34th Annual Southwest Missouri Spring Forage Conference

&

16th Annual Heart of America Grazing Conference

February 26 & 27, 2018

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Welcome to the 34th Annual Southwest Missouri Spring forage Conference and the 16th Annual Heart of America Grazing Conference!

Thank you for attending the combined Southwest Missouri Spring Forage Conference and the Heart of America Grazing Conference. This year marks the 34th Annual Southwest Missouri Spring Forage Conference and the 16th Annual Heart of America Grazing Conference. These conferences have grown throughout the years and this year we have combined the two conferences into one location, for your convenience. The combined conference is offering two great days of education and information about forage based agriculture and grazing related topics.

On Monday afternoon we are privileged to have five speakers presenting a Grassland Soil Health Workshop and for the evening speaker, an entertaining talk by Dr. Garry Lacefield on "Gratitude". On Tuesday, we are pleased to have Dave Pratt from the Ranch Management Consultants and the Ranching for Profit Schools as our Keynote speaker. Throughout the day you have your choice of four different breakout sessions with a variety of topics that you can attend. A list of breakout sessions and a hotel map can be found in this proceedings book and in your bag received at registration. Between the breakout sessions and before lunch, I highly encourage you to visit the trade show and visit with the vendors about the products and services they offer. I guarantee that you will find something you need!

The conference committee is a partnership of the USDA Natural Resources Conservation Service, Soil and Water Conservation Districts of Southwest Missouri, University of Missouri Extension, USDA Farm Service Agency, Missouri State University—William H Darr School of Agriculture, the Missouri Department of Conservation, Missouri Forage and Grassland Council/Grazing Lands Conservation Initiative, Illinois Forage & Grassland Council, Illinois Grazing lands Conservation Initiative Association, University of Illinois Extension, Indiana Forage Council, Purdue University Cooperative Extension, Kentucky Forage and Grassland Council, Kentucky Grassland Conservation Initiative, University of Kentucky Cooperative Extension, Ohio Forage & Grassland Council, and The Ohio State University Cooperative Extension.

Many thanks to the vendors, break sponsors, conference speakers and especially the producers for making this an excellence conference. I would like to offer my gratitude of thanks for all the hard work by the committee and affiliated agencies who are associated with pulling the conference together.

Each year, the Planning Committee strives to improve upon our previous conference. We appreciate your comments and ask that you take a few minutes to complete the conference evaluation before leaving Tuesday. If you have any questions or comments during the conference, all committee members will be wearing tan shirts displaying the Spring Forage Conference logo. We will be more than willing to answer your questions.

Highest Regards,

Aaron Hoefer

2018 Southwest Missouri Spring Forage Conference Committee Chair

34rd Annual Southwest Missouri Spring Forage Conference
16th Annual Heart of America Grazing Conference
February 26 — 27, 2018
TABLE OF CONTENTS

34th ANNUAL SW MISSOURI SPRING FORAGE CONFERENCE/ 16th ANNUAL HEART OF AMERICA GRAZING CONFERENCE

Monday, February 26, 2018

AGENDA & ROOM ASSIGNMENTS

(SEE MAP ON BACK)

12:00-6:00 PM REGISTRATION & VISIT TRADE SHOW -- CONVENTION CENTER - NEBRASKA ROOM

Grassland Soil Health Workshop
1:00 -- 5:00 PM

Moderator – Mark Kennedy,
MFGC/GLCI Grassland Specialist, Reeds Spring, MO

SESSION A (1:00 PM - 2:45 PM)	ROOM	SPEAKER
Principles of Soil Health in Grassland	Convention Center Arizona/Georgia	Doug Peterson, NRCS Regional Soil Health Specialist, Missouri-Iowa
Diverse Native Grasslands: Soil Health in Heart of America	Convention Center Arizona/Georgia	Amy Hamilton & Elizabeth Steele, Producers, Hamilton Native Outpost, Elk Creek, MO

2:45-3:15 PM – BREAK & VISIT TRADE SHOW -- CONVENTION CENTER - NEBRASKA ROOM

SESSION B (3:15 PM - 5:00 PM)	ROOM	SPEAKER
Where's the Profit in Soil Health? A Producer's Prospective	Convention Center Arizona/Georgia	Dr. Alex Miller, Producer, East Tennessee
Foraging for Soil Health	Convention Center Arizona/Georgia	Dr. Alan Franzluebbers, Research Ecologist, USDA-ARS, North Carolina State Univ.

5:00-6:30 PM – SOCIAL & VISIT TRADE SHOW -- CONVENTION CENTER - NEBRASKA ROOM

6:30 - 8:00 PM - DINNER BANQUET -- CONVENTION CENTER - Arizona/Georgia Rooms

Welcome -- Emcee -- Mark Green, Spring Forage Conference Vice-Chair MFGC Board Member

Keynote Address

"GRATITUDE"

Dr. Garry Lacefield
Professor Emeritus, University of Kentucky

8:00 PM ADJOURN

34th ANNUAL SW MISSOURI SPRING FORAGE CONFERENCE &
16th ANNUAL HEART OF AMERICA GRAZING CONFERENCE

Tuesday, February 27, 2018

AGENDA & ROOM ASSIGNMENTS

8:00-8:45 am REGISTRATION & VISIT TRADE SHOW -- CONVENTION CENTER/NEBRASKA ROOM

SESSION A (8:45 AM 9:30 AM)	ROOM	SPEAKER
A1) Adapting to Forage Growth Curve **REPEATED AT 2:45 PM**	COLORADO	Dr. Will McClain, Assistant Professor, MSU Darr College of Agriculture, Springfield. MO
A2) Top Dollar for Your Calves, Value Added Opportunities **REPEATED AT 2:45 PM**	ILLINOIS	Dr. Gant Mourer, Mourer Family Farm, Morrison, OK
A3) Finding Hard Work & Harmony in Family Relationships on the Farm	OKLAHOMA	Dave Pratt. Ranch Management Consultants, Ranching For Profits Schools, Fairfield, CA
A4) Chemical Weed Control in Pastures	KANSAS	Tim Schnakenberg, MU Ext Agronomist, Galena, MO

9:30-10:15 am – BREAK & VISIT TRADE SHOW -- CONVENTION CENTER/NEBRASKA ROOM

SESSION B (10:15 AM - 11:00 AM)	ROOM	SPEAKER
B1) Understanding Forage Quality RFQ **REPEATED AT 2:45 PM**	COLORADO	Dr. Garry Lacefield. Professor Emeritus. Univ. of Kentucky
B2) Conditioning Cows for Pregnancy	ILLINOIS	Dr. Jason Salchow. Producer Veterinarian Billings. MO
B3) Grazing Alfalfa	OKLAHOMA	Dr. Twain Butler, Professor Research Agronomist. Noble Research Institute, Ardmore, OK.
B4) Non-Chemical Weed Management. Strategic Grazing and Other Options	KANSAS	Dr. Michael Burton, MSU Darr College of Agriculture Terry Halleran, MU Extension Agronomist, Hermitage, MO Dr. Will McClain, MSU Darr College of Agriculture

11:00-11:30 am – BREAK & VISIT TRADE SHOW -- CONVENTION CENTER/NEBRASKA ROOM

11:30 AM - LUNCHEON -- CONVENTION CENTER

Welcome -- Emcee -- Joann Pipkin, Show Me Agri-Comm

Keynote Address

"Do You Own Your Job or Business? Are You Working for a Lunatic?"

Dave Pratt, Ranch Management Consultants,
Ranching For Profits Schools, Fairfield. CA

1:15-1:45 pm – BREAK & VISIT TRADE SHOW -- CONVENTION CENTER/NEBRASKA ROOM

SESSION C (1:45 PM - 2:30 PM)	ROOM	SPEAKER
C1) Mineral Supplements in Pastures	COLORADO	Dr. Eric Bailey. State Ext Beef Nutritionist. Univ. of MO. Columbia. MO
C2) Incorporating Sheep and Goats Into a Cattle Operation	ILLINOIS	Greg Christiansen. Farmer Rancher. Parker, Kansas
C3) Bermudagrass - Benefits in a Grazing System.	OKLAHOMA	Dr. James Rogers, Associate Professor, Noble Research Institute, Ardmore, OK.
C4) The 3 Secrets for Increasing Profit -- Dave Pratt	KANSAS	Dave Pratt, Ranch Management Consultants, Ranching For Profits Schools, Fairfield, CA

2:30 - 2:45 pm – BREAK

SESSION D (2:45 PM - 3:30 PM)	ROOM	SPEAKER
D1) Beef Genetics	COLORADO	Jared Decker. Assistant Professor. Animal Science Research. Univ. of MO. Columbia. MO
D2) Adapting to Forage Growth Curve	ILLINOIS	Dr. Will McClain, Assistant Professor, MSU Darr College of Agriculture. Springfield. MO
D3) Understanding Forage Quality RFQ	OKLAHOMA	Dr. Garry Lacefield. Professor Emeritus. Univ. of Kentucky
D4) Top Dollar for Your Calves. Value Added Opportunities	KANSAS	Dr. Gant Mourer, Mourer Family Farm, Morrison. OK

3:30 pm ADJOURN

16th Annual
Heart of America Grazing Conference
Executive Committee Members

Matt Bunger
USDA Natural Resources Conservation Service
Grassland Specialist
402 North Kays Drive
Normal, Illinois 61761
309-452-3848 Ext. 112
matt.bunger@il.usda.gov

Mark Kennedy
Grassland Services LLC
2559 Old Wilderness Road
Reeds Spring, Missouri 63737
417-766-0805
makennedy715@gmail.com

Ray Smith
University of Kentucky Forage
N-222C Ag Science Center North
Lexington, Kentucky 40546
859-257-3358
raysmith@uky.edu

Jason Tower
Southern Indiana Purdue Agriculture Center (SIPAC)
11371 East Purdue Farm Road
Dubois, Indiana 47527
812-678-4427
towerj@purdue.edu

Ohio State University
Position Currently Open

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Committee Members

Pat Adams – NRCS
Area Resource Conservationist
1786 South 16th Avenue, Suite 103, Ozark, MO 65721
417-581-2719 Ext. 108
pat.adams@mo.usda.gov
Planning Committee Public Relations Chair

Reagan Bluel - University of Missouri Extension
Dairy Specialist
Barry County Extension Center
700 Main, Suite 4
Cassville, MO 65625
417-847-3161
bluelrj@missouri.edu

Dr. Michael Burton - Missouri State University
William H. Darr College of Agriculture
Associate Professor
901 South National Avenue
Springfield, MO 65804
417-836-5085
MikeBurton@MissouriState.edu

Patrick Davis - University of Missouri Extension
Livestock Specialist
113 South Street
Stockton, MO 65785
417-276-3313
davismp@missouri.edu

Mark Emerson - Webster County NRCS
Resource Conservationist (Grassland)
1202 Banning Street
Marshfield, MO 65706
417-468-4176 Ext. 3
mark.emerson@mo.usda.gov

Alan Garton - Laclede County NRCS
Resource Conservationist
1242 Deadra Drive
Lebanon, MO 65536-1015
417-532-6305 Ext. 3 or 800-203-4467
alan.garton@mo.usda.gov

Dee Glenn - Dade County SWCD
District Manager/Technician
124 South Highway 39
Greenfield, MO 65661
417-637-5993 Ext. 3
dee.glenn@swcd.mo.gov

Mark Green - Greene County NRCS
Lead Resource Conservationist
688 South State Highway B, Suite 200
Springfield, MO 65802
417-831-5246 Ext. 3
mark.green@mo.usda.gov
Planning Committee Vice-Chair

Terry Halleran - University of Missouri Extension
Agronomy Specialist
Hickory County Extension Center
203 Cedar Street
Hermitage, MO 65668
417-745-6767
halleranw@missouri.edu

Aaron Hoefer - Christian County NRCS
District Conservationist
1786 South 16th Avenue, Suite 102
Ozark, MO 65721
417-581-2719 Ext. 3
aaron.hoefer@mo.usda.gov
2018 Planning Committee Chair

Abby Inglis – Farm Service Agency
CED, Greene and Webster Counties
688 South State Highway B, Suite 100
Springfield, MO 65802
417-831-5246 Ext. 2
abby.inglis@mo.usda.gov

Will Knuckles - University of Missouri Extension
Agronomy Graduate Assistant
Taney County Extension Center
PO Box 598, Forsyth, MO 65653
417-546-4431
knucklesc@missouri.edu

Jamie Kurtz – Douglas County NRCS
Resource Conservationist
3210 Hoover Drive
West Plains, MO 65775
417-256-7117 Ext. 3
jamie.kurtz@mo.usda.gov

Jody Lawson – Webster County SWCD
Program Specialist/Tech II
1202 Banning Street
Marshfield, MO 65706
417-468-4176 Ext. 3
jody.lawson@swcd.mo.gov

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Committee Members

Will McClain—Missouri State University
Assistant Professor
207 Karls Hall, Missouri State University
901 South National Avenue
Springfield, MO 65897
417-836-5098
WillMcClain@MissouriState.edu

Andy McCorkill
University of Missouri Extension
Livestock Specialist
Dallas County Extension Center
PO Box 1070
Buffalo, MO 65622
417-345-7551
mccorkilla@missouri.edu

Rita Mueller – Lawrence County NRCS
Resource Conservationist
10763-G Highway 39, Mount Vernon, MO 65712
417-466-7682 Ext. 3
rita.mueller@mo.usda.gov
Planning Committee Proceedings Chair

Ted Probert – University of Missouri Extension
Dairy Specialist
9740 Red Spring Road
Mountain Grove, MO 65711
417-547-7545
ProbertT@missouri.edu

Scott Radford
Missouri Department of Conservation
Area Biologist
1786 South 16th Avenue, Suite 102
Ozark, MO 65721
417-581-2719 Ext. 6
scott.radford@mo.usda.gov

Tony Rosen – Dallas County SWCD
District Technician
1240 West Truman, Buffalo, MO 65622
417-345-2312 Ext. 3 or Ext. 111
tony.rosen@swcd.mo.gov

Jill Scheidt – University of Missouri Extension
Agronomy Specialist
Barton County Extension Center
801 East 12th Street, Lamar, MO 64759
417-682-3579
scheidtjk@missouri.edu
2018 Planning Committee Secretary

Tim Schnakenberg
University of Missouri Extension
Agronomy Specialist
Stone County Extension Center
PO Box 345, Galena, MO 65656
417-357-6812
SchnakenbergC@missouri.edu
Continuing Education Credits Coordinator

Jim Spencer – University of Missouri Extension
Agriculture Business Specialist
Christian County Extension Center
105 North Second Street, Ozark, MO 65721
417-581-3558
spencerjr@missouri.edu

Mary Jo Tannehill – Laclede County SWCD
District Manager
1242 Deadra Drive, Lebanon, MO 65536
417-532-6305 Ext. 3
mary.tannehill@swcd.mo.gov
Planning Committee Registration/Treasurer

Wesley Tucker – University of Missouri Extension
Agriculture Business Specialist
Polk County Extension Center
110 East Jefferson
Bolivar, MO 65613
417-326-4916
tuckerw@missouri.edu

Nathan Witt – Newton County NRCS
Resource Conservationist
1900 South Highway 71
Neosho, MO 64850
417-451-1366 Ext. 3
nathan.witt@mo.usda.gov
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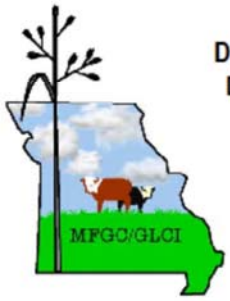

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MASTER OF CEREMONIES

MARK GREEN

USDA Natural Resources Conservation Service

688 South State Highway B, Suite 200
Springfield, Missouri 65802
417-831-5246 ext 121, mark.green@mo.usda.gov

Mark was born in Scottsbluff, Nebraska, and was raised on a ranch in the mountains southwest of Denver, Colorado. He received his Bachelor of Science Degree in Agronomy from Southwest Missouri State University in 1983.

