Warm season grasses as emergency forages

2015 MIDWEST FORAGE ASSOICATION

Tour de Forage

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BACKGROUND: ALFALFA

- Alfalfa is the most important perennial forage in the Midwest
  - 1.1 million acres in Minnesota (2014)
  - Livestock feed
  - Ecosystem services
  - Nitrogen contribution

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BACKGROUND: CHALLENGES

- Perennial crop subject to winterkill

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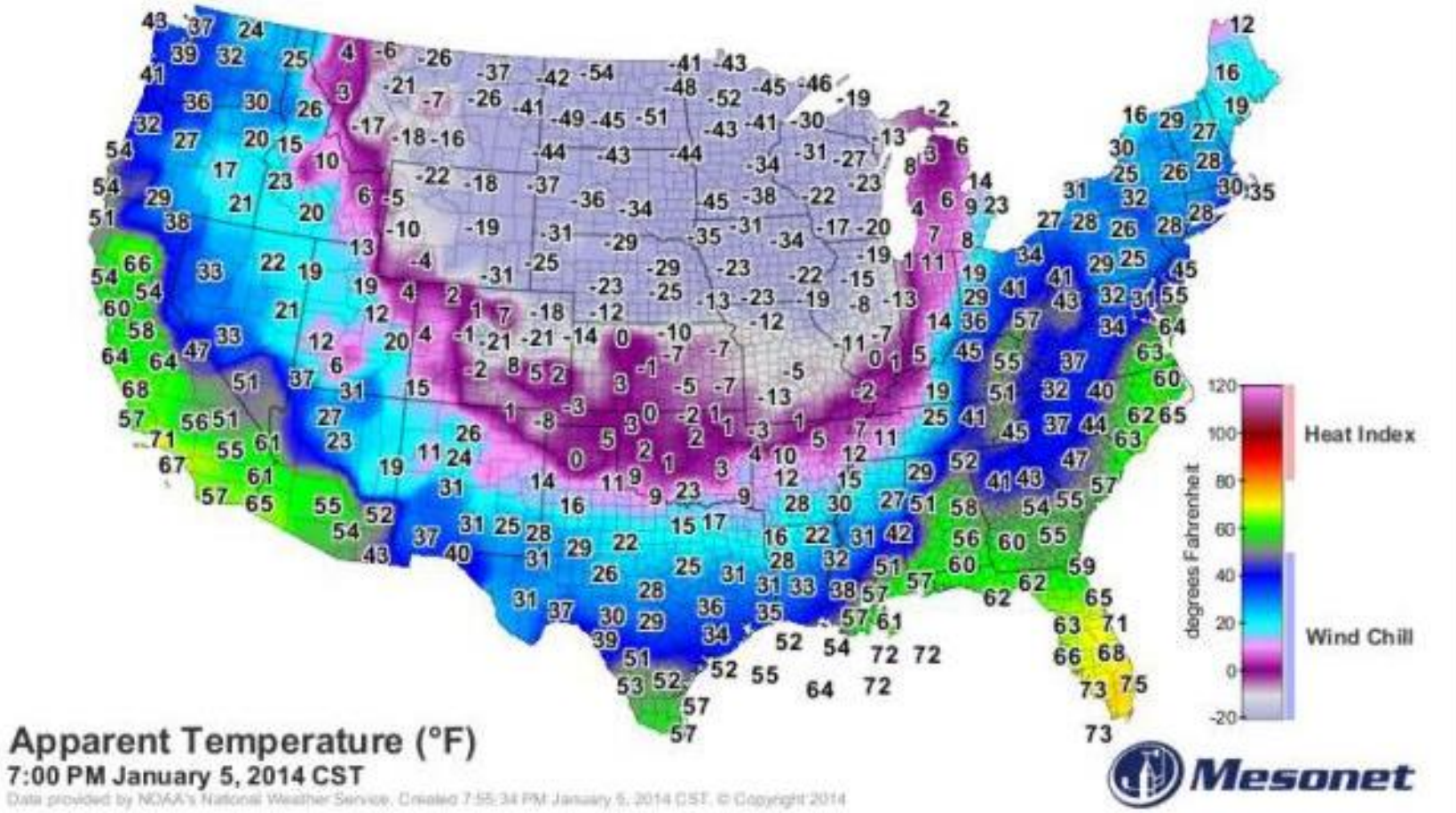
BACKGROUND: WINTER INJURY



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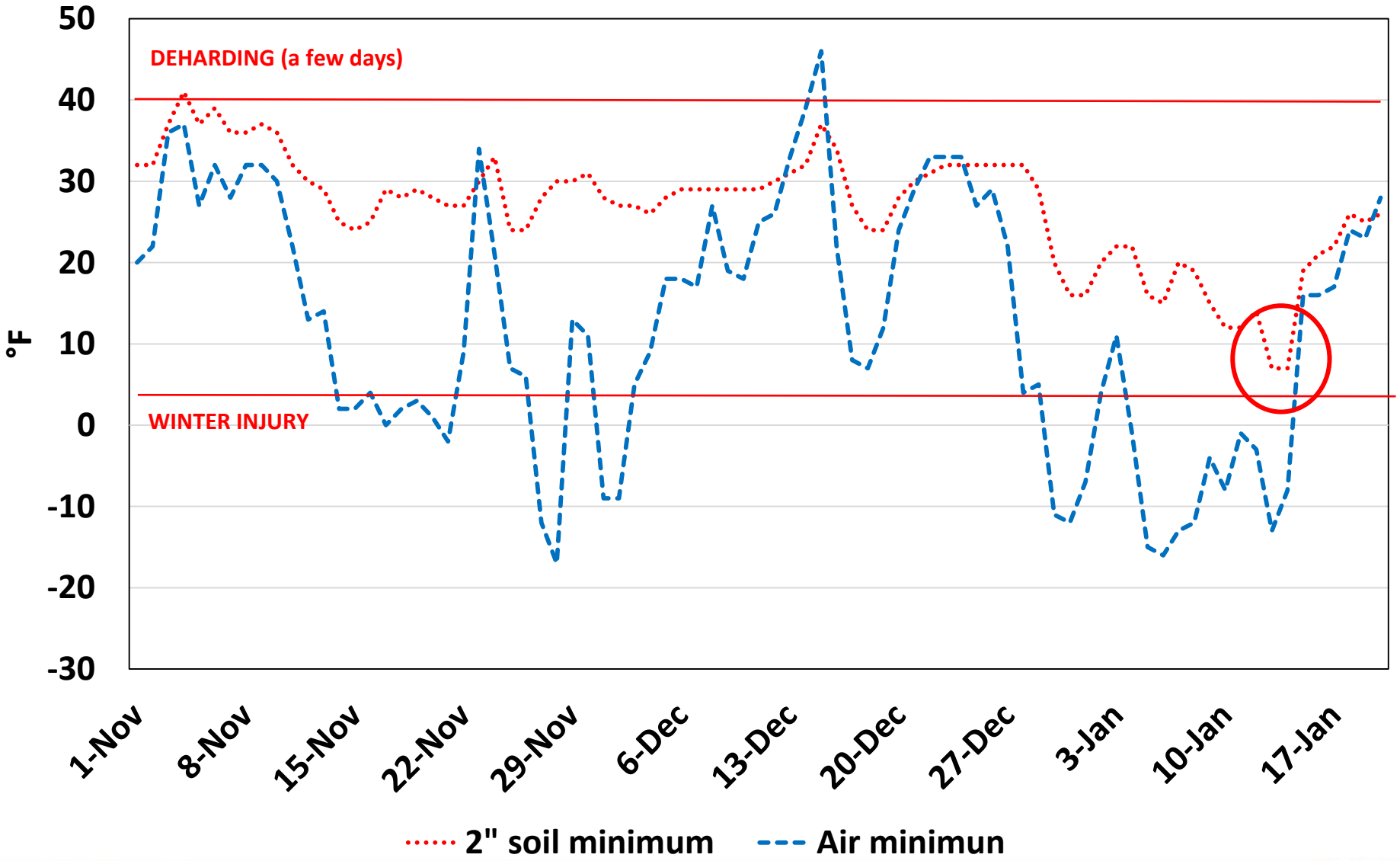
Minimum Temperatures: Waseca 2015



