2017. Understanding grazing management terms and improving harvest efficiency. Progressive Cattleman, September issue: 48-49.
- 3. Stephenson, M. B. 2017. Coping with drought conditions in central Nebraska. June 30, 2017. Panhandle Perspectives, Scottsbluff Star Herald, 7/9/2017
- 4. Stephenson, M. B. 2017. Abnormally dry conditions in the central Sandhills. 7/2017 UNL BeefWatch article.
- 5. Stephenson, M. B. 2017. Maps detail rangeland areas in western Nebraska. The Business Farmer, May 2017.

- 6. Stephenson, M. B. 2017. Rangelands in western Nebraska, a valuable grassland resource. The Fence Post, 5/8/2017. 43-44.
- 7. Stephenson, M. B. 2017. Targeted grazing for specific management objectives. Progressive Cattleman, June issue: 19-20
- 8. Stephenson, M. B. 2017. Challenges facing rangelands in western Nebraska. Panhandle Perspectives News Release. Scottsbluff Star Herald, 4/30/2017
- 9. Stephenson, M. B. 2017. Understanding cattle behavior with GPS technology. Plants, Pots, and Plots UNL Agron/Hort Newsletter.
- 10. Anderson, B., D. Redfearn, J. Volesky, and M. Stephenson. 2017. Increase pastures through cropland conversion. Progressive Forage.
- 11. Jenkins, K. Intensively Managing Cows as Part of a System with Limited Grass Panhandle Perspectives – Scottsbluff Star Herald
- 12. Jenkins, K. Nutrient Value of Standing Annual Forages through the Winter BeefWatch –December 2016
- Jenkins, K. Spring Planted Forage Cocktails for Beef Cattle –BeefWatch March 2017
- 14. Jenkins, K. Preparing for a Drought BeefWatch July 2017
- 15. Jenkins, K. Storing and Utilizing Sugar Beets Rejected for Human Consumption-BeefWatch March 2017
- 16. Jenkins, K. Using CRP Hay during a Drought BeefWatch August 2017
- Parsons, J., M. Drewnoski, and D. Redfearn. Online crop residue exchange links growers and grazers. CropWatch Electronic Newsletter, August 16, 2017. Online: https://cropwatch.unl.edu/2017/online-crop-residue-exchange-connects-farmersranchers
- Parsons, J., Drewnoski, M., and Redfearn, D. "Crop Residue Exchange Available." BeefWatch Electronic Newsletter, September 2017. Online: http://newsroom.unl.edu/announce/beef/6901/39143.
- 19. Anderson, B., D. Redfearn, J. Volesky, M. Stephenson. Increase pastures through cropland conversion. Progressive Forage, March 7, 2017. Online: https://www.progressiveforage.com/forage-types/grasses-and-grazing/increase-pastures-through-cropland-conversion
- 20. Drewnoski, M. E. and J. Parsons. 2016. Grazing Cornstalks-Do You Have a Rental Agreement? BeefWatch Electronic Newsletter. October.
- 21. Drewnoski, M. E., J. MacDonald, K. Ulmer and J. Cox. 2016. Value of Oats and Brassicas for Fall Forage. CropWatch Electronic Newsletter. December.
- 22. Drewnoski, M., and D. Redfearn. Planting guidelines for annual forages. BeefWatch Electronic Newsletter, February 2017. Online: https://beef.unl.edu/planting-annual-forages
- 23. Parsons, J. "Annual Forage Insurance Plan Changes." BeefWatch Electronic Newsletter, July 2017. Online: http://newsroom.unl.edu/announce/beef/6710/38420.
- 24. Redfearn, D., Drewnoski, M. and Parsons, J. Need spring pasture? Try oats. BeefWatch Electronic Newsletter, April 2017. Online: http://newsroom.unl.edu/announce/beef/6399/35908