Mark has worked for the SCS/NRCS since 1981 as a Soil Conservationist, Area Resource Conservationist, District Conservationist, and Lead Resource Conservationist.

Mark conducts electric fence field days and workshops for producers in Missouri, Kansas, and Oklahoma. Mark serves as an instructor and regional coordinator for SW Missouri Regional Management-Intensive Grazing Schools.

Mark is a member of American Forage and Grassland Council, a Board Member for Missouri Forage and Grassland Council, and committee member for the Missouri High School Grassland Evaluation Contests.

Mark has worked with grazing management in southwest Missouri for the past 36 years.

Most importantly, he has been married to Jill for 39 years and has three grown children and seven grandkids!

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16th Annual Heart of America Grazing Conference

MASTER OF CEREMONIES

JOANN PIPKIN

Show Me Agri-Comm
3674 South State Highway N, Republic, Missouri 65738
417-827-2756, showmeagricomm1@icloud.com

Joann Pipkin is owner of Show Me Agri-Comm, a freelance agricultural public relations business offering writing, photography, graphic design and marketing services. In that capacity, Joann works with Joplin Regional Stockyards, serving as editor of its monthly customer news magazine, *Cattlemen's News.*

Joann also manages the Missouri FFA Today magazine, as well as Missouri FFA's eNewsletter and website. In addition, Joann writes for a number of agricultural publications including Farm Journal Media, FCS Financial's *Heartbeat*, and the Angus Journal. She is a member of the Agricultural Editors Association and the Livestock Publications Council.

Raised on a family dairy farm, today Joann and her husband, Jim, live near Republic, where they operate Clearwater Angus Farm with his family. A fifth-generation seedstock operation, Clearwater Farm has been in business since 1933. Joann and Jim are parents to daughter Jera, a junior at Oklahoma State University, and son Jace, a third grader.

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DOUG PETERSON

Principals of Soil Health in Grassland

Doug Peterson
Regional Soil Health Specialist
USDA Natural Resources Conservation Service
210 Walnut Street, Room 693
Des Moines, Iowa 50309
202-510-7559, doug.peterson@ia.usda.gov

Doug Peterson has been an NRCS employee for over 29 years. He started his career as a Soil Scientist. He has been a District Conservationist in both a grassland based county in south Missouri and a large cropland county in north Missouri. He has also been a State Grassland Conservationist and a State Soil Health Specialist. Currently he is a Regional Soil Health Specialist for Missouri and Iowa teaching NRCS staff and producers around the mid-west about soil health, how it impacts virtually all natural resource processes, and what type of management it will take to effectively improve our soils health, function and productivity.

He attended college at Missouri Western State University graduating in 1986 with a B.S. degree in Agriculture with an emphasis in Economics and Agronomy.

He grew up on a crop and livestock farm near Newtown in north Missouri. Today he continues to operate a cow/calf and contract grazing operation with his father, Steve. Currently they run about 250 cows. They utilize Management-intensive Grazing and Holistic High Density Grazing to improve soil health, eliminate the need for most purchased fertilizer and limit hay needs to about one bale per cow per winter.

Doug's NRCS training coupled with his real world hands on experience make him a unique speaker that is relatable to both agency personnel and producers.

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AMY HAMILTON AND ELIZABETH HAMILTON—STEELE

Amy and Rex Hamilton
Elizabeth Hamilton—Steele
Hamilton Native Outpost
16786 Brown Road
Elk Creek, Missouri 65464
417-967-2190
natives@hamiltonoutpost.com

Amy Hamilton and Elizabeth Steele, mother and daughter, both live in the Ozarks near Elk Creek, Missouri. Amy and her husband, Rex, own Hamilton Native Outpost, which raises native seed and livestock. The unique combination of knowledge about native plants and livestock led them to establish a diverse native grassland with over 100 species of plants for the purpose of grazing.

Amy's training in agronomy at the University of Missouri and her previous experience of working for the Soil Conservation Service (now the Natural Resources Conservation Service) gave her a basic understanding of soils. She is now building upon this foundation of knowledge as she studies the soil health of the diverse native grassland. Amy and Rex have three grown children. Two of their children have returned to work in the business. In her free time, Amy enjoys cooking for and entertaining people and landscaping with native wildflowers around her house.

Elizabeth works for Hamilton Native Outpost. Having grown up around native plants and spending many hours on the remnant native prairies harvesting seed, she has a knowledge of where and how the native plants grow. She graduated from the University of Missouri with a degree in soil and plant science, which gave her training in how plants and soils function. In her free time, Elizabeth enjoys gardening and being outside with her husband, Loren, and her two kids.

34rd Annual Southwest Missouri Spring Forage Conference
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AMY HAMILTON AND ELIZABETH HAMILTON—STEELE

Diverse Native Grasslands: Soil Health in the Heart of America

Diverse native grasslands are what created the original productive grassland soils found in the heart of America. We started the original project, to see if we could improve the soil health in our pastures as well as produce more and higher quality forage than a fescue field while still providing the wildlife and pollinator habitat that natives grasses and forbs are known for even though we planned to graze them.

It has been a long story in the making, but it more or less started as Rex and Amy Hamilton spent time on Missouri's remnant grasslands for over 30 years while harvesting seed. They noticed the productive native warm season grasses and even planted them for their own cattle operation. They noticed the beautiful wildflowers, but never thought of them as forage. They also noticed the cool season grass and grass-like species, but they never really thought about their forage potential either. Then, they found an article about some research by Dr. David Tillman that described the production potential of a monoculture in comparison to diversity. With 16 species of plants, the production was 238% more than a monoculture; this is impressive but even more so knowing that the monoculture was switchgrass, which is thought of as "biomass king" because of its production potential. Diversity was 238% better than the best!

This all culminated in a project that received a Conservation Innovation Grant from NRCS and also help from the MO Department of Conservation. In 2010, fifty eight acres of fescue was killed in a process that involved about a year. Then in 2012 we planted about 100 species of native plants. Realizing that each plant has a unique season of growth (i.e. some are green and growing in the cool weather of spring and fall while others prefer the hot weather of summer), we chose species that grew in various seasons. We wanted plants to be growing and collecting sunlight as much of the year as possible. We also realized that plants have unique root systems (e.g. deep rooted vs. shallow rooted, fibrous vs. tap rooted). We wanted to include this uniqueness in the planting so that we could use as much of the soil moisture as possible to grow forage whenever the rains came. Lastly, we knew we wanted to include native legumes because these plants would provide "free nitrogen fertilizer" to the pasture. In the end, we planted four functional diversity groups: warm season grasses, cool season grass and grass-like species, legumes, and forbs (also called wildflowers). After the natives established, we began grazing. So what have we discovered about grazing a diverse native grassland?

AMY HAMILTON AND ELIZABETH HAMILTON—STEELE
Continued...

Diverse Native Grasslands:
Soil Health in the Heart of America

Better for the Rancher. To begin with, we are pleased with the quantity of forage production; it is currently equal to the production of our remaining fescue pastures, and we have reason to believe it will continue to increase as it is still a relatively immature stand. We weaned heavier calves when they grazed natives than when they grazed fescue pastures, and the cows had better conception rates. We also feel that the diverse native grasslands have an advantage in that there is no one best date for grazing. In comparison, a monoculture, be it of a native warm season grass or fescue or something else, there is THE exact day or short range of days to be grazing the pasture to optimize production and quality; in a diverse native planting there is a whole range of maturity dates, which means it is not as crucial to be there at any exact time. Finally, we have also observed that our cattle consume less mineral when grazing diverse natives than when grazing fescue; we believe that this is because their diet is supplying those minerals when grazing a diverse native grassland.

Better for Soil Health. While we recognized when we started this project that diverse native grasslands are what developed the fertile grassland soils of America's heartland, we didn't realize the significant impact that switching from a well-managed stand of fescue to diverse natives would have. Here are some of the results we have measured and observed:

We measured soil organic matter (SOM) at a 0-6 inch depth at the onset of this project and again at the completion of the Conservation Innovation Grant. The SOM increased by 0.9%, which was a 28% increase. This increase means that an area of soil 1 foot by 1 foot by 6 inches deep can hold an extra ½ gallon of water!

Rooting depth is impressive in the diverse native grassland. We dug a soil pit and found that roots go beyond 3 feet even in our gravelly, acidic Ozark soils. To think of the water and nutrients that can be obtained by these plants as opposed to our fescue plants whose roots generally don't extend much below 1 foot.

The deeper rooting depth in the diverse native grassland made us wonder if that was corresponding to an increase in organic matter deeper in the soil. Indeed, when we compared the SOM at an 8-12 inch depth in the diverse native grassland with our fescue pasture on a similar landscape position, we found that the diverse native grassland was 0.4% higher than the fescue pasture. When viewed in light of the SOM increase from the surface of the soil to the depth of the deepest native plant root, the increased water and nutrient holding capacity of the diverse native grassland is impressive.

AMY HAMILTON AND ELIZABETH HAMILTON—STEELE
Continued...

Diverse Native Grasslands:
Soil Health in the Heart of America

We have also measured faster water infiltration in the diverse native grassland. Because our fescue pasture is well managed and on a similar landscape position, we didn't expect to see a big difference in infiltration rates. However, we found that water infiltrated in the diverse native grassland almost 3 times as fast as in the fescue pasture. For the second inch of water, which soil health specialists say is more meaningful than the first inch, it took 12 minutes for the land to drink in the water in the diverse native grassland and 33 minutes in the fescue pasture. When considered alongside the diverse native grassland's higher SOM, the soils in our diverse native grassland have the capacity to drink in and hold significantly more rain water for plant and microbial use than even our perennial, well managed fescue pastures.
As we were measuring infiltration, we observed that the diverse native grassland had significantly more earthworm castings on top of the soil. So, we did some earthworm counts and found that the diverse native grassland had over 3 times as many as the fescue pasture; 18 verses 5, respectively.

Better for Wildlife. A good friend of ours says that the health of the wildlife population is an indicator of the health of the farm. If wildlife doesn't want to live on the farm, do your livestock really want to live there? As for the charismatic megafauna, we have observed that our diverse native grassland is the place to find deer and deer antler sheds. One evening this fall on the 58 acres, we observed 32 deer at the same time and another evening 38. It is an excellent place to go turkey hunting as the turkeys like to both strut and forage there. We also have an interest in the health of pollinators and other insects. While we haven't directly measured their populations, we do observe that we have blooming plants from which pollinators can collect pollen and nectar. We are providing other habitat components as well ranging from thatch and old, standing stems to bare ground.

What We Have Learned about the Creation of Diverse Native Grasslands. We have learned a lot about grazing and natives. We have observed that flowers really do make good forage. We have learned that the plants are adapted to herbivores in different ways. Some plants are not very palatable early in the growing season but are quite appetizing later in the year. Other plants are quite palatable throughout the year and their efforts to bloom are not hindered by a grazing event; rather the grazing triggers the plant to bloom yet again.

AMY HAMILTON AND ELIZABETH HAMILTON—STEELE
Continued...

Diverse Native Grasslands:
Soil Health in the Heart of America

We also see the importance of a successful establishment. Too many times not enough time and effort is given to killing the existing vegetation before the natives are planted. Also, considering the field borders and odd areas (e.g. near creeks or the edges of trees) and having a plan to eradicate the fescue plants in those areas is important. Lastly, it is important to consider how to keep fescue from becoming reintroduced to the planting as livestock, machinery, and water running downhill are all vectors for seed movement.

When designing a diverse native grassland, it is important to include plants from as many functional diversity groups as possible including warm season grasses, cool season grass and grass-like species, forbs, and legumes. This maximizes the solar collector (we are collecting sunlight as many days of the year as possible), water and nutrient collections from all depths of the soil, and beneficial symbiotic relationships between plants and soil microbes such as mycorrhizae and nitrogen fixing bacteria.

As all of us do, we have biases in life. We happen to sell native grass and wildflower seed. On one hand, this has given us a unique perspective and knowledge of plants; we have seen how the native warm season grasses keep on producing forage through a summer drought, and we have seen how the native cool seasons green up during the fall and spring. We know these plants in a unique way. But, on the other hand, we also realize that it makes us appear to be salesmen for this concept. And, we are. But it is not just so that we can make a living from raising and selling native seed, it is a concept that we truly believe in. To be honest, native plants are not where we started the “diversity journey.” We started by planting mixed fields of native warm and introduced cool season grasses with introduced legumes. We have never really been happy with the expression of the different functional diversity groups in these plantings. We stop and ask ourselves why it didn’t work, and we are not sure. However, what we do know is that the native plants have a history of working together in a grassland. They were part of a functioning ecosystem long before white man arrived on the continent and brought with him the plants that were familiar from the old world. The native plants in the grasslands all worked together then and can work together now just as well. Additionally, the native plants have proven to be adapted to our soils and climate.

In the end, we believe that diverse native grasslands are as good as it gets for the rancher, soil health, and wildlife. To read more about our project, see establishment timelines for converting to diverse native grasslands, and see dates for upcoming field days, visit our website www.HamiltonNativeOutpost.com.

34rd Annual Southwest Missouri Spring Forage Conference
16th Annual Heart of America Grazing Conference

DR. ALEX MILLER

Dr. Alex Miller
Miller Family Farms
New Market, Tennessee
865-387-5106
amiller2@utk.edu

Dr. Alex Miller is a chaired professor in the business school at the University of Tennessee, and a partner in a 900-acre beef cattle operation in East Tennessee.