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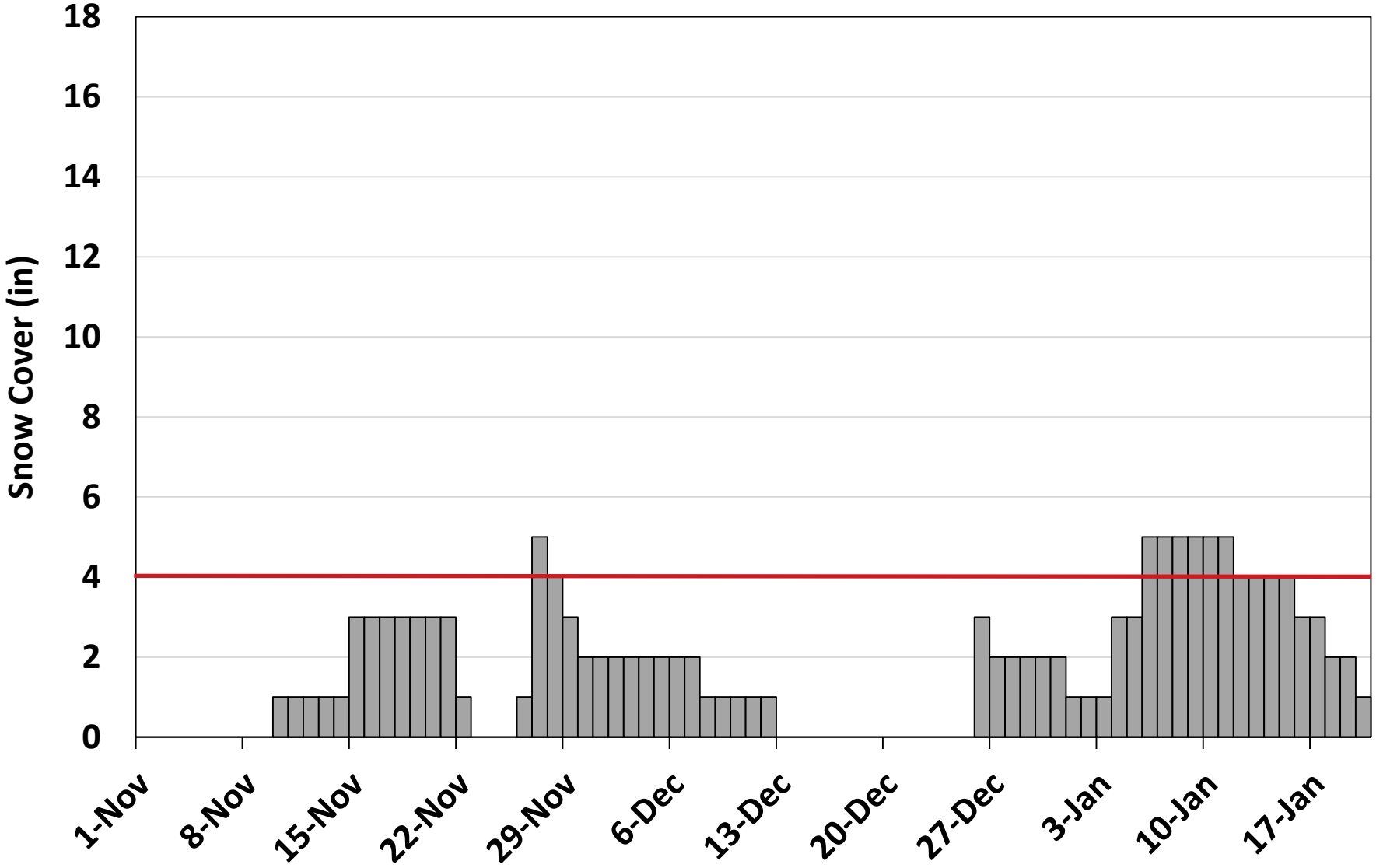
Snow Cover: Waseca 2014-2015