- Redfearn, D. Truisms for successful cover crops. Progressive Forage, September 7, 2017. Online: https://www.progressiveforage.com/forage-types/otherforage/truisms-for-successful-cover-crops
- 26. Redfearn, D. Seed vigor, quality may improve cover crop establishment. Nebraska Farmer, July 21, 2017. Online: http://www.nebraskafarmer.com/covercrops/seed-vigor-quality-may-improve-cover-crop-establishment
- 27. Redfearn, D. Grass hay production practices simply stated. BeefWatch Electronic Newsletter, June 2017. Online: http://newsroom.unl.edu/announce/beef/6650/38089
- 28. Redfearn, D., and B. Anderson. 2016. Frosted sorghums: To graze or not to graze? BeefWatch Electronic Newsletter. November. Online: http://newsroom.unl.edu/announce/beef/5891/33380
- 29. Redfearn, D., and B. Anderson. 2016. Is nitrogen fixation oversold with legume cover crops? CropWatch Electronic Newsletter. December 16, 2016. Online: http://cropwatch.unl.edu/2016/nitrogen-fixation-oversold-legume-cover-crops
- 30. Redfearn, D., B. Anderson, J. Volesky, and M. Stephenson. 2017. Converting cropland to pastureland. UNL CropWatch.
- 31. Redfearn, D., B. Anderson, J. Volesky, and M. Stephenson. Converting cropland to pastureland. CropWatch Electronic Newsletter, March 16, 2017. Online: https://cropwatch.unl.edu/2017/converting-cropland-pastureland
- 32. Farney, J. K.. 2017. Cautions using cover crops for cattle production. Progressive Cattlemen. April. https://www.progressivecattle.com/topics/feed-nutrition/7812-cautions-using-cover-crops-for-cattle-production

Webinars/Videos and URL for online access None

Student theses and/or dissertations

- 1. Bondurant, R. G. 2017. Use of byproducts in forage-based, post-weaning beef systems and effects of serial slaughter on performance and profitability. Dissertation. University of Nebraska Lincoln.
- 2. King, T. M. 2017. Estimates of corn residue quality. Thesis. University of Nebraska Lincoln.
- 3. Welchons, C. A. 2017. Effect of Backgrounding Management Strategies on the Performance and Profitability of Yearling Beef Cattle. Dissertation. University of Nebraska Lincoln.
- 4. Ulmer, K. 2016. Managing Corn Residue and Double Cropped Forages in Crop and Livestock Systems. Thesis. University of Nebraska Lincoln.

## Funding (include grants and contracts)

Source, amount, start/end dates, title of project, Project Director, Co-Project Director(s)

 National Fish & Wildlife Foundation (project no. 2003.12.039817) – KC Olson, PI \$547,630 "Restoration of Tallgrass Prairie Infested with Sericea Lespedeza through Grazing and Fire during the Late Growing Season"; July 2013 to June 2018.

- 2. Nebraska Grazing Lands Coalition, \$50,000, 1/1/2017 6/1/2019, Grazing cover crops and annual forages, Mitch Stephenson, Karla Jenkins, Cody Creech
- Northern Plains Regional Climate Hub, \$4,858, 1/1/2017 12/31/2017, Fostering collaborative, adaptive, and climate smart rangeland decision-making through digital storytelling in Colorado and Nebraska, (PI) R. Bruegger, M. Stephenson, M. Wilmer
- Optimizing Cropping Systems for Resilience to Stress: The Role of Maturity Group Selection and Cover Crops on Yield, Weeds, Insects, and Microbes (2017-2021). C. Proctor, R. Elmore, D. Redfearn, M. Drewnoski, J. Parsons, S. Everhart, J. McMechan, J. Laborde, M. Licht, L. Lindsey, E. Haramoto, R. Werle, and M. Cortasa. USDA-NIFA (\$461,187).
- Enhancing Animal Protein through Crops and Cattle (2017-2022). J. MacDonald. T. Awada, S. Banerjee, H. Blanco, M. Drewnoski, G. Erickson, J. Okalebo, J. Parsons, D. Redfearn, and A. Suyker. Foundation for Food and Agricultural Research (\$1,000,000)
- IANR Strategic Investment in Beef Systems (2017-2022). W. Schacht, J. Parsons, D. Redfearn, M. Spangler, R. Funston, J. MacDonald, M. Stephenson, and M. Drewnoski. Institute of Agriculture and Natural Resources Internal Funding (\$1,500,000).
- 7. Evaluating nitrate toxicity potential in grazed cover crops. Lenz, M.E. and M. E. Drewnoski. 9/1/17 8/31/18. \$11,948
- 8. Soil Health Initiative (2017-2022). R. Rasby, D. Redfearn, and R. Elmore. USDA-NRCS (\$314,184).
- Risk Management Education for Nebraska Livestock and Forage Producers, Women in Agriculture, and New and Beginning Producers (2016-2017). Parsons, J., Griffith, C., Lemmons, T., Shulski, M. USDA-Risk Management Agency (\$85,779).