Alex is a seventh generation East Tennessee farmer.

For his leadership in agriculture, he has been recognized as Tennessee Cattleman of the Year, and won various awards for environmental conservation.

Where's the Profit in Soil Health? A Producer's Prospective

At Miller Family Farms, an 800-acre cow-calf operation in Eastern Tennessee, we are transitioning from retained ownership through feedlot finishing to on-farm grass finishing. To enable this transition, we have adopted numerous best practices over the years. The three having the greatest impact on farm performance are:

The direct benefits of soil health,
The reduced use of hay connected to soil health, and
Low input production, which both enables - and is enabled by - soil health.

Soil Health

We have adapted the four principles of soil health to our particular environment/operation as follows:

Use plant diversity to increase diversity in the soil. We carefully blend "cocktails" to maximize diversity of foliage and root types. We have come to recognize many species of forbs once considered weeds as our most favored forages. With these changes, our soil quality and soil life have increased dramatically.

Manage soils more by disturbing them less. Rather than business as usual, any tillage today is rare and "strategic." However, we do see benefits in using the presence of livestock to "disturb" pastures between long stretches of undisturbed production.

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16th Annual Heart of America Grazing Conference

DR. ALEX MILLER continued...

Where's the Profit in Soil Health? A Producer's Prospective

Keep green plants growing throughout the year to feed the soil. Our efforts to increase diversity have resulted in pastures blending cool season and warm season annuals and perennials, so we are approaching year-round growth. Our biggest challenge is not the summer slump (thanks to extensive Johnson Grass pastures), but rather an early fall slump as we try to stockpile as much fescue as possible while waiting on winter annuals to establish themselves.

Keep the soil covered as much as possible. As we don't row crop, this has been the easiest principle to implement. The key to our cover has been combining raised grazing and mowing heights with the above three principles.

Following this four-part plan has greatly increased organic matter, soil life, water retention, and production.

Reduced Hay

We are implementing a five-year plan to reduce tons of hay fed per animal unit to 1/6 of its former level. We are recovering from what we now call our "inversion;" at our worst, hay production and feeding hay had inadvertently become our central focus instead of focusing on low-cost beef production. We were "hooked on hay." We produced hay all summer long, stressed quantity over quality, went into winter with tremendous hay stores and very little forage in our fields, and fed hay daily for 6 months a year. We now focus on forage production, stockpiling, winter annuals, and buying most of our hay. To date, we have reduced our consumption by nearly 70%, but changes planned for the next two years should reduce consumption per animal unit even further. Our goal is not to be hay-free, but to balance carrying capacity, stockpiling, and winter annuals against hay costs to optimize returns.

Low Input Production

In the past, we have been guilty of working for our cattle rather than employing our cattle to work for us. We bred for feedlot production rather than on-farm efficiency. We had the most extensive (and expensive) herd-health program the vet-supply company salesmen could design. We managed our pastures with extensive use of herbicides and fertilize. In short, we did everything by the book, and it was costing us a fortune to farm! Today, we breed and cull for efficient cows, we have dropped 95% of our former herd-health program, and we use almost no fertilize or herbicides.

Additionally, we use our herd the way we used to use farm equipment: we expect the cattle to mow our pastures, clip our weeds, spread our fertilize, control our parasites, and till our ground. The result has been reduced cost, greatly reduced stress, and the healthiest cattle we have ever produced.

For Miller Family Farms, these three practices represent a paradigm shift, which has greatly improved our farm, our cattle, our profits, and our lifestyle. It has not been simple or mistake-free, but we are fully committed to this new approach to farming, and intend to press on.

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16th Annual Heart of America Grazing Conference

DR. ALAN FRANZLUEBBERS

Foraging for Soil Health

Dr. Alan Franzluebbers
Research Ecologist
USDA Agricultural Research Service
3218 Williams Hall, Box 7619
North Carolina State University Campus
Raleigh, North Carolina 27695-7619
914-515-1973
alan.franzluebbers@ars.usda.gov

Dr. Alan Franzluebbers is a Research Ecologist with the USDA Agricultural Research Service in Raleigh, North Carolina. He serves as USDA Professor in the Department of Crop and Soil Sciences at North Carolina State University.

Research is being conducted on soil ecology and management for development of more sustainable agricultural systems. Alan has investigated forage and grazing management systems throughout his scientific career. From 2001 to 2013, he published a series of research papers on bermudagrass management in the southeastern United States. He investigated the production and environmental impacts of grazing cover crops in mixed crop-livestock systems, as well in tall fescue grazing systems.

He was the editor of a book "Farming with Grass: Achieving Sustainable Mixed Agricultural Landscapes", published in 2009 as an outcome of a special conference sponsored by the Soil and Water Conservation Society. He has led collaborative efforts bridging science and policy by publishing on topics such as "Agricultural exhaust: A reason to invest in soil", "Well-managed grazing systems: A forgotten hero of conservation", "Grass roots of soil carbon sequestration", and "Integrated crop-livestock systems – A way to reach compromise between agricultural production and environmental preservation?" He currently leads a research project on silvopasture management in Goldsboro, North Carolina.

He received B.S. and M.S. degrees from the University of Nebraska and Ph.D. from Texas A&M University.

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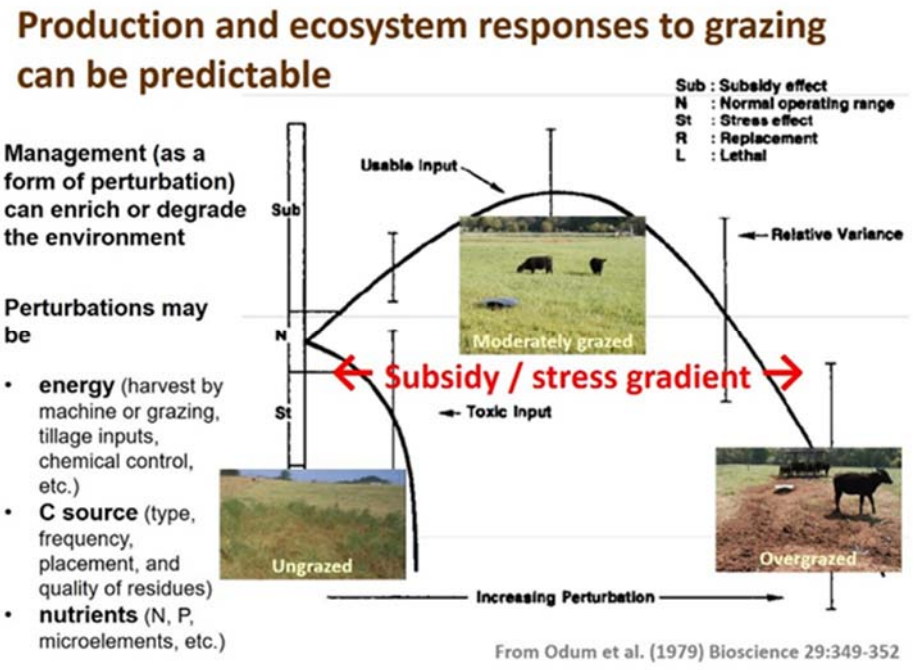
DR. ALAN FRANZLUEBBERS continued...

Foraging for Soil Health

Soil is an essential part of our planet. We may call it dirt, but It cleans our air, it cleans our water, and it cleans our souls – living with Nature close to the soil makes us better people…

The concept of soil health recognizes our important role in fostering human development through land stewardship. Soil health has chemical, physical, and biological components. The focus of soil health evaluation should be on optimizing important functions of soil. Soil functions of key importance include (a) producing plants and food, (b) supplying water, nutrients, and plant-growth promoting compounds, (c) enabling animal habitat, (d) serving as a reservoir of biodiversity, (e) filtering elements, (f) cycling nutrients, (g) storing carbon and nitrogen, (h) protecting water quality, (i) providing physical stability, and (j) buffering against toxic accumulations.

Achieving soil health requires us to know from where we've come and to where we'd like to be.
Important questions are:
Is production reaching desired potential?
Are environmental conditions compromised?
Are roots penetrating soil to adequate depth?
Are nutrients in sufficient quantity and available at the right times?
Is water infiltrating and being appropriately utilized by plants?
Is soil stable and the surface protected?



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16th Annual Heart of America Grazing Conference

DR. ALAN FRANZLUEBBERS continued...

Foraging for Soil Health

Are soil organisms diverse and active?

Perennial pastures offer enormous opportunities to improve soil health through accumulation of soil organic matter and surface litter to feed soil organisms. With proper grazing management, ruminants can be beneficial to soil health and ecosystem resilience. However, as with any system taken to an extreme, excessive grazing leads to stressed plant communities and poor soil health. Cattlemen and land managers have a key role in designing agricultural systems to achieve a balance between productivity and environmental quality. Soil health indicators can help identify where this balance might occur in different regions and landscape settings.

Soil organic carbon was shown to be optimized with moderate grazing pressure of perennial bermudagrass pastures in the southeastern US. Along with this storage of soil organic matter, soil biological activity was enhanced. Soil biological activity is an important process that helps cycle nutrients contained within plant residues, animal manure, and soil organic matter back to growing plants. In an optimized grazing system, the need for external nutrients can be greatly minimized (even for nitrogen), as timely and efficient biological cycling synchronizes with plant growth demands. Temperature and moisture are important for plant growth, and these are the same dominant factors controlling soil microbial activity.

As shown in an evaluation of nitrogen requirements to achieve economically optimum fall-stockpiled tall fescue forage, the level of biological activity in the surface 4" of soil reflects a recent history of grazing management and its impacts on nutrient cycling capability. Soil biological activity is directly related to the ability of soil to convert nitrogen in organic forms (unavailable to plants) to inorganic forms of ammonium- and nitrate-nitrogen (available to plants for uptake). This research was described in *Progressive Forage* (p. 18-20, Issue 9, 1 October 2017).

Soil health can be characterized based on resource concerns and a few key indicators, such as soil organic matter, aggregation, inorganic nutrients, and soil biological activity. Managing residual forage mass is a key visual indicator of importance in grazing lands.

Additional information on "Fostering the Future with Forages: The Case for Pasture-Crop Rotations" can be found in *Better Crops*, Volume 101, Issue 4, Pages 3-5 - http://www.ipni.net/publication/bettercrops.nsf/0/AF247C910D172751852581D00054BCD4/$FILE/BC-2017-4%20p3.pdf

34rd Annual Southwest Missouri Spring Forage Conference
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DR. GARRY LACEFIELD

Gratitude—Keynote Address 2/26/2018

Professor Emeritus
University of Kentucky
832 Hardwood Drive
Bowling Green, Kentucky 42109
270-339-2273, glacefield@uky.edu

Garry is a native of McHenry, Kentucky (Ohio County), and grew up on a crop-livestock farm in the Western Kentucky Coal Field Area. After graduation from Centertown High School, he entered the U.S. Army and served 2.5 years in Germany.

He received his B.S. and M.S. degrees from Western Kentucky University with a major in Agriculture and Biology. He received the Ph.D. degree from the University of Missouri in 1974.

Dr. Lacefield joined the University of Kentucky staff in 1974 as Extension Forage Specialist. He retired from U.K. in March 2015 after a 41-year career. He has authored and co-authored over 300 extension publications, papers, articles, and book chapters. He is co-author of the book "Southern Forages". He developed and was senior author of a monthly newsletter and wrote a monthly column for the Kentucky Cattlemen's Association magazine until his retirement.

Dr. Lacefield has emphasized the team approach in his forage extension program. As evidenced by his list of publications, he has worked harmoniously with other agronomists in a complementary and unified program for the benefit of Kentucky's forage-livestock industry. In addition to working closely with other agronomists, Dr. Lacefield has served in the leadership role in developing programs to meet the ever changing needs of the forage-livestock industry of the state. He organized the Kentucky Alfalfa Conference in 1980 and has served as Chairman each year. The 35th Annual Conference was held in February 2015.

DR. GARRY LACEFIELD continued...

Dr. Lacefield is a member of many professional organizations including ASA, CSSA, CAST and AFGC. He serves on the Advisory Board of the Oregon Tall Fescue Commission, Oregon Clover Commission, Oregon Orchardgrass Commission and Oregon Ryegrass Commission.

He is secretary of the Forage and Grassland Foundation. He received the Merit Certificate, Medallion and President's Award from the American Forage and Grassland Council, Public Service to Forage Award from the Kentucky Forage and Grassland Council and the U.K. Outstanding Extension Specialist award. He is a "Fellow" in the American Society of Agronomy and Crop Science Society of America.

He was selected 1989 Alumnus of the Year by the College of Agriculture, Western Kentucky University. He received the 1991 Alfalfa Extension Award from the Certified Alfalfa Seed Council. In 1992, he received the American Society of Agronomy Agronomic Extension Education Award. He was selected as Progressive Farmer's "1993 Man of the Year in Agriculture". He was inducted into the Western Kentucky University "Hall of Distinguished Alumni" in October 1995. The Certified Alfalfa Seed Council honored him in 2001 with their Distinguished Service Award.

In recognition of his leadership in the Kentucky Alfalfa Program, the Public Service to Alfalfa Award was named in his honor in 2000 by the Kentucky Forage & Grassland Council. Dr. Lacefield was inducted as an Honorary Member of the North American Alfalfa Improvement Conference in 2002 making the third Extension Forage Specialist ever inducted. The CSREES/USDA presented him with the 2008 Regional Award for Excellence in Extension and the 2015 Farm Bureau Communications Award.

Dr. Lacefield serves on a number of state and National boards and committees and is Past President of the American Forage and Grassland Council. Dr. Lacefield has traveled and lectured throughout the United States and abroad. In the last decade, he has traveled and/or lectured in Japan, China, Hong Kong, New Zealand, Australia, Canada, Argentina, Chile, Brazil, Uruguay, South Africa, England, Germany, Mexico, the Czech Republic, South Korea, Turkey, Greece, Panama, Croatia, Slovenia, Hungary, Sweden, Norway, Russia, Poland, and India.

In addition to professional responsibility, he is in demand as a banquet speaker.

Garry is married to the former Cheryl Cavender and has two sons, two daughter-in-laws, two granddaughters, and two grandsons.

DR. GARRY LACEFIELD continued...

Understanding Forage Quality

Profitable livestock production almost always requires a forage program that will supply large quantities of adequate quality, homegrown feed. A major percentage of the feed units for beef (83%) and dairy cattle (61%) come from forages. In addition, forages supply an estimated 91%, 72%, 15% and 99% of the nutrients consumed by sheep and goats, horses, swine, and wildlife, respectively.

Although both quantity and quality are important, it is easier for livestock producers to recognize problems associated with quantity than with quality because quantity can be readily assessed visually; whereas, analysis of a sample is required to determine quality. Fiber, which is less digestible than other components increases with age, so it is not possible to simultaneously maximize quantity and quality from a given pasture or hay/silage field.