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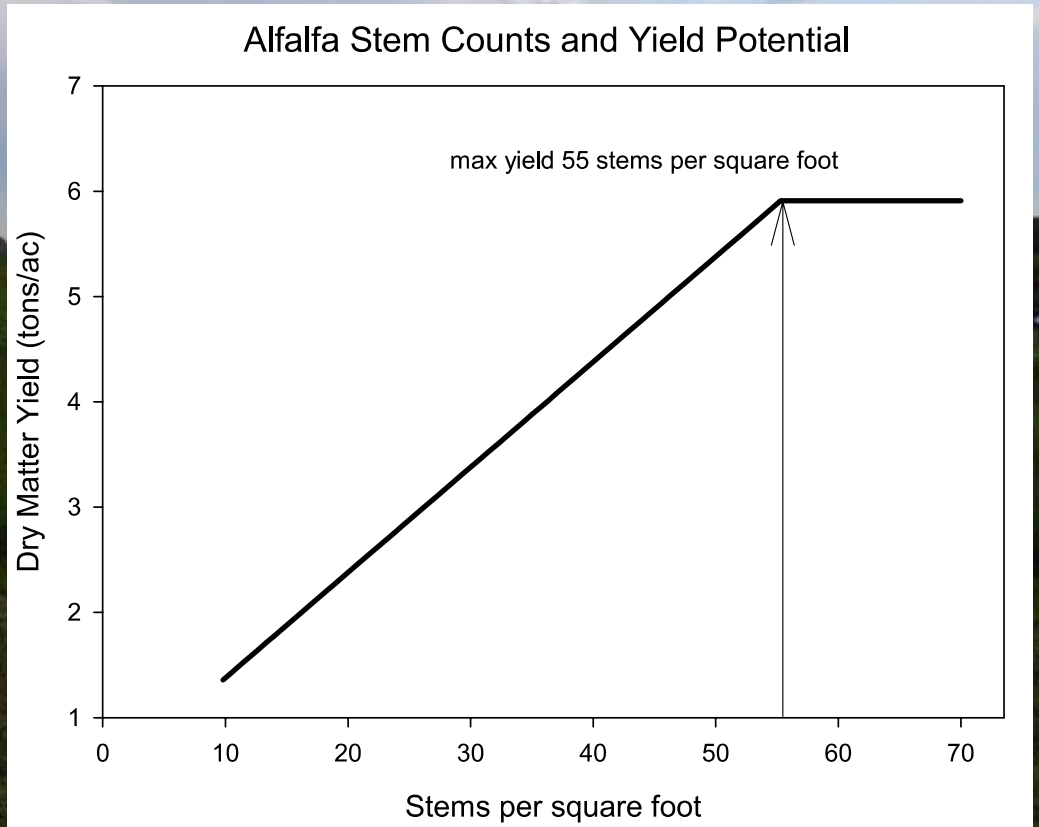
BACKGROUND: CHALLENGES

- Shortage of quality feed
- Increasing environmental variability
- **Challenge:** identify annual forages to fill this gap



OBJECTIVES

1. Evaluate 8 warm season forage options no-till seeded into winterkilled alfalfa
   - Nitrogen Management
   - Intensive Cutting Management

2. Determine nitrogen contribution to emergency crop yield

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METHODS

- Planting
  - May 28, 2014
  - Truax no-till drill
- Fertility
  - 0, 56, & 112 kg N/ha
  - Applied at planting
- Cutting schedule
  - 30 day intervals from the time of planting

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EMERGENCY FORAGES

	Seeding Rate (kg/ha)
Annual Ryegrass	34
Italian Ryegrass	39
Teff	13
Japanese Millet	34
Sudangrass	50
Sorghum sudangrass	39
BMR Sorghum	39
Red clover / A. Ryegrass	9 / 17

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SPECIES DESCRIPTIONS

- **Sorghums**
  - **BMR Sorghum, Sudangrass, Sorghum-sudangrass**
  - **'Brown midrib' gene mutation = lower lignin = higher digestibility**
  - **High yielding**
  - **Cutting height = 6 inches**

- **Ryegrasses**
  - **Annual Ryegrass, Italian Ryegrass**
  - **High yielding, high nutritive value**
  - **Excellent nutrient scavengers (but sensitive to low fertility)**
  - **Tolerates grazing and/or cutting well**
  - **Cutting height = 4 inches**

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SPECIES DESCRIPTIONS

- **Red Clover**
  - **Companion crop with Annual Ryegrass**
  - **Leguminous N fixation (tolerates low fertility)**
  - **Tap roots**
- **Japanese Millet**
  - **Fast growing**
  - **Good nutritive value**
  - **Cutting height = 6 inches**
- **Teff**
  - **Drought and heat tolerant**
  - **High yielding**
  - **Tolerates low fertility and responds well to fertilization**
  - **Cutting height = 4 inches**

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EMERGENCY FORAGES

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RESULTS

- **<u>Yield</u>**
- Nutritive value

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RESULTS: AVERAGE YIELD

- **Averaged across all cutting events**

ANOVA: Yield				
Effect	Num DF	Den DF	F Value	Pr > F
Species (S)	7	24	3.75	**0.0070**
N Rate (N)	2	48	12.79	**<.0001**
S X N	14	48	0.79	0.6739

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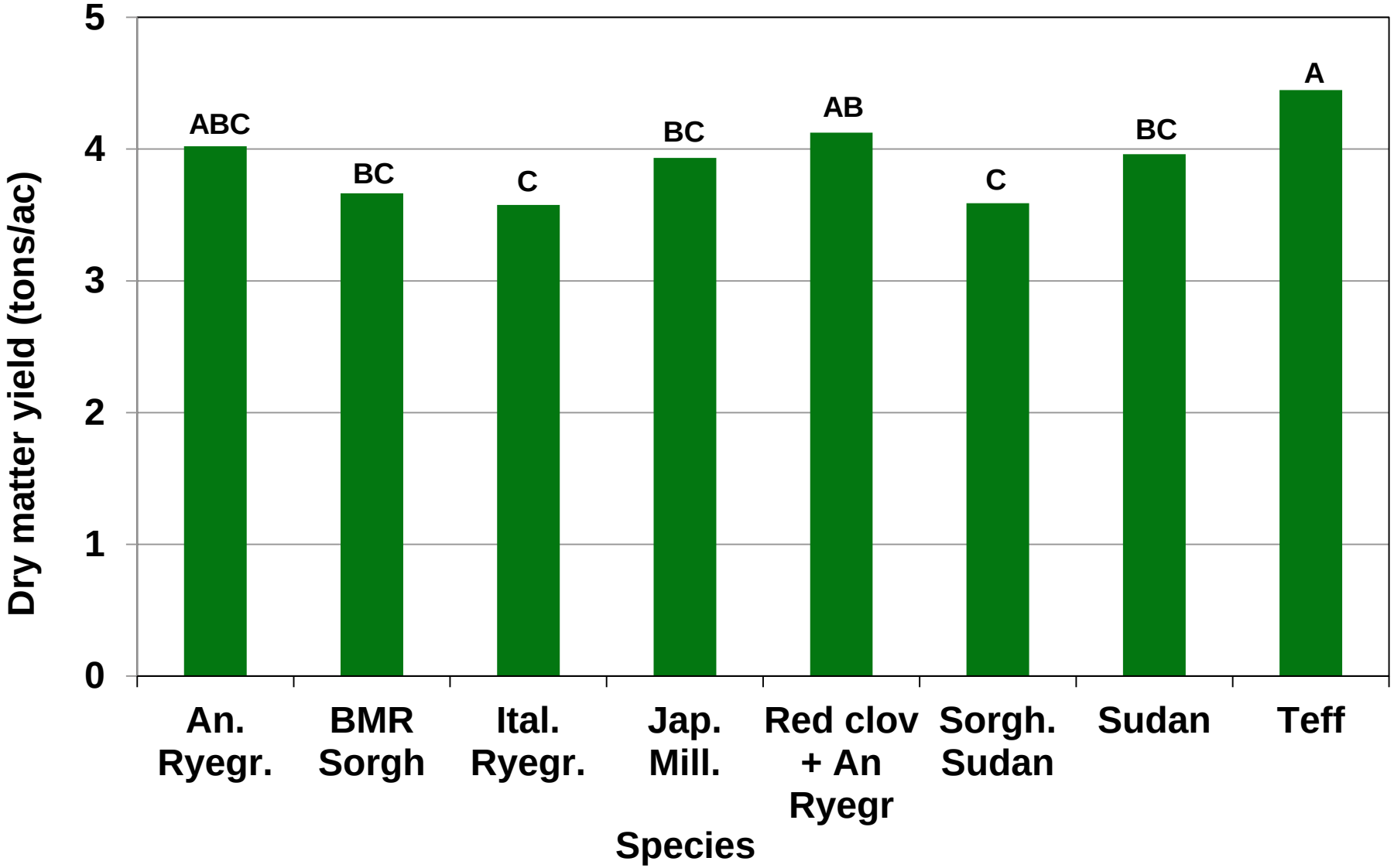
TOTAL YIELD SPECIES



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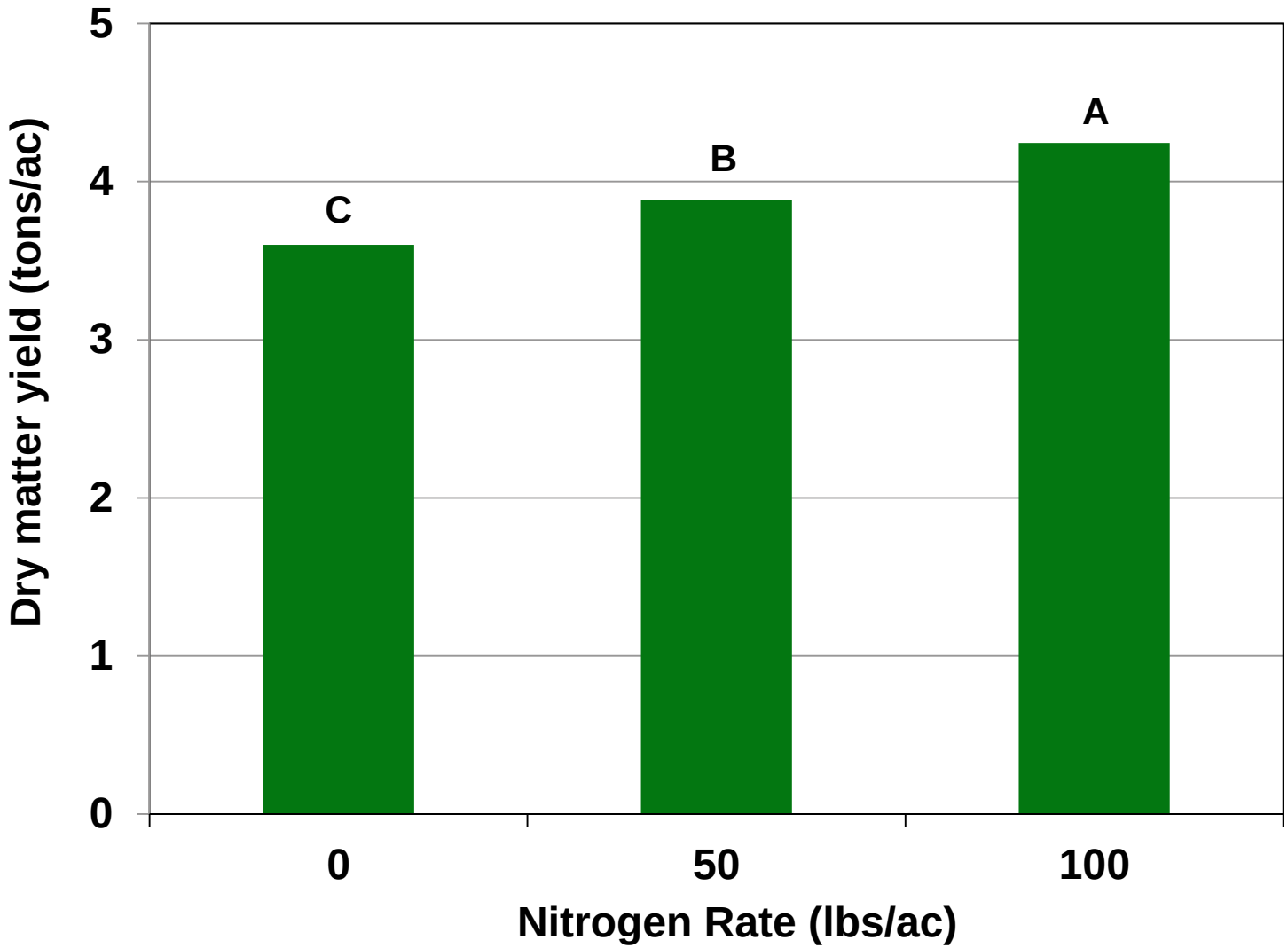
N RATE VS. YIELD



- Teff
- Annual Ryegrass
- Annual Ryegrass + Red Clover

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ECONOMICS

Current Reported Prices

- **$465 $/ton urea = $0.51 $/lb N**
- **Dry fertilizer application cost = $6.00/ac**
- **"Good quality" grass hay = $100/ton**

N – Rate (lbs/ac)	Average Yield (t/ac)	Fertilizer ($/ac)	Net return ($/ac)
0	3.60	$0.00	$360.01
50	3.88	$31.50	$356.93
100	4.25	$57.00	$367.56

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RESULTS

- Yield
- **Nutritive value**
  - **Crude protein**
  - **NDFD**
  - **Relative Forage Quality (RFQ)**

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NUTRITIVE VALUE DEFINITIONS

- **Crude Protein (CP)**
  - **Approximate protein content based on total nitrogen content**

- **Neutral Detergent Fiber Digestibility (NDFD)**
  - **Percentage of Neutral Detergent Fiber (NDF) that is digestible (48 hours in vitro)**
  - **NDF = Hemicellulose + Cellulose + Lignin + Cutin**

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NUTRITIVE VALUE DEFINITIONS

- **Relative Forage Quality (RFQ)**
  - **Generalized forage quality index based on the combined consideration of several nutritive values.**
  - **Commonly used in hay pricing standards**

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CRUDE PROTEIN (YIELD WEIGHTED)