WHAT IS QUALITY?

Quality has been defined in many ways, including protein, fiber, lignin content, relative feed value, relative forage quality color, smell, leafiness, fineness of stems, total digestible nutrients, and other physical and/or chemical components. Each of these has merit, but all fall short of clearly defining forage quality. Factors such as average daily gains, conception rates, milk production, wool production, etc. are reliable indicators of quality.

Perhaps the best concise definition of quality is: the extent to which forage (pasture, hay, or silage) has the potential to produce a desired animal response. This definition acknowledges the necessity of considering the animal. As an example, a high producing dairy cow needs higher quality feed than a dry, pregnant beef cow. Animal performance is influenced by a number of factors, including:

Palatability - Will the animals eat it? Animal selection of one forage species over another depends on smell, touch, and taste. Therefore, palatability may be affected by texture, leafiness, fertilization, dung or urine patches, moisture content, pest infestation, or compounds that cause forage to be sweet, sour, or salty. In general, high quality forage is highly palatable and vice versa.

Intake - How much will they eat? Forage must be consumed in adequate quantities to enable animals to perform well. In general, the higher the palatability and forage quality, the more that will be consumed. The poorer forage quality is, the longer it remains in a ruminant animal's digestive system, resulting in lower animal performance.

Digestibility - Of the forage consumed, how much will be digested? Digestibility (the portion of the forage consumed as it passes through an animal's body) varies greatly. Immature, leafy plants may be 80 to 90 percent digested, while mature, stemmy material often has a digestibility below 50 percent.

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DR. GARRY LACEFIELD continued...

Understanding Forage Quality

Nutrient content - Once digested, does the forage provide an adequate level of nutrients? Leafy, growing forage plants usually contain 70 to 90 percent water. Because of this range in water content, for most purposes, it is best to express forage yield and nutrient content on a dry matter basis. Forage dry matter can be divided into two main categories: (1) cell contents (the non-structural part of the plant tissue such as protein, sugar, and starch); and (2) structural components of the cell wall (cellulose, hemicellulose, and lignin).

Anti-quality factors - Depending on the plant species, time of year, environmental conditions, and animal sensitivity, various compounds may be present in forage that can result in reduced animal performance, sickness, or even death. Such compounds include tannins, nitrates, alkaloids, cyanoglycosides, estrogens, and mycotoxins. High quality forages must not contain harmful levels of anti-quality components.

The ultimate test of forage quality is animal performance. Forage quality encompasses its "nutritive quality" (its potential for supplying nutrients), the intake that results when it is made available to animals, and any anti-quality factors present. We cannot separate forage quality from animals because their performance can be influenced by any of a number of factors associated with plants and forage-consuming animals. A failure to give proper consideration to any of these factors may result in a level of performance less than is desired.

WHAT CAN WE DO ABOUT FORAGE QUALITY?
Forage plants, both grasses and legumes, have high quality potential. Our ability to manage all the factors impacting quality will determine how much of this "potential" we can capture and have available for use by our animals or for sale.

Forage quality is influenced by soils and fertility, varieties, other species, pests, growing conditions, season of the year, time of day, stage of maturity, harvesting, handling and storage, and of course weather. All of these factors can have an impact on forage quality regardless of whether we are using it as pasture, hay, or silage.

Although all of the above are important, in general, the most important and the one that will have the greatest impact on forage quality is the "stage of maturity" when harvested. As forage plants advance form the vegetative to reproductive (seed) stage, they become higher in fiber and lignin content, lower in protein, digestibility and acceptability to livestock. For example, delaying harvest from late bud to full bloom (early seed stage) can result in over 45 percent loss in protein. Digestibility can drop by up to 0.5 percent per day and RFV by 5 points per day. Likewise, grazing management can greatly impact pasture quality. Using some form of rotational grazing system can permit using pasture plants in a higher quality (vegetative) stage resulting in better animal performance.

DR. GARRY LACEFIELD continued...

Understanding Forage Quality

WILL IT PAY TO PRODUCE HIGHER QUALITY?
This is an excellent question and one that I would like to say a resounding YES to; however, it's not always that easy and true. To say "it depends" may seem like a very weak answer, but in this case I think it is true. For example, if you are selling by the ton or bale and quality is not a factor, then it will likely not pay you to go the extra mile to achieve the highest quality if overall yield is reduced in the process or stand persistence is compromised. There are some markets where this is the case, but things are changing.

In general, most people are able to market their highest quality hay even during surplus production years. The biggest challenge during these years is how to market the medium and low quality.

With advances in testing and marketing, and with greater awareness of the relationship between quality and animal performance, and with a greater database showing the relationship between quality and price, it appears the answer to the question "Will it pay?" is appearing more positive all the time.

As with hay quality, pasture quality improvement paybacks can be variable since so many variables are involved. Spending money to fertilize, control weeds, add legumes, fencing and watering systems will likely not be profitability if we are grazing dry pregnant beef cows and stocked at one cow per ten acres. If we are grazing high nutrient requiring dairy cows or stockers and stocked at one animal per acre then improving quality and quantity are not only important but necessary for profitability.

SUMMARY
Our challenge is: to establish to get good stands, produce for high yields, graze/harvest for highest quality and market for profit.

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34rd Annual Southwest Missouri Spring Forage Conference
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DR. WILL MCCLAIN

Adapting to Forage Growth Curve

Will McClain, PhD
Assistant Professor, Environmental Plant Science and Natural Resources Unit
William H. Darr College of Agriculture
Missouri State University
207 Karls Hall, 901 South National Avenue
Springfield, Missouri 65897
417-836-5098
WillMcClain@MissouriState.edu

William Edward McClain II (Will) was born 1970 in Little Rock, Arkansas, and grew up in the town of Mount Vernon, Missouri. In 1989, he joined the Army early to help pay for a college education and stayed in the National Guard until 1999.
He attended Missouri State University and received a B.S. in Horticulture/Agronomy before working at a private country club as the head horticulturist and heavy equipment operator for several years. He then returned to Missouri State University and obtained a M.S. in Plant Sciences followed by a couple of years teaching soil and plant science courses in the Agriculture Department. After being convinced by Dr. Anson Elliott to pursue a PhD, he started at the University of Missouri under the advisement of Dr. Dale Blevins. His research projects covered many aspects of tall fescue production including stockpiling, seed production, and nutrient dynamics.

After completing his PhD, he worked as a senior research specialist for Dr. Robert Sharp on a drought project looking at changes in root architecture and depth of several soybean cultivars. Will worked for University of Missouri Extension as Regional Agronomy Specialist from 2007 until 2015. In the fall of 2015, he returned to his alma mater and accepted an Assistant Professor position in the Environmental Plant Science and Natural Resources Department of the William H. Darr College of Agriculture at Missouri State University. Will is married to Julie and has three children – Madison 20, Gwenyth 16, and Cole 13. When not at work, spending time with his family or asleep on the couch, you can usually find Will fishing any one of the great creeks or rivers in south central Missouri.

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DR. GANT MOURER

Gant Mourer
201 K Animal Sciences
Oklahoma State University
405-744-4268, GantM@okstate.edu

Gant Mourer joined the beef extension group at Oklahoma State University the fall of 2012. A native of Carrier, Oklahoma, Gant graduated with a BS degree in 2005 and completed his MS in 2012.

While completing his MS degree, Gant was a herdsman for the Range Cow Research Center, North Range Unit at Oklahoma State University.

Currently, Gant is the Beef Value Enhancement Specialist and specializes in adding value to Oklahoma's cow herd. He is also the coordinator of the Oklahoma Quality Beef Network and OQBN Vac-45 Sales.

Increasing Value of Your Calf Crop

Adding value to our calf crop comes down to a few simple considerations. Just like any item we may purchase, we all want to purchase something that is of high quality. We want to purchase items that perform in an efficient manner, that are durable, last for many years, and perceive a value for the buyer reassuring them that the purchase they made…even though it may have been at a premium…was a great value generating profitability. Cattle are no different.

When we put ourselves in the buyer's shoes, how do we want that animal to perform? What are the factors that increase the value of that calf to the buyer? What is the most valuable trait to us on the ranch? A live calf! This is also the most valuable trait to buyers. For that calf to have any chance for success it must be alive and it must remain healthy. Preconditioning our calf crop sets up those animals for continued success after the point of sale. We are allowing that animal to overcome the most stressful point in that calf's life in an environment in which that animal is immunologically accustomed. We can use a fence line weaning system with high quality nutrition and water while vaccinating in a low stress manner so cattle can have a positive response to the vaccine.

DR. GANT MOURER continued...

Increasing Value of Your Calf Crop

When we have that healthy calf up and ready to go, genetics start to play a big role. Genetics and the type of cattle you have will be the first measure a buyer has as an indicator of quality. Genetic quality to a stocker or feedlot operator means really two things…grow and grade. Can that calf grow efficiently and grade at the plant. Indicators in the sale ring are muscling, frame size, fat cover, and to a lesser extent breed or hide color.

The question always arises of "does preconditioning make money"? Williams and others (2013) indicate that 80 percent of the time a certified Vac-45 verified calf will have a return greater than $0.00 and on average that return is $69.00 a head. For me to evaluate the value of preconditioning it is important to look at two values, the value of gain and cost of gain. A calf that was weaned this fall in October at 550 lbs had a value of $139/cwt or $764/hd. If we put 100 lbs on that animal and look at the price in December the 650 lbs calf had a value of 136.00$/cwt or 884$/hd. The 100 lbs is worth about $1.20/lb. The cost of the 100 lbs on average in a precondition program is about $0.75-0.80/lb. Making us a margin $0.45/lb of gain or $45.00/hd.

The increased value of a well-managed animal in a Vac-45 program during the fall of 2017 was $14.25/cwt (OQBN Data). So, if we are able increase value of our calf crop by $45.00/hd on the gain and add another $92.00/hd on increased value, overall, we added $137.00 hd to our calf crop this fall.

An important point needs to be made about the value of preconditioned cattle. When data is collected on cattle at the time of sale, the comparison for the increased value has always been a calf that has no known history or background. Those "plain" cattle were the base line for value added premium. Recently, that dynamic has changed cattle that are not managed according the minimum of a vac-45 program are receiving a discount. The current normal or average calf is now a Vac-45 managed preconditioned calf.

To increase value, we must have a live calf, good genetics, and a preconditioning program in place to make the most of our calf crop at the time of marketing.

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DAVE PRATT — Keynote Speaker 2/27/2018

Dave Pratt
President
Ranch Management Consultants, Inc.
953 Linden Avenue
Fairfield, California 94533
707-429-2292, pratt@ranchmanagement.com

Dave Pratt is one of the most sought after speakers and respected authorities on sustainable ranching in North America. He's earned a reputation for innovative teaching with a practical edge and has helped hundreds of farmers and ranchers develop and implement strategies to improve their land, strengthen their relationships and increase profit. His programs, which include the Ranching For Profit School and Executive Link, have benefited thousands of families and millions of acres.

Dave's new book, Healthy Land Happy Families and Profitable Businesses has received high acclaim from industry leaders. Joel Salatin said, "This book delivers more meaningful advice in one small space than I've ever seen." Wayne Fahsholtz, former President and CEO of Padlock Ranch advised, "If you are serious about wanting your ranch to be successful/sustainable, then this is an important read." Stan Parsons called it, "…the best book ever written about ranching anywhere."

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DAVE PRATT

Hard Work and Harmony
Effective Relationships in Family Businesses

Tom Watson, the founder of IBM, once said, "I realized that for IBM to become a great company it would have to act like a great company long before it ever became one." You may think that there's no comparison between IBM and your ranch. After all, IBM is more than a great company. It is a great BIG company! But any ranch that makes a consistent profit, improves the health of the land, creates or continues family traditions, builds financial security and creates opportunities for the next generation is a great business too. If you want to have a great ranch business, you have to act like it is a great business before it ever becomes one.

There are actually more similarities than differences between a successful farm or ranch business and IBM. IBM has to produce something and watch their costs. So do you. IBM has to market products in a competitive marketplace where consumers have lots of buying options. You do too. IBM has to manage money. You have cash flow and capital availability issues too. People problems? Both you and Big Blue have plenty of them.

There is one difference between your business and IBM. IBM has an HR department dedicated to managing the people issues. Most farmers and ranchers do their best to avoid these issues.

There is another difference between most farms and ranches and IBM. Our people problems are more important and more complicated than IBM. Our people problems often involve family. IBM's don't. How are you supposed to hold your kid, parent, sibling or spouse accountable in the business without having a food-fight at the dinner table? It's one thing to fire a non-family employee, but what are the repercussions of firing your kid, your parent, your spouse or your sibling?

In the Hard Work and Harmony workshop we will explore the essential elements of building healthy and effective working relationships in family businesses. One essential feature is establishing boundaries.

Business is Business and Family is Family
In a healthy family business there is a clear line separating business and family. In other words, business is business and family is family. But in most family businesses the line between work and family gets blurred. Am I talking to my parent or the CEO? My daughter or my employee? In ranching, where most of us live inside our businesses, the line may be non-existent. When we are at home, we are at work and when we are at work we are still at home.

DAVE PRATT continued...

Hard Work and Harmony
Effective Relationships in Family Businesses

This boundary between work and life is important. Without it, what we do becomes who we are. If what we do is who we are, who are we when we stop doing? How do we make the transition to the next generation? It often happens over Dad's dead body, literally. Without the line between work and life, how do we hold family members accountable in the business without having a food fight at the dinner table? (Or is it the board room?)

The line between family and business becomes sharper when we hold regular WOTB (Working On The Business) meetings. WOTB meetings focus on the important issues facing the business. They provide an effective forum for having business discussions and making strategic and tactical decisions.

We recommend that Ranching For Profit School graduates hold a WOTB meeting every month. They use these sessions to create their drought plan, establish employee policies for their ranch, develop their succession plan, make decisions on expansion, and tackle other issues important to the success of the business.

Our alumni tell us that the results they get from holding regular WOTB meetings are powerful. They also tell us that actually holding the meetings is a hard habit to get into. On a family ranch it is easy to distract ourselves with WITB (working in the business).

Sometimes alumni tell me with a little shame, "We need to hold more WOTB meetings." They are usually surprised when I ask, "Why?" After a moment's pause they usually say something like, "I thought you said we should." But the point isn't to hold a meeting. The point is to create a marketing plan, assess the potential of a new enterprise, devise a risk management strategy, and do a dozen other things that every business needs to do. The WOTB meeting is just the vehicle through which we produce these results. By focusing on the results we need, the incentive to hold WOTB meetings goes up and the tendency to become distracted with WITB goes away.

It is probably unrealistic to keep business-related discussions out of the bedroom and away from the dinner table. If you are lying in bed staring at the ceiling in a cold sweat at 2:00 AM worrying about your cash flow, you need to be able to express those concerns. But that's WATB (Worrying About The Business) not WOTB. If you had held some effective WOTB meetings you'd probably be sleeping at 2 AM.

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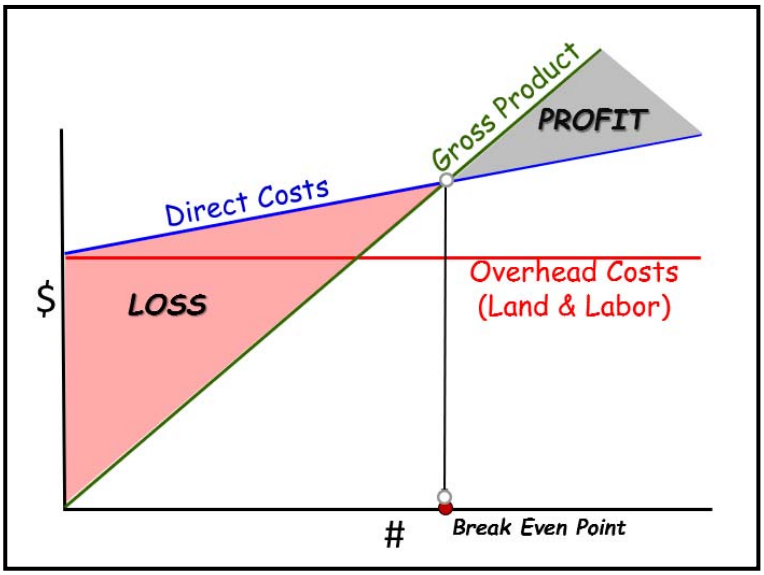
DAVE PRATT

The Three Secrets for Increasing Profit

There are only three choices in any business: 1. We can make it profitable; 2. We can subsidize the business; or, 3. We can go out of business (bankruptcy). Whether we realize it or not, most of us choose the second option, we subsidize our businesses. I'm not speaking about government subsidies, but rather the ways in which we subsidize ourselves. Living off inherited wealth and appreciating land values, relying on off-farm income to make ends meet and working for less than it would cost to replace yourself are all ways in which we subsidize our ranches.

I'll assume that most ranchers would rather not have to subsidize their ranches and would prefer to make profit. There are only three ways to increase profit. At Ranch Management Consultants we call them the three secrets. They are:

Reduce Overhead Costs
Improve Gross Margin Per Unit
Increase Turnover



Reduce Overhead Costs

Overhead costs are those costs that don't change much as livestock numbers change. There are two types of overheads: land and labor costs. Any costs related to land (e.g. fencing or water trough repairs, property taxes, leases, etc.) are overheads. Likewise, any costs related to labor (e.g. salaries and benefits, vehicles and equipment costs, etc.) are labor overheads. Economists sometimes call these fixed costs. But they are not fixed, they can be changed, and that is one of the three secrets for increasing profit.

Improve Gross Margin Per Unit

Gross margin is a measure of the economic efficiency of your livestock. It is calculated by subtracting the *direct costs* of production from *gross product*. Direct costs are those costs that increase or decrease as cow numbers increase or decrease. Direct costs include feed, health, freight, marketing commissions, and interest on livestock loans. Gross product refers to the gross value of production. This includes livestock sales minus purchases. It also includes changes in the value of your herd. Total gross margin is divided by the number of animals in the herd to calculate gross margin per unit. Increasing gross margin per unit (the efficiency of production) is another way to increase profit.

DAVE PRATT continued...

The Three Secrets for Increasing Profit

Increase Turnover

In ranching, "turnover" is the number of animal units carried. If gross margin is positive, increasing turnover will increase profit if it doesn't increase land or labor costs or damage the resource base. However, there is no point in increasing the number of units if each unit makes a negative contribution toward overhead costs.

The question is which of the "three secrets" is *the* secret to increasing profit in your business. The diagram below shows the thought process we teach people at the Ranching for Profit School to diagnose the problems and opportunities in their businesses. Let's take a closer look.

We calculate profit by adding the gross margin for each enterprise and subtracting overheads. If the difference is positive the business made profit. If it is negative the business lost money.

Gross Margin (enterprise a)
+ Gross Margin (enterprise b)
+ Gross Margin (enterprise z)
- Overhead Costs

Profit (Loss)

Profit is calculated by subtracting overhead costs from gross margin. So if profit is low it is either because gross margin is too low or overheads are too high.

Gross margin is calculated by subtracting direct costs from gross product, so if gross margin is too low, it is either because direct costs are too high or gross product is too low.
Gross product is a measure of how much we produced and how much we got paid for it, so if gross product is too low it is either because we didn't produce enough (production), or we didn't get paid enough for what we produced (price).

If we didn't get paid enough it is either because the market is too low or our marketing is not adequate.

If the gross product is low but the price is reasonable, then production is too low. If production is low it is either because we didn't produce enough things (reproduction) or because the things we produced weren't big enough (gain).

If gross margin is low, but gross product is not the problem, then the focus turns to direct costs. There are only two major direct costs: feed costs and health related costs.

DAVE PRATT continued...

The Three Secrets for Increasing Profit

If gross margin is healthy but the business still isn't profitable, the problem may lie in the overhead cost category. There are only two kinds of overheads: land costs and labor costs.

There are only two kinds of land costs: the cost of getting land (e.g. lease payments) and the cost of maintaining the land and the improvements on it.

If land costs aren't the problem, the focus turns to labor. There are two major labor costs: costs associated with people (e.g. salaries, retirement plans, health benefits, etc.) and costs related to vehicles and other equipment.

But we also know that cutting overheads and improving gross margins aren't the only ways to increase profit. Increasing turnover is the third way to increase profit. If gross margins are healthy and there's no room left to cut overheads, then turnover is probably the most promising way to increase profit. At the Ranching for Profit School, participants review a case study of an actual ranch business in dire economic condition. When asked for solutions on the first day students come up with a shot gun array of possibilities. After using this thought process to guide them they discover the source of the problem and find that some of their original solutions would have actually made matters worse.

The three secrets can help you pin point problems and opportunities in your business. And that's essential if you want to be Ranching For Profit.

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TIM SCHNAKENBERG

Chemical Weed Control in Pastures

Tim Schnakenberg
University of Missouri Extension
Agronomy Specialist
Stone County Extension Center
PO Box 345, Galena, MO 65656
417-357-6812
SchnakenbergC@missouri.edu

Tim Schnakenberg serves as University of Missouri Extension regional agronomy specialist based in Stone County. He is one of three agronomy specialists serving the southwest region of Missouri.

He has worked as an agronomy specialist since 1991 and currently focuses on pasture and hay management, crop production, pest management, pesticide training, soil fertility and soil conservation.

Ongoing educational efforts include Livestock and Forage Conferences, an annual Dairy Day, regional hay production schools, regional grazing schools, farm tours, on-farm demonstrations and pesticide applicator training.

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DR. JASON SALCHOW

Conditioning Cows for Pregnancy

Dr. Jason Salchow
Producer/Veterinarian
Billings, Missouri 65610
417-880-5050

Dr. Jason Salchow grew up on beef farm in Christian County, Missouri. He earned an Animal Science degree from Southwest Missouri State University in 1996. He then graduated from the University of Missouri, College of Veterinary Medicine in 2001. After graduation, he returned home to work in a mixed animal practice and to establish a grass farm.

His start in custom grazing was in 2001 with contract dairy replacement heifers. In the fall of 2003, he left mixed animal practice to devote more time to his family and to develop several agriculture enterprises. Jason also teaches the Veterinary Science course at Missouri State University, and facilitates a hands-on lab for Animal Science students at Barry County Regional Stockyards.

His family uses various grazing systems on owned and leased ground to be very flexible with class of livestock and seasonality. Recently, most custom grazing has been on stocker calves, replacement heifers, and forage developed breeding bulls. Their goal is to continue to improve the soil and forages the Lord has given them to steward and to develop and cultivate relationships with livestock owners and investors.

His wife Sharon tries to keep Jared (17), Jenna (14), Josie (11), Jeremiah (4), Jonathan (3), and the entire operation held together to the best of her ability.

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DR. TWAIN BUTLER

Dr. Twain Butler
Noble Research Institute
2510 Sam Noble Parkway
Ardmore, Oklahoma 73401
580-224-6850, tjbutler@noble.org

Twain Butler is a Professor and Research Agronomist at the Noble Research Institute. Dr. Butler received B.S. degree from Texas Tech University, M.S. degrees from Oklahoma State University, and Ph.D. degree from Texas A&M University.

Dr. Butler's program focuses mainly on forage establishment, management, and production that leads to improved cultivars and practices for producers in the southern Great Plains. His research evaluates forage establishment, grazing management, and production economics of alfalfa, tall fescue, small grains and bermudagrass systems.

Butler has authored or co-authored 66 refereed journal articles, 72 abstracts, 16 reviewed proceeding papers, 8 extension publications, 1 grower guide, 3 book chapters, and one patent application.

He has served as an associate editor for Agronomy Journal and Crop Science, and has been active in the ASA and CSSA societies. Butler has numerous invitations to present research at national and international conferences.

Grazing Alfalfa Systems in the Southern Great Plains

Introduction

Alfalfa is a perennial legume that can fix its own nitrogen in association with rhizobia bacteria. It has very high nutritional value, and due to the development of grazing type alfalfas, it is considered to have tremendous forage potential, however its use as a grazing crop has been limited. Therefore, we have evaluated grazing tolerant alfalfa cultivars under various systems. We evaluated various methods to establish alfalfa in perennial grass systems (tall fescue and bermudagrass) prior to evaluating the production of the optimal system.

DR. TWAIN BUTLER continued...

Grazing Alfalfa Systems in the Southern Great Plains

Establishment

Alfalfa-tall fescue: A series of experiments evaluated establishment methods and persistence of alfalfa (Bulldog 505) and both summer-active (Texoma Max Q II) and summer-dormant (Flecha) tall fescue types (Butler et al., 2011). Successful establishment (based on seedling counts) occurred with all treatments, however mixing seed in the same drill row resulted in one species dominating the stand (usually alfalfa). Planting perpendicular rows also resulted in dominance of alfalfa (although to a lesser extent). Planting in alternating drill rows resulted in successful establishment of both species, however in the second season, cattle preferentially grazed down the row of alfalfa avoiding the tall fescue. Planting in a combination of alternating and perpendicular method referred to a checkerboard matrix, resulted in successful establishment and persistence of both species (3 years). Therefore the checkerboard method is the preferred and recommended method in our environment.

Alfalfa-Bermudagrass: An experiment was conducted at the Red River Farm in the 2013-14 and 2014-15 seasons (unpublished data). Main plot consisted of three planting dates (Sept 15, Oct 15, and Feb 15), sub-plot consisted of three seedbed preparation methods (haying, tillage, and haying plus glyphosate), and sub-subplot consisted of various fungicide and insecticide seed treatments. Establishment (seedling counts 30 DAE) was successful with all treatments, however seedlings in the Feb planting dates and Hay only seedbed preparation sub-treatment did not survive or contributed very little to DM yield. Glyphosate in October was inconsistent: in year one, alfalfa production was equal to tillage, however in year two, early frost negated the effect of the glyphosate and bermudagrass outcompeted the alfalfa. Although both tillage and glyphosate seedbed treatments were similar in September, we recommend glyphosate due to ease of application compared to tillage. Although we did not observe any specific insect damage, the cruiser insecticide either alone or in combination consistently provided the greatest number of seedlings and alfalfa DM production.

Production

Alfalfa monoculture: Over 3-year average, steers grazing monoculture stands of alfalfa gained 2.05 lb per day and grazed 204 days per acre, which resulted in total gain of 420 lb per acre. Full economic analysis accounted for all input costs (seed, chemical, fertilizer, custom rates for tillage and planting) and output revenue based on total gain and the value of gain (Butler et al., 2012). Alfalfa stands only lasted three years in this experiment due to loss form Cotton Root Rot. Amortized on three year stand-life, grazing alfalfa was profitable ($127 per acre) and similar to rye/ryegrass graze out system (Butler et al., 2012), however net returns were not as great compared to an enterprise budget of alfalfa produced and sold for hay. It is unlikely that producers in the southern great plains will utilize alfalfa as a grazing crop, since the dry environment allows for successful hay production; However in more humid, high rainfall areas where it is difficult to put up high quality hay, grazing alfalfa could be an option.

DR. TWAIN BUTLER continued...

Grazing Alfalfa Systems in the Southern Great Plains

Alfalfa-tall fescue: Mixtures of alfalfa-tall fescue were established using the checker-board alternating and perpendicular row orientation (described earlier) during the 2013-14 season, which were then compared to a tall fescue plus 100 lb N per acre system and a wheat plus 100 lb N per acre graze out system. Averaged across four seasons (2013-17), the annual wheat-N and the alfalfa-tall fescue mixture had the greatest average daily gain (2.18 and 2.11 lb per day, respectively) followed by the tall fescue-N (1.69 lb per day ADG). Total gain was greatest in the wheat-N system (400 lb live weight gain per acre) followed by the tall fescue- N (350 lb live weight gain per acre) and the tall fescue-alfalfa mixture (340 lb live weight gain per acre). These preliminary results suggest that alfalfa could be substituted for N fertilizer in tall fescue systems, if alfalfa persistence is long enough to account for the establishment costs. Net returns have not been calculated yet, since the alfalfa died and these systems had to be replanted after the 2015 flood of tropical storm Bill, which dropped 12 inches of rain in 12 hours. This was considered to be greater than a 100 year flood event and is not likely to occur again anytime soon. This experiment (second planting) will continue for the complete alfalfa stand life, before economic analysis in conducted. We will also determine the minimum stand-life needed before alfalfa is economically viable as a grazing crop, which will give guidance to the alfalfa plant breeding program.