ANOVA: Crude protein				
Effect	Num DF	Den DF	F Value	**Pr > F**
Species (S)	7	21	16.87	**<.0001**
N Rate (N)	2	48	14.36	**<.0001**
S X N	14	48	1.84	**0.0592**

- **Approximate protein content based on total nitrogen content**

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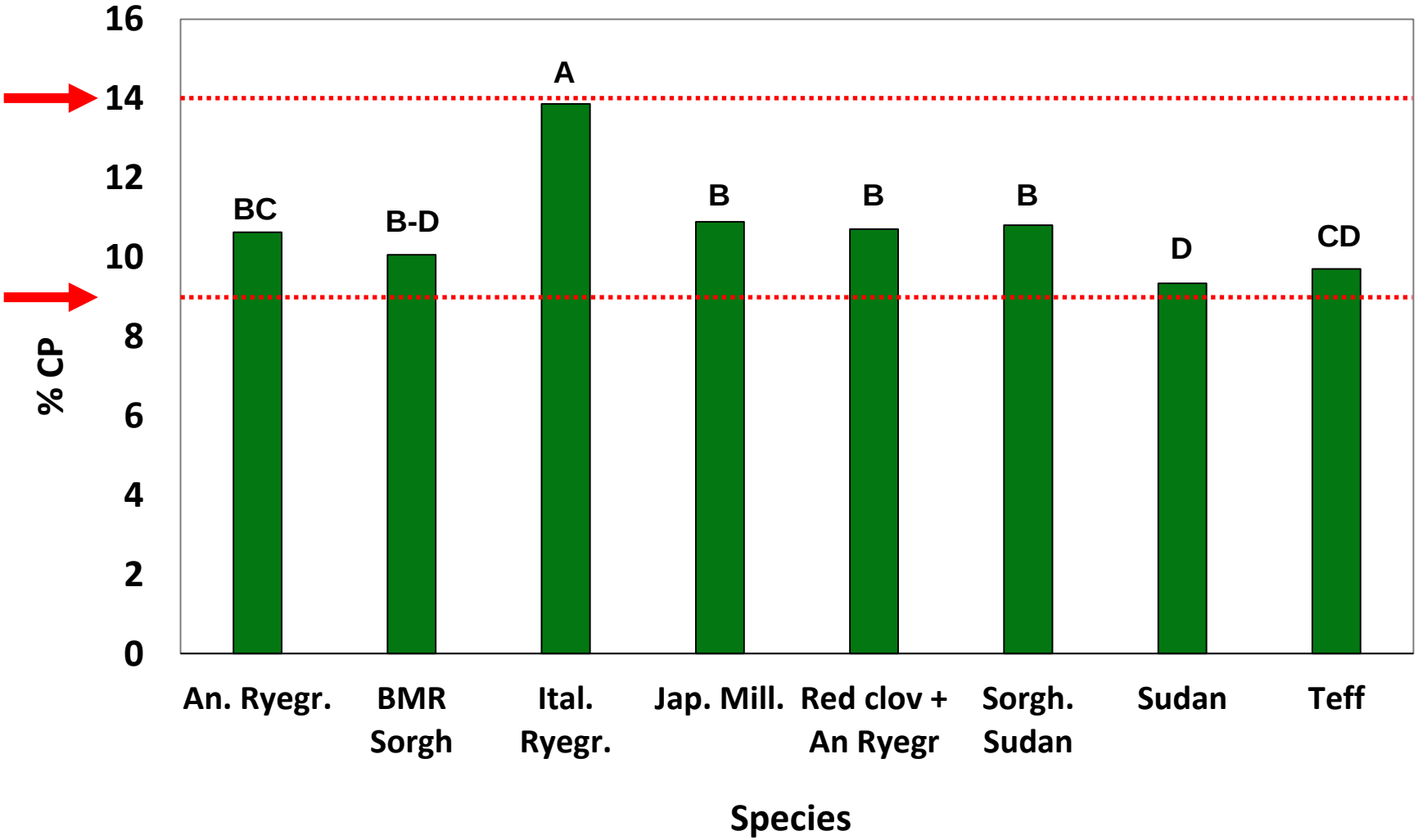
CRUDE PROTEIN: SPECIES EFFECTS



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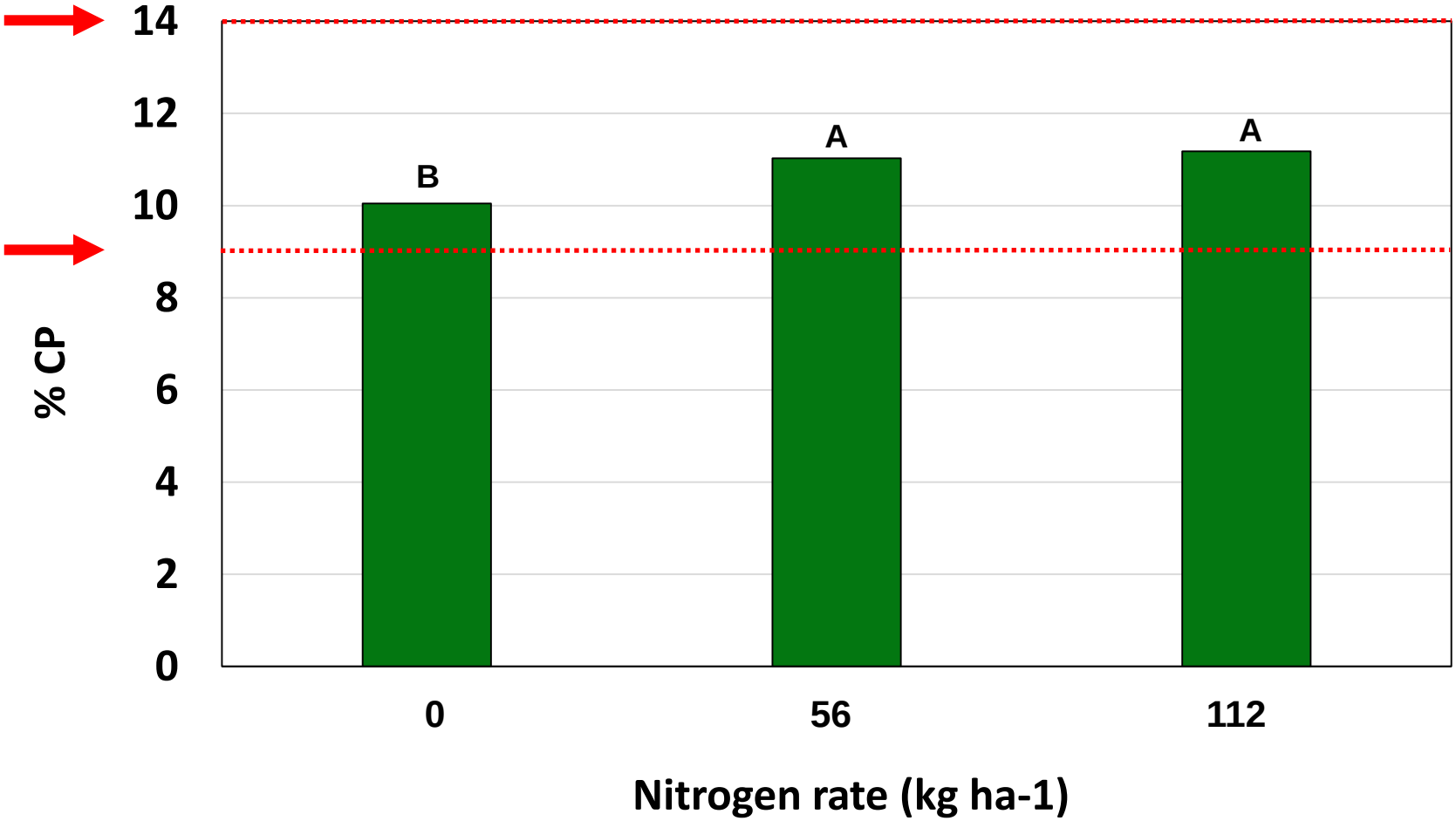
CRUDE PROTEIN: N RATE EFFECTS