Alfalfa-bermudagrass: Interseeding alfalfa into established bermudagrass pastures can increase nutritive value and seasonal forage distribution as well as contribute to the nitrogen needs of bermudagrass. The objective of this study is to evaluate stocking rate, forage allowance, grazing days ac^{-1}, and animal performance of bermudagrass grazing systems in Ardmore, OK. Forage treatments are 1) monoculture bermudagrass with 0 lb N, 2) monoculture bermudagrass with 0 lb N and protein supplement (0.5% BW) 3) monoculture bermudagrass with 100 lb N per acre, 4) monoculture bermudagrass with 100 lb N per acre and protein supplement (0.5% BW), and 5) bermudagrass interseeded with 800RR alfalfa in September following hay removal and 1 lb ai glyphosate per acre. All treatments have a continuous (2.0 ac) and rotationally (4.0 ac) stocked (with 21 day rest period) component with three replications in a completely randomized design. Continuously and rotationally stocked paddocks generally did not differ in grazing days, average daily, and total live weight gain per acre, therefore data is pooled across years (random) and stocking method. Greatest average daily gain occurred with both supplementation treatments (0.97 lb per day) and alfalfa interseeded into bermudagrass (0.90 lb per day), however, greatest total live weight gain (332 lb per acre) occurred with the bermudagrass + 100 N per acre plus 0.5% BW supplementation treatment. A full economic analysis will be conducted after the third season is completed, however preliminary results based on two years of data, suggest the bermudagrass with protein/energy supplement at 0.5% BW provided the lowest value of gain when compared to the control of no N fertilizer and no feed supplement.

DR. TWAIN BUTLER continued...

Grazing Alfalfa Systems in the Southern Great Plains

Summary and Conclusion

Alfalfa does have potential to be utilized as a grazing forage crop, however due to the limited persistence under grazing (3 year stand life), it has not compared favorably to other alternatives. In order for it to be successful, the seed price must come down or the length of stand life must be increased substantially. Current efforts in alfalfa breeding are addressing the persistence issues, with the hope of developing a cultivar that will persist for five years under grazing.

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DR. MICHAEL BURTON
TERRY HALLERAN
DR. WILL MCCLAIN

Non-Chemical Weed Management, Strategic Grazing, and Other Options

Dr. Michael Burton
Associate Professor, William H. Darr College of Agriculture
Missouri State University
901 South National Avenue, Springfield, Missouri 65804
417-836-5085, MikeBurton@MissouriState.edu

Terry Halleran
Agronomy Specialist, University of Missouri Extension
203 Cedar Street, Hermitage, Missouri 65668
417-745-6767, halleranw@missouri.edu

Dr. Will McClain
Assistant Professor, William H. Darr College of Agriculture
Missouri State University
207 Karls Hall, 901 South National Avenue, Springfield, Missouri 65897
417-836-5098, WillMcClain@MissouriState.edu

DR. MICHAEL BURTON
TERRY HALLERAN
DR. WILL MCCLAIN

Dr. Mike Burton
Professor, William H. Darr School of Agriculture
Missouri State University

Dr. Mike Burton is Professor in the W.H. Darr School of Agriculture at Missouri State University where he teaches courses in the Plant Science/Natural Resources Unit. His teaching and research interests are in agronomy and ecology and his courses currently include Forages, Grains, Soil Conservation, Weed Science, and Sustainable Agriculture. Mike and his wife Susan live near Turners, Missouri, have three grown children with an average finishing weight of 155 lbs.

Terry Halleran
Agronomy Specialist
University of Missouri Extension

Terry / Mr. Halleran owns and operates a small cow calf operation in Southwest Missouri while currently serving as the Agronomy Specialist for MU Extension located in Hermitage, Missouri. He is a retired High School Agriculture Education / FFA Advisor of 32 years while also teaching assorted college courses at MU, MSU, and OTC throughout his career. He also taught two years at Crowder College in Neosho, Missouri, as the Agronomy Instructor as well. His agricultural experiences include raising beef cattle, custom combining fescue seed, square bale hay hauling, and large-scale farrow to finish swine operation in his younger years. One of his main goals in life is to make sure his grandchildren get an opportunity to experience the traditional ways of true agricultural life. One of his most common comments is, "Computers and cell phones are great tools but they can't do the work. So stop relying on the machine and learn how to get it done."

Dr. Will McClain (see full biography on page 36)
Assistant Professor, William H. Darr College of Agriculture
Missouri State University

Will worked for University of Missouri Extension as Regional Agronomy Specialist from 2007 until 2015. In the fall of 2015, he returned to his alma mater and accepted an Assistant Professor position in the Environmental Plant Science and Natural Resources Department of the William H. Darr College of Agriculture at Missouri State University. Will is married to Julie and has three children – Madison 20, Gwenyth 16, and Cole 13. When not at work, spending time with his family or asleep on the couch, you can usually find Will fishing any one of the great creeks or rivers in south central Missouri.

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DR. MICHAEL BURTON
TERRY HALLERAN
DR. WILL MCCLAIN

Non-Chemical Weed Management, Strategic Grazing, and Other Options

Most forage managers in southwest Missouri and the surrounding region can recognize at least part of their problems in terms of weed pests. Musk thistle, dogfennel, broomsedge and johnsongrass are easily identified as problems by livestock producers when these weeds quickly invade a stressed pasture, slowly come to dominate a hayfield, are the only plants left standing after grazing, or result in a dead animal after an early fall frost. In other cases, weeds can provide acceptable forage or even desirable habitat for wildlife where wildlife conservation is among the producer's goals.

The concept of integrated weed management has advocated that managers use many different tactics to reduce selection for resistance within a population of weeds. Many other factors (e.g. environmental, ecological, economic, social media, or market incentives) can also cause managers to favor one class of tactics over others. Here we present some of the most effective non-chemical weed management tactics and strategies for some of the most commonly encountered weed problems.

Know your goals and your enemies

There are likely several species within the sea of green in your fields. Depending on your goals, some of the species that would be considered enemies of producers of hay for sale (johnsongrass, blackberry, etc.) might be considered useful as cheap feed or bedding for on-farm (johnsongrass; note that sale of hay containing johnsongrass is prohibited in Missouri), or wildlife escape habitat (blackberry) for Northern bobwhite quail. Persons managing for dual purposes (e.g. cattle and wildlife) will perceive and manage the same weeds differently than someone managing for top-dollar, high-quality hay for sale to equine enthusiasts. Some weeds are decent forage. For example, crabgrass species, yellow foxtail, and fall panicum can have protein and digestibility levels that are as good as (or better than) tall fescue. Recognizing the limitations and life-cycles of the weeds might allow your livestock (or wildlife populations) to gain valuable forage (or seeds) in the proper time. Being able to identify individual species within the sea of green is a valuable trade skill for forage producers, and many inexpensive identification aids are available (e.g. buy MU Extension Publication M169 and a magnifying glass – you might be surprised how easy it is once you can see the right features). Additionally, knowing life-cycle characteristics (such as whether a species is an annual, perennial, or biennial), palatability or toxicity, and growth patterns will aid you in making management decisions.

DR. MICHAEL BURTON continued...
TERRY HALLERAN
DR. WILL MCCLAIN

Non-Chemical Weed Management, Strategic Grazing, and Other Options

Although this presentation is about non-chemical weed management, candor requires us to point out that some noxious weeds are difficult to eliminate -- even with herbicide. For example, Carolina horsenettle and johnsongrass have extensive, horizontal, below-ground stems (rhizomes) that make these species more difficult to kill. Some claim that close-mowing or continuous grazing by cattle will control johnsongrass, but we have all seen this species persist in close-cut Roundup Ready alfalfa, and even frequently mowed yards. Remember that prior to the advent of systemic herbicides, our ancestors sometimes *abandoned* crop fields because of noxious weeds. Please recognize that some weed species (e.g. Carolina horsenettle) are extremely difficult to manage without herbicides. Sometimes an herbicide really is the best choice. Where intractable, noxious species are present, we recommend selecting and applying an effective herbicide according to label instructions in addition to using non-chemical tactics.

<u>Cultural and mechanical methods</u>

Historically, weed scientists have recognized the need to use a variety of methods for weed management. Ideally, use of many different methods will inhibit the development of resistance to any single tactic. Tactics have generally been grouped into Biological, Chemical, Cultural and Mechanical methods. Biological methods are usually employed on a regional, rather than an on-farm, basis, and Chemical methods are discussed in a separate presentation. Here, we focus on Cultural and Mechanical methods of weed management. Cultural methods focus on soil fertility and forage management, whereas Mechanical methods focus on injury to the offending weed by mowing or burning. Both Cultural and Mechanical methods will be most effective when the tactics are well-timed.

Cultural methods give the advantage to the desired crop species through soil fertility; grazing intensity, frequency, and animal species; and prevention of the introduction of weeds. Each of these aspects has potentially powerful effects on some – but not all – weed species. These tactics become increasingly powerful when used in combination with other tactics.

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DR. MICHAEL BURTON continued...
TERRY HALLERAN
DR. WILL MCCLAIN

Non-Chemical Weed Management, Strategic Grazing, and Other Options

Soil fertility can be powerful as an integrated weed management tactic. Essentially, you confer the advantage to the desired crop species by adjusting soil pH or fertility levels to optimum levels for crops, rather than levels that are only well-tolerated by weed species. The classic weed example is broomsedge. How many times have you heard someone oversimplify the solution to the problem of broomsedge? "That guy needs to lime his field. Problem solved." Sadly, the broomsedge problem might not go away when the soil is limed to an acceptable pH, especially if phosphorus soil test level is also low and it has dominated a field to the exclusion of other grasses. Optimizing the soil conditions might *still* not be enough if competitive desirable plants are not present to compete. We recommend a four part approach: 1) conduct a proper soil test, 2) lime and fertilize according to recommendations (so clovers will have a fighting chance), 3) graze the infested pasture aggressively as broomsedge begins to elongate (while tissues are still tender), and 4) seed the area with desired species at the recommended time. Some managers might see improvement by doing part 2 or part 3 alone, but almost everyone can improve forage quality by completing all four parts. With these steps you can make an informed decision, create a suitable environment for the desired species, injure and stress the perennial weed, and provide a seed source of the desired species (e.g. novel-endophyte tall fescue and ladino clover). Parts 3 and 4 are often ignored or forgotten. Don't count on getting something from nothing!

Grazing management can also have a strong effect on the increase and decrease of weed species. Overgrazing, or a combination of drought and overgrazing, gave many producers in our region an added challenge when musk thistle and buckhorn plantain opportunistically filled gaps left in the forage canopy after the drought of 2012. Stress from drought and/or overgrazing resulted in the death of plants and the loss of some grass cover. Maintaining grass cover does more than protect soil to reduce runoff and erosion, grass cover is also a barrier to opportunistic weeds. Musk thistle (biennial), dogfennel (perennial) and other wind-dispersed weeds often emerge in larger numbers after exposed soil provides an opening for germination and emergence in pastures. Musk thistle can be injured by repeatedly mowing at the first sign of flowers (don't wait for the flowers to turn purple!). Two or more timely mowing events, or destruction of the crown by digging with a spade, will drastically reduce seed production or kill this biennial. Bag and burn flowers if they have opened. If the forage canopy has sufficiently regrown, subsequent populations will be much smaller the following year. In this way, diesel fuel, steel and sweat (i.e. mowing and chopping) substitute for spot-spraying with a systemic herbicide.

DR. MICHAEL BURTON continued...
TERRY HALLERAN
DR. WILL MCCLAIN

Non-Chemical Weed Management, Strategic Grazing, and Other Options

Grazing intensity can also be used to harvest weeds as forage. Care must be taken, however, so that livestock is not restricted to areas containing toxic weeds (recall the early suggestion to "know your goals and your enemy"). For example, animal illness or death could result if you employ attempt high-density grazing and constrain the animals to an area infested with poison hemlock (biennial) in springtime or perilla mint (annual) in fall, which are normally avoided by animals grazing at low stock density. Where toxic weeds are few and high-density grazing is practiced, weeds become forage! Weeds that are often avoided by cattle when other choices are available (wild carrot (biennial), ironweed (perennial), etc.) are quickly consumed before the neighboring animal eats it – those of us that come from large families can relate: eat what's in front of you without complaint! When high-density grazing is timed to occur before flowering, seed production and subsequent weed populations can be reduced. Many of the non-toxic weeds that are avoided by livestock at lower stock densities are surprisingly nutritious. Work by Dr. Fred Provenza and Kathy Voth has demonstrated that livestock can be effectively "conditioned" to consume weeds (even weeds they normally avoid at lower stock density; see: http://www.livestockforlandscapes.com/cowmanagers.htm). Stock density and conditioning (just like Pavlov's dogs) are powerful tools that can be harnessed to modify the weed consuming behavior of livestock.

Rotational grazing frequency and multi-species grazing are also important tools for the management of thorny species such as blackberry (perennial) and multiflora rose (perennial). Dr. Jean-Marie Luginbuhl (NCSU) documented over 92 to 100% death of canes of thorny species, as well as an increase in % grass cover, when cattle+goats or goats (alone) were used to defoliate the species. In another study, using cattle alone in similar paddocks resulted in an increase in multiflora rose, while cows+goats nearly eradicated multiflora rose over a few years' time. Black locust, sumac, oak, blackberry, and multiflora rose are all targeted by goats. While cattle and horses select browse (tree and shrub species) less than 10% of total, sheep consume 10-20% and goats consume 40-60% browse. Multi-species grazing can solve, or keep in check, many common woody weed species. Keeping the goats behind your fence (and dogs/coyotes out) of your fence is a separate issue! (Note that many meat goat producers in our region successfully contain goats using two-strand electrified wire.) Some will rightly argue that goats could be considered a Biological agent for weed management, but we include them as an effective tool within grazing management.

DR. MICHAEL BURTON continued...
TERRY HALLERAN
DR. WILL MCCLAIN

Non-Chemical Weed Management, Strategic Grazing, and Other Options

Cultural methods also include preventing the introduction (or re-introduction) of undesirable species. Earlier we discussed wind-dispersed species, for which there is no perfect prevention. Wind generally does not respect property lines and barbed wire. Working with good neighbors to keep field edges and ditches free of troublesome weeds in a coordinated manner can help to reduce these problems. Even more effective is prudent management of hay on the farm and careful inspection of purchased hay, which might harbor weed seeds or rhizomes that can propagate problems. If you made hay in a field with weeds, feed it in the same fields from which you harvested so you don't spread the problem species to other fields. Unroll hay in areas where soil is thin or compacted to improve soil quality over time, and return it to the same field from which it was harvested so you don't export weed seeds and soil mineral nutrients. Broomsedge, johnsongrass and thistles are easily recognizable in hay. So, inspect and reject hay that contains weeds you know will be a source of problems later – cheap hay might cost you more later.

Remember that digestion in livestock often requires days from ingestion to excretion. This is plenty of time for animals imported from other farms (even from other states) to deposit manure containing new weed problems in your pastures. Manure purchased and applied to fields often contains live weed seeds, so it's also perfectly reasonable to quarantine animals for a few days to allow weedy hitchhikers to pass out of the animal.

Mowing or burning can be used over time to reduce the spread of some weed species. A well-controlled fire or well-timed mowing events can reduce the resources available to weeds and destroy woody above ground growth (e.g. multiflora rose and buckbrush/coralberry). Note that fire could be used in most any season, provided that environmental conditions and careful safety preparations have been made. Planning fire management to occur during periods when desirable forage species can rapidly regrow is best. Mowing before flowering (and NOT mowing when fruit are present) can reduce seed production and dispersal. For example, we advise against mowing buckbrush in the fall when it is fruiting since this would simply spread the seeds. Among tree species, Eastern red cedar is alternatively considered a nuisance or a valuable source of shade or wind-breaks. A good, hot fire can be effective in destroying cedars and multiflora rose provided that there is sufficient grass fuel at the base of the tree to damage the thin bark. Where you want to stop the spread, but not eliminate all Eastern red cedar, you can also take advantage of their biology. Like mulberry, Eastern red cedar trees are either male or female, but not both. Reduce the spread of this species on your farm by noting and marking which trees are females. Then cut down the female cedars to prevent future seed production and local bird dispersal.

DR. MICHAEL BURTON continued...
TERRY HALLERAN
DR. WILL MCCLAIN

Non-Chemical Weed Management, Strategic Grazing, and Other Options

An awareness of the characteristics of the species we manage is valuable information. Some knowledge of the biology and the cause and effect of the tactic and its timing can increase success in forage weed management and minimize the need for synthetic herbicides. Plant ID skills, along with cultural and mechanical tactics (used in combination), can be powerful tools to maintain or increase productivity, prevent injury or illness, and better meet the goals of the producer for both livestock and wildlife.

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DR. ERIC BAILEY

Dr. Eric Bailey
University of Missouri
920 East Campus Loop
Columbia, Missouri 65211
573-289-3111
BaileyEric@missouri.edu

Dr. Bailey is the State Extension Beef Nutrition Specialist at the University of Missouri. He joined the University of Missouri in June 2017 after a stint as the Endowed Chair of Cow Calf Nutrition and Management at West Texas A&M University.

He was born and raised on a commercial cow-calf and stocker operation outside of Santa Rosa, Mexico. He has degrees from West Texas A&M University and Kansas State University.

Research interests include ranch-of-origin preconditioning programs and nutrient supplementation for cattle grazing low-quality forages. Extension programming interests include strategies to reduce reliance on purchased and raised feedstuffs, as feed costs often are the largest component of an annual operating budget for cow-calf production.

Mineral Supplementation for Beef Cows

Introduction

Mineral supplements formulated for beef cattle are intended to augment their diet, much like multivitamins for people. Beef producers exert significant effort to discover the "best" mineral supplement for their cowherd without consideration of the "background" mineral content of the diet; that is the mineral content of individual feeds that make up the diet. Cattle require different levels of minerals, depending on age, size, sex, physiological state, and level of performance. The purpose of this presentation is to identify likely limiting minerals in a fescue-based beef cattle production system, along with discussing the author's philosophy on mineral supplementation and where mineral supplements fit into a beef cow's operating budget.

DR. ERIC BAILEY continued...

Mineral Supplementation for Beef Cows

Mineral Philosophy

"Do not measure with an axe and cut with a micrometer" – Dr. Tim Steffens

The quote above is from a former colleague and is fitting in this scenario. One of the fundamental challenges of forage-based livestock nutrition is the lack of ability to measure how much feed cattle consume daily while grazing. There are general rules of thumb about the amount of forage grazing cattle consume, but the nutrient content of the grazed forage fluctuates based on a number of factors; leaf:stem ratio of grazed forage, time of the year, stocking rate (forage availability). In addition, mineral requirements of domestic livestock are poorly defined; we know the dosage each mineral required to prevent clinical symptoms of deficiency and the dosage of each mineral that causes clinical symptoms of toxicity.

Scientists have evaluated mineral levels in beef cattle diets for decades and the data are clear as mud; some experiments demonstrate a clear benefit to additional mineral supplements above currently known cattle requirements and others show no (or even a negative) benefit to mineral supplements. There are 17 minerals listed with a requirement by the Nutrient Requirements for Beef Cattle, a publication from the National Academies of Science, Engineering and Medicine that serves as the "gold-standard" for evidence-based diet formulation. Unfortunately, there are exponentially more than 17 antagonisms among the various minerals, where increasing the amount of one mineral in the diet reduces the availability (digestion) of another mineral in the diet.

Based on the discussion above, it is clear that anytime a supplement is provided to livestock, we are insuring their performance by ensuring the diet is not going to be deficient in a mineral or two, or more.

Mineral Content of tall fescue

Across forage types, some minerals are frequently deficient throughout a growing year. In grazing livestock, phosphorus is described as the prevalent mineral deficiency across the world. Research conducted at the MU Southwest Center Dairy found a range in phosphorus content of tall fescue from 0.26% of dry matter to 0.51%; for reference, lactating cow requirement is reported as 0.2% of dry matter by the Nutrient Requirements for Beef Cattle publication. Magnesium deficiency is indicated as a causative agent in grass tetany, a common malady when cattle graze lush cool-season forages. High magnesium minerals (6% + Mg in supplement) are recommended during spring grazing. Salt is often fed to cattle free-choice (i.e., cattle are allowed to select a dietary component of their own volition). Cattle will usually consume more salt than needed when it is fed free-choice.

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DR. ERIC BAILEY continued...

Mineral Supplementation for Beef Cows

Trace minerals are required at concentrations less than 100 parts per million (ppm) of animal diets. Beef cattle have 10 trace minerals listed as essential in the Nutrient Requirements for Beef Cattle publication. However, only about 4 are generally recognized as the most problematic in grazing beef cattle: copper (Cu), zinc (Zn), manganese (Mn), and selenium (Se). Mortimer et al. (1999) analyzed the trace mineral content of tall fescue samples and reported only 2.7% of samples were deficient in Mn. Copper, zinc, and selenium were more problematic; 74% of samples were deficient in copper, 85% of samples were deficient in zinc and 96% of samples were deficient in selenium.

The recommendation for trace minerals is to ensure that your mineral supplement contains copper, zinc, and selenium. Most formulations will contain 75-85% of cattle requirement for each trace mineral and the burden on producers is to ensure that cattle consume the supplement. Extension Publication g2081 from MU is a comprehensive review of beef cattle mineral requirements and discusses this topic in further detail.

Fitting minerals into a cow calf budget

Price of mineral supplements varies across brands, depending on formulation and type of minerals used. Mineral supplements are among the highest margin products for feed companies though, so one should be cautious about the "extra goodies" marketed in a mineral supplement. The extra goodies are feed additives that may have little objective research to determine their efficacy. Minerals exist in various forms, and the value of each form is largely based on how bioavailable it is in the body; essentially, how well the body can absorb the mineral from the gut and use it throughout the body. Mineral supplements with high bioavailability have been marked heavily recently, yet their cost can be substantially greater than other forms. Answering the question of whether high-bioavailability mineral supplements are worth it are beyond the scope of this discussion.

A common concern noted by producers is, "I'm spending too much on my mineral." The answer to that statement potentially covers several aspects. One underappreciated aspect of mineral supplement is the intended daily consumption rate of mineral supplements, which ranges between 2 and 8 ounces per head per day. If a supplement is intended to be consumed at 4 ounces per head per day, that represents 91.25 lbs of mineral supplement per head per year. If you factor in an addition 10% for inventory loss, grazing beef cattle should consume two bags of mineral per head per year. Most producers I encounter are feeding significantly more than two bags per head per year. Evaluate mineral consumption by your herd and determine if it is in line with feed tag recommended intake.

DR. ERIC BAILEY continued...

Mineral Supplementation for Beef Cows

Mineral supplements represent a small amount in 2018 MU Extension Livestock Budgets. For southern Missouri, the budgets allocate $45.86 to mineral and protein supplements, against an annual operating cow cost of $790.25. Mineral and protein supplements represent 5.8% of annual operating costs and is the sixth largest operating expense. Even if mineral cost doubled, it would represent ~11% of operating costs and remain the sixth largest cost, out of 14 listed operating costs. Producers should focus on the largest costs in the budget, cow replacement, purchased and raised forage, and machinery costs when attempting to reduce cow operating costs.

Summary

Nutritional management of livestock that gather a majority of nutrients through grazing is very imprecise. This leads the author to consider mineral supplementation an insurance policy, which represents a small portion of annual operating costs per cow. Use a mineral supplement that has worked for you or is known to work well in your area. Spend as much or as little as will let you sleep at night. Keeping mineral out year-round is more important than haggling over a marginal difference in cost among the various supplements. Mineral supplements are among the highest margin products for feed companies though, so one should be cautious about the "extra goodies" marketed in a mineral supplement. There may be very little objective data to determine the efficacy of the additional additives. However, if you are raising $4000+ bulls or high-dollar show cattle, it might make sense to spend extra on a premium "insurance" plan. The majority of nutritional issue the author has encountered have been related to protein and energy intake. Worry about intake of the macronutrients (energy, protein, water) and consistent access to a mineral supplement.

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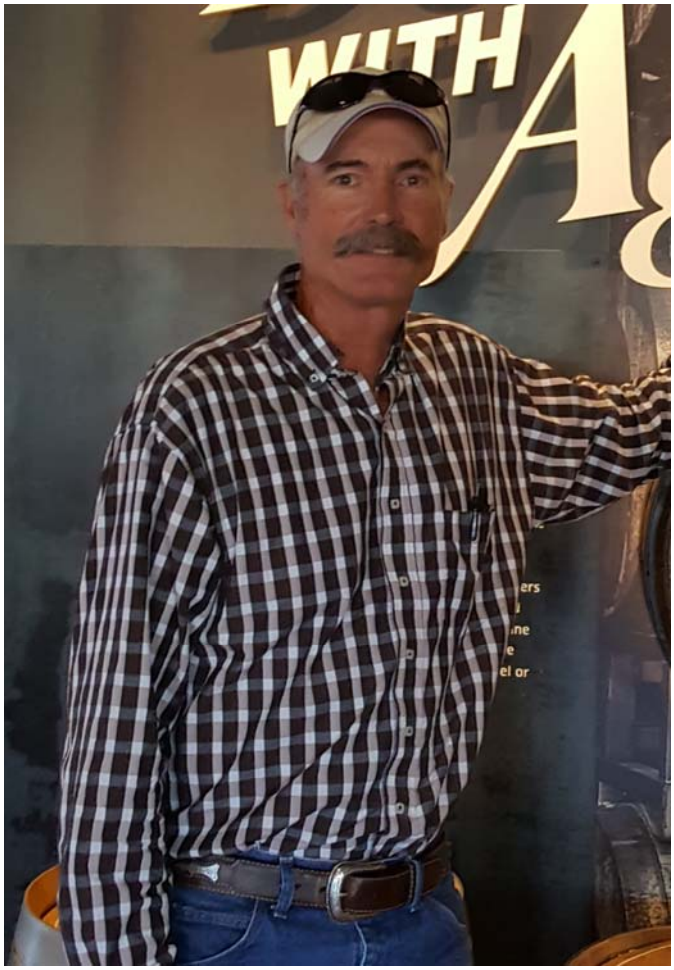
GREG CHRISTIANSEN



Greg Christiansen
9572 West 2100 Road
Parker, Kansas 66072
913-731-3727
greglchristiansen@gmail.com

After receiving a Bachelor of Science degree from Kansas State University, Greg made his living for several years from cattle ranches to feedlots from Colorado, Texas, Missouri, and Oklahoma. He then moved to a farm in east central Kansas and began a farming and cattle operation.

About 15 years ago he started buying meat goats and began to grow his herd. In a typical year Greg will have more than 600 commercial does and replacement stock, along with raising corn, soybeans, wheat, hay, and cattle. He has recently added sheep to the operation.

Integrating Sheep and Goats into Your Livestock Operation

You are competing in a reality show every day. The reality is that you must have a profitable business in order to pay the bills and live the lifestyle you enjoy. What is your competitive advantage? What will make you a winner and able to play again next year? In the livestock business everyone works hard, everyone works long hours. That alone will not make you a winner.

If you can stop spending money on an expense, that is a step in the right direction. If you can stop spending money on an expense and turn that expense into an income that you have a competitive advantage that can separate you from the rest of the players.

GREG CHRISTIANSEN continued...

Integrating Sheep and Goats into Your Livestock Operation

How many dollars do your livestock need to generate to control the weeds and brush that invade your pastures? What would your budget look like if you could remove that expense from the ledger? What would it look like if weeds and brush were forage that you had no expense in growing and you actually looked forward to seeing in the spring because it would represent income.

So you have weeds and brush in your pasture that you would like to control and your thinking about grazing sheep or goats with your cattle. The only problem is that you don't know anything about sheep or goats.

You're in luck. There are only two things you need to know to be successful grazing these small ruminants. Keep them in, and keep them alive. If you can't keep them in you will become frustrated and soon give up when the neighbors are constantly calling about your goats being out. If you can't keep them alive, well they don't make much money.

Sounds easy right, but you know better. It is really easier than you have probably been led to believe.

I can show you how I have learned to use a single electric wire just inside your barb wire cow fence so you can easily keep goats where they belong. How to build it so it is easy to maintain and cost effective.

There are similar things I have learned *(and keep learning)* to help you keep them alive.

What vaccines to give and when, parasite management, castration, weaning, protection from predators and facilities that will help you manage your herd or flock.

Where to buy breeding stock and what do I need to know to sell the kids will also be addressed.

Keeping Them In
Fencing
www.Kencove.com
www.premier1supplies.com
www.taylorfence.net

GREG CHRISTIANSEN continued...

Integrating Sheep and Goats into Your Livestock Operation

Keeping Them Alive
Health
CDT
Pneumonia
(Mannheimia Haemolytica Pasteurella)
Parasite Management
www.wormx.info

Facilities

Predator Protection
Akbash
Anatolian Shepherd
Great Pyrenees

Economics
Fence Cost 160 acres
80 Goats
Things happen to goats.

Feeding
The Breeding Herd
The Meat Kids
Langston University Nutrient calculator http://www.luresext.edu/?q=Nutrient-Calculators

Buying and Selling
Buying breeding stock
Selling kids

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DR. JAMES ROGERS

Bermudagrass—Benefits to a Grazing System

Dr. James Rogers
Associate Professor, Pasture and Range, Noble Research Institute
2510 Sam Noble Parkway Ardmore, Oklahoma 73401
580 224-6466, jkrogers@noble.org

Rogers serves as an associate professor and principle investigator in the Research Cornerstone at the Noble Research Institute in Ardmore, Oklahoma. He also provides consulting services to producers in pasture and range. His research interests include cover crops, winter pasture production and management, tall fescue management, grazing season extension, and grazing management. As a consultant, his practical experience along with his research aids regional agricultural producers in forage selection, establishment, production and management as well as estimation of stocking rates and grazing management.

Prior to the Noble Foundation, Rogers was a livestock specialist with the University of Missouri Outreach and Extension for 10 years. His work concerned grazing systems to enhance both forage and livestock performance.