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NDFD (YIELD WEIGHTED)

ANOVA: NDFD				
Effect	Num DF	Den DF	F Value	**Pr > F**
Species (S)	7	21	34.29	**<.0001**
N Rate (N)	2	48	1.75	**0.1843**
S X N	14	48	1.79	**0.0676**

- **Neutral Detergent Fiber Digestibility**
- **Digestible portion of total Neutral Detergent Fiber (NDF)**

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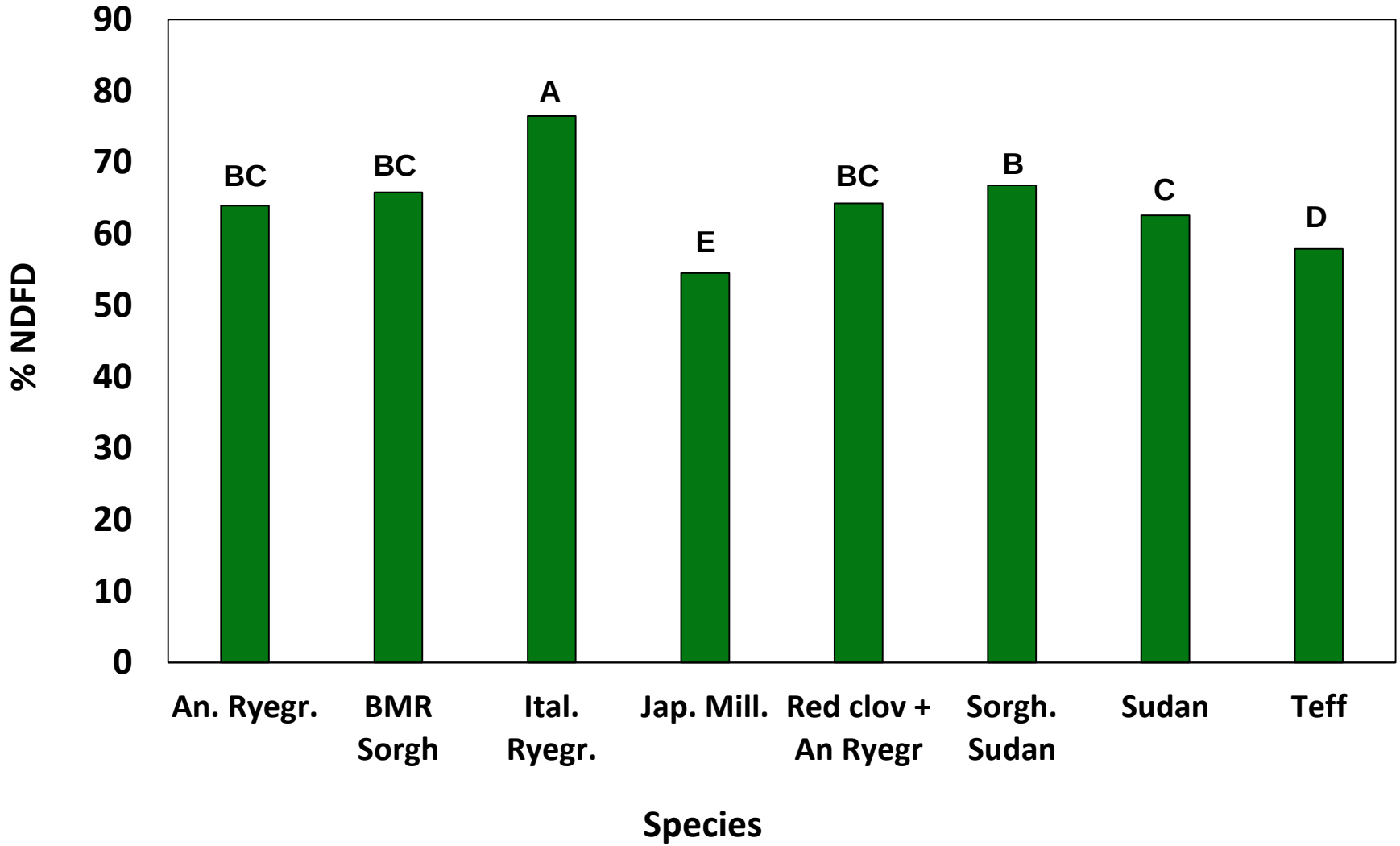
NDFD: SPECIES EFFECTS



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RELATIVE FORAGE QUALITY (RFQ)

- Generalized forage quality index based on the combined consideration of several nutritive values.