Rogers is a member of the American Forage and Grasslands Council, the American Society of Agronomy, Crop Science Society of America, Soil Science Society of America and the Society for Range Management.

A native of upstate South Carolina, Rogers was raised on a beef cattle and row crop farm. His wife, Susan is a high school math teacher and he has two sons and one daughter.

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DR. JAMES ROGERS continued...

Bermudagrass—Benefits to a Grazing System

History and introduction

Webster defines a system as a group of related parts that work together. While this definition is simple, it does not convey the complexity of a working cow/calf grazing system. In manufacturing we can think of an assembly line putting together trucks as an example. All the parts for the truck are designed to fit together into a whole unit and each part for one truck is identical to the same part in another truck. This makes the assembly easy and efficient for each truck. Not so with a biological system involving plants and animals. These systems are subject to abiotic and biotic stresses that vary across and within years. While it would be ideal to establish a cow/calf grazing system where grazing is split equally between cool and warm season forages with grazing occurring 365 days a year with no supplementation that produces calves weaned at 600 pounds, reality would soon hit hard as all the interrelated moving parts of this system don't always fit together so nicely.

Bermudagrass (*Cynodon dactylon*) is a warm season C_4 perennial grass that is native to southeastern Africa. Occasionally you will hear an area of bermudagrass described as 'native Coastal' bermudagrass which is an incorrect description. Bermudagrass is not a North American native plant, it is an introduced species. The term Coastal refers to the first named variety of bermudagrass to be released by the Tifton Georgia Experiment Station back in the 1940s. Bermudagrass was introduced through Savannah, Georgia sometime around 1751 by the Governor of Georgia at the time, Henry Ellis. Soon after its introduction the value of bermudagrass as a forage was recognized. By 1917 in USDA Farmers Bulletin no. 814 this quote concerning bermudagrass was made: "bermudagrass is the most common and most valuable pasture plant in the Southern states, being of the same relative importance in that region as Kentucky bluegrass is in the more Northern states." Despite being recognized as a valued forage plant, bermudagrass also has its share of detractors. J.R. Harlan in a 1969 issue of Crop Science described bermudagrass as a "ubiquitous, cosmopolitan weed." Bermudagrass is both, it a versatile forage plant that can be a valuable part of a grazing system or because of its ability to spread through rhizomes and stolons it can be an invasive, hard to kill weed.

The photosynthetic advantage of C4 plants

The C_4 term associated with bermudagrass and other warm season plants refers to their photosynthetic pathway. Photosynthesis occurs in organelles called chloroplast that are found predominately in the leaves of plants. In C_3 plants the first measureable product produced by photosynthesis is a 3-carbon compound thus, plants that utilize this type of photosynthetic pathway are referred to as C_3 plants. The majority of plant species are C_3 plants and include the common forage species of tall fescue, the small grains, and many of the legumes. C_4 plants have a slightly different photosynthetic pathway that results in the formation of a 4-carbon organic acid product. Plants utilizing the C_4 photosynthetic pathway include bermudagrass, bahiagrass, the sorghums, and native grass species such as little bluestem, big bluestem, Indiangrass, and switchgrass.

DR. JAMES ROGERS continued...

Bermudagrass—Benefits to a Grazing System

Photosynthesis is more efficient in C_4 plants compared to C_3 plants. C_3 plants become 'light saturated' and photosynthesis will maximize in less than full sunlight while photosynthesis in C_4 plants will continue to increase in full sunlight conditions. Photosynthesis is also affected by temperatures. In C_3 plants, photosynthesis can occur at temperatures from near freezing to maximum rates at 77°F and declining at temperatures above 86°F. By comparison, C_4 plants have very little photosynthetic activity below 50°F but their photosynthetic activity can increase up to temperatures slightly above 100°F. Because of the efficiency of the C_4 photosynthetic pathway in capturing light energy and turning it into chemical energy and the ability of this pathway to continue to function at elevated temperatures, warm season grasses often can produce greater amounts of forage biomass in a shorter growing period than cool season grasses. They have greater forage production efficiency in hot, dry conditions and are more efficient in nitrogen (N) utilization.

Adaptation and establishment

In the United States, bermudagrass is best adapted to the southern states from North Carolina west to southern California and south. It can be found up through the coastal plains of Virginia and into the southern counties of Kentucky, Missouri, and Kansas. Common bermudagrass is quite predominant on the Missouri State Fairgrounds in Sedalia probably getting a start from hay coming in with livestock from southern states. Optimal growth for bermudagrass will occur with daytime temperatures above 75°F and nighttime temperature above 60°F. Bermudagrass will grow some at temperatures between 40-50°F and plant dieback of stems and leaves can occur with sustained temperatures of 26-28°F. There is quite a bit of variation in cold tolerance between bermudagrass varieties. In southern Oklahoma, bermudagrass has a very long growing season breaking dormancy in April and continuing growth to a killing frost which usually occurs in mid-November. In southern Missouri, the active growing period will be shorter from approximately May to late September or mid-October.

Bermudagrass can grow on a wide range of soil types from sand to clay but, it is best adapted to sandy loam soils where it is also most easily established. Bermudagrass spreads by rhizomes (below ground stems) or stolons (above ground stems) which spread very rapidly through lighter soil types. Often when conditions are right, bermudagrass can be established in a year on lighter soils. In clay soils the rate of spread by rhizomes and stolons is greatly reduced resulting in increased establishment time. Stand failures have occurred on heavy clay soil as a result of delayed establishment that leads to weed competition and stand failure. Once bermudagrass becomes established on clay soils it can be highly productive.

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DR. JAMES ROGERS continued...

Bermudagrass—Benefits to a Grazing System

Bermudagrass can be established either through seed or by planting a portion of a live plant called a sprig. Many of the improved bermudagrass types are hybrids and can only be established by planting a sprig. Some of the more common hybrids are Midland, Midland 99, Ozark, Tifton 44, Tifton 85, and Coastal. Tifton 85 and Coastal have poor cold tolerance and should not be considered in Missouri. As a general rule, hybrids are more productive, are higher in nutritive value and tend to have greater cold and drought tolerance. There are always exceptions and in recent years some seeded types have been released that will yield similarly to hybrid types. Common seeded types include Cheyenne II, Wrangler, Giant and Texas Tough. There are many other seeded bermudagrass varieties on the market. Often these named seeded varieties may contain a blend of one or more varieties of seeded bermudagrass blended together. Common bermudagrass and Giant bermudagrass are often used as a base with other varieties then mixed in. Giant bermudagrass is often included because it establishes quickly, yields well and can act as a nurse crop for the other types within a mix. However, Giant bermudagrass has very little cold tolerance and will disappear from the stand in one to two years. In northern areas it would not be recommended in a mix.

If considering establishing bermudagrass, as with all good establishment protocols, take time to prepare for establishment success. This includes assessment of the land area that you plan to establish. Bermudagrass is established during the spring. Seeded types will need to be planted when soil temperatures reach 60-65°F. Hybrids need to be sprigged while sprigs are still dormant but, just prior to the sprigs breaking dormancy which for southern Missouri will be in April. Soil test the area that you tend to establish 6 months prior to establishment. Soil pH should be 5.5 minimum for establishment and this will allow you enough time to acquire and spread lime if needed. Soil phosphorus (P) and potassium (K) levels are also important for bermudagrass establishment. For establishment, available soil P should be a minimum of 20 lb/ac and K - 125 lb/ac. This is a minimum requirement, ideally soil P should be 40-65 lb/ac available and K - 200-250 lb/ac available for maximum production.

Know the area that you plan to establish. Bermudagrass will perform best on well-drained but not droughty soils. It will tolerate flooding but will not be very productive on wet soils. It will establish best in clean fields with little or no competition. Understand what type of weed competition may be present prior to establishment and be prepared to battle weeds if needed during the establishment phase. Broadleaf weeds can be controlled fairly easily with a broad range of herbicides but, grass weed competition is a problem. Weed competition is more easily handled with hybrid bermudagrass than with seeded types. A pre-emerge herbicide (Diuron) can be used to control weeds with hybrid types since you are planting a live plant (sprig). If seeding, pre-emergent herbicides are not an option.

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Most bermudagrass stands are established by first preparing a tilled, weed-free, firm seedbed. Sprigged bermudagrass can be no-till established as there are no-till sprigging machines available. No-till establishment of bermudagrass can be successful if, just like tilled seed bed preparation, adequate time is taken to prepare the area to be sprigged. Sprigging requires specialized equipment for establishment. A sprig digger to dig and chop sprigs, a source of the sprigs, and a sprigging machine to plant the sprigs. After sprigging the field should be rolled or cultipacked to smooth the field. If this is not done, you will regret it later while driving over it. Sprigging rates are in bushels of sprigs per acre. Do not be stingy with the sprigging rate, the more sprigs the better and the quicker the coverage and establishment. Cost of the sprigs is generally a function of variety availability but will range from $1-5 per bushel. Sprigging rates will range from 20-40 bushels per acre with the higher range being preferred. Try and locate a sprig source as close to the area that you will be sprigging. Minimize the time between when the sprigs are dug and planted. This will reduce sprig death loss and increase the number of live sprigs planted. The size of the field that you wish to establish to bermudagrass may dictate which route you go with either sprigs or seed. Many spriggers will require a minimum acreage to sprig to make it worth their time and effort. For smaller acreages, your only choice may be a seeded type.

Bermudagrass seed is small and can come either with the seed hulled or un-hulled. Hulled seed has a seed count of around 2,000,000 seed per pound with a seeding rate of 5-10 lb/acre. Seeding depth is important and should be at ½ inch depth. Seeded bermudagrass can be established with either tillage or no-tillage methods. Handling such small seed is difficult and many seed companies will coat the seed to improve handling and seed placement. This makes the seed larger so, if using coated seed make sure and adjust seeding rates to compensate for size. In clean till establishment of seeded bermudagrass, cultipacker type seeders work well. If using no-till, a small seed box attachment is a must and careful attention paid to seed depth.

After planting, wait till the bermudagrass has begun to run prior to applying any broadleaf herbicide for weed control. During the year of establishment be sparing with nitrogen fertilizer application. Nitrogen can stimulate bermudagrass growth but it can also stimulate weed growth and competition as well. Wait till bermudagrass stolons are running prior to applying nitrogen and then apply 50 lb/acre or less. If soil test indicates good soil nitrate levels then you may not need to apply additional nitrogen. If grassy weeds begin to shade the sprigs, they will need to be controlled. This can be done with grazing or mowing. Be careful not to mow or graze the establishing bermudagrass, remove enough of the weed canopy to allow light to penetrate down to the bermudagrass.

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Bermudagrass—Benefits to a Grazing System

Benefits to a grazing system

Bermudagrass is an easily managed forage crop that is tolerate of close grazing and a lot of management miscues. It compliments tall fescue providing an alternative from tall fescue during the summer months. Bermudagrass is also versatile as it can be grazed, hayed and overseeded during the dormant season. A problem with bermudagrass is that because it can develop a dense sod and is an aggressive plant it is difficult to grow companion forages with it during the active growing season. In some areas, alfalfa is grown with bermudagrass and clovers can be grown with it as well but, elevated management is required. As with all grazing systems, determining the proper stocking rate is important to management success of bermudagrass. Understand the forage production potential of bermudagrass and match this potential to the appropriate number of grazing animals. Rotational grazing is preferred to continuous and if this is practiced, forage utilization of bermudagrass can be 65-75%.

Pasture fertility is important, make sure P and K levels are adequate for production. In Oklahoma we expect 1 T/ac of dry matter with no nitrogen and 1 T/ac of dry matter for each 50 lb N/ac applied. In areas of higher rainfall, dry matter production would be higher. Poultry litter is also an excellent source of fertility for bermudagrass in areas where it is available. Nutritive value of bermudagrass will vary with stage of maturity and fertility as it does for other forage plants. Overly mature bermudagrass or bermudagrass that is unfertilized may have crude protein levels of less than 10% while fertilized bermudagrass that is harvested at 28 day intervals can have crude protein content of 12-15%. An important consideration for bermudagrass is that it is not endophyte infected and offers livestock a break from toxic endophyte infected tall fescue.

Effect of bermudagrass maturity on forage nutritive value.

Maturity stage	%CP*	%NDF	%ADF	%TDN
Early vegetative	16.0	66	30	61
Late vegetative	16.5	70	32	54
15-28 days growth	16.0	74	33	55
29-42 days growth	12.0	76	38	50
43-56 days growth	8.0	78	43	43

Source: Management of Hay Production MP434 University of Arkansas
%CP – percent crude protein
%NDF – percent neutral detergent fiber
%ADF – percent acid detergent fiber
%TDN – percent total digestible nutrient

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Bermudagrass—Benefits to a Grazing System

Another management option for bermudagrass during the late summer and through fall is the ability to stockpile bermudagrass for additional grazing after frost. To accomplish this bermudagrass is grazed close in August then nitrogen is applied to produce fresh forage growth up to frost. After frost, cattle are turned in and allowed to graze. This can also help manage tall fescue if endophyte is a problem. By delaying grazing tall fescue until after bermudagrass stockpile is depleted the tall fescue will then be grazed during cooler time periods when alkaloid levels in the tall fescue have dropped. Bermudagrass can also be overseeded in the fall with cool season forages to provide additional quality grazing in early spring if needed.

In summary, bermudagrass is a versatile forage plant that offers potential as an excellent warm season compliment to tall fescue. In the more northern regions of its adaptation zone, care must be taken to select a variety with good cold tolerance. Bermudagrass is easily managed and tolerates a wide range of growing conditions and management. As with all forages the better it is managed, the better it will respond.

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JARED DECKER

Beef Genetics—
Selecting Breeding Cattle for our Environment

Dr. Jared Decker
State Beef Genetics Specialist
University of Missouri Extension
573-882-2504
deckerje@missouri.edu

Jared Decker is an assistant professor in the University of Missouri Division of Animal Science and Beef Genetics, State Beef Genetics Extension Specialist.

Decker received his B.S. from New Mexico State University, graduating with top honors. He majored in Animal Science with a minor in Biology. He earned his Ph.D. at the University of Missouri in Genetics, with a Ph.D. minor in Statistics.

Jared grew up on a small farm in northwest New Mexico where his family raised registered cattle. He now owns a small farm in Mid-Missouri to teach his kids the value of hard work.

Jared is working to help stakeholders in the beef industry better understand the rapidly changing genetic technologies. His research focuses on understanding the history of cattle breeds and improving the cost and accuracy of genomic tests.

He is active on social media and his website *A Steak in Genomics*.

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Southwest Missouri RC&D

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We welcome your suggestions and feedback.

We look forward to seeing you in 2019!