- Commonly used in hay pricing standards

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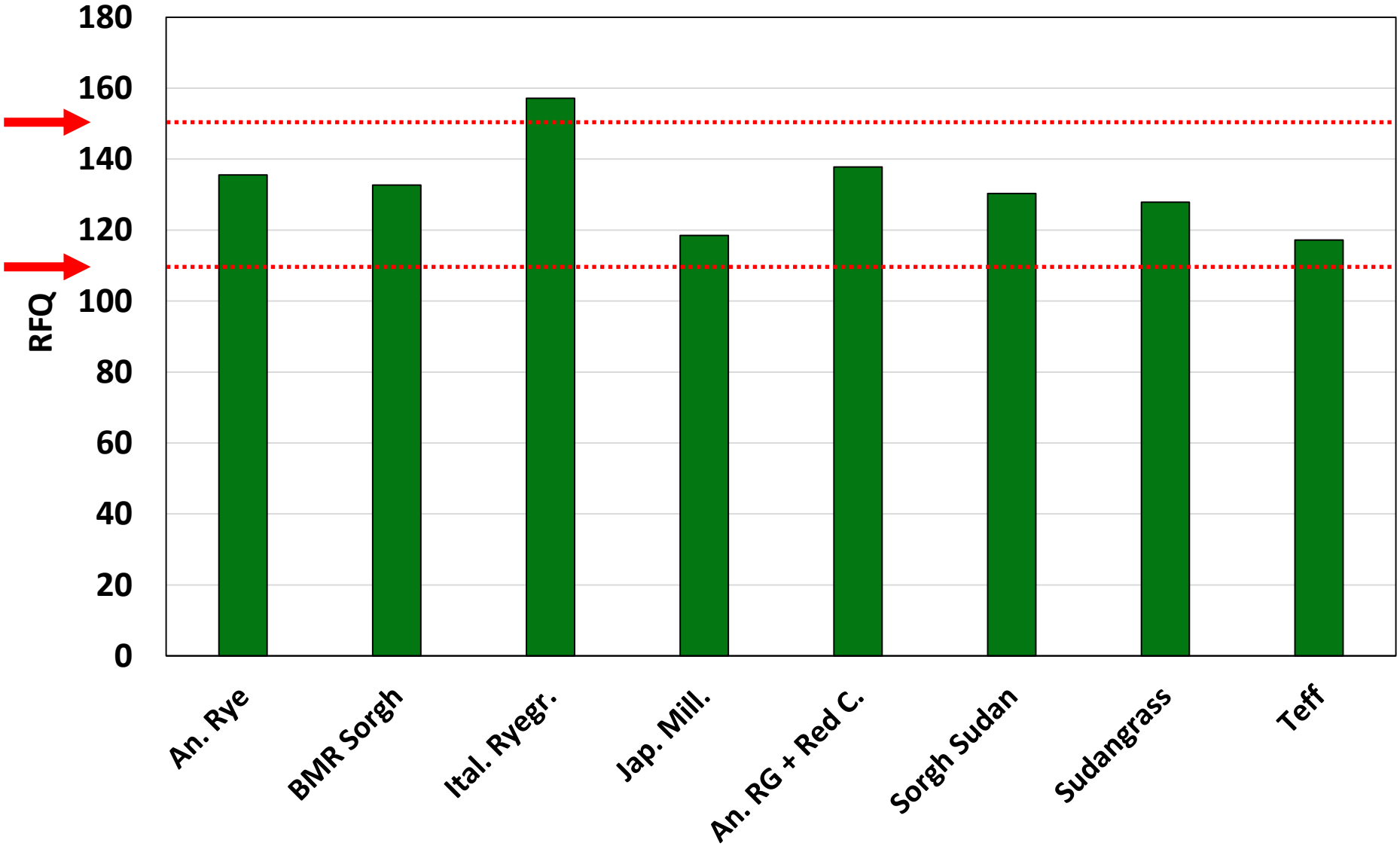
Relative Forage Quality (RFQ)



RFQ range: Hancock. 2011. University of Georgia

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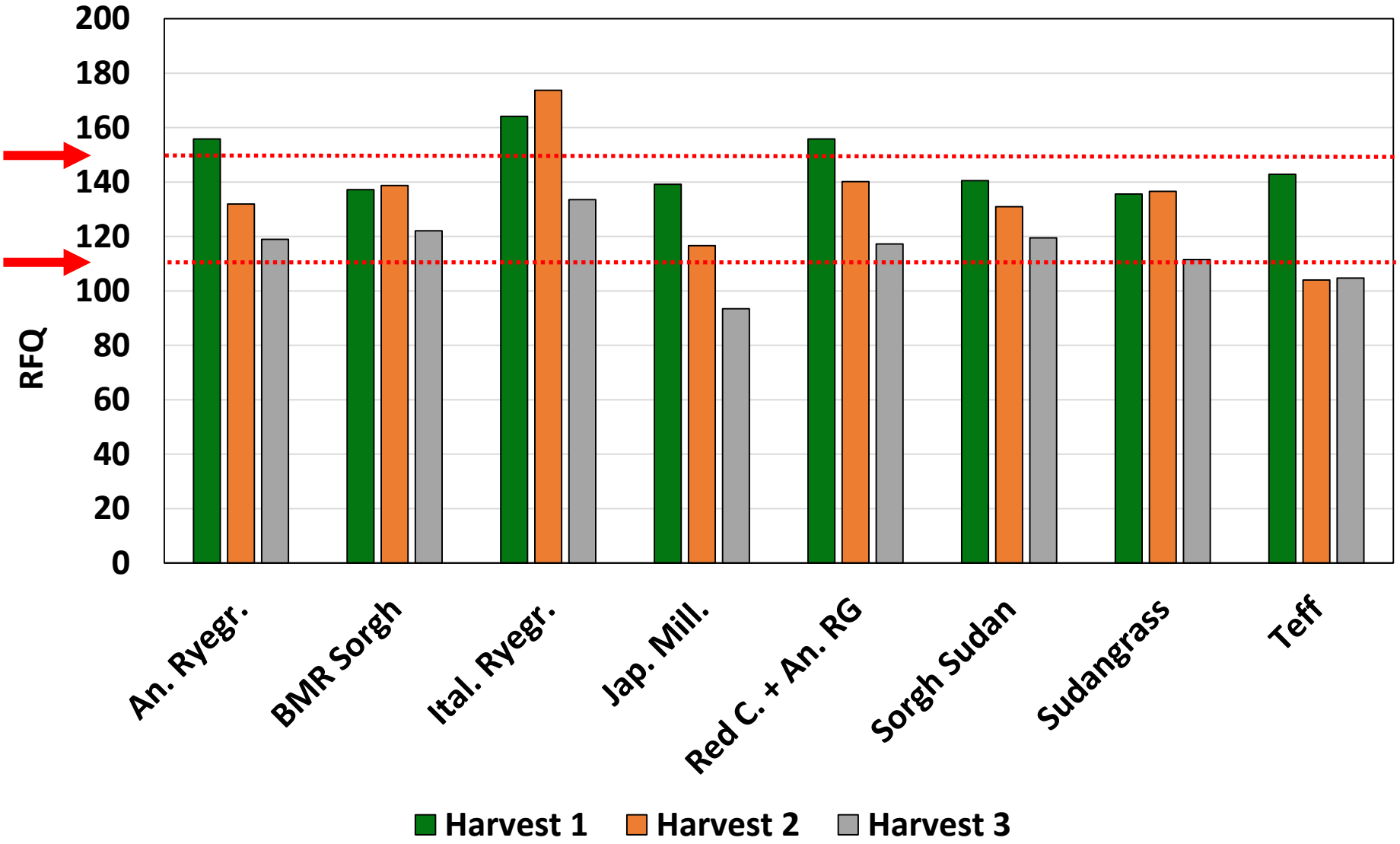
Relative Forage Quality across Harvest Events



RFQ range: Hancock. 2011. University of Georgia

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CONCLUSIONS: YIELD

- Think Flexibility!
- Greatest total yields
  - Teff
  - Annual ryegrass
  - Red clover + ryegrass
- Yield benefits from additional fertilization
  - No economic benefit with 56 kg N/ha
  - Yield increase with 112 kg N/ha showed to be economically beneficial

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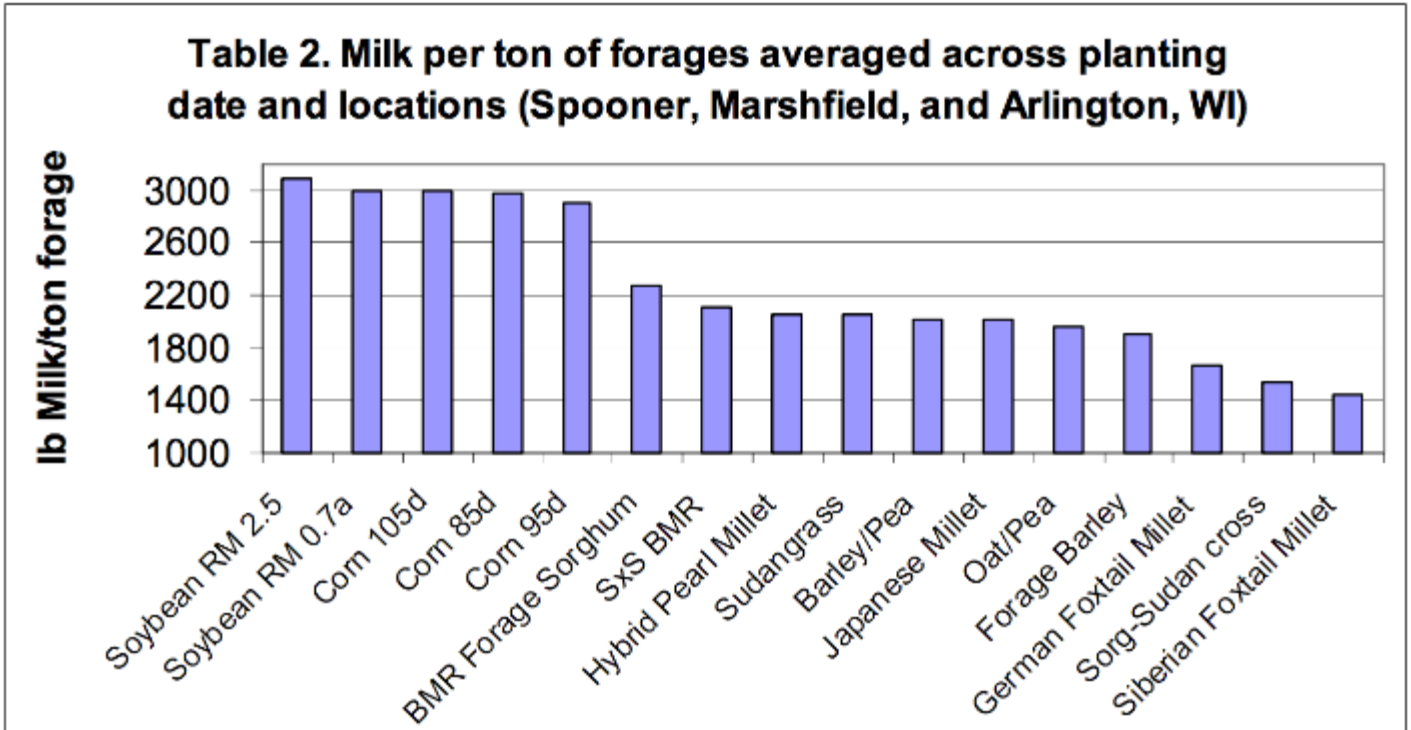
CONCLUSIONS: MANAGEMENT

- Previous research concluded that corn silage is often the best option for tonnage and nutritive value.



Undersander, D. UW-Extension: http://www.uwex.edu/ces/forage/pubs/best_forage_for_late_planting.pdf

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CONCLUSIONS: MANAGEMENT

- Previous research* concluded that corn silage is often the best option for tonnage and nutritive value.

- Under intensive grazing or haying management, teff, sudangrass, and ryegrass options are more suitable.

* Peterson et al. 2004. Universities of MN and WI-Madison

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TEFF

- Highest yielding
- Notable weed competition

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FUTURE RESEARCH

- Weed suppression effects

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Varietal trials, forage identification and selection , alfalfa history

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Growth and development

Growth and stand evaluation, weather and crop damage

Utilization and management

Hay, silages, pastures and grazing, biomass, stand termination

Soil and water management

Soil properties, benefits to soil, cover crops, irrigation management

Nutrient management

Nutrient guidelines, legume N fixation and credits

Pest management

Diseases, weeds, insects

Organic production

→ Organic Risk Management website for organic and transitioning producers

Forages for "U" workshops

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Minnesota Field Crop Trials – 2014

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2015 Dates and locations

University of Minnesota Extension will host three Forages for "U" workshops in areas that represent significant forage production and grazing acres:

Hutchinson, MN

Date & time: Tuesday, February 10, 10:00 a.m. – 2:30 p.m.

Location: McLeod County Fairgrounds, 840 Century Ave. S.W. Map

Program cost: $30 at the door, includes lunch

Contact: Nathan Winter (wint0146@umn.edu or 320-484-4303)

Fergus Falls, MN

Date & time: Tuesday, February 10, 5:00 – 9:00 p.m. (4:30 registration)

Location: Otter Tail Government Service Center, 500 Fir Ave W. Map

Program cost: $30 at the door, includes dinner

Contact: Doug Holen (holen009@umn.edu or 320-589-1711)

Rushford, MN

Date & time: Friday, February 20, 10:00 a.m. – 2:30 p.m. (9:30 registration)

Location: The Creamery, 407 S. Mill St. Map

Program cost: $30 at the door, includes lunch

Contact: Jake Overgaard (over0128@umn.edu or 507-457-6440)

Forages for "U" workshops

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Questions?

http://z.umn.edu/forages

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